

G05D

SYSTEMS FOR CONTROLLING OR REGULATING NON-ELECTRIC VARIABLES (for continuous casting of metals [B22D 11/16](#); valves per se [F16K](#); sensing non-electric variables, see the relevant subclasses of [G01](#); for regulating electric or magnetic variables [G05F](#))

Definition statement

This place covers:

Systems for controlling or regulating non-electric variables, in particular: position, trajectory, attitude or altitude of a vehicle; position or direction of an object; thickness or size of materials; flow rate; level; quantity ratio; linear or angular speed; force or stress; fluid pressure; torque or mechanical power; vibrations; chemical variables; humidity; temperature; viscosity; and illumination.

"controlling" means influencing a variable in any way, e.g. changing its direction or its value (including changing it to or from zero), maintaining it constant, limiting its range of variation.

"regulation" means maintaining a variable automatically at a desired value or within a desired range of values. The desired value or range may be fixed, or manually varied, or may vary with time according to a predetermined "programme" or according to variation of another variable. Regulation is a form of control.

Merely acting on a variable for the purpose of influencing the state of a system (e.g. acting on the fuel flow rate in an engine for achieving a certain speed), where the value of the variable itself remains irrelevant, should a priori not be considered as controlling or regulating said variable.

References

Limiting references

This place does not cover:

Features of general applicability to regulating systems, e.g. anti-hunting arrangements	G05B
Regulating electric or magnetic variables	G05F

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Milking machines	A01J 5/007
Welding parameters	B23K 9/095
Copying	B23Q 35/00
Grinding or polishing	B24B 17/00 , B24B 49/00
Abrasive blasts	B24C 7/00
Dispensing beverages on draught	B67D 1/12
Electrographic, electrophotographic or magnetographic processes	G03G 21/20
Dynamo-electric motors or generators	H02P 5/00 - H02P 9/00

Special rules of classification

Control systems specially adapted for particular apparatuses, machines or processes are classified in the subclasses for the apparatus, machine or process, provided that there is specific provision for control or regulation relevant to the special adaptation, either at a detailed level, (e.g. [A21B 1/40](#): "for regulating temperature in bakers' ovens") or at a general level, (e.g. [B23K 9/095](#): "for automatic control of welding parameters in arc welding"). Otherwise, classification is made in the most appropriate place in this subclass.

Places where there is specific provision of the kind referred to above at a detailed level have been listed under the main groups of this subclass (see "References relevant to classification in this subclass"). Where the provision is at a general level (e.g. of a kind appropriate to more than one of the main groups specified in the lists, or to main groups [G05D 27/00](#) or [G05D 29/00](#)), the places are listed under this subclass.

A document that can be applied to two or more applications is not specific for any of them and has to be classified in [G05D](#) (for instance a thermostat for heating or air conditioning).

A formulation of the kind "regulator for the application X" should a priori not be considered as specific to said application.

Usually, the subdivisions of the regulation classes in the field of the application are less precise than in [G05D](#), therefore giving a class in [G05D](#) may be useful for search.

When in a document there is mention of several controlled variables, one should try to visualize the block scheme of the regulation. The document is then to be classified in the group of the variable controlled in the outer control loop. In case the regulation in one of the other control loops is of particular interest, it should also be classified in the group(s) of the variable(s) concerned.

Note that the above is without prejudice of the limiting references contained in the titles of the different groups and subgroups in this subclass.

In the main groups of this subclass, remarks found under "Further details of subgroups" are not meant to replace the definitions in the titles, but either give further information about the definitions or mention particular types of documents to be classified in the subgroups or to be excluded from them. In case no remark is made on a given subgroup, the title is considered to be self-explanatory.

In [G05D](#), the hierarchy in classification is generally done according:

- to the physical variable
- Then to the nature of the auxiliary power used, with the following possibilities, not used for all the variables:
 - without auxiliary power (purely mechanical regulation)
 - with auxiliary non-electric power (e.g. pneumatic or hydraulic)
 - characterised by the use of electric means
 - with combination of electric and non-electric auxiliary power
- Then, to the type of sensor used.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Systems	includes self-contained devices such as speed governors, pressure regulators
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G05D 1/00

Control of position, course or altitude of land, water, air, or space vehicles, e.g. automatic pilot (radio navigation systems or analogous systems using other waves [G01S](#))

Definition statement

This place covers:

Control of position, course or altitude of land, water, air, or space vehicles, e.g. automatic pilot

Further details of subgroups

[G05D 1/0005](#)

This subgroup covers control systems where the trajectory of an aircraft or satellite is optimized.

