

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 [F02E](#); {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 (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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> attached by means of a divided ring
F16J 13/12	<ul style="list-style-type: none"> attached by wedging action by means of screw-thread, interrupted screw-thread, bayonet closure, or the like
F16J 13/14	<ul style="list-style-type: none"> attached exclusively by spring action or elastic action
F16J 13/16	<ul style="list-style-type: none"> Pivoted closures (F16J 13/22 takes precedence)
F16J 13/18	<ul style="list-style-type: none"> pivoted directly on the frame
F16J 13/20	<ul style="list-style-type: none"> mounted by mobile fastening on swinging arms
F16J 13/22	<ul style="list-style-type: none"> with movement parallel to the plane of the opening
F16J 13/24	<ul style="list-style-type: none"> with safety devices, e.g. to prevent opening prior to pressure release
F16J 15/00	Sealings
F16J 15/002	<ul style="list-style-type: none"> {comprising at least two sealings in succession (F16J 15/162, F16J 15/40 take precedence)}
F16J 15/004	<ul style="list-style-type: none"> {forming or recuperation chamber for the leaking fluid}
F16J 15/006	<ul style="list-style-type: none"> {with division of the pressure (F16J 15/44 takes precedence)}
F16J 15/008	<ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> between relatively-stationary surfaces (F16J 15/46, F16J 15/48 take precedence)
F16J 15/021	<ul style="list-style-type: none"> {with elastic packing (F16J 15/08 takes precedence)}
F16J 15/022	<ul style="list-style-type: none"> {characterised by structure or material}
F16J 15/024	<ul style="list-style-type: none"> {the packing being locally weakened in order to increase elasticity}
F16J 15/025	<ul style="list-style-type: none"> {and with at least one flexible lip}
F16J 15/027	<ul style="list-style-type: none"> {and with a hollow profile}
F16J 15/028	<ul style="list-style-type: none"> {the packing being mechanically expanded against the sealing surface}
F16J 15/04	<ul style="list-style-type: none"> without packing between the surfaces, e.g. with ground surfaces, with cutting edge
F16J 15/06	<ul style="list-style-type: none"> with solid packing compressed between sealing surfaces
F16J 15/061	<ul style="list-style-type: none"> {with positioning means (F16J 15/0831 takes precedence)}
F16J 15/062	<ul style="list-style-type: none"> {characterised by the geometry of the seat}
F16J 15/064	<ul style="list-style-type: none"> {the packing combining the sealing function with other functions}
F16J 15/065	<ul style="list-style-type: none"> {fire resistant}
F16J 15/067	<ul style="list-style-type: none"> {Split packings}
F16J 15/068	<ul style="list-style-type: none"> {the packing swelling under working conditions}
F16J 15/08	<ul style="list-style-type: none"> with exclusively metal packing
F16J 15/0806	<ul style="list-style-type: none"> {characterised by material or surface treatment}
F16J 15/0812	<ul style="list-style-type: none"> {with a braided or knitted body}
F16J 15/0818	<ul style="list-style-type: none"> {Flat gaskets}
F16J 15/0825	<ul style="list-style-type: none"> {laminated}

F16J 15/0831	. . . . . {with mounting aids}
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}
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 sealings of similar construction F16J 9/00)
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 sealings, e.g. O-rings
F16J 15/3204	. . . with at least one lip
F16J 15/3208	. . . . provided with tension elements, e.g. elastic rings
F16J 15/3212	. . . . . with metal springs
F16J 15/3216	. . . . supported in a direction parallel to the surfaces
F16J 15/322	. . . . supported in a direction perpendicular to the surfaces
F16J 15/3224	. . . . capable of accommodating changes in distances or misalignment between the surfaces, e.g. able to compensate for defaults of eccentricity or angular deviations
F16J 15/3228	. . . . formed by deforming a flat ring
F16J 15/3232	. . . . having two or more lips
F16J 15/3236	. . . . . with at least one lip for each surface, e.g. U-cup packings
F16J 15/324	. . . Arrangements for lubrication or cooling of the sealing itself
F16J 15/3244	. . . with hydrodynamic pumping action
F16J 15/3248	. . . provided with casings or supports
F16J 15/3252	. . . . with rigid casings or supports
F16J 15/3256	. . . . . comprising two casing or support elements, one attached to each surface, e.g. cartridge or cassette seals
F16J 15/326	. . . . . with means for detecting or measuring relative rotation of the two elements
F16J 15/3264	. . . . . the elements being separable from each other
F16J 15/3268	. . . Mounting of sealing rings
F16J 15/3272	. . . . the rings having a break or opening, e.g. to enable mounting on a shaft otherwise than from a shaft end
F16J 15/3276	. . . . with additional static sealing between the sealing, or its casing or support, and the surface on which it is mounted
F16J 15/328	. . . Manufacturing methods specially adapted for elastic sealings (moulding B29C)
F16J 15/3284	. . . characterised by their structure; Selection of materials
F16J 15/3288	. . . . Filamentary structures, e.g. brush seals
F16J 15/3292	. . . . Lamellar structures

- F16J 15/3296 . . . Arrangements for monitoring the condition or operation of elastic sealings ([F16J 15/326 takes precedence](#)); Arrangements for control of elastic sealings, e.g. of their geometry or stiffness
- 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