

CPC**COOPERATIVE PATENT CLASSIFICATION****F16H**

GEARING { (steering of motor vehicles by differentially driving ground-engaging elements on opposite vehicle sides [B62D 11/02](#)) }

NOTE

1. Combinations including mechanical gearings are classified in groups [F16H 37/00](#) or [F16H 47/00](#) , unless they are provided for in groups [F16H 1/00](#) to [F16H 35/00](#) .
2. In this subclass, sets of rigidly-connected members are regarded as single members.
3. In this subclass, the following terms or expressions are used with the meanings indicated:
 - "toothed gearing" includes worm gearing and other gearing involving at least one wheel or sector provided with teeth or the equivalent, EXCEPT gearing with chains or toothed belts, which is treated as friction gearing;
 - "conveying motion" includes transmitting energy, and means that the applied and resultant motions are of the same kind, though they may differ in, e.g. speed, direction extent:
 - "rotary" implies that the motion may continue indefinitely;
 - "oscillating" means moving about an axis to an extent which is limited by the construction of the gearing, and which may exceed one revolution, the movement being alternately forwards and backwards during continued operation of the gearing;
 - "reciprocating" means moving substantially in a straight line, the movement being alternately forwards and backwards during continued operation of the gearing;
 - "reversing" or "reversal" means that an applied movement in one direction may produce a resultant movement in either of two opposed directions at will;
 - "central gears" includes any gears whose axis is the main axis of the gearing. Attention is drawn to the following places:

[A01D 69/06](#) Gearings in harvesting machines
[A63H 31/00](#) Gearing for toys
[B21B 35/12](#) Toothed-wheel gearing for metal-rolling mills
[B60K](#) Arrangement of transmissions in vehicles
[B61C 9/00](#) Transmissions for railway locomotives
[B62D 3/00](#) Vehicle steering gears
[B62M](#) Transmissions for cycles
[B63H 23/00](#) Transmissions for marine propulsions
[B63H 25/00](#) Marine steering gears
 { [B64C 27/12](#) , [B64C 27/58](#) Transmissions for helicopters
[B64D 35/00](#) Transmissions for aircraft }
[F01](#) to [F04](#) Machines, engines, pumps
[F15B 15/00](#) Gearings associated with fluid-actuated devices
[G01D 5/04](#) Gearing used in indicating or recording apparatus in connection with measuring devices
[H03J 1/00](#) Driving arrangements for tuning resonant circuits
[H04L 13/04](#) Driving mechanisms for apparatus for transmission of coded digital information.

WARNING

1. The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[F16H 48/00](#) covered by [F16H 1/38](#) ;
[F16H 48/02](#) covered by [B60K](#) ;
[F16H 48/04](#) covered by [B60K](#) ;
[F16H 48/06](#) covered by [F16H 1/38](#) ;
[F16H 48/08](#) covered by [F16H 1/40](#) ;
[F16H 48/10](#) covered by [F16H 1/42](#) ;
[F16H 48/12](#) covered by [F16H 35/04](#) ;
[F16H 48/14](#) covered by [F16H 35/04](#) C;
[F16H 48/16](#) covered by [F16H 35/04](#) , [F16H 41/00](#) ;
[F16H 48/18](#) covered by [F16H 39/40](#) ;
[F16H 48/20](#) covered by [F16H 1/44](#) ;
[F16H 48/22](#) covered by [F16H 1/44](#) ;
[F16H 48/24](#) covered by [F16H 1/44](#) ;
[F16H 48/26](#) covered by [F16H 1/45](#) S;
[F16H 48/28](#) covered by [F16H 1/45](#) , [F16H 1/45](#) B, [F16H 1/45](#) C;
[F16H 48/30](#) covered by [F16H 1/44](#) S.

Guidance heading: Toothed gearings for conveying rotary motion

F16H 1/00 **Toothed gearings for conveying rotary motion** (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H 3/00](#))

- F16H 1/003 . { Monodirectionally torque-transmitting toothed gearing }
- F16H 1/006 . { the driving and driven axes being designed to assume variable positions relative to one another during operation }
- F16H 1/02 . without gears having orbital motion
- F16H 1/04 . . involving only two intermeshing members
- F16H 1/06 . . . with parallel axes
- F16H 1/08 the members having helical, herringbone, or like teeth
- F16H 1/10 one of the members being internally toothed
- F16H 1/12 . . with non-parallel axes
- F16H 1/125 . . . { comprising spiral gears }
- F16H 1/14 . . . comprising conical gears only
- F16H 1/145 { with offset axes, e.g. hypoid gearings }
- F16H 1/16 . . . comprising worm and worm-wheel
- F16H 1/163 { with balls between the co-operating parts }
- F16H 1/166 { with members rotating around axes on the worm or worm-wheel }
- F16H 1/18 . . . the members having helical, herringbone, or like teeth ([F16H 1/14](#) takes precedence)
- F16H 1/20 . . involving more than two intermeshing members
- F16H 1/203 . . { with non-parallel axes ([F16H 1/22](#) takes precedence) }
- F16H 1/206 . . { characterised by the driving or driven member being composed of two or more gear wheels }

- F16H 1/22 ... with a plurality of driving or driven shafts ; with arrangements for dividing torque between two or more intermediate shafts
- F16H 1/222 { with non-parallel axes }
- F16H 1/225 { with two or more worm and worm-wheel gearings }
- F16H 1/227 { comprising two or more gearwheels in mesh with the same internally toothed wheel }
- F16H 1/24 .. involving gears essentially having intermeshing elements other than involute or cycloidal teeth ([F16H 1/16 takes precedence](#))
- F16H 1/26 .. Special means compensating for misalignment of axes
- F16H 1/28 . with gears having orbital motion
- F16H 1/2809 .. { with means for equalising the distribution of load on the planet-wheels }
- F16H 1/2818 ... { by allowing limited movement of the ring gear relative to the casing or shaft }
- F16H 1/2827 ... { by allowing limited movement of the planet carrier, e.g. relative to its shaft }
- F16H 1/2836 ... { by allowing limited movement of the planets relative to the planet carrier or by using free floating planets }
- F16H 1/2845 ... { by allowing limited movement of the sun gear }
- F16H 1/2854 .. { involving conical gears }
- F16H 1/2863 .. { Arrangements for adjusting or for taking-up backlash }
- F16H 2001/2872 .. comprising three central gears, i.e. ring or sun gear, engaged by at least one common orbital gear mounted on an idling carrier
- F16H 2001/2881 .. comprising two axially spaced central gears, i.e. ring or sun gear, engaged by at least one common orbital gear wherein one of the central gears is forming the output
- F16H 2001/289 .. comprising two or more coaxial and identical sets of orbital gears, e.g. for distributing torque between the coaxial sets
- F16H 1/30 .. in which an orbital gear has an axis crossing the main axes of the gearing and has helical teeth or is a worm
- F16H 1/32 .. in which the central axis of the gearing lies inside the periphery of an orbital gear
- F16H 1/321 ... { the orbital gear being nutating }
- F16H 2001/322 ... comprising at least one universal joint, e.g. a Cardan joint
- F16H 2001/323 ... comprising eccentric crankshafts driving or driven by a gearing
- F16H 2001/324 ... comprising two axially spaced, rigidly interconnected, orbital gears
- F16H 2001/325 ... comprising a carrier with pins guiding at least one orbital gear with circular holes
- F16H 2001/326 ... comprising a carrier with linear guiding means guiding at least one orbital gear
- F16H 2001/327 ... with orbital gear sets comprising an internally toothed ring gear
- F16H 2001/328 ... comprising balancing means
- F16H 1/34 .. involving gears essentially having intermeshing elements other than involute or cycloidal teeth ([in worm gearing F16H 1/30](#))
- F16H 1/36 .. with two central gears coupled by intermeshing orbital gears
- F16H 1/46 .. Systems consisting of a plurality of gear trains each with orbital gears, { i.e. systems having three or more central gears }
- F16H 1/48 .. Special means compensating for misalignment of axes { e.g. for equalising distribution of load on the face width of the teeth ([in combination with distribution of load on the planet-wheels F16H 1/2809](#)) }

F16H 3/00

Toothed gearings for conveying rotary motion with variable gear ratio or for reversing rotary motion ([speed-changing or reversing mechanisms F16H 59/00](#) to

F16H 63/00)

- F16H 3/001 . { convertible for varying the gear-ratio, e.g. for selecting one of several shafts as the input shaft }
- F16H 3/002 . { using gears having teeth movable out of mesh ([F16H 3/42](#) takes precedence) }
- F16H 3/003 . { the gear-ratio being changed by inversion of torque direction }
- F16H 3/005 . . { for gearings using gears having orbital motion }
- F16H 3/006 . { power being selectively transmitted by either one of the parallel flow paths }
- F16H 2003/007 . . with two flow paths, one being directly connected to the input, the other being connected to the input through a clutch
- F16H 2003/008 . . comprising means for selectively driving countershafts
- F16H 3/02 . without gears having orbital motion
- F16H 3/04 . . with internally-toothed gears
- F16H 3/06 . . with worm and worm-wheel or gears essentially having helical or herring-bone teeth

NOTE

In groups [F16H 3/08](#) , [F16H 3/16](#) and [F16H 3/20](#) , gears which can be put out of mesh are not taken into consideration if they are used for reversal only.

- F16H 3/08 . . exclusively or essentially with continuously meshing gears, that can be disengaged from their shafts
- F16H 2003/0803 . . . with countershafts coaxial with input or output shaft
- F16H 2003/0807 . . . with gear ratios in which the power is transferred by axially coupling idle gears
- F16H 2003/0811 . . . using unsynchronised clutches
- F16H 2003/0815 . . . using torque sharing, i.e. engaging two gear ratios simultaneously to transfer large torque, e.g. using one slipping clutch
- F16H 2003/0818 . . . comprising means for power-shifting
- F16H 2003/0822 . . . characterised by the arrangement of at least one reverse gear
- F16H 2003/0826 . . . wherein at least one gear on the input shaft, or on a countershaft is used for two different forward gear ratios
- F16H 3/083 . . . with radially acting and axially controlled clutching members, e.g. sliding keys { ([clutches with clutching members movable otherwise than only axially F16D 11/12](#) ; [clutches with wedgeable clutching members F16D 15/00](#) ; systems of mechanically actuated clutches [F16D 21/04](#)) }
- F16H 3/085 . . . with more than one output shaft
- F16H 3/087 . . . characterised by the disposition of the gears ([F16H 3/083](#) , [F16H 3/085](#) take precedence)

NOTE

When counting the countershafts, the reverse countershaft is not taken into consideration if it is used for reversal only.

| | | |
|----------------|-------|---|
| F16H 3/089 | .... | all of the meshing gears being supported by a pair of parallel shafts, one being the input shaft and the other the output shaft, there being no countershaft involved |
| F16H 3/091 | .... | including a single countershaft |
| F16H 3/0915 | ..... | { with coaxial input and output shafts } |
| F16H 3/093 | .... | with two or more countershafts |
| F16H 2003/0931 | ..... | each countershaft having an output gear meshing with a single common gear on the output shaft |
| F16H 2003/0933 | ..... | with coaxial countershafts |
| F16H 2003/0935 | ..... | with multiple countershafts comprising only one idle gear and one gear fixed to the countershaft |
| F16H 2003/0936 | ..... | with multiple countershafts comprising only two idle gears and one gear fixed to the countershaft |
| F16H 2003/0938 | ..... | with multiple gears on the input shaft directly meshing with respective gears on the output shaft |
| F16H 3/095 | ..... | with means for ensuring an even distribution of torque between the countershafts |
| F16H 3/097 | ..... | the input and output shafts being aligned on the same axis |
| F16H 3/10 | ... | with one or more one-way clutches as an essential feature |
| F16H 3/12 | ... | with means for synchronisation not incorporated in the clutches (synchronised clutches F16D 23/02) |
| F16H 2003/123 | .... | using a brake |
| F16H 3/126 | .... | { using an electric drive } |
| F16H 3/14 | ... | Gearings for reversal only |
| F16H 3/145 | .... | { with a pair of coaxial bevel gears, rotatable in opposite directions } |
| F16H 3/16 | .. | essentially with both gears that can be put out of gear and continuously-meshing gears that can be disengaged from their shafts |
| F16H 3/18 | ... | Gearings for reversal only |
| F16H 3/20 | .. | exclusively or essentially using gears that can be moved out of gear |
| F16H 3/22 | ... | with gears shiftable only axially |
| F16H 3/24 | .... | with driving and driven shafts coaxial |
| F16H 3/26 | ..... | and two or more additional shafts |
| F16H 3/28 | ..... | an additional shaft being coaxial with the main shafts |
| F16H 3/30 | .... | with driving and driven shafts not coaxial |
| F16H 3/32 | ..... | and an additional shaft |
| F16H 3/34 | ... | with gears shiftable otherwise than only axially |
| F16H 3/36 | ... | with a single gear meshable with any of a set of coaxial gears of different diameters |
| F16H 3/363 | .... | { the teeth of the set of coaxial gears being arranged on a surface of generally conical shape } |
| F16H 3/366 | .... | { the teeth of the set of coaxial gears being arranged on a generally flat, e.g. disc-type, surface } |
| F16H 3/38 | ... | with synchro-meshing |
| F16H 3/385 | .... | { with braking means (constructional features of the final output mechanisms for reversing F16H 63/302) } |
| F16H 3/40 | ... | Gearings for reversal only |

- F16H 3/42 .. with gears having teeth formed or arranged for obtaining multiple gear ratios, e.g. nearly infinitely variable
- F16H 3/423 ... { the teeth being arranged on a surface of generally conical shape }
- F16H 3/426 ... { the teeth being arranged on a generally flat, e.g. disc-type surface }
- F16H 3/44 . using gears having orbital motion { (the gear-ratio being changed by inversion of torque direction [F16H 3/005](#)) }
- F16H 2003/442 .. comprising two or more sets of orbital gears arranged in a single plane
- F16H 2003/445 .. without permanent connection between the input and the set of orbital gears
- F16H 2003/447 .. without permanent connection between the set of orbital gears and the output
- F16H 3/46 .. Gearings having only two central gears, connected by orbital gears ([F16H 3/68](#) to [F16H 3/78](#) take precedence)
- F16H 3/48 ... with single orbital gears or pairs or rigidly-connected orbital gears
- F16H 3/50 comprising orbital conical gears
- F16H 3/52 comprising orbital spur gears
- F16H 3/54 one of the central gears being internally toothed and the other externally toothed
- F16H 3/56 both central gears being sun gears
- F16H 3/58 ... with sets of orbital gears, each consisting of two or more intermeshing orbital gears
- F16H 3/60 ... Gearings for reversal only
- F16H 3/62 .. Gearings having three or more central gears ([F16H 3/68](#) to [F16H 3/78](#) take precedence)
- F16H 3/64 ... composed of a number of gear trains, the drive always passing through all the trains, each train having not more than one connection for driving another train
- F16H 3/66 ... composed of a number of gear trains without drive passing from one train to another
- F16H 3/663 { with conveying rotary motion between axially spaced orbital gears, e.g. RAVIGNEAUX }
- F16H 3/666 { with compound planetary gear units, e.g. two intermeshing orbital gears ([F16H 3/663](#) takes precedence) }
- F16H 3/68 .. in which an orbital gear has an axis crossing the main axis of the gearing and has helical teeth or is a worm
- F16H 3/70 .. in which the central axis of the gearing lies inside the periphery of an orbital gear
- F16H 3/72 .. with a secondary drive, e.g. regulating motor, in order to vary speed continuously
- F16H 3/721 ... { with an energy dissipating device, e.g. regulating brake or fluid throttle, in order to vary speed continuously }
- F16H 3/722 { with a fluid throttle }
- F16H 3/724 ... { using external powered electric machines }
- F16H 3/725 { with means to change ratio in the mechanical gearing }
- F16H 3/727 ... { with at least two dynamo electric machines for creating an electric power path inside the gearing, e.g. using generator and motor for a variable power torque path (special adapted for a hybrid electric vehicle [B60K 6/04](#)) }
- F16H 3/728 { with means to change ratio in the mechanical gearing }
- F16H 3/74 .. Complexes, not using actuatable speedchanging or regulating members, e.g. with gear ratio determined by free play of frictional or other forces
- F16H 3/76 .. with an orbital gear having teeth formed or arranged for obtaining multiple gear

ratios, e.g. nearly infinitely variable

F16H 3/78 . . . Special adaptation of synchronisation mechanisms to these gearings

Guidance heading: **Gearing for conveying rotary motion by endless flexible members** { (control of exclusively fluid gearings for conveying rotary motion by endless flexible members [F16H 61/38C](#)) }

F16H 7/00 **Gearings for conveying rotary motion by endless flexible members** (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H 9/00](#) ; { Belts, V-belts, ropes, cables, and chains [F16G](#) , chain-wheels [F16H 55/30](#) ; pulleys [F16H 55/36](#) })

F16H 7/02 . with belts ; with V-belts

F16H 7/023 . . { with belts having a toothed contact surface or regularly spaced bosses or hollows for slipless or nearly slipless meshing with complementary profiled contact surface of a pulley (toothed belts [F16G 1/28](#) , [F16G 5/20](#)) }

F16H 2007/026 . . with belts running in a mist of oil

F16H 7/04 . with ropes

F16H 7/06 . with chains

F16H 7/08 . Means for varying tension of belts, ropes, or chains (pulleys of adjustable construction [F16H 55/52](#) ; { gearings with endless belts [F16H 7/02](#) ; tensioning for chains or belts specially adapted for cycles [B62M 9/16](#) ; belt or chain tensioning arrangements for endless conveyers [B65G 23/44](#) })

F16H 2007/0802 . . . Actuators for final output members

F16H 2007/0804 . . . Leaf springs

F16H 2007/0806 . . . Compression coil springs

F16H 2007/0808 . . . Extension coil springs

F16H 2007/081 . . . Torsion springs

F16H 2007/0812 . . . Fluid pressure

F16H 2007/0814 with valves opening on surplus pressure

F16H 2007/0817 with means for venting unwanted gas

F16H 2007/0819 . . . Rubber or other elastic materials

F16H 2007/0821 . . . working with gravity

F16H 2007/0823 . . . Electric actuators

F16H 2007/0825 . . . influenced by other actuators of output members

F16H 7/0827 . . { for disconnecting the drive }

F16H 7/0829 . . { with vibration damping means }

F16H 7/0831 . . . { of the dry friction type }

F16H 7/0834 . . . { of the viscous friction type, e.g. viscous fluid }

F16H 7/0836 . . . { of the fluid and restriction type, e.g. dashpot }

F16H 7/0838 . . . { of the dissipating material type, e.g. elastomeric spring }

F16H 2007/084 . . . having vibration damping characteristics dependent on the moving direction of the tensioner