[G05D 1/0077](#)

Redundant control systems in general are classified only in [G05B 9/03](#).

[G05D 1/0083](#)

This subgroup covers control of an aircraft while on the ground, i.e. while accelerating before taking-off, braking after touching down or taxiing.

[G05D 1/02](#) and subgroups

This subgroup covers control systems where the position determination or the position evolution takes place on a two-dimensional space. If the nature of the vehicle is specified, then it is classified in the corresponding subgroup.

[G05D 1/0202](#) and subgroup

This subgroup covers two-dimensional navigation of an aircraft while in flight.

[G05D 1/021](#) and subgroups

This subgroup covers control systems to define a trajectory for a land vehicle, and to take suitable actions to make the vehicle follow said trajectory.

Aspects of navigation systems that are important per se should also be classified in the relevant groups of [G01C](#).

Aspects of radio, sonar or lidar navigation systems that are important per se should also be classified in the relevant groups of [G01S](#).

Aspects of navigation systems for traffic purposes that are important per se should also be classified in the relevant groups of [G08G](#).

[G05D 1/0236](#)

This subgroup also covers control systems using barcode readers for positioning.

[G05D 1/0261](#)

This subgroup also covers control systems using RFID tags for positioning.

[G05D 1/0295](#)

This subgroup covers control systems where one of the vehicles sends orders to the others.

Relationships with other classification places

Subclass [G01C](#) covers navigation in general, i.e. determining the position and course of land vehicles, ships, aircraft, and space vehicles.

Subclass [G01S](#) covers radio, sonar or lidar navigation systems, i.e. navigation by use of radio, acoustic or optical waves, or analogue arrangements using other electromagnetic waves.

Subclass [G08G](#) covers navigation systems for traffic control purposes, i.e. systems in which the navigation is not performed autonomously by or in the vehicle, but where the vehicles are guided by instructions transmitted to them.

References

Limiting references

This place does not cover:

Radio navigation systems or analogous systems using other waves	G01S
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Agricultural machines or implements	A01B 69/00
Toy vehicles	A63H 17/36
Air-cushion vehicles	B60V 1/11
Driver Assistance Systems for road vehicles	B60W 30/00
Steering controls of motor vehicles or trailers, i.e. means for initiating a change of direction	B62D 1/00
Arrangements for automatically controlling the steering depending on driving conditions	B62D 6/00
Active steering aids	B62D 15/025
Chassis of endless-tracked vehicles	B62D 55/116
Marine steering; control of waterborne vessels	B63H 25/00
Controlling aircraft	B64C 13/00 - B64C 15/00
Controlling attitude or direction of aircraft ejector seats	B64D 25/10
Cosmonautic vehicles	B64G 1/24
Self-propelled missiles	F41G 7/00
Guided missiles	F42B 15/01
Marine torpedoes	F42B 19/01

Informative references

Attention is drawn to the following places, which may be of interest for search:

Linear or angular position control of an object not being a vehicle	G05D 3/00
Control of linear or angular speed or of acceleration	G05D 13/00
Steering applicable only to other than landborne vehicles, e.g. three-dimensional steering applicable to both aircraft and submarines	B60K
Rail vehicles	B61

Construction or disposition of steering means on land vehicles	B62
on waterborne vessels	B63
Manual or automatic control of aircraft, e.g. using automatic pilot or radiated signal	B64C
Altitude control by jet reaction	B64C 15/00
Aircraft capable of landing or taking-off vertically	B64C 29/00
Flying bombs	B64C 2201/121
Unmanned aerial vehicles characterized by flight control	B64C 2201/14
Unmanned aerial vehicles characterized by landing method	B64C 2201/18
Aircraft carrier installations	B64F
Altimeters	G01C 5/005
Navigation, i.e. determining the position and course of land vehicles, ships, aircraft, and space vehicles	G01C 21/00
Measuring distance traversed on the ground by vehicles, e.g. using odometers	G01C 22/00
Flight directors	G01C 23/005
Displays for beacons e.g. LORAN, VOR	G01S 1/047
Using amplitude comparison of signals transmitted simultaneously from aerials or aerials systems having differently-oriented overlapping directivity-characteristics	G01S 1/14
LORAN systems	G01S 1/24
LORAC or TORAN systems	G01S 1/304
TACAN systems	G01S 1/48
VOR systems	G01S 1/50
Position-fixing by co-ordinating a plurality of determinations of direction or position lines	G01S 5/00
Determining distance or velocity using waves and not using reflection or reradiation of waves	G01S 11/00
Radar systems specially designed for missile homing, autodirectors	G01S 13/883
Radar systems specially designed for traffic control	G01S 13/91
Radar systems specially designed for anti-collision purposes	G01S 13/93
Radar systems specially designed for terrain avoidance	G01S 13/94
Sonar systems specially designed for anti-collision purposes	G01S 15/93
Lidar systems specially designed for anti-collision purposes	G01S 17/93
Traffic control systems for road vehicles	G08G 1/00
Anti-collision traffic control systems	G08G 1/16
Monitoring the location of fleet of vehicles in traffic control systems	G08G 1/20
Modification of a flight plan	G08G 5/0039
Terrain avoidance systems	G08G 5/0086
Systems for monitoring atmospheric conditions	G08G 5/0091
Traffic collision avoidance systems	G08G 5/04

