

CPC**COOPERATIVE PATENT CLASSIFICATION****F16J**

PISTONS { (specially adapted for dampers [F16F 9/32](#)) }; **CYLINDERS;**
SEALINGS

NOTE

Attention is drawn to the following places:

[A47J 27/08](#) Pressure cookers
[E04B 1/68](#) Sealing building joints
[E05C 9/00](#) Multi-point fastening of wings in general
[F01B](#) Machines or engines in general or of reciprocating type, e.g. cylinders peculiar to steam engines
[F01B 31/28](#)
[F02F 1/00](#) Cylinders for combustion engines
[F02F 3/00](#) Pistons for combustion engines
[F04D 29/08](#) Sealings of non-positive displacement pumps
[F17B 1/04](#) Sealing devices for sliding parts of gas holders of variable capacity
[F28F 9/04](#) Arrangements for sealing elements into header boxes or end plates of heat-exchangers.

WARNING

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

[F16J 15/53](#) covered by [F16J 15/43](#)

F16J 1/00

Pistons; Trunk pistons; Plungers (bellows pistons [F16J 3/06](#); piston-rings or seats therefor [F16J 9/00](#); { manufacture of pistons [B23P 15/10](#) }; rotary pistons, e.g. for "Wankel" type engines [F01C](#) ; specific for combustion engines, i.e. constructed to withstand high temperature or modified for guiding, igniting, vaporising or otherwise treating the charge [F02F](#) ; { pistons for hydraulic engines [F03C](#) }; pumps [F04B](#) ; floats [F16K 33/00](#))

F16J 1/001

- . { One-piece pistons }

F16J 1/003

- .. { with integral sealing lips }

F16J 1/005

- . { obtained by assembling several pieces }

F16J 1/006

- .. { of different materials }

F16J 1/008

- ... { with sealing lips }

F16J 1/01

- . characterised by the use of particular materials ([F16J 1/02](#) takes precedence)

F16J 1/02

- . Bearing surfaces

F16J 1/04

- . Resilient guiding parts, e.g. skirts, particularly for trunk pistons

F16J 1/06

- .. with separate expansion members; Expansion members

F16J 1/08

- . Constructional features providing for lubrication

F16J 1/09

- . with means for guiding fluids ([F16J 1/08](#) takes precedence)

- F16J 1/10 . Connection to driving members
- F16J 1/12 . . with piston-rods, e.g. rigid connections
- F16J 1/14 . . with connecting-rods, i.e. pivotal connections
- F16J 1/16 . . . with gudgeon-pin; Gudgeon-pins
- F16J 1/18 Securing of gudgeon-pins
- F16J 1/20 . . . with rolling contact, other than in ball or roller bearings
- F16J 1/22 . . . with universal joint, e.g. ball-joint
- F16J 1/24 . . designed to give the piston some rotary movement about its axis

F16J 3/00 **Diaphragms; Bellows; Bellows pistons** ([connection of valves to inflatable elastic bodies B60C 29/00](#); bellows or the like used in instruments [G12B 1/04](#); diaphragms for electromechanical transducers [H04R 7/00](#))

- F16J 3/02 . Diaphragms
- F16J 3/04 . Bellows
- F16J 3/041 . . { Non-metallic bellows }
- F16J 3/042 . . . { Fastening details }
- F16J 3/043 . . . { with particular means for limiting wear }
- F16J 3/045 . . . { Split bellows }
- F16J 3/046 . . . { Lubrication or venting arrangements }
- F16J 3/047 . . { Metallic bellows }
- F16J 3/048 . . [with guiding or supporting means]
- F16J 3/06 . Bellows pistons

F16J 7/00 **Piston-rods**

F16J 9/00 **Piston-rings, { e.g. non-metallic piston-rings }, seats therefor; Ring sealings of similar construction in general** ([other sealings between pistons and cylinders F16J 3/06, F16J 15/16](#); { [manufacture of piston-rings B23P 15/06, B23P 15/08](#) }; tools for mounting or removing piston-rings or the like [B25B](#) ; piston sealing arrangements on brake master cylinders [B60T 11/236](#); { [sealing provided on pump pistons F04B 53/143](#) })