- F16H 2007/0842 .. Mounting or support of tensioner
- F16H 2007/0844 ... Mounting elements essentially within boundaries of final output members
- F16H 2007/0846 .. comprising a mechanical stopper
- F16H 7/0848 .. { with means for impeding reverse motion }
- F16H 2007/0851 ... Wedges
- F16H 2007/0853 ... Ratchets
- F16H 2007/0855 comprising a clip member engaging with the rack teeth
- F16H 2007/0857 ... Screw mechanisms
- F16H 2007/0859 ... Check valves
- F16H 2007/0861 .. comprising means for sensing tensioner position
- F16H 2007/0863 .. Finally actuated members, e.g. constructional details thereof
- F16H 2007/0865 ... Pulleys
- F16H 2007/0868 comprising means for changing working diameter of pulley
- F16H 2007/087 ... Sprockets
- F16H 2007/0872 ... Sliding members
- F16H 2007/0874 ... Two or more finally actuated members
- F16H 2007/0876 .. Control or adjustment of actuators
- F16H 2007/0878 ... Disabling during transport
- F16H 2007/088 ... Manual adjustment
- F16H 2007/0882 ... the tension being a function of temperature
- F16H 2007/0885 ... the tension being a function of engine running condition
- F16H 2007/0887 ... the tension being a function of load
- F16H 2007/0889 .. Path of movement of the finally actuated member
- F16H 2007/0891 ... Linear path
- F16H 2007/0893 ... Circular path
- F16H 2007/0895 ... Internal to external direction
- F16H 2007/0897 ... External to internal direction
- F16H 7/10 .. by adjusting the axis of a pulley { [F16H 7/0827](#) takes precedence }
- F16H 7/12 ... of an idle pulley
- F16H 7/1209 { with vibration damping means (vibration damping per se [F16F](#)) }
- F16H 7/1218 { of the dry friction type }
- F16H 7/1227 { of the viscous friction type, e.g. viscous fluid }
- F16H 7/1236 { of the fluid and restriction type, e.g. dashpot }
- F16H 7/1245 { of the dissipating material type, e.g. elastomeric spring }
- F16H 7/1254 { without vibration damping means }
- F16H 7/1263 { where the axis of the pulley moves along a substantially straight path }
- F16H 7/1272 { with means for impeding reverse motion }
- F16H 7/1281 { where the axis of the pulley moves along a substantially circular path }
- F16H 7/129 { with means for impeding reverse motion }
- F16H 7/14 ... of a driving or driven pulley
- F16H 7/16 without adjusting the driving or driven shaft
- F16H 7/18 . Means for guiding or supporting belts, ropes, or chains (construction of pulleys [F16H](#)

[55/36](#))

- F16H 2007/185 . . the guiding surface in contact with the belt, rope or chain having particular shapes, structures or materials
- F16H 7/20 . . Mountings for rollers or pulleys
- F16H 7/22 . Belt, rope, or chain shifters
- F16H 7/24 . Equipment for mounting belts, ropes or chains

F16H 9/00 **Gearings for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by endless flexible members** (control of change-speed or reversing-gearings conveying rotary motion [F16H 59/00](#) to [F16H 63/00](#))

- F16H 9/02 . without members having orbital motion
- F16H 9/04 . . using belts, V-belts, or ropes (with toothed belts [F16H 9/24](#) ; pulleys of adjustable construction [F16H 55/52](#))
- F16H 9/06 . . . engaging a stepped pulley
- F16H 9/08 . . . engaging a conical drum ([F16H 9/12](#) takes precedence)
- F16H 9/10 . . . engaging a pulley provided with radially-actuatable elements carrying the belt
- F16H 9/12 . . . engaging a pulley built-up out of relatively axially-adjustable parts in which the belt engages the opposite flanges of the pulley directly without interposed belt-supporting members { (means for controlling the geometrical interrelationship of pulleys and the endless flexible member, e.g. belt alignment or position of the resulting axial pulley force in the plane perpendicular to the pulley axis [F16H 61/662P](#)) }
- F16H 9/125 { characterised by means for controlling the geometrical interrelationship of pulleys and the endless flexible member, e.g. belt alignment or position of the resulting axial pulley force in the plane perpendicular to the pulley axis }
- F16H 9/14 using only one pulley built-up out of adjustable conical parts
- F16H 9/16 using two pulleys, both built-up out of adjustable conical parts
- F16H 2009/163 Arrangements of two or more belt gearings mounted in parallel, e.g. for increasing transmittable torque
- F16H 2009/166 Arrangements of two or more belt gearings mounted in series, e.g. for increasing ratio coverage
- F16H 9/18 only one flange of each pulley being adjustable
- F16H 9/20 both flanges of the pulleys being adjustable
- F16H 9/22 . . . specially adapted for ropes
- F16H 9/24 . . using chains or toothed belts, belts in the form of links ; Chains or belts specially adapted to such gearing (toothed belts [F16G 1/28](#) ; V-belts in the form of links [F16G 5/18](#) ; toothed V-belts [F16G 5/20](#))
- F16H 2009/245 . . . with idle wheels to assist ratio change
- F16H 9/26 . with members having orbital motion

Guidance heading: **Other friction gearing for conveying rotary motion** { (control of exclusively friction gearings for conveying rotary motion [F16H 61/38B](#)) }

F16H 13/00 **Gearings for conveying rotary motion by friction between rotary members** (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H](#)

[15/00](#) ; { [friction discs](#) [F16H 55/32](#) })

- [F16H 13/02](#) . without members having orbital motion
- [F16H 13/04](#) . . with balls or with rollers acting in a similar manner
- [F16H 13/06](#) . with members having orbital motion
- [F16H 13/08](#) . . with balls or with rollers acting in a similar manner
- [F16H 13/10](#) . Means for influencing the pressure between the members
- [F16H 13/12](#) . . by magnetic forces
- [F16H 13/14](#) . . for automatically varying the pressure mechanically

[F16H 15/00](#) **Gearings for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by friction between rotary members ({ [gearings for reversal only](#) [F16H 3/14](#) , [F16H 3/60](#) } ; control of change-speed or reversing-gearings conveying rotary motion [F16H 59/00](#) to [F16H 63/00](#))**

- [F16H 15/01](#) . characterised by the use of a magnetisable powder or liquid as friction medium between the rotary members
- [F16H 15/02](#) . without members having orbital motion
- [F16H 15/04](#) . . Gearings providing a continuous range of gear ratios
- [F16H 15/06](#) . . . in which a member A of uniform effective diameter mounted on a shaft may co-operate with different parts of a member B
- [F16H 15/08](#) in which the member B is a disc with a flat or approximately flat friction surface
- [F16H 15/10](#) in which the axes of the two members cross or intersect
- [F16H 15/12](#) in which one or each member is duplicated, e.g. for obtaining better transmission, for lessening the reaction forces on the bearings
- [F16H 15/14](#) in which the axes of the members are parallel or approximately parallel
- [F16H 15/16](#) in which the member B has a conical friction surface
- [F16H 15/18](#) externally
- [F16H 15/20](#) co-operating with the outer rim of the member A, which is perpendicular or nearly perpendicular to the friction surface of the member B
- [F16H 15/22](#) the axes of the members being parallel or approximately parallel
- [F16H 15/24](#) internally
- [F16H 15/26](#) in which the member B has a spherical friction surface centered on its axis of revolution
- [F16H 15/28](#) with external friction surface
- [F16H 15/30](#) with internal friction surface
- [F16H 15/32](#) in which the member B has a curved friction surface formed as a surface of a body of revolution generated by a curve which is neither a circular arc centered on its axis of revolution nor a straight line
- [F16H 15/34](#) with convex friction surface
- [F16H 15/36](#) with concave friction surface, e.g. a hollow toroid surface

- F16H 15/38 with two members B having hollow toroid surface opposite to each other, the member or members A being adjustably mounted between the surfaces
- F16H 2015/383 with two or more sets of toroid gearings arranged in parallel
- F16H 2015/386 with two or more sets of toroid gearings arranged in series
- F16H 15/40 ... in which two members co-operative by means of balls, or rollers of uniform effective diameter, not mounted on shafts
- F16H 15/42 ... in which two members co-operate by means of rings or by means of parts of endless flexible members pressed between the first mentioned members
- F16H 15/44 ... in which two members of non-uniform effective diameter directly co-operate with one another
- F16H 15/46 .. Gearings providing a discontinuous or stepped range of gear ratios
- F16H 15/48 . with members having orbital motion
- F16H 15/50 .. Gearings providing a continuous range of gear ratios
- F16H 15/503 ... { in which two members co-operate by means of balls or rollers of uniform effective diameter, not mounted on shafts }
- F16H 15/506 ... { in which two members of non-uniform effective diameter directly co-operate with one another }
- F16H 15/52 ... in which a member of uniform effective diameter mounted on a shaft may co-operate with different parts of another member
- F16H 15/54 ... in which two members co-operate by means of rings or by means of parts of endless flexible members pressed between the first-mentioned members
- F16H 15/56 .. Gearings providing a discontinuous or stepped range of gear ratios
-
- F16H 19/00** **Gearings comprising essentially only toothed gears or friction members and not capable of conveying indefinitely-continuing rotary motion (with intermittently-driving members [F16H 27/00](#) - [F16H 31/00](#) ; rope or like tackle for lifting or haulage [B66D 3/00](#))**
-
- F16H 19/001 . { for conveying reciprocating or limited rotary motion }
- F16H 19/003 .. { comprising a flexible member }
- F16H 19/005 ... { for conveying oscillating or limited rotary motion }
- F16H 19/006 ... { for converting reciprocating into an other reciprocating motion }
- F16H 2019/008 .. Facilitating the engagement or stopping of gear sections
-
- F16H 19/02 . for interconverting rotary motion and reciprocating motion
- F16H 19/025 .. { comprising a friction shaft }
- F16H 19/04 .. comprising a rack
- F16H 19/043 ... { for converting reciprocating movement in a continuous rotary movement or vice versa, e.g. by opposite racks engaging intermittently for a part of the stroke }
-
- F16H 2019/046 ... Facilitating the engagement or stopping of racks
- F16H 19/06 .. comprising { flexible members, e.g. an } endless flexible member

WARNING

Groups [F16H 19/0604](#) - [F16H 19/0672](#) are not complete pending

reclassification; see also this group

| | | |
|----------------|------|---|
| F16H 19/0604 | ... | { with means to double or half the stroke of the reciprocating member } |
| F16H 2019/0609 | ... | the reciprocating motion being created by drums with different diameters using a differential effect |
| F16H 2019/0613 | ... | the flexible member being a toothed belt or chain engaging a rack |
| F16H 19/0618 | ... | { the flexible member, e.g. cable, being wound on a drum or thread for creating axial movement parallel to the drum } |
| F16H 19/0622 | ... | { for converting reciprocating movement into oscillating movement and vice versa, the reciprocating movement is perpendicular to the axis of oscillation } |
| F16H 2019/0627 | .... | { the flexible member, e.g. a cable, being wound with one string to a drum and unwound with other string from the same or an other drum to create reciprocating movement of the flexible member } |
| F16H 19/0631 | ... | { the flexible member, e.g. a cable, being wound with one string to a drum and unwound with other string from the same or an other drum to create reciprocating movement of the flexible member } |
| F16H 19/0636 | ... | { the flexible member being a non-buckling chain } |
| F16H 19/064 | ... | { the flexible push member uses a bended profile to generate stiffness, e.g. spreading belts } |
| F16H 19/0645 | ... | { using guided flexible members, i.e. the flexible member being supported at least partially by a guide to transmit the reciprocating movement } |
| F16H 19/065 | ... | { with flexible members between discs creating reciprocation by relative rotation of the discs } |
| F16H 19/0654 | ... | { using twisting movement of flexible members to shorten the axial length } |
| F16H 19/0659 | ... | { combined with means for creating non-linear characteristics, e.g. cams; Means for creating different velocity on forward and reverse stroke } |
| F16H 19/0663 | ... | { with telescopic means, e.g. for supporting or shielding the reciprocating member } |
| F16H 2019/0668 | ... | Both ends of the flexible member are fixed to the casing |
| F16H 19/0672 | ... | { characterised by means for tensioning the flexible member } |
| F16H 2019/0677 | ... | characterised by the means for fixing the flexible member to a drum |
| F16H 2019/0681 | ... | characterised by an endless flexible member, i.e. the flexible member forming a closed loop |
| F16H 2019/0686 | .... | the flexible member being directly driven, e.g. by a pulley, and the reciprocating member forming a part of the loop, i.e. a part of the endless flexible member |
| F16H 2019/069 | ... | with means for generating two superposed movements, e.g. for driving a X-Y table |
| F16H 2019/0695 | ... | Generating pivoting movement of a joint |
| F16H 19/08 | . | for interconverting rotary motion and oscillating motion |
| F16H 2019/085 | .. | by using flexible members |

Guidance heading: Gearing for conveying or converting motion by means of levers, links, or cams (combination of gearings of different types [F16H 37/00](#))

F16H 21/00 Gearings comprising primarily only links or levers, with or without slides

- F16H 21/02 . the movements of two or more independently-moving members being combined into a single movement
- F16H 21/04 . Guiding mechanisms, e.g. for straight-line guidance ([for drawing-machines B43L](#))
- F16H 21/06 . which can be made ineffective when desired
- F16H 21/08 . . by pushing a reciprocating rod out of its operative position
- F16H 21/10 . all movement being in or parallel to a single plane
- F16H 21/12 . . for conveying rotary motion
- F16H 21/14 . . . by means of cranks, eccentrics, or like members fixed to one rotary member and guided along tracks on the other
- F16H 21/16 . . for interconverting rotary motion and reciprocating motion
- F16H 21/18 . . . Crank gearings ; Eccentric gearings
- F16H 21/20 with adjustment of throw ([adjustable cranks or eccentrics F16C 3/28](#) ; [adjustable connecting-rods F16C 7/06](#))
- F16H 21/22 with one connecting-rod and one guided slide to each crank or eccentric
- F16H 21/24 without further links or guides
- F16H 21/26 with toggle action
- F16H 21/28 with cams or additional guides
- F16H 21/30 with members having rolling contact
- F16H 21/32 with additional members comprising only pivoted links or arms
- F16H 21/34 with two or more connecting-rods to each crank or eccentric
- F16H 21/36 without swinging connecting-rod, e.g. with epicyclic parallel motion, slot and crank motion
- F16H 21/365 { [with planetary gearing having a ratio of 2:1 between sun gear and planet gear](#) }
- F16H 21/38 with means for temporary energy accumulation, e.g. to overcome dead-centre positions
- F16H 21/40 . . for interconverting rotary motion and oscillating motion
- F16H 21/42 . . . with adjustable throw
- F16H 21/44 . . for conveying or interconverting oscillating or reciprocating motions
- F16H 21/46 . with movements in three dimensions
- F16H 21/48 . . for conveying rotary motions
- F16H 21/50 . . for interconverting rotary motion and reciprocating motion ([F16H 23/00 takes precedence](#))
- F16H 21/52 . . for interconverting rotary motion and oscillating motion
- F16H 21/54 . . for conveying or interconverting oscillating or reciprocating motions
- F16H 23/00** **Wobble-plate gearings ; Oblique-crank gearings** { ([conveying rotary motion with toothed nutating gears F16H 1/321](#)) }
- F16H 23/02 . with adjustment of throw by changing the position of the wobble-member ([F16H 29/04](#) , [F16H 33/10 take precedence](#))
- F16H 23/04 . with non-rotary wobble-members

- F16H 23/06 . . with sliding members hinged to reciprocating members
- F16H 23/08 . . connected to reciprocating members by connecting-rods
- F16H 23/10 . with rotary wobble-plates with plane surfaces
- F16H 25/00 Gearing comprising primarily only cams, cam-followers and screw-and-nut mechanisms**
- F16H 25/02 . the movements of two or more independently moving members being combined into a single movement
- F16H 25/04 . for conveying rotary motion
- F16H 25/06 . . with intermediate members guided along tracks on both rotary members
- F16H 2025/063 . . . the intermediate members, e.g. balls, engaging cams on opposite coaxial discs
- F16H 2025/066 . . . the intermediate members being rollers supported in a chain
- F16H 25/08 . for interconverting rotary motion and reciprocating motion ([F16H 23/00](#) takes precedence)
- F16H 25/10 . . with adjustable throw (adjustable cams [F16H 53/04](#))
- F16H 25/12 . . with reciprocation along the axis of rotation, e.g. gearings with helical grooves and automatic reversal, { or cams } (screw mechanism without automatic reversal [F16H 25/20](#))
- F16H 25/122 . . . { Gearings with helical grooves and automatic reversal }
- F16H 25/125 . . . { having the cam on an end surface of the rotating element }
- F16H 2025/127 . . . using electric solenoids for generating the reciprocating motion
- F16H 25/14 . . with reciprocation perpendicular to the axis of rotation ([F16H 21/36](#) takes precedence)
- F16H 25/16 . for interconverting rotary motion and oscillating motion
- F16H 25/18 . for conveying or interconverting oscillating or reciprocating motions
- F16H 25/183 . . { conveying only reciprocating motion, e.g. wedges }
- F16H 25/186 . . { with reciprocation along the axis of oscillation }
- F16H 25/20 . . Screw mechanisms (with automatic reversal [F16H 25/12](#))
- F16H 25/2003 . . . { with arrangements for taking up backlash ([F16H 25/2209](#) takes precedence) }
- F16H 25/2006 { with more than one nut or with nuts consisting of more than one bearing part }
- F16H 25/2009 { with radial preloading }
- F16H 2025/2012 using a spring member creating rotary torque for counter rotating the two nuts, e.g. a torsion bar
- F16H 25/2015 . . . { Elements specially adapted for stopping actuators in the end position; Position sensing means }
- F16H 25/2018 . . . { with both screw and nut being driven, i.e. screw and nut are both rotating }
- F16H 25/2021 . . . { with means for avoiding overloading }
- F16H 25/2025 . . . { with means to disengage the nut or screw from their counterpart; Means for connecting screw and nut for stopping reciprocating movement ([F16H 25/2015](#) takes precedence) }

| | | |
|----------------|------|--|
| F16H 2025/2028 | ... | ... specially adapted for converting reciprocating motion into rotary motion, e.g. by using screw profile with high efficiency |
| F16H 2025/2031 | ... | Actuator casings |
| F16H 2025/2034 | .... | Extruded frame casings |
| F16H 2025/2037 | ... | Actuator supports or means for fixing piston end, e.g. flanges |
| F16H 2025/204 | ... | Axial sliding means, i.e. for rotary support and axial guiding of nut or screw shaft |
| F16H 2025/2043 | ... | Screw mechanisms driving an oscillating lever, e.g. lever with perpendicular pivoting axis |
| F16H 2025/2046 | ... | with gears arranged perpendicular to screw shaft axis, e.g. helical gears engaging tangentially the screw shaft |
| F16H 25/205 | ... | { comprising alternate power paths, e.g. for fail safe back-up } |

WARNING

This group is not complete pending reclassification; see also [F16H 25/20](#) and subgroups

| | | |
|----------------|-----|---|
| F16H 2025/2053 | ... | Screws in parallel arrangement driven simultaneously with an output member moved by both screws |
| F16H 25/2056 | ... | { Telescopic screws with at least three screw members in coaxial arrangement } |