Special rules of classification

This main group concerns only vehicles.

Documents are classified here in case:

- the stability of the vehicle is obtained or improved by the regulation;
- the sensors are piloting-specific: (i) to follow a predetermined trajectory; (ii) there is an interaction between the position determination and the goal to be achieved (for example there is a camera to recognize the environment and a processor to determine the trajectory);
- the security of the piloting or the control of the piloting is achieved by electronic means;
- of remote control;
- of piloting-specific optimization; or
- of interactions between vehicles.

Within this main group, the possible applications of a land vehicle are also classified in [G05D 2201/02](#).

Within [G05D 1/021](#) and its subgroups, an invention is classified in the subgroups of all the sensors that are essential for the invention. Sensors that are either optional or not directly involved in the invention are classified as additional information.

G05D 3/00

Control of position or direction ([G05D 1/00](#) takes precedence)

References

Limiting references

This place does not cover:

Position control of a vehicle	G05D 1/00
Control of linear or angular speed or of acceleration	G05D 13/00
Control of machine tools	B23Q
Programme-controlled manipulators	B25J 9/00
Programme-control systems	G05B 19/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Footwear manufacture	A43D 119/00
Tool carriers in forging or pressing	B21K 31/00
Pattern-controlled boring or drilling tools	B23B 39/26
Planing or slotting machines controlled by copying device	B23D 1/30 , B23D 3/06 , B23D 5/04
Electrode to workpiece spacing in electric discharge and electrochemical machining	B23H 7/18
Workpiece in laser welding or cutting	B23K 26/02
Workpiece in welding	B23K 37/04
Molten metal in welding	B23K 37/06
Spindles in machine tools	B23Q 5/20

Tool or work position in machine tools	B23Q 15/00 , B23Q 16/00
Tools controlled by pattern or master model	B23Q 35/00
Grinding controlled by patterns, drawings, magnetic tape or the like	B24B 17/00
Starting position in grinding	B24B 47/22
Actuating members in presses	B30B 15/24
Chassis of tracked vehicles	B62D 55/116
Web-advancing mechanisms	B65H 23/18
Dippers or buckets in dredgers	E02F 3/43
Fluid-pressure servomotors with follow-up action	F15B 9/00
Tracking of solar heat collectors	F24S 50/20
Photomechanical production of patterned or textured surfaces	G03F 9/00
Rotating heads in information storage systems	G11B 5/588
Movement of control elements in nuclear reactors	G21C 7/12

G05D 5/00

Control of dimensions of material

Definition statement

This place covers:

Control of thickness or size of material

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Tobacco cutting	A24B 7/14
Thickness of coating of fluent material on surface	B05C 11/02
Thickness, width, diameter or other transverse dimensions of the products of metal-rolling mills	B21B 37/16
Dimension of glass ribbon	C03B 18/04
Thickness of layer in paper making	D21F 7/06

G05D 7/00

Control of flow (level control [G05D 9/00](#); ratio control [G05D 11/00](#); weighing apparatus [G01G](#))

Definition statement

This place covers:

Control of flow of liquids, gases, particulate matter and other fluent materials by action on throttling means and/or flow sources.

Further details of subgroups:

[G05D 7/0113](#)

This subgroup covers valves where the flexible member itself, e.g. a membrane, acts on the valve seat.

[G05D 7/012](#)

This subgroup covers for example flexible members having the form of a torus.

[G05D 7/0133](#)

This subgroup covers valves with a piston having one extreme facing the inlet chamber and an opposite extreme facing the outlet chamber.

[G05D 7/014](#) and [G05D 7/0153](#)

These subgroups cover valves in which at least part of the piston has the form of a cylindrical sleeve in contact with and sliding over a fixed or moving stem. They also cover valves in which the control chamber comprising the biasing member is surrounded by the controlled fluid

[G05D 7/0186](#)

This subgroup covers valves using calibrated orifices for achieving a constant flow.