- F16J 9/02 . L-section rings
- F16J 9/04 . Helical rings
- F16J 9/06 . using separate springs { [or elastic elements](#) } expanding the rings; Springs therefor; { [Expansion by wedging](#) }
- F16J 9/061 . . { [using metallic coiled or blade springs \(F16J 9/145 takes precedence \)](#) }
- F16J 9/062 . . . { [Coiled spring along the entire circumference](#) }
- F16J 9/063 . . . { [Strip or wire along the entire circumference](#) }
- F16J 9/064 . . { [Rings with a flat annular side rail](#) }
- F16J 9/065 . . . { [Spring expander with massive cross-section](#) }

- F16J 9/066 . . . { Spring expander from sheet metal }
- F16J 9/067 { corrugated in the radial direction }
- F16J 9/068 { corrugated in the axial direction }
- F16J 9/069 { with a "C"-shaped cross section along the entire circumference }

- F16J 9/08 . with expansion obtained by pressure of the medium

- F16J 9/10 . Special members for adjusting the rings

- F16J 9/12 . Details
- F16J 9/14 . . Joint-closures
- F16J 9/145 . . . { of spring expanders }
- F16J 9/16 . . . obtained by stacking of rings
- F16J 9/18 . . . with separate bridge-elements
- F16J 9/20 . . Rings with special cross-section (L-section rings [F16J 9/02](#)); Oil-scraping rings { ([F16J 9/06](#) takes precedence) }
- F16J 9/203 . . . { Oil-scraping rings }

WARNING

The group [F16J 9/203](#) is no longer used for the classification of new documents from August [1st](#) , 2002. The backlog of this group is being continuously reclassified to [F16J 9/206](#), and to [F16J 9/06](#) and sub-groups

- F16J 9/206 . . . { One-piece oil-scraping rings }
- F16J 9/22 . . Rings for preventing wear of grooves or like seatings
- F16J 9/24 . . Members preventing rotation of rings in grooves

- F16J 9/26 . characterised by the use of particular materials

- F16J 9/28 . of non-metals

- F16J 10/00** **Engine or like cylinders** (pressure vessels in general [F16J 12/00](#); cylinders for engines or other apparatus of particular kinds, see the appropriate subclasses, e.g. for combustion engines [F02F](#)); **Features of hollow, e.g. cylindrical, bodies in general**

- F16J 10/02 . Cylinders designed to receive moving pistons or plungers
- F16J 10/04 . . Running faces; Liners

- F16J 12/00** **Pressure vessels in general** (covers therefor [F16J 13/00](#); for particular applications, see the relevant subclasses, e.g. [B01J](#) , [F17C](#) , [G21C](#))

- F16J 13/00** **Covers or similar closure members for pressure vessels in general** (for engines or like cylinders [F16J 10/00](#); sealings [F16J 15/02](#); covers for box-like containers [B65D 43/00](#); devices for securing or retaining closure members [B65D 45/00](#); closures for containers not otherwise provided for [B65D 51/00](#); manholes, covers for large containers [B65D 90/10](#); gates or closures for large containers [B65D 90/54](#); for vessels for containing or storing compressed, liquefied or solidified gases [F17C 13/06](#); steam boilers [F22B](#))