WARNING

This group is not complete pending reclassification, see also [F16H 25/20](#) and subgroups

| | | |
|----------------|-------|---|
| F16H 2025/2059 | ... | Superposing movement by two coaxial screws, e.g. with opposite thread direction (telescopic screws with three screw members F16H 25/2056) |
| F16H 2025/2062 | ... | Arrangements for driving the actuator |
| F16H 2025/2065 | .... | Manual back-up means for overriding motor control, e.g. hand operation in case of failure |
| F16H 2025/2068 | .... | Means for returning linear actuator to zero position, e.g. upon occurrence of failure by using a spring |
| F16H 2025/2071 | .... | Disconnecting drive source from the actuator, e.g. using clutches for release of drive connection during manual control |
| F16H 2025/2075 | .... | Coaxial drive motors |
| F16H 2025/2078 | ..... | the rotor being integrated with the nut body |
| F16H 2025/2081 | .... | Parallel arrangement of drive motor to screw axis |
| F16H 2025/2084 | .... | Perpendicular arrangement of drive motor to screw axis |
| F16H 2025/2087 | .... | using planetary gears |
| F16H 2025/209 | .... | using worm gears |
| F16H 2025/2093 | .... | using conical gears |
| F16H 2025/2096 | .... | using endless flexible members |
| F16H 25/22 | ... | with balls, rollers, or similar members between the co-operating parts ; Elements essential to the use of such members |
| F16H 25/2204 | .... | { with balls } |
| F16H 25/2209 | ..... | { with arrangements for taking up backlash } |
| F16H 25/2214 | ..... | { with elements for guiding the circulating balls } |

| | | |
|----------------|-------|---|
| F16H 25/2219 | ..... | { Axially mounted end-deflectors } |
| F16H 25/2223 | ..... | { Cross over deflectors between adjacent thread turns, e.g. S-form deflectors connecting neighbouring threads } |
| F16H 25/2228 | ..... | { the device for circulation forming a part of the screw member } |
| F16H 25/2233 | ..... | { with cages or means to hold the balls in position } |
| F16H 25/2238 | ..... | { using ball spacers, i.e. spacers separating the balls, e.g. by forming a chain supporting the balls } |
| F16H 2025/2242 | ..... | Thread profile of the screw or nut showing a pointed "gothic" arch in cross-section |
| F16H 25/2247 | .... | { with rollers } |
| F16H 25/2252 | ..... | { Planetary rollers between nut and screw } |
| F16H 2025/2257 | ..... | with means for shifting planetary rollers axially, e.g. into central position |
| F16H 25/2261 | ..... | { arranged substantially perpendicular to the screw shaft axis } |
| F16H 25/2266 | ..... | { arranged substantially in parallel to the screw shaft axis (planetary rollers F16H 25/2252) } |
| F16H 2025/2271 | ..... | with means for guiding circulating rollers |
| F16H 2025/2276 | ..... | using roller spacers, i.e. spacers separating the rollers, e.g. by forming a complete chain |
| F16H 2025/228 | ..... | Screw mechanisms having rollers being supported by the screw shaft and engaging the nut |
| F16H 25/2285 | .... | { with rings engaging the screw shaft with the inner perimeter, e.g. using inner rings of a ball bearing } |
| F16H 25/229 | ..... | { Eccentric rings with their axis arranged substantially parallel to the screw shaft axis } |
| F16H 25/2295 | ..... | { Rings which are inclined or can pivot around an axis perpendicular to the screw shaft } |
| F16H 25/24 | ... | Elements essential to such mechanisms, e.g. screws, nuts (F16H 25/22 takes precedence) |
| F16H 25/2409 | .... | { one of the threads being replaced by elements specially formed for engaging the screw or nut, e.g. pins, racks, toothed belts } |
| F16H 25/2418 | .... | { Screw seals, wipers, scrapers or the like } |
| F16H 25/2427 | .... | { one of the threads being replaced by a wire or stripmetal, e.g. spring } |
| F16H 2025/2436 | .... | Intermediate screw supports for reducing unsupported length of screw shaft |
| F16H 2025/2445 | .... | Supports for compensating misalignment or offset between screw and nut |
| F16H 25/2454 | .... | { Brakes; Rotational locks } |
| F16H 2025/2463 | ..... | using a wrap spring brake, i.e. a helical wind up spring for braking or locking |
| F16H 25/2472 | .... | { Safety nuts } |
| F16H 2025/2481 | .... | Special features for facilitating the manufacturing of spindles, nuts, or sleeves of screw devices |
| F16H 2025/249 | .... | Special materials or coatings for screws or nuts (lubrication F16H 57/0497) |

Guidance heading: Gearings with intermittently-driving member

F16H 27/00 Step-by-step mechanisms without freewheel members, e.g. Geneva driven (rotary gearings with cyclically-varying velocity ratio [F16H 35/02](#) ; impulse couplings [F16D 5/00](#) ; clockwork escapements [G04B 15/00](#))

- F16H 27/02
 - . with at least one reciprocating or oscillating transmission member { ([F16H 27/04](#) takes precedence) }
- F16H 27/04
 - . for converting continuous rotation into a step-by-step rotary movement
- F16H 27/045
 - .. { Mechanism comprising a member with partially helical tracks }
- F16H 27/06
 - .. Mechanisms with driving pins in driven slots, e.g. Geneva drives
- F16H 27/08
 - .. with driving toothed gears with interrupted toothing
- F16H 27/10
 - .. obtained by means of disengageable transmission members, combined or not combined with mechanisms according to group [F16H 27/06](#) or [F16H 27/08](#)
- F16H 29/00**

Gearings for conveying rotary motion with intermittently-driving members, e.g. with freewheel action ([freewheels F16D 41/00](#) ; { [Gearings for converting oscillating or reciprocating movement with freewheeling members or other intermittently-driving members into a rotary movement F16H 31/00](#) })
- F16H 29/02
 - . between one of the shafts and an oscillating of reciprocating intermediate member, not rotating with either of the shafts ([F16H 29/20](#) , [F16H 29/22](#) take precedence)
- F16H 29/04
 - .. in which the transmission ratio is changed by adjustment of a crank, an eccentric a wobble-plate, or cam, on one of the shafts
- F16H 29/06
 - ... with concentric shafts, an annular intermediate member moving around and being supported on an adjustable crank or eccentric
- F16H 29/08
 - .. in which the transmission ratio is changed by adjustment of the path of movement, the location of the pivot, or the effective length, of an oscillating connecting member
- F16H 29/10
 - .. in which the transmission ratio is changed by directly operating on the intermittently driving members
- F16H 29/12
 - . between rotary driving and driven members ([F16H 29/20](#) , [F16H 29/22](#) take precedence)
- F16H 29/14
 - .. in which the transmission ratio is changed by adjustment of an otherwise stationary guide member for the intermittently-driving members
- F16H 29/16
 - .. in which the transmission ratio is changed by adjustment of the distance between the axes of the rotary members
- F16H 29/18
 - ... in which the intermittently-driving members slide along approximately radial guides while rotating with one of the rotary members
- F16H 29/20
 - . the intermittently-acting members being shaped as worms, screws, or racks
- F16H 29/22
 - . with automatic speed change
- F16H 31/00**

Other gearings with freewheeling members or other intermittently driving members ([F16H 21/00](#) , [F16H 23/00](#) , [F16H 25/00](#) take precedence; gearings involving the use of automatic changing-mechanisms, e.g. cyclically-actuated reversal gearings, see the appropriate groups)
- F16H 31/001
 - . { Mechanisms with freewheeling members }
- F16H 31/002
 - .. { Hand-driven ratchets (wrenches of the ratchet type [B25B 13/46](#)) }
- F16H 31/003
 - . { Step-by-step mechanisms for rotary motion }

- F16H 31/004 . . { with pawls driven by a rotary cam }
- F16H 31/005 . . { with pawls driven by a reciprocating or oscillating transmission member ([F16H 31/002](#) , [F16H 31/004](#) take precedence) }
- F16H 31/006 . . { with friction means }
- F16H 31/007 . { Step-by-step mechanisms for linear motion }
- F16H 31/008 . . { with friction means }

F16H 33/00 Gearings based on repeated accumulation and delivery of energy

- F16H 33/02 . Rotary transmissions with mechanical accumulators, e.g. weights, springs, intermittently-connected fly-wheels
- F16H 33/04 . . Gearings for conveying rotary motion with variable velocity ratio, in which self-regulation is sought
- F16H 33/06 . . . based essentially on spring action ([ratchet slip couplings F16D 7/04](#))
- F16H 33/08 . . . based essentially on inertia
- F16H 33/10 . . . with gyroscopic action, e.g. comprising wobble-plates, oblique cranks
- F16H 33/12 . . . with a driving member connected differentially with both a driven member and an oscillatory member with large resistance to movement, e.g. Constantinesco gearing
- F16H 33/14 . . . having orbital members influenced by regulating masses
- F16H 33/16 which have their own free motion, or consist of fluid
- F16H 33/18 of which the motion is constrained
- F16H 33/185 { the masses being fixed to the orbital members }
- F16H 33/20 . for interconversion, based essentially on inertia, of rotary motion and reciprocating or oscillating motion { ([for converting into a linear propulsion force, i.e. inertia motors F03G 3/00](#)) }

F16H 35/00 Gearings or mechanisms with other special functional features

- F16H 2035/001 . Gearings with eccentric mounted gears, e. g. for cyclically varying ratio
- F16H 2035/003 . Gearings comprising pulleys or toothed members of non-circular shape, e.g. elliptical gears ([harmonic drives with elliptical wave generators F16H 49/001](#))
- F16H 2035/005 . Gearings or mechanisms preventing back-driving ([braking or locking of screw actuators F16H 25/2454](#))
- F16H 2035/006 . Gearings or mechanisms for stopping or limiting movement, e.g. stopping a movement after few turns ([for linear screw actuators F16H 25/2015](#))
- F16H 35/008 . { for variation of rotational phase relationship, e.g. angular relationship between input and output shaft ([couplings F16D 3/10](#)) }
- F16H 35/02 . for conveying rotary motion with cyclically varying velocity ratio ([speed-changing mechanisms operating cyclically, see the appropriate groups](#))
- F16H 35/06 . Gearings designed to allow relative movement between supports thereof without ill effects ([F16H 1/26](#) , [F16H 1/48](#) take precedence; { [mounting or supporting gearboxes](#) }

[F16H 57/025](#) })

- F16H 35/08 . for adjustment of members on moving parts from a stationary place
- F16H 35/10 . Arrangements or devices for absorbing overload or preventing damage by overload ({ [for screw mechanisms F16H 25/2021](#) } ; [couplings for transmitting rotation F16D](#))
- F16H 2035/103 . . with drive interruption by structural failure of overload preventing means, e.g. using shear pins
- F16H 2035/106 . . Monitoring of overload
- F16H 35/12 . Transmitting mechanisms with delayed effect ([vibration- or shock-dampers in general F16F](#))
- F16H 35/14 . Mechanisms with only two stable positions, e.g. acting at definite angular positions
- F16H 35/16 . Mechanisms for movements or movement relations conforming to mathematical formulae ([devices in which computing operations are performed mechanically G06G 3/00](#))
- F16H 35/18 . Turning devices for rotatable members, e.g. shafts ([starting devices for internal-combustion engines F02N](#))

F16H 37/00

Combinations of mechanical gearings, not hereinbefore provided for ([applications of "underdrives" or "overdrives" in motor vehicles, combinations with differential gearings in motor vehicles B60K](#))

- F16H 37/02 . comprising essentially only toothed or friction gearings
- F16H 37/021 . . { [toothed gearing combined with continuous variable friction gearing](#) }
- F16H 37/022 . . . { [the toothed gearing having orbital motion](#) }
- F16H 2037/023 . . . CVT's provided with at least two forward and one reverse ratio in a serial arranged sub-transmission
- F16H 2037/025 . . . CVT's in which the ratio coverage is used more than once to produce the overall transmission ratio coverage, e.g. by shift to end of range, then change ratio in sub-transmission and shift CVT through range once again
- F16H 2037/026 . . . CVT layouts with particular features of reversing gear, e.g. to achieve compact arrangement
- F16H 37/027 . . { [toothed gearing combined with a gear using endless flexible members for reversing rotary motion only](#) }
- F16H 2037/028 . . having two distinct forward drive ratios and one reverse drive ratio arranged in series with a continuously variable transmission unit
- F16H 37/04 . . Combinations of toothed gearings only ([F16H 37/06 takes precedence](#))
- F16H 37/041 . . . { [for conveying rotary motion with constant gear ratio](#) }

WARNING

This group is not complete pending a reorganisation; see also subgroups of [F16H 1/00](#)

- F16H 37/042 . . . { [change gear transmissions in group arrangement](#) }
- F16H 37/043 { [without gears having orbital motion](#) }

| | | |
|----------------|-------|--|
| F16H 2037/044 | ..... | comprising a separate gearing unit for shifting between forward or reverse |
| F16H 2037/045 | ..... | comprising a separate gearing unit for shifting between high and low ratio range |
| F16H 37/046 | .... | { with an additional planetary gear train, e.g. creep gear, overdrive } |
| F16H 2037/047 | ... | comprising one or more orbital gear sets coaxial with a first shaft and having more than one drive connection to a second shaft parallel to the first shaft |
| F16H 2037/048 | ... | Combinations of parallel shaft and orbital motion gearing, wherein the orbital motion gear has more than one connection with the parallel shaft gearing |
| F16H 2037/049 | ... | Forward-reverse units with forward and reverse gears for achieving multiple forward and reverse gears, e.g. for working machines |
| F16H 37/06 | .. | with a plurality of driving or driven shafts ; with arrangements for dividing torque between two or more intermediate shafts |
| F16H 37/065 | ... | { with a plurality of driving or driven shafts (F16H 37/08 takes precedence) } |
| F16H 37/08 | ... | with differential gearing |
| F16H 37/0806 | ..... | { with a plurality of driving or driven shafts } |
| F16H 37/0813 | ..... | { with only one input shaft (differentials for four wheel drive vehicles B60K 17/346) } |
| F16H 37/082 | ..... | { and additional planetary reduction gears } |
| F16H 37/0826 | ..... | { with only one output shaft } |
| F16H 37/0833 | .... | { with arrangements for dividing torque between two or more intermediate shafts, i.e. with two or more internal power paths (F16H 3/72 takes precedence) } |
| F16H 37/084 | ..... | { at least one power path being a continuously variable transmission, i.e. CVT } |
| F16H 37/0846 | ..... | { CVT using endless flexible members } |
| F16H 37/0853 | ..... | { CVT using friction between rotary members having a first member of uniform effective diameter cooperating with different parts of a second member } |
| F16H 37/086 | ..... | { CVT using two coaxial friction members cooperating with at least one intermediate friction member } |
| F16H 2037/0866 | ..... | Power split variators with distributing differentials, with the output of the CVT connected or connectable to the output shaft |
| F16H 2037/0873 | ..... | with switching, e.g. to change ranges |
| F16H 2037/088 | ..... | Power split variators with summing differentials, with the input of the CVT connected or connectable to the input shaft |
| F16H 2037/0886 | ..... | with switching means, e.g. to change ranges |
| F16H 2037/0893 | ..... | characterised in the ratio of the continuously variable transmission is different from zero when the output shaft speed is zero |
| F16H 37/10 | .... | at both ends of intermediate shafts { (F16H 37/0806 takes precedence) } |
| F16H 2037/101 | ..... | Power split variators with one differential at each end of the CVT |
| F16H 2037/102 | ..... | the input or output shaft of the transmission is connected or connectable to two or more differentials |
| F16H 2037/103 | ..... | Power split variators with each end of the CVT connected or connectable to a Ravigneaux set |
| F16H 2037/104 | ..... | Power split variators with one end of the CVT connected or connectable to two or more differentials |
| F16H 2037/105 | ..... | characterised by number of modes or ranges, e.g. for compound gearing |

- F16H 2037/106 with switching means to provide two variator modes or ranges
- F16H 2037/107 with switching means to provide three variator modes or ranges
- F16H 2037/108 with switching means to provide four or more variator modes or ranges

- F16H 37/12 . Gearings comprising primarily toothed or friction gearing, links or levers, and cams, or members of at least two of these types ([F16H 21/14](#) , [F16H 21/28](#) , [F16H 21/30](#) take precedence; toothed or friction gearing or cam gearing with only an additional lever or link, see the appropriate group for the main gearing)
- F16H 37/122 .. { for interconverting rotary motion and oscillating motion }
- F16H 37/124 .. { for interconverting rotary motion and reciprocating motion }
- F16H 37/126 ... { Guiding mechanism using levers combined with gearings for straight line output movement, e.g. by using gears or pulleys with ratio 2:1 }
- F16H 2037/128 .. Generating reciprocating motion by a planetary gear (ratio 2:1) using endless flexible members
- F16H 37/14 .. the movements of two or more independently-moving members being combined into a single movement ([screw mechanisms with both nut and screw being driven F16H 25/2018](#))]
- F16H 37/16 .. with a driving or driven member which both rotates or oscillates on its axis and reciprocates

Guidance heading: **Fluid gearing** (fluid actuators [F15B](#) ; couplings or clutches with a fluid or semi-fluid as power-transmitting means [F16D 31/00](#) to [F16D 39/00](#) ; fluid-resistance brakes [F16D 57/00](#))

F16H 39/00 **Rotary fluid gearing using pumps and motors of the volumetric type, i.e. passing a predetermined volume of fluid per revolution** ({ application to motor vehicles [B60K](#) } ; application to lifting or pushing equipment [B66F](#) ; control of exclusively fluid gearing [F16H 61/38](#))

- F16H 2039/005 . comprising arrangements or layout to change the capacity of the motor or pump by moving the hydraulic chamber of the motor or pump

- F16H 39/01 . Pneumatic gearing ; Gearing working with sub-atmospheric pressure ([pneumatic hammers B25D 9/00](#))

- F16H 39/02 . with liquid motors at a distance from liquid pumps

- F16H 39/04 . with liquid motor and pump combined in one unit
- F16H 39/06 .. pump and motor being of the same type
- F16H 39/08 ... each with one main shaft and provided with pistons reciprocating in cylinders
- F16H 39/10 with cylinders arranged around and parallel or approximately parallel to the main axis of the gearing

- F16H 2039/105 at least one pair of motors or pumps sharing a common swash plate
- F16H 39/12 with stationary cylinders
- F16H 39/14 with cylinders carried in rotary cylinder blocks or cylinder-bearing members

- F16H 39/16 with cylinders arranged perpendicular to the main axis of the gearing
- F16H 39/18 the connections of the pistons being at the outer ends of the cylinders

- F16H 39/20 the connections of the pistons being at the inner ends of the cylinders
- F16H 39/22 . . . with liquid chambers shaped as bodies of revolution concentric with the main axis of the gearing
- F16H 39/24 with rotary displacement members, e.g. provided with axially or radially movable vanes passing movable sealing members
- F16H 39/26 . . . with liquid chambers not shaped as bodies of revolution or shaped as bodies of revolution eccentric to the main axis of the gearing
- F16H 39/28 with liquid chambers formed in rotary members
- F16H 39/30 with liquid chambers formed in stationary members
- F16H 39/32 with sliding vanes carried by the rotor
- F16H 39/34 . . . in which a rotor on one shaft co-operates with a rotor on another shaft
- F16H 39/36 Toothed-gear type
- F16H 39/38 Displacement screw-pump type
- F16H 39/40 . . . Hydraulic differential gearings, e.g. having a rotary input housing with interconnected liquid chambers for both outputs
- F16H 39/42 . . . pump and motor being of different types

F16H 41/00 Rotary fluid gearing of the hydrokinetic type (control of exclusively fluid gearing [F16H 61/38](#))

- F16H 41/02 . with pump and turbine connected by conduits or ducts
- F16H 41/04 . Combined pump-turbine units
- F16H 41/22 . . Gearing systems consisting of a plurality of hydrokinetic units operating alternatively, e.g. made effective or ineffective by filling or emptying or by mechanical clutches
- F16H 41/24 . Details
- F16H 2041/243 . . Connections between pump shell and cover shell of the turbine
- F16H 2041/246 . . relating to one way clutch of the stator
- F16H 41/26 . . Shape of runner blades or channels with respect to function
- F16H 41/28 . . with respect to manufacture, e.g. blade attachment
- F16H 2041/285 . . . of stator blades
- F16H 41/30 . . relating to venting, lubrication, cooling, circulation of the cooling medium
- F16H 41/32 . Selection of working fluids ([chemical aspects](#), [see the relevant classes](#))

F16H 43/00 Other fluid gearing, e.g. with oscillating input or output ({ generating mechanical vibrations of infrasonic or sonic frequency [B06B](#) ; percussive tools [B25D 9/00](#) ; mine roof supports for step by step movement [E21D 23/00](#) ; reciprocating-piston machines without rotary main shaft [F01B 11/08](#) ; fluid pressure actuatoars [F15B](#) })

- F16H 43/02 . Fluid gearing actuated by pressure waves

F16H 45/00 Combinations of fluid gearings for conveying rotary motion with couplings or clutches ([F16H 41/22](#) , { [F16H 47/085](#) } take precedence; conjoint control of driveline clutches and change-speed gearing in vehicles [B60W 10/02](#) , [B60W 10/10](#) { and [B60W 30/18](#) })