[G05D 7/0611](#) and [G05D 7/0623](#)

These subgroups cover systems where the target flow is defined in dependence on a specific parameter, e.g. the speed of a vehicle.

References

Limiting references

This place does not cover:

Level control	G05D 9/00
Ratio control	G05D 11/00
Weighing apparatus	G01G

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Air in hair drying helmets	A45D 20/26
Flow of media to the human body	A61M 5/168
Gases or vapour in electrostatic separators	B03C 3/36
Fluent material in coating devices	B05C 11/10
Dispensing beverages on draught	B67D 1/12
Transferring liquids	B67D 7/28
Gas purifiers	C10K 1/28
Flushing boreholes	E21B 21/08
Obtaining liquids from wells	E21B 43/12
Flow in non-positive displacement machines or systems	F01D 17/00
Lubrication arrangements	F01M 1/16

Coolant flow in cooling devices	F01P 7/00
Gas-turbine working fluid	F02C 9/16 , F02C 9/50
Throttle passages in pipes	F16L 55/027
Air-flow or supply of heating or cooling fluids in air treatment arrangements	F24F 11/00
Air or gas flow in dryers	F26B 21/12
Continuous flow weighing apparatus	G01G 11/08
Coolant in nuclear power plant	G21D 3/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Of media to the human body	A61M 5/168
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Special rules of classification

[G05D 7/0629](#)

Within this subgroup, an invention is classified in the last appropriate place.

G05D 9/00

Level control, e.g. controlling quantity of material stored in vessel (controlling level of liquid-pool electrode in electric discharge tubes and lamps [H01J 1/10](#), [H01J 13/14](#))

Definition statement

This place covers:

Control of quantity of liquids or particulate matter in a vessel by action on the input and/or the output flow.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Liquid level in sedimentation arrangements	B01D 21/34
Ink level in printing, manifolding or duplicating arrangements	B41L 27/04
Feed water for boilers	F22D 5/00
Liquid pool electrodes in electric discharge tubes or lamps	H01J 1/10 , H01J 13/14

G05D 11/00

Ratio control (control of chemical or physico-chemical variables, e.g. pH-value [G05D 21/00](#) ; humidity control [G05D 22/00](#) ; control of viscosity [G05D 24/00](#) ; proportioning the ingredients for mixing clay or cement with other substances [B28C 7/00](#))

Definition statement

This place covers:

Control of the relative ratio of flow rate or of volume of two or more fluent materials by action on throttling means and/or flow sources.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Density in sedimentation arrangements	B01D 21/32
Mixers	B01F 15/04
Abrasive blasts	B24C 7/00
Mixtures of clays or cements	B28C 7/00
Bulk material conveyors	B65G 53/66
Flow ratio in jet-propulsion plants	F02K 3/075

Further details of subgroups:

[G05D 11/005](#)

This subgroup also covers systems using interconnected pistons

[G05D 11/006](#)

This subgroup covers systems comprising venturi aspirators.

[G05D 11/008](#)

This subgroup covers systems where the motor of the pump acting on the feeding of a fluid is operated by another fluid.

[G05D 11/03](#)

Subgroups [G05D 11/001](#) - [G05D 11/008](#) are used in preference to [G05D 11/03](#), also for flow ratio control systems without auxiliary power.

[G05D 11/16](#)

Systems aiming at regulating a temperature by mixing hot and cold water are only classified in [G05D 23/13](#) and subgroups.

G05D 13/00

Control of linear speed; Control of angular speed; Control of acceleration or deceleration, e.g. of a prime mover (synchronising telegraph receiver and transmitter [H04L 7/00](#))

References

Limiting references

This place does not cover:

Arrangements for synchronising receiver with transmitter	H04L 7/00
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Drum speed in metal drawing	B21C 1/12
Cutting velocity of tool or work	B23Q 15/00
Ram speed in presses	B30B 15/20
Setting or limiting speed of vehicles	B60K 31/00
Electrically-propelled vehicles	B60L 15/00
Road vehicle cruise control	B60W 30/00
Cruising speed of aircraft	B64D 31/08
Feed rate in manufacture of artificial filaments, threads, fibres, bristles or ribbons	D01D 1/09
Carding machines	D01G 15/36
Warping, beaming or leasing machines	D02H 13/14
Cyclically varying speed of looms	D03D 51/16
Speed of fluid carrier in chemical analysis	G01N 30/32
Record carriers or heads for such carriers in information storage systems	G11B 15/46 , G11B 19/28