- F16J 13/02 . Detachable closure members; Means for tightening closures ([F16J 13/16](#), [F16J 13/22](#) take precedence)
- F16J 13/04 . . attached with a bridge member
- F16J 13/06 . . attached only by clamps along the circumference
- F16J 13/065 . . . { the clamp comprising a ring encircling the flange }
- F16J 13/08 . . attached by one or more members actuated to project behind a part or parts of the frame ([similar constructions for doors or windows](#) [E05C 9/00](#))
- F16J 13/10 . . attached by means of a divided ring
- F16J 13/12 . . attached by wedging action by means of screw-thread, interrupted screw-thread, bayonet closure, or the like
- F16J 13/14 . . attached exclusively by spring action or elastic action
- F16J 13/16 . Pivoted closures ([F16J 13/22](#) takes precedence)
- F16J 13/18 . . pivoted directly on the frame
- F16J 13/20 . . mounted by mobile fastening on swinging arms
- F16J 13/22 . with movement parallel to the plane of the opening
- F16J 13/24 . with safety devices, e.g. to prevent opening prior to pressure release
- F16J 15/00** **Sealings** ([sealing arrangements for vehicle windows, windscreens, non-fixed roofs, doors, or similar devices](#) [B60J 10/00](#); [sealing or packing elements for container closures](#) [B65D 53/00](#); [sealing arrangements in rotary-piston machines or engines](#) [F01C 19/00](#); [sealings in non-positive-displacement machines or engines](#) [F01D 11/00](#); [arrangements of sealings in combustion engines](#) [F02F 11/00](#); [sealing arrangements in rotary-piston pumps](#) [F04C 27/00](#); [sealing lead-in or lead-through insulators](#) [H01B 17/30](#))
- F16J 15/002 . { comprising at least two sealings in succession ([F16J 15/162](#), [F16J 15/40](#) take precedence) }
- F16J 15/004 . . { forming or recuperation chamber for the leaking fluid }
- F16J 15/006 . . { with division of the pressure ([F16J 15/44](#) takes precedence) }
- F16J 15/008 . . { with provision to put out of action at least one sealing; One sealing sealing only on standstill; Emergency or servicing sealings ([F16J 15/164](#) takes precedence) }
- F16J 15/02 . between relatively-stationary surfaces ([F16J 15/46](#), [F16J 15/48](#) take precedence)
- F16J 15/021 . . { with elastic packing ([F16J 15/08](#) takes precedence) }
- F16J 15/022 . . . { characterised by structure or material }
- F16J 15/024 { the packing being locally weakened in order to increase elasticity }
- F16J 15/025 { and with at least one flexible lip }
- F16J 15/027 { and with a hollow profile }
- F16J 15/028 . . . { the packing being mechanically expanded against the sealing surface }
- F16J 15/04 . . without packing between the surfaces, e.g. with ground surfaces, with cutting edge
- F16J 15/06 . . with solid packing compressed between sealing surfaces
- F16J 15/061 . . . { with positioning means ([F16J 15/0831](#) takes precedence) }
- F16J 15/062 . . . { characterised by the geometry of the seat }
- F16J 15/064 . . . { the packing combining the sealing function with other functions }

F16J 15/065	....	{ fire resistant }
F16J 15/067	...	{ Split packings }
F16J 15/068	...	{ the packing swelling under working conditions }
F16J 15/08	...	with exclusively metal packing
F16J 15/0806	....	{ characterised by material or surface treatment }
F16J 15/0812	.....	{ with a braided or knitted body }
F16J 15/0818	....	{ Flat gaskets }
F16J 15/0825	.....	{ laminated }
F16J 15/0831	.....	{ with mounting aids }
F16J 15/0881	....	{ the sealing effect being obtained by plastic deformation of the packing }
F16J 15/0887	....	{ the sealing effect being obtained by elastic deformation of the packing }
F16J 15/0893	.....	{ the packing having a hollow profile }
F16J 15/10	...	with non-metallic packing
F16J 15/102	....	{ characterised by material }
F16J 15/104	....	{ characterised by structure }
F16J 15/106	.....	{ homogeneous }
F16J 15/108	....	{ Special methods for making a non-metallic packing }
F16J 15/12	....	with metal reinforcement or covering
F16J 15/121	.....	{ with metal reinforcement }
F16J 15/122	.....	{ generally parallel to the surfaces }
F16J 15/123	.....	{ Details relating to the edges of the packing }
F16J 15/125	.....	{ generally perpendicular to the surfaces }
F16J 15/126	.....	{ consisting of additions, e.g. metallic fibres, metallic powders, randomly dispersed in the packing }
F16J 15/127	.....	{ the reinforcement being a compression stopper }
F16J 15/128	.....	{ with metal covering }
F16J 15/14	..	by means of granular or plastic material, or fluid
F16J 15/16	.	between relatively moving surfaces (F16J 15/50 , F16J 15/52 take precedence; bellows pistons F16J 3/06 ; piston-rings or ring sealing of similar construction in general F16J 9/00 ; spindle sealings for valves F16K 41/00)
F16J 15/162	..	{ Special parts or details relating to lubrication or cooling of the sealing itself (F16J 15/324 , F16J 15/3404 , F16J 15/40 take precedence) }
F16J 15/164	..	{ the sealing action depending on movements; pressure difference, temperature or presence of leaking fluid }
F16J 15/166	..	{ with means to prevent the extrusion of the packing }
F16J 15/168	..	{ which permits material to be continuously conveyed }
F16J 15/18	..	with stuffing-boxes for elastic or plastic packings
F16J 15/181	...	{ for plastic packings }
F16J 15/182	...	{ with lubricating, cooling or draining means }
F16J 15/183	....	{ using a lantern ring }
F16J 15/184	...	{ Tightening mechanisms }
F16J 15/185	....	{ with continuous adjustment of the compression of the packing }
F16J 15/186	.....	{ using springs }