NOTE

Clutches for varying working conditions in fluid torque-converters are regarded as part of the torque converter

- F16H 2045/002 . comprising a clutch between prime mover and fluid gearing
- F16H 2045/005 . comprising a clutch between fluid gearing and the mechanical gearing unit
- F16H 2045/007 . comprising a damper between turbine of the fluid gearing and the mechanical gearing unit
- F16H 45/02 . with mechanical clutches for bridging a fluid gearing of the hydrokinetic type ([control of torque converter lock-up clutches F16H 61/14](#))
- F16H 2045/0205 . . two chamber system, i.e. without a separated, closed chamber specially adapted for actuating a lock-up clutch
- F16H 2045/021 . . three chamber system, i.e. comprising a separated, closed chamber specially adapted for actuating a lock-up clutch
- F16H 2045/0215 . . Details of oil circulation
- F16H 2045/0221 . . with damping means
- F16H 2045/0226 . . . comprising two or more vibration dampers
- F16H 2045/0231 arranged in series
- F16H 2045/0236 . . . with axial dampers, e.g. comprising a ramp system
- F16H 2045/0242 . . . with viscous dampers
- F16H 2045/0247 . . . having a turbine with hydrodynamic damping means
- F16H 2045/0252 . . . having a damper arranged on input side of the lock-up clutch
- F16H 2045/0257 . . . having a pump adapted for use as a secondary mass of the damping system
- F16H 2045/0263 . . . the damper comprising a pendulum
- F16H 2045/0268 . . . the damper comprising a gearing
- F16H 2045/0273 . . characterised by the type of the friction surface of the lock-up clutch
- F16H 2045/0278 . . . comprising only two co-acting friction surfaces
- F16H 2045/0284 . . . Multiple disk type lock-up clutch
- F16H 2045/0289 . . . Details of friction surfaces of the lock-up clutch
- F16H 2045/0294 . . . Single disk type lock-up clutch, i.e. using a single disc engaged between friction members

- F16H 47/00** **Combinations of mechanical gearing with fluid clutches or fluid gearing ([conjoint control of clutch and gearing B60K 41/22](#) ; [control of driveline clutches and change-speed gearing in vehicles B60W 10/02](#) and [B60W 10/10](#))**
- F16H 47/02 . the fluid gearing being of the volumetric type
- F16H 2047/025 . . the fluid gearing comprising a plurality of pumps or motors
- F16H 47/04 . . the mechanical gearing being of the type with members having orbital motion
- F16H 2047/045 . . . the fluid gearing comprising a plurality of pumps or motors

- F16H 47/06 . the fluid gearing being of the hydrokinetic type
- F16H 47/065 .. { the mechanical gearing being of the friction or endless flexible member type }
- F16H 47/07 .. using two or more power-transmitting fluid circuits ({ [F16H 47/065](#) , } [F16H 47/10](#) take precedence)
- F16H 47/08 .. the mechanical gearing being of the type with members having orbital motion { ([F16H 47/065](#) takes precedence) }
- F16H 47/085 ... { with at least two mechanical connections between the hydraulic device and the mechanical transmissions }
- F16H 47/10 ... using two or more power-transmitting fluid circuits
- F16H 47/12 ... the members with orbital motion having vanes interacting with the fluid

F16H 48/00 Differential gearings ([cooling or lubricating of differential gearing F16H 57/04](#))

NOTE

When classifying in this main group, in the absence of an indication to the contrary, classification is made in all appropriate places.

- F16H 2048/02 . Transfer gears for influencing drive between outputs
- F16H 2048/04 .. having unequal torque transfer between two outputs
- F16H 48/05 . Multiple interconnected differential sets
- F16H 48/06 . with gears having orbital motion
- F16H 48/08 .. comprising bevel gears
- F16H 2048/082 ... characterised by the arrangement of output shafts
- F16H 2048/085 ... characterised by shafts or gear carriers for orbital gears
- F16H 2048/087 ... characterised by the pinion gears, e.g. their type or arrangement
- F16H 48/10 .. with orbital spur gears
- F16H 2048/102 ... with spur gears engaging face gears
- F16H 2048/104 ... characterised by two ring gears
- F16H 2048/106 ... characterised by two sun gears
- F16H 2048/108 ... characterised by intermeshing orbital gears, i.e. at least two intermeshing orbital gears
- F16H 48/11 ... having intermeshing planet gears
- F16H 48/12 . without gears having orbital motion
- F16H 48/14 .. with cams
- F16H 48/142 ... { consisting of linked clutches using axially movable inter-engaging parts }
- F16H 48/145 { with friction clutching members }
- F16H 48/147 ... { with driven cam followers or balls engaging two opposite cams }
- F16H 48/16 .. with freewheels
- F16H 48/18 .. with fluid gearing
- F16H 48/19 .. consisting of two linked clutches
- F16H 48/20 . Arrangements for suppressing or influencing the differential action, e.g. locking

- devices
- F16H 2048/201 . . with means directly braking the orbital gears
- F16H 2048/202 . . using freewheel clutches
- F16H 2048/204 . . Control of arrangements for suppressing differential actions
- F16H 2048/205 . . . using the steering as a control parameter
- F16H 2048/207 . . . using torque sensors
- F16H 2048/208 . . . using flywheels
- F16H 48/22 . . using friction clutches or brakes
- F16H 48/24 . . using positive clutches or brakes
- F16H 48/26 . . using fluid action, e.g. viscous clutches
- F16H 2048/265 . . . with a fluid throttling means
- F16H 48/27 . . using internally-actuatable fluid pressure e.g. internal pump types
- F16H 48/28 . . using self-locking gears or self-braking gears
- F16H 2048/282 . . . using the axial movement of axially movable bevel gears
- F16H 48/285 . . . with self-braking intermeshing gears having parallel axes and having worms or helical teeth
- F16H 48/29 . . . with self-braking intermeshing gears having perpendicular arranged axes and having worms or helical teeth
- F16H 48/295 . . using multiple means for force boosting
- F16H 48/30 . . using externally-actuatable means
- F16H 2048/305 . . . using manual actuators
- F16H 48/32 . . . using fluid pressure actuators
- F16H 48/34 . . . using electromagnetic or electric actuators
- F16H 2048/343 using a rotary motor
- F16H 2048/346 using a linear motor
- F16H 48/36 . characterised by intentionally generating speed difference between outputs
- F16H 2048/362 . . using a continuously variable transmission
- F16H 2048/364 . . using electric or hydraulic motors
- F16H 2048/366 . . using additional non-orbital gears in combination with clutches or brakes
- F16H 2048/368 . . using additional orbital gears in combination with clutches or brakes
- F16H 48/38 . Constructional details ([the outer casing comprising the differential and supporting input and output shafts F16H 57/037](#))
- F16H 2048/382 . . Methods for manufacturing differential gearings
- F16H 2048/385 . . of the ring or crown gear
- F16H 2048/387 . . Shields or washers
- F16H 48/40 . . characterised by features of the rotating cases
- F16H 2048/405 . . . characterised by features of the bearing of the rotating case
- F16H 48/42 . . characterised by features of the input shafts, e.g. mounting of drive gears thereon
- F16H 2048/423 . . . characterised by bearing arrangement
- F16H 2048/426 characterised by spigot bearing arrangement, e.g. bearing for supporting the free end of the drive shaft pinion

F16H 49/00**Other gearings**

- F16H 49/001 . { Wave gearings, e.g. harmonic drive transmissions (harmonic drives specially adapted for positioning programme-controlled manipulators [B25J 9/1025](#)) }
- F16H 2049/003 . . Features of the flexsplines therefor
- F16H 49/005 . { Magnetic gearings with physical contact between gears (rotating torque transmitting elements of the permanent-magnet type [H02K 49/102](#)) }
- F16H 2049/006 . Wave generators producing a non-elliptical shape of flexsplines, i.e. with a qualified different shape than elliptical
- F16H 2049/008 . Linear wave gearings, i.e. harmonic type gearing imposing a strain wave to a straight flexible member engaging a second member with different pitch to generate linear motion thereof

Guidance heading: **Details of gearing or mechanisms** (of screw-and-nut gearing [F16H 25/00](#) ; of fluid gearing [F16H 39/00](#) to [F16H 43/00](#) ; shafts, Bowden mechanisms, cranks, eccentrics, bearings, pivotal, pivotal connections, crossheads, connecting-rods [F16C](#) ; chains, belts [F16G](#) ; piston-rods [F16J 7/00](#))

F16H 51/00**Levers of gearing mechanisms** ({ connecting rods or links pivoted at both ends [F16C 7/00](#) ; gear levers [F16H 59/00](#) } ; manipulating levers [G05G](#))

- F16H 51/02 . adjustable

F16H 53/00**Cams ; Non-rotary cams ; Cam followers, e.g. rollers**

- F16H 53/02 . Single-track cams for single-revolution cycles ; Camshafts with such cams
- F16H 53/025 . . { characterised by their construction, e.g. assembling or manufacturing features (grinding of camshafts [B24B 19/12](#)) }
- F16H 53/04 . . Adjustable cams
- F16H 53/06 . Cam-followers ([F16H 53/08](#) takes precedence)
- F16H 53/08 . Multi-track cams, e.g. for cycles consisting of several revolutions ; Cam-followers specially adapted for such cams

F16H 55/00**Elements with teeth or friction surfaces for conveying motion ; Worms ; Pulleys ; Sheaves** (pulley-blocks [B66D 3/04](#))

- F16H 55/02 . Toothed members ; Worms
- F16H 55/06 . . Use of materials ; Use of treatments of toothed members or worms to affect their intrinsic material properties ({ coatings for lubrication [F16H 57/041](#) ; producing gear wheels from plastics or substances in a plastic state [B29D 15/00](#) ; heat treatment [C21D 9/32](#) ; electrolytic surface treatment [C25D](#) ; heating by electromagnetic field [H05B 6/00](#) })
- F16H 2055/065 . . . Moulded gears, e.g. inserts therefor

| | | |
|----------------|------|---|
| F16H 55/08 | .. | Profiling |
| F16H 55/0806 | ... | { Involute profile } |
| F16H 55/0813 | .... | { Intersecting-shaft arrangement of the toothed members } |
| F16H 55/082 | .... | { Skewed-shaft arrangement of the toothed members, i.e. non-intersecting shafts } |
| F16H 55/0826 | ... | { Novikov-Wildhaber profile } |
| F16H 55/0833 | ... | { Flexible toothed member, e.g. harmonic drive } |
| F16H 55/084 | ... | { Non-circular rigid toothed member, e.g. elliptic gear } |
| F16H 55/0846 | ... | { Intersecting-shaft arrangement of the toothed members (F16H 55/0813 , F16H 55/0826 , F16H 55/0833 , F16H 55/084 take precedence) } |
| F16H 55/0853 | ... | { Skewed-shaft arrangement of the toothed members (F16H 55/082 , F16H 55/0826 , F16H 55/0833 , F16H 55/084 take precedence) } |
| F16H 2055/086 | ... | Silent gear profiles |
| F16H 2055/0866 | ... | Profiles for improving radial engagement of gears, e.g. chamfers on the tips of the teeth |
| F16H 55/0873 | ... | { for improving axial engagement, e.g. a chamfer at the end of the tooth flank } |
| F16H 55/088 | ... | { with corrections on tip or foot of the teeth, e.g. addendum relief for better approach contact } |
| F16H 55/0886 | ... | { with corrections along the width, e.g. flank width crowning for better load distribution } |
| F16H 2055/0893 | ... | for parallel shaft arrangement of toothed members |
| F16H 55/10 | .. | Constructively simple tooth shapes, e.g. shaped as pins, as balls ({ gearwork for clocks and watches G04B 13/00 }) |
| F16H 55/12 | .. | with body or rim assembled out of detachable parts |
| F16H 55/14 | .. | Construction providing resilience or vibration-damping (F16H 55/06 takes precedence; resilient coupling of wheel or wheel-rim with shaft F16D 3/50 , F16D 3/80) |
| F16H 55/16 | ... | relating to teeth only |
| F16H 55/17 | .. | Toothed wheels ({ with simple tooth shapes F16H 55/10 } ; worm wheels F16H 55/22 ; chain wheels F16H 55/30) |
| F16H 55/171 | ... | { Toothed belt pulleys } |
| F16H 2055/173 | ... | Crown gears, i.e. gears have axially arranged teeth |
| F16H 2055/175 | ... | specially adapted for easy repair, e.g. exchange of worn teeth |
| F16H 2055/176 | ... | Ring gears with inner teeth |
| F16H 2055/178 | ... | combined with clutch means, e.g. gear with integrated synchronizer clutch |
| F16H 55/18 | ... | Special devices for taking up backlash ({ in tuner actuating devices H03J , H03J 1/06 ; in gear-train of clocks or watches G04B 35/00 }) |
| F16H 2055/185 | .... | using compound gears with coincident teeth of different material, e.g. laminated construction of metal and elastomeric gear layers, where elastic layer is slightly oversized |
| F16H 55/20 | .... | for bevel gears |
| F16H 55/22 | .. | for transmissions with crossing shafts, especially worms, worm-gears (bevel gears, crown wheels, helical gears F16H 55/17) |
| F16H 55/24 | ... | Special devices for taking up backlash |
| F16H 55/26 | .. | Racks |
| F16H 55/28 | ... | Special devices for taking up backlash |

- F16H 2055/281 Cylindrical or half-cylindrical bushings around the rack, e.g. using special wedges to reduce play
- F16H 55/283 { using pressure yokes }
- F16H 55/285 { with rollers or balls to reduce friction }
- F16H 55/286 { with asymmetric layout of the yoke }
- F16H 55/288 { comprising two or more pressure yokes }
- F16H 55/30 . . Chain-wheels (specially adapted for cycles [B62M](#))
- F16H 55/303 . . . { for round linked chains, i.e. hoisting chains with identical links }
- F16H 2055/306 . . . with means providing resilience or vibration damping in chain sprocket wheels

- F16H 55/32 . Friction members (friction surfaces [F16D 69/00](#))
- F16H 2055/325 . . characterized by roughness or hardness of friction surface
- F16H 55/34 . . Non-adjustable friction discs
- F16H 55/36 . . Pulleys (with features essential for adjustments [F16H 55/52](#))
- F16H 2055/363 . . . with special means or properties for lateral tracking of the flexible members running on the pulley, e.g. with crowning to keep a belt on track
- F16H 2055/366 . . . with means providing resilience or vibration damping
- F16H 55/38 . . . Means or measures for increasing adhesion (in general [F16D 69/00](#))
- F16H 55/40 . . . with spokes ([F16H 55/48](#) takes precedence)
- F16H 55/42 . . . Laminated pulleys
- F16H 55/44 . . . Sheet-metal pulleys
- F16H 55/46 . . . Split pulleys
- F16H 55/48 . . . manufactured exclusively or in part of non-metallic material, e.g. plastics ([F16H 55/38](#) , [F16H 55/42](#) , [F16H 55/46](#) take precedence; { manufacture of wooden wheels [B27H 7/00](#) })
- F16H 55/49 . . . Features essential to V-belts pulleys
- F16H 55/50 . . . Features essential to rope pulleys
- F16H 55/52 . . Pulleys or friction discs of adjustable construction
- F16H 55/54 . . . of which the bearing parts are radially adjustable
- F16H 55/56 . . . of which the bearing parts are relatively axially adjustable
- F16H 55/563 { actuated by centrifugal masses }
- F16H 55/566 { only adjustable when pulley is stationary }

- F16H 57/00** **General details of gearing** (of screw-and-nut gearing [F16H 25/00](#) ; of fluid gearing [F16H 39/00](#) - [F16H 43/00](#))
- NOTE**
- Groups [F16H 57/01](#) , [F16H 57/021](#) - [F16H 57/39](#) are based on IPC2012.01

- F16H 57/0006 . { Vibration-damping or noise reducing means specially adapted for gearings (devices for varying tension of belts, ropes or chains with damping means [F16H 7/0829](#) ; toothed members with construction providing vibration damping [F16H 55/14](#) ; reducing vibrations or noise of the gearbox casing [F16H 57/028](#) ; suppression of vibrations or noise of gear selectors [F16H 59/0208](#) ; control of hydrostatic fluid gearing preventing or reducing vibrations or noise [F16H 61/40W](#)) }

- F16H 2057/0012 . . for reducing drive line oscillations
 - F16H 57/0018 . { Shaft assemblies for gearings (camshafts with single track cams [F16H 53/02](#)) }
- WARNING**
- Groups [F16H 57/0018](#) and subgroups are not complete pending a reorganisation; see also [F16H 57/021](#) , [F16H 57/022](#)
- F16H 57/0025 . . { with gearing elements rigidly connected to a shaft, e.g. securing gears or pulleys by specially adapted splines, keys or methods }
 - F16H 57/0031 . . { with gearing elements rotatable supported on the shaft ([F16H 57/021](#) takes precedence) }
 - F16H 57/0037 . . { Special features of coaxial shafts, e.g. relative support thereof }
 - F16H 2057/0043 . Mounting or adjusting transmission parts by robots
 - F16H 2057/005 . Mounting preassembled units, i.e. using pre-mounted structures to speed up final mounting process (mounting of gears or shafts in a gearbox [F16H 57/022](#))
 - F16H 2057/0056 . Mounting parts arranged in special position or by special sequence, e.g. for keeping particular parts in his position during assembly
 - F16H 2057/0062 . Tools specially adapted for assembly of transmissions
 - F16H 2057/0068 . Repairing of transmissions by using repair kits (for gear wheels [F16H 2055/175](#))
 - F16H 2057/0075 . Modifying standard transmissions from manufacturer, e.g. by adding an extension for additional ratios (for control [F16H 2061/0062](#))
 - F16H 2057/0081 . Fixing of, or adapting to transmission failure (detecting transmission failures [F16H 2057/018](#))
 - F16H 2057/0087 . Computer aided design [CAD] specially adapted for gearing features (computer aided design per se [G06F 17/50](#)) ; Analysis of gear systems
 - F16H 2057/0093 . Means or measures for transport, shipping or packaging
 - F16H 57/01 . Monitoring wear or stress of transmission elements, e.g. for triggering maintenance
 - F16H 2057/012 . . of gearings
 - F16H 2057/014 . . of friction elements in transmissions
 - F16H 2057/016 . . Monitoring of overload conditions
 - F16H 2057/018 . . Detection of mechanical transmission failures (fixing or adapting to failure [F16H 2057/0081](#) ; of transmission control [F16H 61/12](#))
 - F16H 57/02 . Gearboxes ; Mounting gearing therein

NOTE

When classifying in this group, in the absence of an indication to the contrary, classification is made in all appropriate subgroups.