G05D 15/00

Control of mechanical force or stress; Control of mechanical pressure

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Portable percussive tools	B25D 9/26
Ram pressure in presses	B30B 15/22
Tension in webs, tapes, filamentary material	B65H 23/00 , B65H 59/00
Tension in filamentary material	B65H 59/00
Rope, cable or chain tension	B66D 1/50

Tension in looms	D03D 49/04
Tension in sewing machines	D05B 47/04
Pressure in paper-making machines	D21F 3/06
Drying fabrics	F26B 13/12
Pressure in dryers	F26B 21/10
Record carrier tension in information storage arrangements	G11B 15/43

G05D 16/00

Control of fluid pressure

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Tyre pressure	B60C 23/00
Air within diving suit	B63C 11/08
Aircraft air-pressure	B64D 13/00
Bulk material conveyors	B65G 53/66
Manufacture of artificial filaments, threads, fibres, bristles or ribbons	D01D 1/09
Flushing boreholes	E21B 21/08
Lubrication arrangements	F01M 1/16
Pressure of fluid carrier in chemical analysis	G01N 30/32
Pressure in electric discharge tubes or lamps	H01J 7/14
Pressure in electric incandescent lamps	H01K 1/52

Informative references

Attention is drawn to the following places, which may be of interest for search:

Valves per se	F16K
Control of pressure in electric discharge tubes or lamps	H01J 7/14
Control of pressure in electric incandescent lamps	H01K 1/52

Special rules of classification

Groups [G05D 16/02](#), [G05D 16/024](#) and [G05D 16/028](#)

These groups describing functional aspects of the invention are generally used in combination with groups [G05D 16/04](#) - [G05D 16/2097](#) describing structural aspects of the valves.

Group [G05D 16/028](#)

This group covers valves controlling a difference between two systems pressures, excluding the following cases:

- When one of the pressures is the ambient (atmospheric) pressure or any other uncontrolled pressure that is external to the system; in this case only the structural aspects of the valve are classified in groups [G05D 16/04](#) – [G05D 16/2097](#).
- When the controlled pressures are across a fixed or adjustable restriction for the purpose of flow regulation, in which case the document should be classified in [G05D 7/00](#); and
- When one of the pressures is a reference pressure generated by a pilot valve or any other means for the purpose of keeping the other pressure at a difference to said reference pressure, in which case the document should be classified either in [G05D 16/14](#) or in [G05D 16/2093](#).

Groups [G05D 16/0402](#) and [G05D 16/0404](#)

These groups are used in combination with groups [G05D 16/06](#) – [G05D 16/12](#) describing one or more of the valves.

G05D 16/0402

{with two or more controllers mounted in series}

Definition statement

This place covers:

- Valves in a series, where the output of one valve is the input of another one.

G05D 16/0404

{with two or more controllers mounted in parallel}

Definition statement

This place covers:

- Valves having their inputs and/or outputs connected together.

G05D 16/10

the sensing element being a piston or plunger

Definition statement

This place covers:

- Valves comprising a piston or plunger, which reacts to fluid pressure in contact therewith.

G05D 16/103

{the sensing element placed between the inlet and outlet (multiple-way valve [G05D 16/101](#))}

Definition statement

This place covers:

- Valves comprising a piston having one extreme facing the inlet chamber and an opposite extreme facing the outlet chamber, for example:

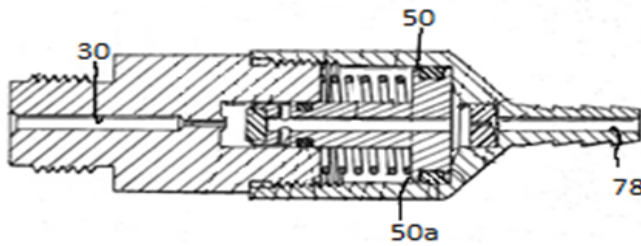


Figure 1. A piston 50 having one extreme 50a facing the inlet 30 and an opposite extreme facing the outlet chamber 78.

References

Limiting references

This place does not cover:

Multiple-way valve	G05D 16/101
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G05D 16/106

{Sleeve-like sensing elements; Sensing elements surrounded by the flow path}

Definition statement

This place covers:

- Valves in which at least part of the piston has the form of a cylindrical sleeve in contact with and sliding over a fixed or moving stem.
- Valves in which the control chamber comprising the biasing member is surrounded by the controlled fluid, for example:

