

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 }

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| 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 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 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 } |

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| 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 } |

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| 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