WARNING

Subgroups of [F16H 57/02](#) are not complete pending reclassification; see provisionally also respective higher groups

- F16H 57/02004 .. { the gears being positioned relative to one another by rolling members or by specially adapted surfaces on the gears }
- F16H 2057/02008 .. characterised by specific dividing lines or planes of the gear case
- F16H 2057/02013 .. Extension units for gearboxes, e.g. additional units attached to a main gear
- F16H 2057/02017 .. characterised by special features related to the manufacturing of the gear case, e.g. special adaptations for casting
- F16H 2057/02021 .. with means for adjusting alignment
- F16H 2057/02026 .. Connection of auxiliaries with a gear case ; Mounting of auxiliaries on the gearbox
- F16H 2057/0203 .. the gearbox is associated or combined with a crank case of an engine
- F16H 2057/02034 .. Gearboxes combined or connected with electric machines ([structural association with electric machines H02K 7/116](#))
- F16H 2057/02039 .. Gearboxes for particular applications
- F16H 2057/02043 ... for vehicle transmissions
- F16H 2057/02047 Automatic transmissions
- F16H 2057/02052 Axle units ; Transfer casings for four wheel drive
- F16H 2057/02056 for utility vehicles, e.g. tractors or agricultural machines
- F16H 2057/0206 for commercial vehicles, e.g. buses or trucks
- F16H 2057/02065 for motorcycles or squads
- F16H 2057/02069 ... for industrial applications
- F16H 2057/02073 Reduction gearboxes for industry
- F16H 2057/02078 ... for wind turbines
- F16H 2057/02082 ... for application in vehicles other than propelling, e.g. adjustment of parts
- F16H 2057/02086 .. Measures for reducing size of gearbox, e.g. for creating a more compact transmission casing
- F16H 2057/02091 .. Measures for reducing weight of gearbox ([by using particular materials F16H 57/032](#))
- F16H 2057/02095 .. Measures for reducing number of parts or components
- F16H 57/021 .. Shaft support structures, e.g. partition walls, bearing eyes, casing walls or covers with bearings
- F16H 2057/0213 ... Support of worm gear shafts
- F16H 2057/0216 ... Intermediate shaft supports, e.g. by using a partition wall
- F16H 57/022 ... Adjustment of transmission shafts or bearings ([for compensating misalignment of axes of toothed gearings without orbital motion F16H 1/26](#) ; [for compensating misalignment of axes of planetary gears F16H 1/48](#))
- F16H 2057/0221 Axial adjustment
- F16H 2057/0222 Lateral adjustment
- F16H 2057/0224 using eccentric bushes
- F16H 2057/0225 with means for adjusting alignment
- F16H 2057/0227 Assembly method measuring first tolerances or position and selecting mating parts accordingly, e.g. special sized shims for transmission bearings

- F16H 2057/0228 Mounting with rough tolerances and fine adjustment after assembly
- F16H 57/023 . . Mounting or installation of gears or shafts in the gearbox casing, e.g. methods or means for assembly
- F16H 2057/0235 . . . specially adapted to allow easy accessibility and repair ([using repair kits F16H 2057/0068](#))
- F16H 57/025 . . Support of transmission casing, e.g. torque arms, or attachment to other devices ([mounting of transmissions in vehicles B60K 17/00](#))
- F16H 57/027 . . Means for venting gearboxes, e.g. air breathers
- F16H 57/028 . . characterised by means for reducing vibration or noise
- F16H 57/029 . . characterised by means for sealing the gearbox casing, e.g. to improve air-tightness
- F16H 57/03 . . characterised by means for reinforcing gearboxes, e.g. ribs
- F16H 57/031 . . characterised by covers or lids for gearboxes
- F16H 57/032 . . characterised by the materials used
- F16H 2057/0325 . . Moulded casings made from plastic
- F16H 57/033 . . Series gearboxes, e.g. gearboxes based on the same design being available in different size or gearboxes using a combination of several standardised units
- F16H 2057/0335 . . . Series transmissions of modular design, e.g. providing for different transmission ratios or power ranges
- F16H 57/035 . . Gearboxes for transmissions with endless flexible members
- F16H 57/037 . . Gearboxes for accommodating differential gearings ([rotating cases for differential gearings F16H 48/40](#))
- F16H 57/038 . . Gearboxes for accommodating bevel gears ([F16H 57/037](#) takes precedence)
- F16H 57/039 . . Gearboxes for accommodating worm gears
- F16H 57/04 . Features relating to lubrication or cooling { [or heating](#) } ({ [in hydrokinetic gearing F16H 41/30](#) ; } [control of lubrication or cooling in hydrostatic gearing F16H 61/4165](#))

WARNING

Subgroups of [F16H 57/04](#) are not complete pending reclassification; see provisionally also respective higher groups

- F16H 57/0401 . . { [using different fluids, e.g. a traction fluid for traction gearing and a lubricant for bearings or reduction gears](#) }
- F16H 57/0402 . . { [Cleaning of lubricants, e.g. filters or magnets](#) }
- F16H 57/0404 . . . { [Lubricant filters](#) }
- F16H 57/0405 . . { [Monitoring quality of lubricant or hydraulic fluids](#) }
- F16H 57/0406 . . { [Absorption elements for lubricants, e.g. oil felts](#) }
- F16H 57/0408 . . { [Exchange or filling of transmission lubricant \(\[filling or draining lubricant of or from machines or engines F01M 11/04\]\(#\) ; \[servicing, maintaining, repairing, or refitting of vehicles B60S 5/00\]\(#\) \)](#) }
- F16H 57/0409 . . { [characterised by the problem to increase efficiency, e.g. by reducing splash losses](#) }
- F16H 57/041 . . { [Coatings or solid lubricants, e.g. antiseize layers or pastes](#) }
- F16H 57/0412 . . { [Cooling or heating; Control of temperature](#) }
- F16H 57/0413 . . . { [Controlled cooling or heating of lubricant; Temperature control therefor](#) }
- F16H 57/0415 . . . { [Air cooling or ventilation; Heat exchangers; Thermal insulations](#) }

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| F16H 57/0416 | | { Air cooling or ventilation } |
| F16H 57/0417 | | { Heat exchangers adapted or integrated in the gearing } |
| F16H 57/0419 | .... | { Thermal insulations } |
| F16H 57/042 | .. | { Guidance of lubricant } |
| F16H 57/0421 | ... | { on or within the casing, e.g. shields or baffles for collecting lubricant, tubes, pipes, grooves, channels or the like } |
| F16H 57/0423 | .... | { Lubricant guiding means mounted or supported on the casing, e.g. shields or baffles for collecting lubricant, tubes or pipes (means for guiding lubricant into an axial channel of a shaft F16H 57/0426 ; lubrication by injection; injection nozzles or tubes therefore F16H 57/0456) } |
| F16H 57/0424 | .... | { Lubricant guiding means in the wall of or integrated with the casing, e.g. grooves, channels, holes (means for guiding lubricant into an axial channel of a shaft F16H 57/0426) } |
| F16H 57/0426 | .... | { Means for guiding lubricant into an axial channel of a shaft } |
| F16H 57/0427 | ... | { on rotary parts, e.g. using baffles for collecting lubricant by centrifugal force } |
| F16H 57/0428 | .... | { Grooves with pumping effect for supplying lubricants } |
| F16H 57/043 | ... | { within rotary parts, e.g. axial channels or radial openings in shafts } |
| F16H 57/0431 | .... | { Means for guiding lubricant directly onto a tooth surface or to foot areas of a gear, e.g. by holes or grooves in a tooth flank } |
| F16H 57/0432 | ... | { Lubricant guiding means on or inside shift rods or shift forks (shift rods or shift forks to be lubricated, cooled or heated F16H 57/0468) } |
| F16H 57/0434 | .. | { relating to lubrication supply, e.g. Pumps (arrangement of pumps F16H 57/0441) ; Pressure control (grooves with pumping effect for supplying lubricant F16H 57/0428 ; generation and variation of line pressure F16H 61/0021) } |
| F16H 57/0435 | ... | { Pressure control for supplying lubricant; Circuits or valves therefor } |
| F16H 57/0436 | ... | { Pumps } |
| F16H 57/0438 | .... | { Pumps of jet type, e.g. jet pumps with means to inject high pressure fluid to the suction area thereby supercharging the pump or means reducing cavitations } |
| F16H 57/0439 | .... | { Pumps with different power sources, e.g. one and the same pump may selectively driven by either the engine or an electric motor } |
| F16H 57/0441 | ... | { Arrangements of pumps } |
| F16H 57/0442 | ... | { for supply in case of failure, i.e. auxiliary supply } |
| F16H 57/0443 | ... | { for supply of lubricant during tilt or high acceleration, e.g. problems related to the tilt or extreme acceleration of the transmission casing and the supply of lubricant under these conditions } |
| F16H 57/0445 | ... | { for supply of different gearbox casings or sections } |
| F16H 57/0446 | ... | { the supply forming part of the transmission control unit, e.g. for automatic transmissions } |
| F16H 57/0447 | .. | { Control of lubricant levels, e.g. lubricant level control dependent on temperature } |
| F16H 57/0449 | ... | { Sensors or indicators for controlling the fluid level } |
| F16H 57/045 | .. | { Lubricant storage reservoirs, e.g. reservoirs in addition to a gear sump for collecting lubricant in the upper part of a gear case } |
| F16H 57/0452 | ... | { Oil pans } |
| F16H 57/0453 | ... | { Section walls to divide a gear sump } |
| F16H 57/0454 | ... | { Sealings between different partitions of a gearing or to a reservoir (means for sealing gearboxes F16H 57/029) } |
| F16H 57/0456 | .. | { Lubrication by injection; Injection nozzles or tubes therefor (oil mist or spray |

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| | | lubrication F16H 57/0458) } |
| F16H 57/0457 | .. | { Splash lubrication (characterised by the problem reducing losses, e.g. splash losses F16H 57/0409) } |
| F16H 57/0458 | .. | { Oil-mist or spray lubrication ; Means to reduce foam formation (lubrication by injection F16H 57/0456 ; venting F16H 57/02B) } |
| F16H 57/046 | ... | { Oil-mist or spray lubrication } |
| F16H 57/0461 | ... | { Means to reduce foam formation } |
| F16H 57/0463 | .. | { Grease lubrication ; Drop-feed lubrication } |
| F16H 57/0464 | ... | { Grease lubrication } |
| F16H 57/0465 | ... | { Drop-feed lubrication } |
| F16H 57/0467 | .. | { Elements of gearings to be lubricated, cooled or heated } |
| F16H 57/0468 | ... | [Shift rods or shift forks] |
| F16H 57/0469 | ... | { Bearings or seals } |
| F16H 57/0471 | .... | { Bearing } |
| F16H 57/0472 | .... | { Seals } |
| F16H 57/0473 | ... | { Friction devices, e.g. clutches or brakes } |
| F16H 57/0475 | ... | { Engine and gearing, i.e. joint lubrication or cooling or heating thereof (electric machines and gearing F16H 57/0476) } |
| F16H 57/0476 | ... | { Electric machines and gearing, i.e. joint lubrication or cooling or heating thereof } |
| F16H 57/0478 | ... | { Synchromesh devices } |
| F16H 57/0479 | ... | { Gears or bearings on planet carriers } |
| F16H 57/048 | .. | { Type of gearings to be lubricated, cooled or heated } |
| F16H 57/0482 | ... | { Gearings with gears having orbital motion } |
| F16H 57/0483 | .... | { Axle or inter-axle differentials } |
| F16H 57/0484 | .... | { with variable gear ratio or for reversing rotary motion } |
| F16H 57/0486 | .... | { with fixed gear ratio (differentials F16H 57/0483) } |
| F16H 57/0487 | ... | { Friction gearings } |
| F16H 57/0489 | .... | { with endless flexible members, e.g. belt CVTs } |
| F16H 57/049 | .... | { of the toroid type } |
| F16H 57/0491 | .... | { of the cone ring type } |
| F16H 57/0493 | ... | { Gearings with spur or bevel gears (differentials with spur or bevel gears F16H 57/0483) } |
| F16H 57/0494 | .... | { with variable gear ratio or for reversing rotary motion } |
| F16H 57/0495 | .... | { with fixed gear ratio } |
| F16H 57/0497 | ... | { Screw mechanisms } |
| F16H 57/0498 | ... | { Worm gearings } |
| F16H 57/05 | .. | of chains (for conveyers B65G 45/02) |
| F16H 57/08 | . | of gearing with members having orbital motion |
| F16H 57/082 | .. | { Planet carriers } |
| F16H 2057/085 | .. | Bearings for orbital gears |
| F16H 2057/087 | .. | Arrangement and support of friction devices in planetary gearings, e.g. support of clutch drums, stacked arrangements of friction devices (see also arrangements for shifting planetary gears F16H 3/62 , F16H 3/30H1) |

- F16H 57/10 .. Braking arrangements
- F16H 57/12 . Arrangements for adjusting or for taking-up backlash not provided for elsewhere
- F16H 2057/121 .. using parallel torque paths and means to twist the two path against each other
- F16H 2057/122 ... by using two independent drive sources, e.g. electric motors
- F16H 2057/123 .. using electric control means
- F16H 2057/125 .. Adjustment of backlash during mounting or assembly of gearing
- F16H 2057/126 .. Self-adjusting during operation, e.g. by a spring
- F16H 2057/127 ... using springs
- F16H 2057/128 .. using axial positioning of gear wheel with addendum modification on gear width, i.e. backlash is compensated by axial positioning of a slightly conical gear wheel

Guidance heading: **Control of gearings conveying rotary motion** (orbital toothed gearings with a secondary drive in order to vary the speed ratio of driving or feeding mechanisms of machine tools [B23Q 5/12](#) , [B23Q 5/46](#) ; conjoint control of drive units for vehicles [B60K 41/00](#) ; cycle transmissions [B62M](#) ; marine propulsion [B63H](#))

NOTE

Attention is drawn to the Notes following group [B60K 41/00](#) .

In groups [F16H 59/00](#) to [F16H 63/00](#) , clutches positioned within a gearbox are considered as comprising part of the gearings.

In groups [F16H 59/00](#) to [F16H 63/00](#) , the following terms or expressions are used with the meaning indicated:

- "final output element" means the final element which is moved to establish a gear ratio, i.e. which achieves the linking between two power transmission means, e.g. reverse idler gear, gear cluster, coupling sleeve, apply piston of a hydraulic clutch;
- "mechanism" means a kinematic chain consisting either of a single element or alternatively of a series of elements, the position of each point on the kinematic chain being derivable from the position of any other point on the chain, and therefore, for a given position of a point on one of the elements forming the kinematic chain there is only one position for each of the other points on the elements forming the kinematic chain;
- "final output mechanism" means the mechanism which includes the final output element;
- "actuating mechanism" means the mechanism, the movement of which causes the movement of another mechanism by being in mutual contact;
- "final actuating mechanism" means the mechanism actuating the final output mechanism.
- { "mechanical force" means the force transmitted by an actuating mechanism or the human body }

Combinations of features individually covered by group [F16H 61/00](#) and one or both of groups [F16H 59/00](#) and [F16H 63/00](#) are classified in group [F16H 61/00](#) .

Combinations of features individually covered by groups [F16H 59/00](#) and [F16H 63/00](#) are classified in group [F16H 63/00](#) .

When classifying in groups [F16H 59/00](#) to [F16H 63/00](#) , control inputs or types of gearing, which are not identified by the preceding notes concerning combinations,

and which are considered to represent information of interest for search, may also be classified. Such non-obligatory classification should be given as "additional information", e.g. selected from subgroup [F15H 61/66](#) relating to the type of gearing controlled or from group [F16H 59/00](#) relating to control inputs

F16H 59/00 **Control inputs to { control units of } change-speed-, or reversing-gearings for conveying rotary motion**

[F16H 2059/003](#) . Detecting or using driving style of a driver, e.g. for adapting shift schedules

[F16H 2059/006](#) . Overriding automatic control

[F16H 59/02](#) . Selector apparatus

NOTE

Selection apparatus of general applicability or of interest apart from its use in control of gearings conveying rotary motion is also classified in subclass [G05G](#)

[F16H 59/0204](#) . . { for automatic transmissions with means for range selection and manual shifting, e.g. range selector with tiptronic }

[F16H 59/0208](#) . . { with means for suppression of vibrations or reduction of noise }

[F16H 59/0213](#) . . { with sealing means, e.g. against entry of dust }

[F16H 59/0217](#) . . { with electric switches or sensors not for gear or range selection, e.g. for controlling auxiliary devices (for gear selection [F16H 59/044](#) ; for range selection [F16H 59/105](#)) }

[F16H 2059/0221](#) . . for selecting modes, i.e. input device (for selecting between different modes with range selector [F16H 2059/082](#) ; for conjoint control [B60W 30/182](#))

[F16H 2059/0226](#) . . . for selecting particular shift speeds, e.g. a fast shift speed with aggressive gear change

[F16H 2059/023](#) . . Selectors for gearings using voice control (for vehicle control [B60R 16/0373](#))

[F16H 2059/0234](#) . . Selectors for gearings using foot control

[F16H 2059/0239](#) . . Up- and down-shift selection by repeated movement (mechanical step by step selection devices [F16H 63/14](#))

[F16H 2059/0243](#) . . . with push buttons, e.g. shift buttons arranged on steering wheel (range selection with push buttons [F16H 59/12](#))

[F16H 2059/0247](#) . . . with lever or pedal behind steering wheel

[F16H 2059/0252](#) . . with means for initiating skip or double gear shifts, e.g. by moving selection lever beyond a threshold

[F16H 2059/0256](#) . . Levers for forward-reverse selection only, e.g. for working machines having a separate lever for switching between forward and reverse mode

[F16H 2059/026](#) . . Details or special features of the selector casing or lever support (for mechanical gear shifting [F16H 59/042](#))

[F16H 2059/0265](#) . . . Selector lever support with pivot axis offset, e.g. support by four bar linkage to create pivoting centre outside the mechanism

[F16H 2059/0269](#) . . . Ball joints or spherical bearings for supporting the lever

[F16H 2059/0273](#) . . . Cardan or gimbal type joints for supporting the lever

- F16H 59/0278 . . { **Constructional features of the selector lever, e.g. grip parts, mounting or manufacturing** }
- F16H 2059/0282 . . . Lever handles with lock mechanisms, e.g. for allowing selection of reverse gear or releasing lever from park position
- F16H 2059/0286 . . . with range or splitter selector on selector lever
- F16H 2059/0291 . . comprising safety means for preventing injuries in case of accidents
- F16H 2059/0295 . . with mechanisms to return lever to neutral or datum position, e.g. by return springs
- F16H 59/04 . . Ratio selector apparatus
- F16H 59/041 . . . { **consisting of a final output mechanism, e.g. ratio selector being directly linked to a shiftfork** }
- F16H 59/042 . . . { **comprising a final actuating mechanism (multiple final output mechanism in a gearbox [F16H 63/08](#))** }
- F16H 59/044 . . . { **consisting of electrical switches or sensors (range selectors with electric switches or sensors [F16H 59/105](#))** } C1011]
- F16H 59/045 . . . { **consisting of fluid valves** }
- F16H 2059/047 . . with essentially straight linear movement for gear selection, e.g. straight selection movement using detent mechanism for improving feeling (**up-down shift by repeated movements [F16H 2059/0239](#)**)
- F16H 2059/048 . . with means for un-locking select or shift movement to allow access to reverse gear position (**particular details of the lever handle [F16H 2059/0282](#)**)
- F16H 59/06 . . . the ratio being infinitely variable
- F16H 2059/065 . . . Inching pedals for setting the ratio of an hydrostatic transmission
- F16H 59/08 . . Range selector apparatus
- F16H 2059/081 . . . using knops or discs for rotary range selection
- F16H 2059/082 . . . with different modes
- F16H 2059/083 Overdrive or overdrive cut-off
- F16H 2059/084 Economy mode
- F16H 2059/085 Power mode
- F16H 2059/086 Adaptive mode, e.g. learning from the driver
- F16H 2059/087 Winter mode, e.g. to start on snow or slippery surfaces
- F16H 2059/088 . . . Fast forward-reverse-sequence mode
- F16H 59/10 . . . comprising levers
- F16H 59/105 { **consisting of electrical switches or sensors** }
- F16H 59/12 . . . comprising push button devices
- F16H 59/14 . . Inputs being a function of torque or torque demand
- F16H 59/141 . . { **of rate of change of torque or torque demand** }
- F16H 2059/142 . . of driving resistance calculated from weight, slope, or the like
- F16H 2059/144 . . characterised by change between positive and negative drive line torque, e.g. torque changes when switching between coasting and acceleration
- F16H 2059/145 . . being a function of power demand of auxiliary devices
- F16H 2059/147 . . Transmission input torque, e.g. measured or estimated engine torque
- F16H 2059/148 . . Transmission output torque, e.g. measured or estimated torque at output drive shaft
- F16H 59/16 . . Dynamometric measurement of torque