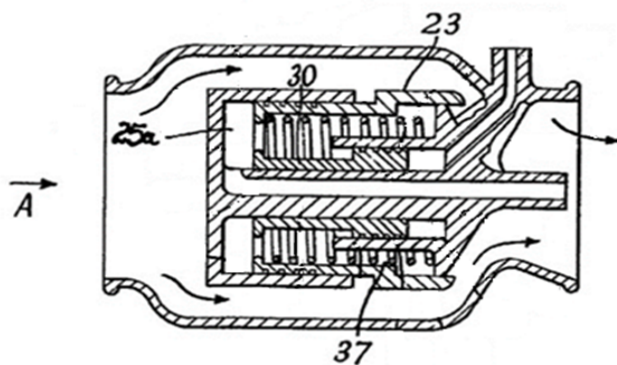


Figure 1. A part 30 of the piston 23 has the form of a cylindrical sleeve in contact with and sliding over a fixed stem 29. Furthermore, the control chamber 25a comprising the biasing member 37 is surrounded by the controlled fluid.

G05D 16/107

{with a spring-loaded piston in combination with a spring-loaded slideable obturator that move together over range of motion during normal operation}

Definition statement

This place covers:

- Valves having a detached obturator that is biased against the sensing piston so that they move together over the range of motion during normal operations, for example:

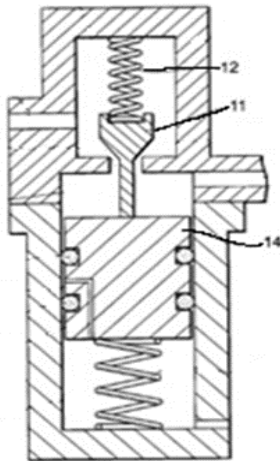


Figure 1. A detached obturator 11 is biased by the auxiliary spring 12 against the sensing piston 14 so that they move together over the range of motion during normal operations.

G05D 16/109

{with two or more pistons acting as a single pressure controller that move together over range of motion during normal operations (controllers mounted in series [G05D 16/0402](#), controller mounted in parallel [G05D 16/0404](#))}

Definition statement

This place covers:

- Valves comprising two or more pistons that move independently of each other over the range of motion during normal operation, at least one of them being the sensing element.

References

Limiting references

This place does not cover:

Control of fluid pressure without auxiliary power with two or more controllers mounted in series	G05D 16/0402
Control of fluid pressure without auxiliary power with two or more controllers mounted in parallel	G05D 16/0404

G05D 16/14**with auxiliary non-electric power****Definition statement***This place covers:*

- Valves in which the controlled pressure is compared to a reference fluid pressure generated by means of an auxiliary pilot valve or any other means.

G05D 16/16**derived from the controlled fluid****Special rules of classification**

This group may be used in combination with groups [G05D 16/06](#) – [G05D 16/12](#) describing structural details of the auxiliary pilot valve.

G05D 16/2006

{with direct action of electric energy on controlling means (combination of electric and non-electric auxiliary [G05D 16/2093](#))}

Definition statement*This place covers:*

- Electric energy acting on the main valve, and
- Electric energy acting on the control element of the pump

References**Limiting references***This place does not cover:*

With combination of electric and non-electric auxiliary power	G05D 16/2093
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G05D 16/2013**{using throttling means as controlling means}****Definition statement***This place covers:*

- Systems controlling the pressure using the electromagnetic valves.

Special rules of classification

Electromagnetic valves allowing only on/off operation are only classified in this group.

G05D 16/2022**{actuated by a proportional solenoid (throttling means [G05D 16/2024](#))}****Definition statement***This place covers:*

- Electromagnetic valves generating an intermediate closing force that is proportional to the current supplied.

References**Limiting references***This place does not cover:*

The throttling means being a multiple-way valve	G05D 16/2024
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G05D 16/2026**{with a plurality of throttling means}****Special rules of classification**

This group may be used in combination - with groups [G05D 16/202](#) - [G05D 16/2024](#) to describe one or more of the valves.

G05D 16/2086**{without direct action of electric energy on the controlling means (combination of electric and non-electric auxiliary [G05D 16/2093](#))}****Definition statement***This place covers:*

- Valves where the electric energy is used for an auxiliary function of an otherwise purely mechanical regulator, e.g. adjusting the set point.

References**Limiting references***This place does not cover:*

With combination of electric and non-electric auxiliary power	G05D 16/2093
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G05D 16/2093**{with combination of electric and non-electric auxiliary power}****Definition statement***This place covers:*

- Valves in which the controller pressure is compared to a reference fluid pressure generated by means of an electromagnetic pilot valve or any other means.

Special rules of classification

This group may be used in combination with subgroups [G05D 16/202](#) - [G05D 16/208](#) describing structural details of the auxiliary pilot valve.