F16J 15/187	...	{ Self-aligning stuffing-boxes }
F16J 15/188	...	{ Split assemblies }
F16J 15/189	...	{ Means for facilitating the removal of the packing }
F16J 15/20	...	Packing materials therefor
F16J 15/22	....	shaped as strands, ropes, threads, ribbons, or the like
F16J 15/24	...	with radially or tangentially compressed packing
F16J 15/26	..	with stuffing-boxes for rigid sealing rings
F16J 15/28	...	with sealing rings made of metal
F16J 15/30	...	with sealing rings made of carbon
F16J 15/32	..	with elastic sealing lip { with elastic sealing, e.g. "O" ring; F16J 15/34 takes precedence }
F16J 15/3204	...	{ with at least one lip }
F16J 15/3208	....	{ provided with a spring-tension element }
F16J 15/3212	.....	{ with a metal spring }
F16J 15/3216	....	{ supported in a direction parallel to the surfaces }
F16J 15/322	....	{ supported in a direction perpendicularly to the surfaces }
F16J 15/3224	....	{ protected against changes in distances between the surfaces }
F16J 15/3228	....	{ formed by deforming a flat annular ring }
F16J 15/3232	....	{ with a plurality of lips (F16J 15/3208 to F16J 15/3228 take precedence) }
F16J 15/3236	.....	{ with at least one lip for each surface, i.e. "U" cup packings }
F16J 15/324	...	{ Details relating to lubrication or cooling of the sealing itself (in general F16J 15/162) }
F16J 15/3244	...	{ with hydro-dynamic pumping action }
F16J 15/3248	...	{ provided with a casing }
F16J 15/3252	....	{ with a rigid casing }
F16J 15/3256	.....	{ comprising two elements fixed respectively on each surface }
F16J 15/326	.....	{ with means for detecting the relative rotation of the two elements }
F16J 15/3264	.....	{ the elements being separable }
F16J 15/3268	....	{ Mounting of sealing lips }
F16J 15/3272	.....	{ The sealing having a break, e.g. permitting the radial mounting around a shaft }
F16J 15/3276	....	{ Static sealing round the fixation on one of the surfaces }
F16J 15/328	...	{ Special methods for making elastic sealings (moulding or like operations, see the relevant classes) }
F16J 15/3284	...	{ Structural composition; Use of special materials }
F16J 15/3288	....	{ Filamentary structures, e.g. brush seal }
F16J 15/3292	....	{ Lamellar structures }
F16J 15/3296	...	{ Measuring or controlling equipment specially adapted for elastic sealings (measuring in general G01 ; Controlling in general G05) }
F16J 15/34	..	with slip-ring pressed against a more or less radial face on one member
F16J 15/3404	...	{ and characterised by parts or details relating to lubrication, cooling or venting of the seal }
F16J 15/3408	....	{ at least one ring having an uneven slipping surface }
F16J 15/3412	.....	{ with cavities (F16J 15/3424 takes precedence) }