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| F16H 59/18 | .. | dependent on the position of the accelerator pedal |
| F16H 2059/183 | ... | Rate of change of accelerator position, i.e. pedal or throttle change gradient |
| F16H 2059/186 | ... | Coasting |
| F16H 59/20 | ... | Kickdown |
| F16H 59/22 | ... | Idle position |
| F16H 59/24 | .. | dependent on the throttle opening |
| F16H 59/26 | .. | dependent on pressure |
| F16H 59/28 | ... | Gasifier pressure in gas turbines |
| F16H 59/30 | ... | Intake manifold vacuum |
| F16H 59/32 | ... | Supercharger pressure in internal combustion engines |
| F16H 59/34 | .. | dependent on fuel feed |
| F16H 59/36 | . | Inputs being a function of speed |
| F16H 2059/363 | .. | Rate of change of engine or motor speed |
| F16H 2059/366 | .. | Engine or motor speed |
| F16H 59/38 | .. | of gearing elements |
| F16H 2059/385 | ... | Turbine speed |
| F16H 59/40 | ... | Output shaft speed |
| F16H 2059/405 | ... | Rate of change of output shaft speed or vehicle speed |
| F16H 59/42 | ... | Input shaft speed |
| F16H 2059/425 | .... | Rate of change of input or turbine shaft speed |
| F16H 59/44 | .. | dependent on machine speed of the machine, { e.g. the vehicle } |
| F16H 2059/443 | ... | Detecting travel direction, e.g. the forward or reverse movement of the vehicle |
| F16H 2059/446 | ... | Detecting vehicle stop, i.e. the vehicle is at stand still, e.g. for engaging parking lock |
| F16H 59/46 | .. | dependent on a comparison between speeds |
| F16H 2059/462 | ... | Detecting synchronisation, i.e. speed difference is approaching zero |
| F16H 2059/465 | ... | Detecting slip, e.g. clutch slip ratio |
| F16H 2059/467 | .... | of torque converter |
| F16H 59/48 | . | Inputs being a function of acceleration |
| F16H 59/50 | . | Inputs being a function of the status of the machine, e.g. position of doors or safety belts |
| F16H 2059/503 | .. | Axle-load distribution |
| F16H 2059/506 | .. | Wheel slip |
| F16H 59/52 | .. | dependent on the weight of the machine, e.g. change in weight resulting from passengers boarding a bus |
| F16H 2059/525 | ... | the machine undergoing additional towing load, e.g. by towing a trailer |
| F16H 59/54 | .. | dependent on signals from the brakes, e.g. parking brakes |
| F16H 59/56 | .. | dependent on signals from the main clutch |
| F16H 59/58 | .. | dependent on signals from the steering |
| F16H 59/60 | . | Inputs being a function of ambient conditions |

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| F16H 2059/605 | .. | Traffic stagnation information, e.g. traffic jams |
| F16H 59/62 | .. | Atmospheric pressure |
| F16H 59/64 | .. | Atmospheric temperature |
| F16H 59/66 | .. | Road conditions, e.g. slope, slippery |
| F16H 2059/663 | ... | Road slope |
| F16H 2059/666 | ... | Determining road conditions by using vehicle location or position, e.g. from global navigation systems (GPS) |
| F16H 59/68 | . | Inputs being a function of gearing status |
| F16H 2059/6807 | .. | Status of gear-change operation, e.g. clutch fully engaged |
| F16H 2059/6815 | .. | Post shift value of gearing, i.e. calculated or estimated parameters after shift is completed, e.g. estimated output torque after shift is performed |
| F16H 2059/6823 | .. | Sensing neutral state of the transmission |
| F16H 2059/683 | .. | Sensing pressure in control systems or in fluid controlled devices, e.g. by pressure sensors (for hydrostatic transmissions F16H 2059/6861) |
| F16H 2059/6838 | .. | Sensing gearing status of hydrostatic transmissions |
| F16H 2059/6846 | ... | the flow in hydrostatic transmissions circuits , e.g. high, low or differential pressures |
| F16H 2059/6853 | ... | the state of the transmission units, i.e. motor or pump capacity, e.g. for controlled shifting of range gear |
| F16H 2059/6861 | ... | the pressures, e.g. high, low or differential pressures |
| F16H 2059/6869 | ... | the pump speed |
| F16H 2059/6876 | ... | the motor speed |
| F16H 2059/6884 | ... | Sensing or calculating the pump torque |
| F16H 2059/6892 | ... | Sensing or calculating the motor torque |
| F16H 59/70 | .. | dependent on the ratio established |
| F16H 2059/702 | ... | Rate of change of gear ratio, e.g. for triggering clutch engagement |
| F16H 2059/704 | ... | Monitoring gear ratio in CVT's |
| F16H 2059/706 | ... | Monitoring gear ratio in stepped transmissions, e.g. by calculating the ratio from input and output speed |
| F16H 2059/708 | ... | Sensing reverse gear, e.g. by a reverse gear switch |
| F16H 59/72 | .. | dependent on oil characteristics, e.g. temperature, viscosity |
| F16H 2059/725 | ... | Sensing or calculating temperature of friction devices, e.g. clutches to prevent overheating of friction linings |
| F16H 59/74 | . | Inputs being a function of engine parameters (F16H 59/14 takes precedence) |
| F16H 2059/743 | .. | using engine performance or power for control of gearing (transmission input torque F16H 2059/147) |
| F16H 2059/746 | .. | Engine running state, e.g. on-off of ignition switch |
| F16H 59/76 | .. | Number of cylinders operating |
| F16H 59/78 | .. | Temperature |
| F16H 61/00 | | Control functions within { control units of } change-speed- or reversing-gearings for conveying rotary motion; { Control of exclusively fluid gearing, friction gearing, gearings with endless flexible members or other particular types of gearing } |
| F16H 61/0003 | . | { Arrangement or mounting of elements of the control apparatus, e.g. valve |

assemblies or snapfittings of valves; Arrangements of the control unit on or in the transmission gearbox }

F16H 61/0006 . . { Special features of electronic control units }

WARNING

This group is not complete pending reclassification; see also [F16H 61/0003](#)

F16H 61/0009 . . { Special features of hydraulic control units, e.g. valve plates or valve units }

F16H 2061/0012 . Transmission control for optimising power output of driveline

F16H 2061/0015 . Transmission control for optimising fuel consumptions

F16H 2061/0018 . Transmission control for optimising exhaust emissions

F16H 61/0021 . { Generation or control of line pressure }

F16H 61/0025 . . { Supply of control fluid; Pumps therefore }

WARNING

Group [F16H 61/0025](#) and subgroups are not complete pending a reorganisation, see also [F16H 61/00 K](#)

F16H 61/0028 . . . { using a single pump driven by different power sources }

F16H 61/0031 . . . { using an auxiliary pump driven by a different power source than the engine }

F16H 2061/0034 . . Accumulators for fluid pressure supply ; Control thereof

F16H 2061/0037 . . characterised by controlled fluid supply to lubrication circuits of the gearing ([see also lubrication control F16H 57/0446](#))

F16H 2061/004 . Venting trapped air from hydraulic systems ([venting of hydrostatic transmissions F16H 61/4174](#) ; [deaeration or removal of unsolved gas F15B 21/044](#))

F16H 2061/0043 . Cleaning of hydraulic parts, e.g. removal of an orifice clogging

F16H 2061/0046 . Details of fluid supply channels, e.g. within shafts, for supplying friction devices or transmission actuators with control fluid

F16H 2061/005 . Supply of electric power, e.g. batteries for back up supply

F16H 2061/0053 . Initializing the parameters of the controller

F16H 2061/0056 . Powering down of the controller

F16H 61/0059 . { Braking of gear output shaft, by simultaneous engagement of clutches for different gears ([engine braking F16H 61/21](#)) }

F16H 2061/0062 . Modifying an existing transmission control from a manufacturer for improvement or adaptation, e.g. by replacing a valve or an electric part

F16H 2061/0065 . Modifying or tuning an existing transmission control for racing, e.g. adaptation of valves for very fast shifting

- F16H 2061/0068 . Method or means for testing of transmission controls or parts thereof
- F16H 2061/0071 . . Robots or simulators for testing control functions in automatic transmission ([testing of transmissions G01M 13/02](#))
- F16H 2061/0075 . characterised by a particular control method
- F16H 2061/0078 . . Linear control, e.g. PID, state feedback or Kalman
- F16H 2061/0081 . . Fuzzy logic
- F16H 2061/0084 . . Neural networks
- F16H 2061/0087 . . Adaptive control, e.g. the control parameters adapted by learning
- F16H 2061/009 . . using formulas or mathematic relations for calculating parameters
- F16H 2061/0093 . . using models to estimate the state of the controlled object
- F16H 2061/0096 . . using a parameter map

- F16H 61/02 . characterised by the signals used { (for shift actuators [F16H 61/28](#) , for continuously variable gearings [F16H 61/66](#)) }

NOTE

Control units where gearshift is controlled by an electric circuit, are classified in [F16H 61/02 E](#)

Control units where gearshift is controlled by hydraulic signals and a subfunction, e.g. kickdown, is controlled by an electric circuit, are classified in [F16H 61/0262](#) with indexing of the electric features

- F16H 61/0202 . . { the signals being electric ([F16H 61/04](#) takes precedence) }
- F16H 61/0204 . . . { for gearshift control, e.g. control functions for performing shifting or generation of shift signal }
- F16H 61/0206 { Layout of electro-hydraulic control circuits, e.g. arrangement of valves (for control of actuators selecting and moving final output members, e.g. shift forks [F16H 61/2807](#)) }
- F16H 2061/0209 with independent solenoid valves modulating the pressure individually for each clutch or brake
- F16H 61/0211 { characterised by low integration or small number of valves }
- F16H 61/0213 { characterised by the method for generating shift signals }
- F16H 2061/0216 Calculation or estimation of post shift values for different gear ratios, e.g. by using engine performance tables
- F16H 2061/0218 Calculation or estimation of the available ratio range, i.e. possible gear ratios, e.g. for prompting a driver with a display
- F16H 2061/022 Calculation or estimation of optimal gear ratio, e.g. best ratio for economy drive or performance according driver preference, or to optimise exhaust emissions
- F16H 2061/0223 Generating of new shift maps, i.e. methods for determining shift points for a schedule by taking into account driveline and vehicle conditions
- F16H 2061/0225 Modifying of shift maps by manual control, e.g. by learning values from the driver during manual shift mode
- F16H 2061/0227 Shift map selection, i.e. methods for controlling selection between different shift maps, e.g. to initiate switch to a map for up-hill driving
- F16H 2061/023 Drive-off gear selection, i.e. optimising gear ratio for drive off of a vehicle

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|----------------|-------|---|
| F16H 2061/0232 | | Selecting ratios for bringing engine into a particular state, e.g. for fast warming up or for reducing exhaust emissions |
| F16H 2061/0234 | ..... | Adapting the ratios to special vehicle conditions |
| F16H 2061/0237 | ..... | Selecting ratios for providing engine braking |
| F16H 2061/0239 | ..... | Selecting ratios for preventing or cancelling wheel slip |
| F16H 2061/0241 | ..... | Adapting the ratio to special transmission conditions, e.g. shifts during warming up phase of transmission when fluid viscosity is high |
| F16H 2061/0244 | ..... | Adapting the automatic ratio to direct driver requests, e.g. manual shift signals or kick down |
| F16H 61/0246 | .... | { characterised by initiating reverse gearshift } |
| F16H 61/0248 | ... | { Control units where shifting is directly initiated by the driver, e.g. semi-automatic transmissions (generation of movements for final actuating mechanisms F16H 61/28) } |

WARNING

This group is not complete pending reclassification; see also groups [F16H 61/0204](#) , [F16H 61/0206](#)

| | | |
|----------------|-------|---|
| F16H 61/0251 | ... | { Elements specially adapted for electric control units, e.g. valves for converting electrical signals to fluid signals } |
| F16H 2061/0253 | .... | Details of electro hydraulic valves, e.g. lands, ports, spools or springs |
| F16H 2061/0255 | .... | Solenoid valve using PWM or duty-cycle control |
| F16H 2061/0258 | .... | Proportional solenoid valve |
| F16H 2061/026 | .... | On-off solenoid valve |
| F16H 61/0262 | .. | { the signals being hydraulic (F16H 61/04 takes precedence) } |
| F16H 61/0265 | ... | { for gearshift control, e.g. control functions for performing shifting or generation of shift signals } |
| F16H 61/0267 | .... | { Layout of hydraulic control circuits, e.g. arrangement of valves (for control of actuators selecting and moving final output members, e.g. shift forks F16H 61/30) } |
| F16H 61/0269 | ..... | { characterised by low integration or small number of valves } |
| F16H 61/0272 | .... | { characterised by initiating reverse gearshift } |
| F16H 61/0274 | ... | { Control units where shifting is directly initiated by the driver, e.g. semi-automatic transmissions (generation of movements for final actuating mechanisms F16H 61/28) } |

WARNING

This group is not complete pending reclassification; see also groups [F16H 61/0265](#) , [F16H 61/0267](#)

| | | |
|----------------|------|--|
| F16H 61/0276 | ... | { Elements specially adapted for hydraulic control units, e.g. valves } |
| F16H 2061/0279 | .... | Details of hydraulic valves, e.g. lands, ports, spools or springs |
| F16H 2061/0281 | .... | Rotary shift valves, e.g. with a rotary moveable spool for supply of fluid to different channels |
| F16H 61/0283 | .... | { Governor valves } |
| F16H 61/0286 | .... | { Manual valves } |
| F16H 2061/0288 | | Relay valve, e.g. valve arranged between shift valve and servo |

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| F16H 61/029 | | { Throttle valves } |
| F16H 61/0293 | .. | { the signals being purely mechanical } |
| F16H 61/0295 | ... | { Automatic gear shift control, e.g. initiating shift by centrifugal forces } |
| F16H 61/0297 | ... | { Gear shift control where shifting is directly initiated by the driver, e.g. semi-automatic transmissions } |
| F16H 61/04 | . | Smoothing ratio shift |
| F16H 61/0403 | .. | { Synchronisation before shifting } |
| F16H 2061/0407 | ... | by control of clutch in parallel torque path |
| F16H 2061/0411 | ... | by control of shaft brakes (shaft brakes F16H 3/12B) |
| F16H 2061/0414 | ... | by retarder control |
| F16H 2061/0418 | ... | by using different synchronisation devices simultaneously, e.g. for faster synchronisation |
| F16H 2061/0422 | ... | by an electric machine, e.g. by accelerating or braking the input shaft |
| F16H 2061/0425 | .. | Bridging torque interruption |
| F16H 2061/0429 | ... | by torque supply with a clutch in parallel torque path |
| F16H 2061/0433 | ... | by torque supply with an electric motor |
| F16H 61/0437 | .. | { by using electrical signals (F16H 61/0403 and F16H 61/061 take precedence) } |
| F16H 2061/044 | .. | when a freewheel device is disengaged or bridged |
| F16H 2061/0444 | .. | during fast shifting over two gearsteps, e.g. jumping from fourth to second gear |
| F16H 2061/0448 | ... | using a particular sequence of gear ratios or friction members |
| F16H 2061/0451 | .. | during swap-shifts, i.e. gear shifts between different planetary units, e.g. with double transitions shift involving three or more friction members |
| F16H 2061/0455 | .. | during shifts involving three or more friction members, e.g. release of 3-4 clutch, 2-4 brake and apply of forward clutch C1 (swap shift F16H 2061/0451) |
| F16H 2061/0459 | .. | using map for shift parameters, e.g. shift time, slip or pressure gradient, for performing controlled shift transition and adapting shift parameters by learning |
| F16H 2061/0462 | .. | by controlling slip rate during gear shift transition |
| F16H 2061/0466 | .. | Smoothing shift shock by apply or release of band brake servos, e.g. overlap control of band brake and a clutch or vice versa |
| F16H 2061/047 | .. | by preventing or solving a tooth but situation upon engagement failure due to misalignment of teeth |
| F16H 2061/0474 | .. | by smoothing engagement of positive clutches ; Methods or means for shock free engagement of dog clutches (for tooth but situations F16H 2061/047) |
| F16H 2061/0477 | .. | by suppression of excessive engine flare or turbine racing during shift transition (engine flare caused by lock-up release F16H 61/143) |
| F16H 2061/0481 | .. | during range shift from drive (D) or reverse (R) to neutral (N) |
| F16H 2061/0485 | .. | during range shift from neutral (N) to reverse (R) |
| F16H 2061/0488 | .. | during range shift from neutral (N) to drive (D) |
| F16H 2061/0492 | .. | for high engine torque, e.g. during acceleration or uphill driving |
| F16H 2061/0496 | .. | for low engine torque, e.g. during coasting, sailing or engine braking |
| F16H 61/06 | .. | by controlling rate of change of fluid pressure |
| F16H 61/061 | ... | { using electric control means } |
| F16H 2061/062 | | for controlling filling of clutches or brake servos, e.g. fill time, fill level or pressure during filling |

| | | |
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| F16H 2061/064 | | for calibration of pressure levels for friction members, e.g. by monitoring the speed change of transmission shafts |
| F16H 61/065 | ... | { using fluid control means } |
| F16H 61/067 | .... | { using an accumulator } |
| F16H 61/068 | .... | { using an orifice control valve (F16H 61/067 takes precedence) } |
| F16H 61/08 | .. | Timing control |
| F16H 2061/085 | ... | Timing of auxilliary gear shifts |
| F16H 61/10 | . | Regulating shift hysteresis |
| F16H 61/12 | . | Detecting malfunction or potential malfunction, e.g. fail safe (in control of hydrostatic gearing F16H 61/4192) ; { Circumventing or fixing failures } |
| F16H 2061/1204 | .. | for malfunction caused by simultaneous engagement of different ratios resulting in transmission lock state or tie-up condition (lock state for braking F16H 61/0059) |
| F16H 2061/1208 | .. | with diagnostic check cycles ; Monitoring of failures |
| F16H 2061/1212 | ... | Plausibility checks ; Counting means for repeated failures |
| F16H 2061/1216 | ... | Display or indication of detected failures |
| F16H 2061/122 | .. | Avoiding failures by using redundant parts |
| F16H 2061/1224 | .. | Adapting to failures or work around with other constraints, e.g. circumvention by avoiding use of failed parts |
| F16H 2061/1228 | .. | Fixing failures by repairing failed parts, e.g. loosening a sticking valve |
| F16H 2061/1232 | .. | Bringing the control into a predefined state, e.g. giving priority to particular actuators or gear ratios |
| F16H 2061/1236 | ... | using fail priority valves |
| F16H 2061/124 | .. | Limiting the input power, torque or speed |
| F16H 2061/1244 | .. | Keeping the current state |
| F16H 2061/1248 | .. | Resuming normal operation |
| F16H 2061/1252 | .. | Fail safe valves (fail priority valves F16H 2061/1236) |
| F16H 2061/1256 | .. | characterised by the parts or units where malfunctioning was assumed or detected |
| F16H 2061/126 | ... | the failing part is the controller |
| F16H 2061/1264 | .... | Hydraulic parts of the controller, e.g. a sticking valve or clogged channel |
| F16H 2061/1268 | .... | Electric parts of the controller, e.g. a defect solenoid, wiring or microprocessor |
| F16H 2061/1272 | ... | the failing part is a part of the final output mechanism, e.g. shift rods or forks |
| F16H 2061/1276 | ... | the failing part is a friction device, e.g. clutches or brakes |
| F16H 2061/128 | .... | the main clutch |
| F16H 2061/1284 | ... | the failing part is a sensor |
| F16H 2061/1288 | ... | the failing part is an actuator |
| F16H 2061/1292 | ... | the failing part is the power supply, e.g. the electric power supply |
| F16H 2061/1296 | ... | the failing part is an electric machine forming part of the transmission |
| F16H 61/14 | . | Control of torque converter lock-up clutches |
| F16H 61/141 | .. | { using means only actuated by centrifugal force } |
| F16H 61/142 | ... | { the means being hydraulic valves } |
| F16H 61/143 | .. | { using electric control means } |