G05D 17/00

Control of torque; Control of mechanical power

Definition statement

This place covers:

Regulation of the torque of tightening tools, control of the torque or power of electric motors, combustion engines and the like when the control is not specific of the particular drive.

References

Limiting references

This place does not cover:

Torque limiters in tools	B25B 23/14
Propulsion units in vehicles	B60K
Control of combustion engines	F02D
Control of electric motors	H02P

G05D 19/00

Control of mechanical oscillations, e.g. of amplitude, of frequency, of phase (generating or transmitting mechanical vibrations [B06B](#) ; control of electric motors [H02P](#))

Definition statement

This place covers:

Control of mechanical oscillations or vibrations in machines or structures, either by generating oscillations, or by damping oscillations, other than suppression of vibrations.

References

Limiting references

This place does not cover:

Musical instruments; acoustics	G10
Loudspeakers or like acoustic electromechanical transducers	H04R

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Portable percussion tools	B25D 9/26
Jigging conveyors	B65G 27/32
Suppression of vibrations in systems	F16F 15/002

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generating or transmitting mechanical vibrations	B06B
Control of electric motors	H02P

G05D 21/00**Control of chemical or physico-chemical variables, e.g. pH value****Definition statement**

This place covers:

Regulation of chemical composition, concentration, pH or the like in a chemical process when the regulation is not specific of the particular process.

References**Limiting references**

This place does not cover:

Ratio control	G05D 11/00
Humidity control	G05D 22/00
Control of viscosity	G05D 24/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Density in sedimentation arrangements	B01D 21/32
Treating gases or vapours	B01D 53/30
Composition of fluid carrier in chemical analysis	G01N 30/34

Informative references

Attention is drawn to the following places, which may be of interest for search:

Physical or chemical processes in general	B01J
Treatment of water	C02F

G05D 22/00**Control of humidity (of tobacco products [A24B 9/00](#) ; air conditioning [F24F](#))****References****Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Watering gardens, fields, sports grounds or the like	A01G 25/16
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Poultry incubators	A01K 41/04
Tobacco products	A24B 9/00
Moistening in air treating devices of vehicles	B60H 3/02
Air conditioning	F24F 11/00
Dryers	F26B 21/08

G05D 23/00

Control of temperature (automatic switching arrangements for electric heating apparatus [H05B 1/02](#))

Definition statement

This place covers:

Control of temperature

Further details of subgroups:

[G05D 23/022](#), [G05D 23/025](#) and [G05D 23/123](#)

These subgroups cover valves controlling the flow of a fluid as a function of the temperature of said fluid.

[G05D 23/023](#), [G05D 23/026](#) and [G05D 23/125](#)

These subgroups cover valves controlling the flow of a fluid as a function of the temperature of an external sensor, e.g. thermostat for radiator.

[G05D 23/024](#) and subgroups

These subgroups cover memory shape alloys working as a sensing element.

[G05D 23/028](#)

This subgroup covers systems where the fusing of an element irreversibly releases a cooling fluid.

[G05D 23/128](#)

This subgroup covers valves controlling the flow of fuel to a burner as a function of the temperature of a controlled space.

[G05D 23/1333](#)

This subgroup covers valves distributing the flow of a fluid among two conduits as a function of the temperature of said fluid, e.g. refrigerating systems.

[G05D 23/1353](#)

This subgroup covers not only valves where the flow is regulated, but also where it is just set by the user.

[G05D 23/185](#) and subgroups

These subgroups cover valves similar to the corresponding subgroups in [G05D 23/01](#), but further comprising the use of auxiliary pneumatic or hydraulic energy.

[G05D 23/19](#) and subgroups

In [G05D 23/19](#) documents are classified in [G05D 23/20](#), [G05D 23/22](#), [G05D 23/24](#), [G05D 23/26](#), [G05D 23/27](#), or [G05D 23/275](#) and their subgroups according to the nature of the main temperature sensor used. Additionally, documents are also classified in the CPC subgroups [G05D 23/1902](#) - [G05D 23/1951](#) relating to control features, if one or more them apply. In case the nature of the temperature sensing element is not mentioned or is irrelevant for the invention, documents are classified only in [G05D 23/19](#) or in one of more subgroups [G05D 23/1902](#) - [G05D 23/1951](#).

[G05D 23/20](#) and subgroups

This covers inventions where the sensing element has a variation of electric or magnetic properties other than defined in [G05D 23/22](#), [G05D 23/24](#) or [G05D 23/26](#), e.g. a semiconductor, an ionized gas or a capacitor.

[G05D 23/1902](#)

This subgroup covers inventions relating to the input means of the reference value.

[G05D 23/1904](#)

This subgroup covers systems where a temperature profile is defined as a function of time.