F16J 15/3416	.....	{ with at least one continuous groove }
F16J 15/342	.....	{ with means for feeding fluid directly to the face }
F16J 15/3424	.....	{ with micro-cavities }
F16J 15/3428	.....	{ with a wavy surface }
F16J 15/3432	.....	{ the geometry of the surface being able to vary during operation }
F16J 15/3436	...	{ Pressing means }
F16J 15/344	....	{ the pressing force being applied by means of an elastic ring supporting the slip-ring }
F16J 15/3444	....	{ by magnetic attraction }
F16J 15/3448	....	{ the pressing force resulting from fluid pressure }
F16J 15/3452	....	{ the pressing force resulting from the action of a spring }
F16J 15/3456	....	{ without external means for pressing the ring against the face, e.g. slip-ring with a resilient lip }
F16J 15/346	....	{ the pressing force varying during operation }
F16J 15/3464	...	{ Mounting of the seal }
F16J 15/3468	....	{ Means for controlling the deformations of the contacting faces }
F16J 15/3472	....	{ Means for centering or aligning the contacting faces }
F16J 15/3476	....	{ Means for minimising vibrations of the slip-ring }
F16J 15/348	....	{ Pre-assembled seals, e.g. cartridge seals }
F16J 15/3484	.....	{ Tandem seals }
F16J 15/3488	....	{ Split-rings }
F16J 15/3492	...	{ with monitoring or measuring means associated with the seal }
F16J 15/3496	...	{ use of special materials }
F16J 15/36	...	connected by a diaphragm { or bellow } to the other member
F16J 15/363	....	{ the diaphragm or bellow being made of metal }
F16J 15/366	.....	{ and comprising vibration-damping means }
F16J 15/38	...	sealed by a packing
F16J 15/40	..	by means of fluid
F16J 15/403	...	{ by changing the state of matter }
F16J 15/406	...	{ by at least one pump }
F16J 15/42	...	kept in sealing position by centrifugal force
F16J 15/43	...	kept in sealing position by magnetic force
F16J 15/44	.	Free-space packings
F16J 15/441	..	{ with floating ring }
F16J 15/442	...	{ segmented }
F16J 15/443	..	{ provided with discharge channels }
F16J 15/444	..	{ with facing materials having honeycomb-like structure }
F16J 15/445	..	{ with means for adjusting the clearance }
F16J 15/447	..	Labyrinth packings
F16J 15/4472	...	{ with axial path }
F16J 15/4474	....	{ Pre-assembled packings }
F16J 15/4476	...	{ with radial path }

- F16J 15/4478 { **Pre-assembled packings** }
- F16J 15/453 . . . characterised by the use of particular materials { ([F16J 15/444](#) takes precedence) }
- F16J 15/46 . with packing ring expanded or pressed into place by fluid pressure, e.g. inflatable packings ([connection of valves to inflatable elastic bodies B60C 29/00](#); { for sealing arrangements in vehicles [B60J 10/0037](#); for sealing arrangements of openings in buildings [E06B 7/2318](#) }; for tube connections [F16L](#))
- F16J 15/48 . . influenced by the pressure within the member to be sealed
- F16J 15/50 . between relatively-movable members, by means of a sealing without relatively-moving surfaces, e.g. fluid-tight sealings for transmitting motion through a wall
- F16J 15/52 . . by means of sealing bellows or diaphragms ([connection of valves to inflatable elastic bodies B60C 29/00](#))
- F16J 15/525 . . . { **fixed to a part of a transmission performing a wobbling or a circular translatory movement** }
- F16J 15/54 . Other sealings for rotating shafts
- F16J 15/545 . . { **submitted to unbalanced pressure in circumference; seals for oscillating actuator** }
- F16J 15/56 . Other sealings for reciprocating rods
- F16J 2015/00** **Sealings** ([sealing arrangements for vehicle windows, windcreens, non-fixed roofs, doors, or similar devices B60J 10/00](#); [sealing or packing elements for container closures B65D 53/00](#); [sealing arrangements in rotary-piston machines or engines F01C 19/00](#); [sealings in non-positive-displacement machines or engines F01D 11/00](#); [arrangements of sealings in combustion engines F02F 11/00](#); [sealing arrangements in rotary-piston pumps F04C 27/00](#); [sealing lead-in or lead-through insulators H01B 17/30](#))
- F16J 2015/02 . between relatively-stationary surfaces ([F16J 15/46](#), [F16J 15/48](#) take precedence)
- F16J 2015/06 . . with solid packing compressed between sealing surfaces
- F16J 2015/08 . . . with exclusively metal packing
- F16J 2015/0818 { **Flat gaskets** }
- F16J 2015/0837 with an edge portion folded over a second plate or shim
- F16J 2015/0843 with an edge portion folded over the plate itself
- F16J 2015/085 without fold over
- F16J 2015/0856 with a non-metallic coating or strip
- F16J 2015/0862 with a bore ring
- F16J 2015/0868 Aspects not related to the edges of the gasket
- F16J 2015/0875 comprising welds