- F16H 2061/145 . . . for controlling slip, e.g. approaching target slip value
- F16H 2061/146 . . . for smoothing gear shift shock
- F16H 2061/147 . . . during engine braking, e.g. to attenuate gear clunk when torque direction is changed
- F16H 61/148 . . { using mechanical control means }
- F16H 61/16 . Inhibiting { or initiating } shift during unfavourable conditions, { e.g. preventing forward reverse shift at high vehicle speed, preventing engine over speed (unintentional control input [F16H 61/18](#)) }
- F16H 2061/161 . . by checking feasibility of shifts, i.e. determine if requested shift can be successfully completed and post shift values are in an acceptable range
- F16H 2061/163 . . Holding the gear for delaying gear shifts under unfavorable conditions, e.g. during cornering
- F16H 2061/165 . . Preventing reverse gear shifts if vehicle speed is too high for safe shifting
- F16H 2061/166 . . Preventing or initiating shifts for preventing stall or overspeed of engine
- F16H 2061/168 . . Forced shifts into neutral for safety reasons, e.g. in case of transmission failure or emergency braking
- F16H 61/18 . Preventing unintentional or unsafe shift, { e.g. preventing manual shift from highest gear to reverse gear }
- F16H 2061/185 . . Means, e.g. catches or interlocks, for preventing unintended shift into reverse gear
- F16H 61/20 . Preventing gear creeping; { Transmission control during standstill, e.g. hill hold control }
- F16H 2061/202 . . Active creep control for slow driving, e.g. by controlling clutch slip
- F16H 2061/205 . . Hill hold control, e.g. with torque converter or an friction device slightly engaged to keep vehicle stationary
- F16H 2061/207 . . by neutral control
- F16H 61/21 . Providing engine brake control
- F16H 2061/213 . . for emergency braking, e.g. for increasing brake power in emergency situations
- F16H 2061/216 . . by using exhaust brakes
- F16H 61/22 . Locking { of the control input devices } ([F16H 63/34](#) takes precedence; { vehicle fittings for preventing unauthorised use, e.g. ignition keys interlocked with gear box or gear lever [B60R 25/06](#) })
- F16H 2061/223 . . Electrical gear shift lock, i.e. locking of lever in park or neutral position by electric means if brake is not applied ; Key interlock, i.e. locking the key if lever is not in park position
- F16H 2061/226 . . Manual distress release of the locking means for shift levers, e.g. to allow towing of vehicle in case of breakdown (for parking locks [F16H 63/3491](#))
- F16H 61/24 . Providing feel, e.g. to enable selection
- F16H 2061/241 . . Actuators providing feel or simulating a shift gate, i.e. with active force generation for providing counter forces for feed back
- F16H 2061/242 . . Mechanical shift gates or similar guiding means during selection and shifting
- F16H 2061/243 . . Cams or detent arrays for guiding and providing feel
- F16H 2061/245 . . Ramp contours for generating force threshold, e.g. cams or pushers for generating additional resistance for a reverse path

- F16H 2061/246 . . Additional mass or weight on shift linkage for improving feel
- F16H 2061/247 . . Detents for range selectors
- F16H 2061/248 . . with audible signals for providing selection or shift feed back
- F16H 61/26 . Generation or transmission of movements for final actuating mechanisms

NOTE

The generation or transmission of movements comprising only the selector apparatus, is classified in group [F16H 59/00](#) .

The generation or transmission of movements, when part of the final output mechanisms, is classified in group [F16H 63/00](#) .

- F16H 61/28 . . with at least one movement of the final actuating mechanism being caused by a non-mechanical force, e.g. power-assisted
- F16H 61/2807 . . . { using electric control signals, e.g. electro-hydraulic control ([F16H 61/30](#) , [F16H 61/32](#) take precedence; methods for generating shift signals [F16H 61/0213](#)) }
- F16H 61/2815 . . . { with a control using only relays and switches }
- F16H 2061/2823 . . Controlling actuator force way characteristic, i.e. controlling force or movement depending on the actuator position, e.g. for adapting force to synchronisation and engagement of gear clutch
- F16H 2061/283 . . Adjustment or calibration of actuator positions, e.g. neutral position
- F16H 2061/2838 . . Arrangements with single drive motor for selecting and shifting movements, i.e. one motor used for generating both movements
- F16H 2061/2846 . . Arrangements of actuators for enabling jump shifting for skipping of gear ratios
- F16H 2061/2853 . . Electromagnetic solenoids
- F16H 2061/2861 . . Linear motors
- F16H 2061/2869 . . Cam or crank gearing
- F16H 2061/2876 . . Racks
- F16H 2061/2884 . . Screw-nut devices
- F16H 2061/2892 . . other gears, e.g. worm gears, for transmitting rotary motion to the output mechanism
- F16H 61/30 . . Hydraulic { or pneumatic } motors { or related fluid control means } therefor
- F16H 2061/301 . . . for power assistance, i.e. servos with follow up action
- F16H 2061/302 with variable force amplification, e.g. force is depending on selected gear or on actuator force ([non-linear amplification](#))
- F16H 2061/304 . . . using telemotors, i.e. systems with master cylinder and linked shift actuator without external pressure source
- F16H 2061/305 . . . Accumulators for fluid supply to the servo motors, or control thereof ([accumulators for line pressure](#) [R16H 61/00K4](#))
- F16H 2061/307 . . . Actuators with three defined positions, i.e. three position servos
- F16H 2061/308 . . . Modular hydraulic shift units, i.e. preassembled actuator units for select and shift movements adapted for being mounted on transmission casing
- F16H 61/32 . . Electric motors { actuators or related electrical control means } therefor
- F16H 2061/323 . . . for power assistance, i.e. servos with follow up action
- F16H 2061/326 . . . Actuators for range selection, i.e. actuators for controlling the range selector or the manual range valve in the transmission

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| F16H 61/34 | .. | comprising two mechanisms, one for the preselection movement, and one for the shifting movement (F16H 61/36 takes precedence) |
| F16H 61/36 | .. | with at least one movement being transmitted by a cable |
| F16H 61/38 | . | Control of exclusively fluid gearing |
| F16H 61/40 | .. | hydrostatic (involving modification of the gearing F16H 39/02 , F16H 39/04) |
| F16H 61/4008 | ... | Control of circuit pressure |
| F16H 61/4017 | .... | Control of high pressure, e.g. avoiding excess pressure by a relief valve |
| F16H 61/4026 | .... | Control of low pressure |
| F16H 61/4035 | ... | Control of circuit flow |
| F16H 61/4043 | ... | Control of a bypass valve |
| F16H 61/4052 | .... | by using a variable restriction, e.g. an orifice valve |
| F16H 61/4061 | ... | Control related to directional control valves, e.g. change-over valves, for crossing the feeding conduits (forward reverse switching by using swash plate F16H 61/438) |
| F16H 61/4069 | ... | Valves related to the control of neutral, e.g. shut off valves (zero tilt rotation holding means F16H 61/439) |
| F16H 61/4078 | ... | Fluid exchange between hydrostatic circuits and external sources or consumers |
| F16H 61/4096 | .... | with pressure accumulators |
| F16H 61/4104 | .... | Flushing, e.g. by using flushing valves or by connection to exhaust |
| F16H 61/4131 | .... | Fluid exchange by aspiration from reservoirs, e.g. sump |
| F16H 61/4139 | .... | Replenishing or scavenging pumps, e.g. auxiliary charge pumps |
| F16H 61/4148 | ... | Open loop circuits |
| F16H 61/4157 | ... | Control of braking, e.g. preventing pump over-speeding when motor acts as a pump |
| F16H 61/4165 | ... | Control of cooling or lubricating |
| F16H 61/4174 | ... | Control of venting, e.g. removing trapped air |
| F16H 61/4183 | ... | Preventing or reducing vibrations or noise, e.g. avoiding cavitations |
| F16H 61/4192 | ... | Detecting malfunction or potential malfunction, e.g. fail safe |
| F16H 61/42 | ... | involving adjustment of a pump or motor with adjustable output or capacity { (F16H 61/46 takes precedence) } |
| F16H 61/421 | .... | Motor capacity control by electro-hydraulic control means, e.g. using solenoid valves |
| F16H 61/423 | .... | Motor capacity control by fluid pressure control means |
| F16H 61/425 | .... | Motor capacity control by electric actuators |
| F16H 61/427 | .... | Motor capacity control by mechanical control means, e.g. by levers or pedals |
| F16H 61/431 | .... | Pump capacity control by electro-hydraulic control means, e.g. using solenoid valves |
| F16H 61/433 | .... | Pump capacity control by fluid pressure control means |
| F16H 61/435 | .... | Pump capacity control by electric actuators |
| F16H 61/437 | .... | Pump capacity control by mechanical control means, e.g. by levers or pedals |
| F16H 61/438 | .... | Control of forward-reverse switching, e.g. control of the swash plate causing discharge in two directions (using a directional control valve F16H 61/4061) |
| F16H 61/439 | | Control of the neutral position, e.g. by zero tilt rotation holding means (using a neutral valve or a shutoff valve F16H 61/4069) |

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| F16H 61/44 | ... | with more than one pump or motor in operation |
| F16H 61/444 | | by changing the number of pump or motor units in operation |
| F16H 61/448 | .... | Control circuits for tandem pumps or motors |
| F16H 61/452 | .... | Selectively controlling multiple pumps or motors, e.g. switching between series or parallel |
| F16H 61/456 | .... | Control of the balance of torque or speed between pumps or motors (hydrostatic differentials F16H 48/18) |
| F16H 61/46 | ... | Automatic regulation in accordance with output requirements |
| F16H 61/461 | .... | { not involving a variation of the output capacity of the main pumps or motors } |
| F16H 61/462 | .... | for achieving a target speed ratio |
| F16H 61/465 | .... | for achieving a target input speed |
| F16H 61/468 | .... | for achieving a target input torque |
| F16H 61/47 | .... | for achieving a target output speed |
| F16H 61/472 | .... | for achieving a target output torque |
| F16H 61/475 | .... | for achieving a target power, e.g. input power or output power |
| F16H 61/478 | .... | for preventing overload, e.g. high pressure limitation |
| F16H 61/48 | .. | hydrodynamic |
| F16H 61/50 | ... | controlled by changing the flow, force, or reaction of the liquid in the working circuit, while maintaining a completely filled working circuit |
| F16H 61/52 | .... | by altering the position of blades |
| F16H 61/54 | ..... | by means of axially-shiftable blade runners |
| F16H 61/56 | ..... | to change the blade angle |
| F16H 61/58 | .... | by change of the mechanical connection of, or between, the runners |
| F16H 61/60 | ..... | exclusively by the use of freewheel clutches |
| F16H 61/62 | ..... | involving use of a speed-changing gearing or of a clutch in the connection between runners (F16H 45/02 , F16H 61/60 take precedence) |
| F16H 61/64 | ... | controlled by changing the amount of liquid in the working circuit |

WARNING

New subgroups of IPC8 introduced in October 2004 are not complete.
Documents from [F16H 61/00](#) and subgroups are in the process of being reorganised to the new groups

| | | |
|----------------|-----|--|
| F16H 61/66 | . | specially adapted for continuously variable gearings (F16H 61/38 takes precedence) |
| F16H 2061/6601 | .. | with arrangements for dividing torque and shifting between different ranges |
| F16H 2061/6602 | .. | with at least two dynamo-electric machines for creating an electric power path inside the transmission device, e.g. using generator and motor for a variable power torque path |
| F16H 2061/6603 | ... | characterised by changing ratio in the mechanical gearing |
| F16H 2061/6604 | .. | Special control features generally applicable to continuously variable gearings |
| F16H 2061/6605 | ... | Control for completing downshift at hard braking |
| F16H 2061/6607 | ... | Controls concerning lubrication or cooling (lubrication features of friction gearings F16H 57/0487) |
| F16H 2061/6608 | ... | Control of clutches, or brakes for forward-reverse shift |

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| F16H 2061/6609 | ... | Control of clutches or brakes in torque split transmissions |
| F16H 2061/661 | ... | Conjoint control of CVT and drive clutch |
| F16H 2061/6611 | ... | Control to achieve a particular driver perception, e.g. for generating a shift shock sensation |
| F16H 2061/6612 | .... | for engine braking |
| F16H 2061/6614 | ... | Control of ratio during dual or multiple pass shifting for enlarged ration coverage |
| F16H 2061/6615 | ... | Imitating a stepped transmissions |
| F16H 2061/6616 | .... | the shifting of the transmission being manually controlled |
| F16H 2061/6617 | ... | Manual control of CVTs while continuously varying the ratio |
| F16H 2061/6618 | ... | Protecting CVTs against overload by limiting clutch capacity, e.g. torque fuse |
| F16H 61/662 | .. | with endless flexible means |
| F16H 2061/66204 | ... | Control for modifying the ratio control characteristic |
| F16H 2061/66209 | .... | dependent on ambient conditions |
| F16H 2061/66213 | .... | dependent on driver's choice |
| F16H 2061/66218 | .... | dependent on control input parameters other than ambient conditions or driver's choice |
| F16H 2061/66222 | .... | the ratio is varied in order to reduce surface wear of belt or pulley |
| F16H 61/66227 | ... | { controlling shifting exclusively as a function of speed and torque } |
| F16H 61/66231 | ... | { controlling shifting exclusively as a function of speed } |
| F16H 61/66236 | .... | { using electrical or electronical sensing or control means } |
| F16H 61/6624 | .... | { using only hydraulical and mechanical sensing or control means } |
| F16H 61/66245 | .... | { using purely mechanical sensing or control means } |
| F16H 61/6625 | ... | { controlling shifting exclusively as a function of torque } |
| F16H 61/66254 | ... | { controlling of shifting being influenced by a signal derived from the engine and the main coupling } |
| F16H 61/66259 | .... | { using electrical or electronical sensing or control means } |
| F16H 61/66263 | .... | { using only hydraulical and mechanical sensing or control means } |
| F16H 61/66268 | .... | { using purely mechanical sensing or control means } |
| F16H 61/66272 | ... | { characterised by means for controlling the torque transmitting capability of the gearing } |
| F16H 2061/66277 | .... | by optimising the clamping force exerted on the endless flexible member |
| F16H 2061/66281 | .... | by increasing the line pressure at the occurrence of input torque peak |
| F16H 2061/66286 | ... | Control for optimising pump efficiency |
| F16H 2061/6629 | ... | Detection of slip for determining level of wear |
| F16H 2061/66295 | ... | characterised by means for controlling the geometrical interrelationship of pulleys and the endless flexible member, e.g. belt alignment or position of the resulting axial pulley force in the plane perpendicular to the pulley axis |
| F16H 61/664 | .. | Friction gearings |
| F16H 2061/6641 | ... | Control for modifying the ratio control characteristic |
| F16H 2061/6642 | .... | dependent on ambient conditions |
| F16H 2061/6643 | .... | dependent on driver's choice |
| F16H 2061/6644 | .... | dependent on control input parameters other than ambient conditions or driver's choice |
| F16H 61/6645 | ... | { controlling shifting exclusively as a function of speed and torque } |

- F16H 61/6646 . . . { controlling shifting exclusively as a function of speed }
- F16H 61/6647 . . . { controlling shifting exclusively as a function of torque }
- F16H 61/6648 . . . { controlling of shifting being influenced by a signal derived from the engine and the main coupling }
- F16H 61/6649 . . . { characterised by the means for controlling the torque transmitting capability of the gearing }

- F16H 61/68 . specially adapted for stepped gearings
- F16H 61/682 . . with interruption of drive
- F16H 61/684 . . without interruption of drive
- F16H 61/686 . . . with orbital gears
- F16H 61/688 . . . with two inputs, e.g. selection of one of two torque-flow paths by clutches

- F16H 61/70 . specially adapted for change-speed gearing in group arrangement, i.e. with separate change-speed gear trains arranged in series, e.g. range or overdrive-type gearing arrangements
- F16H 61/702 . . { using electric or electrohydraulic control means (timing of auxilliary gear shifts [F16H 61/08B](#)) }
- F16H 61/705 . . { using hydraulic and mechanical control means (timing of auxilliary gear shifts [F16H 61/08B](#)) }
- F16H 61/707 . . { using only mechanical control means }

WARNING

This group is not complete pending reclassification; see also group [F16H 63/44](#)

- F16H 63/00** **Control outputs { from the control unit } to change-speed- or reversing-gearings for conveying rotary motion { or to other devices than the final output mechanism }**
- F16H 2063/005 . Preassembled gear shift units for mounting on gear case (for hydraulic shift units [F16H 2061/308](#))

 - F16H 63/02 . Final output mechanisms therefor ; Actuating means for the final output mechanisms
 - F16H 2063/025 . . Final output mechanisms for double clutch transmissions
 - F16H 63/04 . . a single final output mechanism being moved by a single final actuating mechanism { ([Constructional features of the final output mechanisms F16H 63/30](#)) }

 - F16H 63/06 . . . the final output mechanism having an indefinite number of positions
 - F16H 63/062 { electric or electro-mechanical actuating means }
 - F16H 63/065 { hydraulic actuating means }
 - F16H 63/067 { mechanical actuating means }
 - F16H 63/08 . . Multiple final output mechanisms being moved by a single common final actuating mechanism { ([Constructional features of the final output mechanisms F16H 63/30](#)) }

 - F16H 63/10 . . . the final actuating mechanism having a series of independent ways of movement, each way of movement being associated with only one final output mechanism

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|----------------|-------|---|
| F16H 63/12 | | two or more ways of movement occurring simultaneously |
| F16H 63/14 | ... | the final output mechanisms being successively actuated by repeated movement of the final actuating mechanism |
| F16H 63/16 | ... | the final output mechanisms being successively actuated by progressive movement of the final actuating mechanism |
| F16H 63/18 | .... | the final actuating mechanism comprising cams |
| F16H 63/20 | ... | with preselection and subsequent movement of each final output mechanism by movement of the final actuating mechanism in two different ways, e.g. guided by a shift gate |
| F16H 2063/202 | .... | using cam plates for selection or shifting, e.g. shift plates with recesses or grooves moved by a selector extension |
| F16H 2063/204 | .... | the gear shift lever being the immediate final actuating mechanism, e.g. the shift finger being a part of the gear shift lever |
| F16H 63/206 | .... | { the final output mechanisms being mounted coaxially on a single shaft, e.g. mono rail shift mechanism } |
| F16H 2063/208 | .... | using two or more selecting fingers |
| F16H 63/22 | .... | the final output mechanisms being simultaneously moved by the final actuating mechanism |
| F16H 63/24 | .. | each of the final output mechanisms being moved by only one of the various final actuating mechanisms { (Constructional features of the final output mechanisms F16H 63/30) } |
| F16H 63/26 | ... | some of the movements of the final output mechanisms being caused by another final output mechanism |
| F16H 63/28 | .. | two or more final actuating mechanisms moving the same final output mechanism { (Constructional features of the final output mechanisms F16H 63/30) } |
| F16H 63/285 | ... | { with a first final actuating member applying a force to two or more final output members and a second final actuating member locking in position another final output member } |
| F16H 63/30 | .. | Constructional features of the final output mechanisms |
| F16H 63/3003 | ... | { Bandbrake actuating mechanisms } |
| F16H 2063/3006 | .... | moved by a non-mechanical force |
| F16H 63/3009 | ... | { the final output mechanisms having elements remote from the gearbox } |
| F16H 63/3013 | ... | { the final output mechanism being characterised by linkages converting movement, e.g. into opposite direction by a pivoting lever linking two shift rods } |
| F16H 63/3016 | ... | { Final output mechanisms varying the leverage or force ratio } |
| F16H 63/302 | ... | { Final output mechanisms for reversing } |
| F16H 63/3023 | ... | { the final output mechanisms comprising elements moved by fluid pressure (F16H 63/30B1 takes precedence) } |
| F16H 63/3026 | .... | { comprising friction clutches or brakes (band brake actuating mechanisms F16H 63/3003) } |
| F16H 2063/303 | ..... | the friction member is actuated and released by applying pressure to different fluid chambers |
| F16H 2063/3033 | ..... | the brake is actuated by springs and released by a fluid pressure |
| F16H 2063/3036 | ..... | the clutch is actuated by springs and released by a fluid pressure |
| F16H 63/304 | ... | { the final output mechanisms comprising elements moved by electrical or magnetic force (F16H 63/30B1 takes precedence) } |
| F16H 63/3043 | .... | { comprising friction clutches or brakes } |
| F16H 2063/3046 | | using electromagnetic clutch for coupling gear wheel to shaft (friction |