[G05D 23/1906](#)

This subgroup covers systems where the control action is a continuous function of the measured error.

[G05D 23/1913](#)

This subgroup covers systems delivering a series of pulses having a frequency that is a continuous function of the measured error.

[G05D 23/1919](#)

This subgroup covers systems using Peltier effect devices.

[G05D 23/1921](#)

This subgroup covers systems where the actuator consists of a heat expanding element being heated electrically in order to act on a valve.

[G05D 23/1923](#)

This subgroup covers control systems for storage heaters.

[G05D 23/1924](#)

This subgroup covers systems using solar energy.

[G05D 23/1931](#)

This subgroup covers systems measuring the temperature of the controlled space and of another space in thermal relationship with it, e.g. outdoors.

[G05D 23/1935](#)

This subgroup covers systems where one sensor is used for control after the other, e.g. measuring the input flow temperature of a heating system and later switching to measuring the output flow temperature.

References

Limiting references

This place does not cover:

Automatic switching arrangements for electric heating apparatus	H05B 1/02
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Bakers' ovens	A21B 1/40
Hair curlers	A45D 6/20
Metal extruding	B21C 31/00
Tyre temperature	B60C 23/00
Cosmonautic vehicles	B64G 1/50
Float baths in glass making	C03B 18/18 , C03B 18/22
Manufacture of artificial filaments, threads, fibres, bristles or ribbons	D01D 1/09
Knitting machines	D04B 35/30
Hand irons	D06F 75/26
Paper-making machines	D21F 5/06
Lubricant in lubrication arrangements	F01M 5/00
Arrangements for supplying oil or unspecified lubricant from a reservoir	F16N 7/08
Steam superheat	F22G 5/00
Dryers	F26B 21/10
Temperature of fluid carrier in chemical analysis	G01N 30/30
Electric storage cells	H01M 10/60
Automatic switching arrangements for electric heating apparatus	H05B 1/02
Dielectric, induction or microwave heating	H05B 6/06 , H05B 6/50 , H05B 6/68
Anode of X-ray tube	H05G 1/36

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of central heating systems	F24D 19/10
Control of air-humidification systems	F24F 11/0008
Thermal management of data-processing equipment	G06F 1/206
Controlling induction heating	H05B 6/06
Regulating temperature of anode of X-ray tube	H05G 1/36
Cooling arrangement of electrical apparatus	H05K 7/20

Special rules of classification

Within subgroups [G05D 23/01](#) - [G05D 23/32](#), an invention is classified in the last appropriate place in the absence of an indication of the contrary.

G05D 25/00

Control of light, e.g. intensity, colour, phase (mechanically operable parts of lighting devices for the control of light [F21V](#) ; optical devices or arrangements using movable or deformable elements for controlling light independent of the light source [G02B 26/00](#) ; devices or arrangements, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements for the control of light, circuit arrangements specially adapted therefor, control of light by electro-magnetic waves, electrons or other elementary particles [G02F 1/00](#) ; circuit arrangements for controlling light sources [H01S 3/10](#), [H05B 33/08](#), [H05B 35/00](#) - [H05B 43/00](#))

Definition statement

This place covers:

Regulation of intensity, colour or phase of light other than by acting on the light sources.

References

Limiting references

This place does not cover:

Vehicle lighting	B60Q
Operating screening devices	E06B 9/68
Mechanically operable parts of lighting devices for the control of light	F21V
Optical devices or arrangements using movable or deformable elements for controlling light independent of the light source	G02B 26/00
Devices or arrangements, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements for the control of light, circuit arrangements specially adapted therefor, control of light by electro-magnetic waves, electrons or other elementary particles	G02F 1/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Photographic composing machines	B41B 21/08
Lasers and other light sources	H01S 3/10 , H05B 33/08 , H05B 35/00 - H05B 43/00

G05D 27/00

Simultaneous control of variables covered by two or more of the preceding main groups

Special rules of classification

If there is a double regulation (two independent set points for two corresponding controlled variables, e.g. temperature and humidity, when there are interactions in the control loops), the document is also classified in this group. Thus, this group should be assigned in addition to the groups corresponding to the two or more controlled variables.

G05D 29/00

Simultaneous control of electric and non-electric variables

Special rules of classification

If there is a double regulation (two independent set points for two corresponding controlled variables, when there are interactions in the control loops), the document is also classified in this group. Thus, this group should be assigned in addition to the groups corresponding to the two or more controlled variables.

G05D 99/00

Subject matter not provided for in other groups of this subclass

Special rules of classification

This group is not being used.