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|--------------------------------|-------|--|
| | | clutches F16H 63/3043) |
| F16H 2063/305 | | using electromagnetic solenoids |
| F16H 2063/3053 | | using linear motors |
| F16H 2063/3056 | .... | using cam or crank gearing |
| F16H 2063/3059 | .... | using racks |
| F16H 2063/3063 | .... | using screw devices |
| F16H 2063/3066 | .... | using worm gears |
| F16H 63/3069 | ... | { Interrelationship between two or more final output mechanisms (interlocking devices F16H 63/36) } |
| F16H 2063/3073 | .... | final output mechanisms mounted on a single shaft |
| F16H 2063/3076 | ... | Selector shaft assembly, e.g. supporting, assembly or manufacturing of selector or shift shafts ; Special details thereof |
| F16H 2063/3079 | ... | Shift rod assembly, e.g. supporting, assembly or manufacturing of shift rails or rods ; Special details thereof |
| F16H 2063/3083 | ... | Shift finger arrangements, e.g. shape or attachment of shift fingers |
| F16H 2063/3086 | ... | Shift head arrangements, e.g. forms or arrangements of shift heads for preselection or shifting |
| F16H 2063/3089 | ... | Spring assisted shift, e.g. springs for accumulating energy of shift movement and release it when clutch teeth are aligned |
| F16H 2063/3093 | ... | Final output elements, i.e. the final elements to establish gear ratio, e.g. dog clutches or other means establishing coupling to shaft (fluid actuated clutches F16H 63/3026 ; electromagnetic clutches F16H 2063/3046) |
| F16H 2063/3096 | .... | Sliding keys as final output elements ; Details thereof |
| F16H 63/32 | ... | Gear shift yokes, { e.g. shift forks } |
| F16H 2063/321 | .... | characterised by the interface between fork body and shift rod, e.g. fixing means, bushes, cams or pins |
| F16H 2063/322 | .... | characterised by catches or notches for moving the fork |
| F16H 2063/324 | .... | characterised by slide shoes, or similar means to transfer shift force to sleeve |
| F16H 2063/325 | .... | Rocker or swiveling forks, i.e. the forks are pivoted in the gear case when moving the sleeve |
| F16H 2063/327 | .... | essentially made of sheet metal |
| F16H 2063/328 | .... | essentially made of plastics, e.g. injection molded |
| F16H 63/34 | ... | Locking or disabling mechanisms |
| F16H 63/3408 | .... | { the locking mechanism being moved by the final actuating mechanism } |
| F16H 63/3416 | .... | { Parking lock mechanisms or brakes in the transmission } |
| F16H 63/3425 | ..... | { characterised by pawls or wheels } |
| F16H 63/3433 | ..... | { Details of latch mechanisms, e.g. for keeping pawls out of engagement } |
| F16H 63/3441 | ..... | { Parking locks engaging axially } |
| F16H 63/345 | ..... | { using friction brakes, e.g. a band brakes } |
| F16H 63/3458 | ..... | { with electric actuating means, e.g. shift by wire } |
| F16H 63/3466 | ..... | { using electric motors } |
| F16H 63/3475 | | { using solenoids } |
| F16H 63/3483 | | { with hydraulic actuating means } |

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|--------------|-------|---|
| F16H 63/3491 | | { Emergency release or engagement of parking locks or brakes } |
| F16H 63/36 | | Interlocking devices |
| F16H 63/38 | ... | Detents { (spring-loaded ball units for holding levers in a limited number of positions G05G 5/065) } |
| F16H 63/40 | . | comprising signals other than signals for actuating the final output mechanisms |
| F16H 63/42 | .. | Ratio indicator devices |

WARNING

This group is not complete pending reclassification; see also codes [B60K 2741/22](#) , [B60K 2741/225](#)

| | | |
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| F16H 2063/423 | ... | Range indicators for automatic transmissions, e.g. showing selected range or mode |
| F16H 2063/426 | ... | with means for advising the driver for proper shift action, e.g. prompting the driver with allowable selection range of ratios |
| F16H 63/44 | .. | Signals to the control unit of auxiliary gearing |
| F16H 63/46 | .. | Signals to a clutch outside the gearbox |
| F16H 63/48 | .. | Signals to a parking brake { or parking lock; Control of parking locks or brakes being part of the transmission } |
| F16H 63/483 | ... | { Circuits for controlling engagement of parking locks or brakes } |
| F16H 63/486 | ... | { Common control of parking locks or brakes in the transmission and other parking brakes, e.g. wheel brakes } |
| F16H 63/50 | .. | Signals to an engine or motor |
| F16H 63/502 | ... | { for smoothing gear shifts } |
| F16H 2063/504 | ... | for bringing engine into special condition by transmission control, e.g. by changing torque converter characteristic to modify engine set point to higher engine speed for better acceleration performance |
| F16H 2063/506 | ... | for engine torque resume after shift transition, e.g. a resume adapted to the driving style |
| F16H 2063/508 | ... | for limiting transmission input torque, e.g. to prevent damage of transmission parts |

Guidance heading:**F16H 2200/00 Transmissions for multiple ratios**

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|----------------|---|--|
| F16H 2200/0004 | . | comprising a power take off shaft |
| F16H 2200/0008 | . | specially adapted for front-wheel-driven vehicles |
| F16H 2200/0013 | . | specially adapted for rear-wheel-driven vehicles |
| F16H 2200/0017 | . | specially adapted for four-wheel-driven vehicles |
| F16H 2200/0021 | . | specially adapted for electric vehicles |
| F16H 2200/0026 | . | comprising at least one creep low gear, e.g. additional gear for extra low speed or creeping |

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| F16H 2200/003 | . characterised by the number of forward speeds |
| F16H 2200/0034 | .. the gear ratios comprising two forward speeds |
| F16H 2200/0039 | .. the gear ratios comprising three forward speeds |
| F16H 2200/0043 | .. the gear ratios comprising four forward speeds |
| F16H 2200/0047 | .. the gear ratios comprising five forward speeds |
| F16H 2200/0052 | .. the gear ratios comprising six forward speeds |
| F16H 2200/0056 | .. the gear ratios comprising seven forward speeds |
| F16H 2200/006 | .. the gear ratios comprising eight forward speeds |
| F16H 2200/0065 | .. the gear ratios comprising nine forward speeds |
| F16H 2200/0069 | .. the gear ratios comprising ten forward speeds |
| F16H 2200/0073 | .. the gear ratios comprising eleven forward speeds |
| F16H 2200/0078 | .. the gear ratio comprising twelve or more forward speeds |
| F16H 2200/0082 | . characterised by the number of reverse speeds |
| F16H 2200/0086 | .. the gear ratios comprising two reverse speeds |
| F16H 2200/0091 | .. the gear ratios comprising three reverse speeds |
| F16H 2200/0095 | .. the gear ratios comprising four reverse speeds |
| F16H 2200/20 | . Transmissions using gears with orbital motion |
| F16H 2200/2002 | .. characterised by the number of sets of orbital gears |
| F16H 2200/2005 | ... with one sets of orbital gears |
| F16H 2200/2007 | ... with two sets of orbital gears |
| F16H 2200/201 | ... with three sets of orbital gears |
| F16H 2200/2012 | ... with four sets of orbital gears |
| F16H 2200/2015 | ... with five sets of orbital gears |
| F16H 2200/2017 | ... with six sets of orbital gears |
| F16H 2200/202 | .. characterised by the type of Ravigneaux set |
| F16H 2200/2023 | ... using a Ravigneaux set with 4 connections |
| F16H 2200/2025 | ... using a Ravigneaux set with 5 connections |
| F16H 2200/2028 | ... using a Ravigneaux set with 6 connections |
| F16H 2200/203 | .. characterised by the engaging friction means not of the freewheel type, e.g. friction clutches or brakes |
| F16H 2200/2033 | ... with one engaging means |
| F16H 2200/2035 | ... with two engaging means |
| F16H 2200/2038 | ... with three engaging means |
| F16H 2200/2041 | ... with four engaging means |
| F16H 2200/2043 | ... with five engaging means |
| F16H 2200/2046 | ... with six engaging means |
| F16H 2200/2048 | ... with seven engaging means |
| F16H 2200/2051 | ... with eight engaging means |
| F16H 2200/2053 | ... with nine engaging means |
| F16H 2200/2056 | ... with ten engaging means |

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| F16H 2200/2058 | ... | with eleven engaging means |
| F16H 2200/2061 | ... | with twelve engaging means |
| F16H 2200/2064 | ... | using at least one positive clutch, e.g. dog clutch |
| F16H 2200/2066 | ... | using one freewheel mechanism |
| F16H 2200/2069 | ... | using two freewheel mechanism |
| F16H 2200/2071 | ... | using three freewheel mechanism |
| F16H 2200/2074 | ... | using four freewheel mechanism |
| F16H 2200/2076 | ... | using at least five freewheel mechanism |
| F16H 2200/2079 | .. | using freewheel type mechanisms, e.g. freewheel clutches |
| F16H 2200/2082 | ... | one freewheel mechanisms |
| F16H 2200/2084 | ... | two freewheel mechanisms |
| F16H 2200/2087 | ... | three freewheel mechanisms |
| F16H 2200/2089 | ... | four freewheel mechanisms |
| F16H 2200/2092 | ... | at least five freewheel mechanisms |
| F16H 2200/2094 | .. | using positive clutches, e.g. dog clutches |
| F16H 2200/2097 | .. | comprising an orbital gear set member permanently connected to the housing, e.g. a sun wheel permanently connected to the housing |

Guidance heading:

F16H 2300/00 Determining of new ratio

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|--------------|---|--|
| F16H 2300/02 | . | Computing a new ratio |
| F16H 2300/14 | . | Selecting a state of operation, e.g. depending on two wheel or four wheel drive mode |
| F16H 2300/18 | . | Determining the range |

Guidance heading:

F16H 2302/00 Determining the way or trajectory to new ratio, e.g. by determining speed, torque or time parameters for shift transition

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|--------------|---|---|
| F16H 2302/02 | . | Optimizing the way to the new ratio |
| F16H 2302/04 | . | Determining a modus for shifting (selection of shift speed modus F16H 2059/0226) |
| F16H 2302/06 | . | Determining timing parameters of shifting, e.g. start of shifting (for smoothing gear shift F16H 61/08) |

F16H 2306/00 Shifting

| | | |
|--------------|---|---|
| F16H 2306/14 | . | Skipping gear shift (for smoothing gear shift F16H 2061/0444) |
| F16H 2306/18 | . | Preparing coupling or engaging of future gear |

- F16H 2306/20 . Timing of gear shifts ([for smoothing gear shift F16H 61/08](#))
- F16H 2306/21 . . for auxiliary gear shifts ([for smoothing auxiliary gear shifts F16H 2061/085](#))
- F16H 2306/22 . Swap shifting ([for smoothing gear shift F16H 2061/0451](#))
- F16H 2306/24 . Interruption of shift, e.g. if new shift is initiated during ongoing previous shift
- F16H 2306/30 . characterised by the way or trajectory to a new ratio, e.g. by performing shift according to a particular algorithm or function ([determining the way or trajectory to a new ratio F16H 2302/00](#))
- F16H 2306/32 . Preparing the opening or release of the torque transmitting element
- F16H 2306/36 . Filling the dead volume of actuators ([controlling filling of clutches or brake servos F16H 61/06E2](#))
- F16H 2306/40 . Shifting activities
- F16H 2306/42 . . Changing the input torque to the transmission
- F16H 2306/44 . . Removing torque from current gears
- F16H 2306/46 . . Uncoupling of current gear
- F16H 2306/48 . . Synchronising of new gear
- F16H 2306/50 . . Coupling of new gear
- F16H 2306/52 . . Applying torque to new gears
- F16H 2306/54 . . Synchronizing engine speed to transmission input speed

F16H 2312/00 Driving activities

- F16H 2312/02 . Driving off
- F16H 2312/022 . . Preparing to drive off
- F16H 2312/04 . Holding or hillholding
- F16H 2312/06 . Creeping
- F16H 2312/08 . Rocking
- F16H 2312/09 . Switching between forward and reverse ([rocking F16H 2312/08](#))
- F16H 2312/10 . Inching
- F16H 2312/12 . Parking
- F16H 2312/14 . Going to, or coming from standby operation, e.g. for engine start-stop operation at traffic lights
- F16H 2312/16 . Coming to a halt
- F16H 2312/18 . Strong or emergency braking
- F16H 2312/20 . Start-up or shut-down

F16H 2342/00**Calibrating**

F16H 2342/02

- Calibrating shift or range movements

F16H 2342/04

- Calibrating engagement of friction elements

F16H 2342/042

- · Point of engagement

F16H 2342/044

- · Torque transmitting capability

F16H 2342/06

- Determining which part to calibrate or timing of calibrations

F16H 2342/10

- Calibrating valves

F16H 2700/00**Transmission housings and mounting of transmission components therein ; Cooling ; Lubrification ; Flexible suspensions, e.g. floating frames**

F16H 2700/02

- Transmissions, specially for working vehicles

F16H 2700/04

- · Starting devices or devices to start turning of shafts

F16H 2700/06

- Protections for shifting mechanical transmissions

F16H 2702/00**Combinations of two or more transmissions**

F16H 2702/02

- Mechanical transmissions with planetary gearing combined with one or more other mechanical transmissions

F16H 2702/04

- · Combinations of a speed-change mechanism without planetary gearing with a differential for driving a vehicle drive axle

F16H 2702/06

- Combinations of transmissions with parallel force splitting paths having same output

F16H 2704/00**Control mechanisms and elements applying a mechanical movement**

F16H 2704/02

- Speed-change devices wherein the control lever actuates directly sliding gears pivoting around two non-parallel axis

F16H 2704/04

- Speed-change devices with an intermediary mechanism placed between control member and actuator

F16H 2706/00**Rotary transmissions with mechanical energy accumulation and recovery without means for automatic selfregulation essentially based on spring action or inertia****F16H 2708/00****Control devices for speed-changing geared mechanisms, e.g. specially adapted couplings for synchronising devices, devices to simplify control, control of auxiliary gearboxes**

F16H 2708/02

- only the toothed wheels remain engaged

F16H 2708/04

- · the control being mechanical

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| F16H 2708/06 | . . the control being hydraulic or pneumatic |
| F16H 2708/08 | . . the control being electric |
| F16H 2708/10 | . only the toothed wheels may be disengaged |
| F16H 2708/12 | . . the control being mechanical |
| F16H 2708/14 | . . the control being hydraulic or pneumatic |
| F16H 2708/16 | . wherein the gearing is not described or not essential |
| F16H 2708/18 | . . the control being mechanical |
| F16H 2708/20 | . . the control being hydraulic or pneumatic |
| F16H 2708/22 | . . the control being electric |
| F16H 2708/24 | . with a preselection system, mainly semi-automatic, e.g. with automatic preselection, but controlled at the intended moment, with force amplification |
| F16H 2708/26 | . . only the toothed wheels remain engaged |
| F16H 2708/28 | . . only the toothed wheels may be disengaged |
| F16H 2710/00 | Control devices for speed-change mechanisms, the speed change control is dependent on function parameters of the gearing |
| F16H 2710/02 | . Control dependent on speed and torque, wherein only the toothed wheels remain engaged, control being mechanical |
| F16H 2710/04 | . Control dependent on speed |
| F16H 2710/06 | . . only the toothed wheels remain engaged |
| F16H 2710/08 | . . . the control being mechanical |
| F16H 2710/10 | . . . the control being hydraulic or pneumatic |
| F16H 2710/12 | . . . the control being electric |
| F16H 2710/14 | . Control dependent on speed, wherein only the toothed wheels may be disengaged, control being mechanical |
| F16H 2710/16 | . the gearing is not described or not essential |
| F16H 2710/18 | . . the control being mechanical |
| F16H 2710/20 | . . the control being hydraulic or pneumatic |
| F16H 2710/22 | . . the control being electric |
| F16H 2710/24 | . Control dependent on torque |
| F16H 2710/26 | . . wherein only the toothed wheels remain engaged, the control being mechanical |
| F16H 2712/00 | Mechanisms for changing direction |
| F16H 2712/02 | . Automatic control, e.g. for an alternating movement |
| F16H 2712/04 | . the control being hydraulic or pneumatic |
| F16H 2712/06 | . only with toothed wheels or friction wheels |

- F16H 2712/08 . . only the toothed wheels may be disengaged
- F16H 2712/10 . . with a combination of engaged and disengageable toothed wheels

F16H 2714/00 Different types speed-changing mechanisms for toothed gearing

- F16H 2714/02 . only with toothed wheels remaining engaged
- F16H 2714/04 . with specially adapted devices

F16H 2716/00 Control devices for speed-change mechanisms of planetary gearings, with toothed wheels remaining engaged, e.g. also for devices to simplify the control or for synchronising devices combined with control devices

- F16H 2716/02 . the control being mechanical
- F16H 2716/04 . the control being hydraulic or pneumatic
- F16H 2716/06 . . Circuits thereof
- F16H 2716/08 . the control being electric
- F16H 2716/10 . only the toothed wheels may be disengaged, the control being mechanical
- F16H 2716/12 . with preselection system, mainly semi-automatic, e.g. with automatic preselection, but controlled at the intended moment, with force amplification
- F16H 2716/14 . . only with toothed wheels remaining engaged

F16H 2718/00 Mechanisms for speed-change of planetary gearing, the speed change control being dependent on function parameters of the gearing

- F16H 2718/02 . Control dependent on speed and torque, wherein only the toothed wheels remain engaged
- F16H 2718/04 . . the control being mechanical
- F16H 2718/06 . . the control being hydraulic or pneumatic
- F16H 2718/08 . Control dependent on speed
- F16H 2718/10 . . only the toothed wheels remain engaged
- F16H 2718/12 . . . the control being mechanical
- F16H 2718/14 . . . the control being hydraulic or pneumatic
- F16H 2718/16 . . . the control being electric
- F16H 2718/18 . Control dependent on torque
- F16H 2718/20 . . only the toothed wheels remain engaged
- F16H 2718/22 . . . the control being mechanical
- F16H 2718/24 . . . the control being hydraulic or pneumatic
- F16H 2718/26 . . . the control being electric

F16H 2720/00 Different types of speed-change gear mechanisms

F16H 2720/02

- . Gears with a non-circular rolling curve or gears with special teeth

F16H 2720/04

- . Combining a planetary speed-change gearing with a motor vehicle drive axle differential