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(71) Applicant: **Corcos Industriale di Freudenberg & Cosso S.r.l.,**
Società in Accomandita Semplice
10064 Pinerolo (IT)

(72) Inventor: **Lantelme, Flavio**
10064 Pinerolo (IT)

(74) Representative: **D'Angelo, Fabio et al**
Studio Torta S.r.l.
Via Viotti, 9
10121 Torino (IT)

(54) Gasket for a valve of an internal combustion engine

(57) It is described a gasket (18) for a valve (12) of an internal combustion engine (1) comprising a supporting element (26) having a tubular conformation according to an axis (B), and an elastically deformable element (25) adapted to be arranged between the valve (12) and the supporting element (26); the supporting element (26) comprising a first portion (42) extending transversally to the axis (B) and adapted to receive an action with component parallel to the axis (B) itself to facilitate the assembly of the gasket (18) on the valve (12), and a second portion (41) elongated towards the axis (B) from the first portion (42) and in turn comprising at least one segment (45) having increasing radial dimensions towards the first portion (42) itself (46) so as to reduce the volume of the elastically deformable element (25).

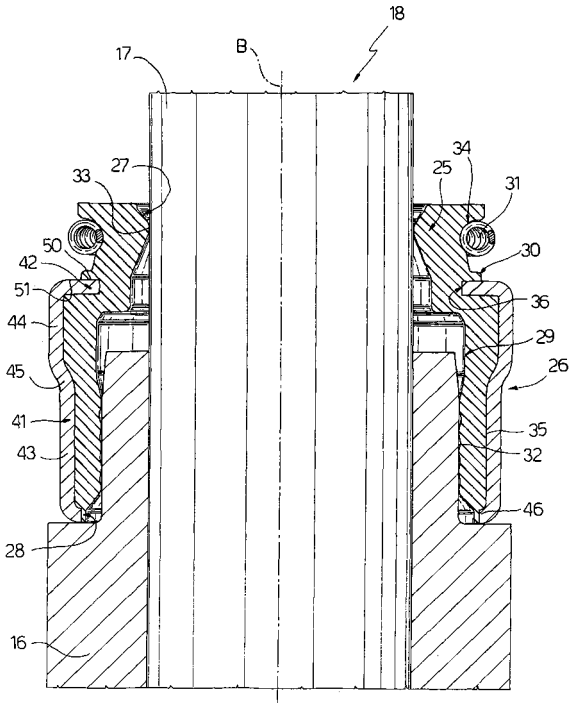

Fig.2

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Description

[0001] The present invention relates to a gasket for a valve of an internal combustion engine.

[0002] There are known internal combustion engines for vehicles including a head defining a plurality of combustion chambers and of respective cylinders, inside which is performed an engine cycle adapted to transform the chemical energy present in a mixture of combustible gas and air into mechanical energy. Furthermore, the head defines a feeding unit adapted to bring forward inside the combustion chambers the mixture of combustible gas and air, and an exhaust unit adapted to carry away the burnt gas and the air from the combustion chambers.

[0003] The feeding unit comprises a plurality of suction pipes adapted to feed respective combustion chambers with the combustible gas and combustion air, and a plurality of suction valves interfering, via a respective shutter section and according to predetermined time laws, with respective suction pipes for regulating the flow of the combustible gas and the combustion air towards each combustion chamber.

[0004] Similarly, the exhaust unit comprises a plurality of pipes adapted to carry away the burnt gas and air from respective combustion chambers towards an environment external to the engine, and a plurality of exhaust valves interfering, via a respective shutter section and according to predetermined time laws, with the respective exhaust pipes for regulating the flow of burnt gas and combustion air towards the exhaust pipes themselves.

[0005] In particular, each suction/exhaust valve comprises, in general, a guiding element fastened inside a cavity made in the head and a stem slidingly mobile in opposite directions within a through seat defined by the guiding element.

[0006] On the valves of the type described above there are normally fitted sealing gaskets for the lubricant oil normally circulating in the engines so as to control the amount of oil which flows from the feeding/exhaust unit to the combustion chambers.

[0007] Such gaskets define, towards the combustion chambers, firstly a dynamic type seal for allowing only a minimum flow of oil needed to lubricate the coupling between the stem and the guiding element and, then, a static type seal to prevent a second flow path of the oil to the combustion chamber.

[0008] The gaskets normally include an elastomeric portion pressed on the stem and on the guiding element to achieve the aforementioned sealing functions, and a supporting element fitted on the elastomeric portion to press the same onto the stem and onto the guiding element.

[0009] More precisely, a first fraction of an internal surface of the elastomeric portion cooperates directly with the stem so as to allow the minimum flow of oil needed to lubricate the coupling between stem and guiding element (dynamic seal), and a second fraction of the above-mentioned internal surface, arranged between the first fraction and the combustion chamber, cooperates with the guiding element preventing the leakage of lubricant oil towards the combustion chambers (static seal).

[0010] In the sector it is felt the need to effectively achieve the static sealing and dynamic sealing functions, and at the same time, to ensure the maintenance of the correct positioning, in working conditions, of the elastomeric portion. Furthermore, in the sector it is felt the need to contain the volume of the elastomeric portion and to facilitate the assembly of the gasket on the valve.

[0011] It is the object of the present invention to make a gasket for a valve of an internal combustion engine which simply and cost-effectively fulfils the above specified needs.

[0012] The aforementioned object is reached by the present invention, inasmuch it is related to a gasket for a valve of an internal combustion engine as defined in claim 1.

[0013] For a better understanding of the present invention, it will now be described a preferred embodiment only by way of non-limitative example, and with reference to the accompanying drawings, in which:

figure 1 is a partial sectional view of an internal combustion engine provided with a gasket for a valve made according to the dictates of the present invention; and

figure 2 is an axial section in magnified scale of the valve and the seal in figure 1.

[0014] With reference to figure 1, it is indicated as a whole with 1 an internal combustion engine adapted to transform the chemical energy contained in a fuel into mechanical energy and shown only in that is necessary for understanding the present invention.

[0015] In greater detail, in figure 1 it is shown the engine 1 limitedly to a head 2 extending symmetrically with respect to an axis A and shown only partially.

[0016] The head 2 defines a combustion chamber 3 (only partially shown) inside which a combustible gas is oxidised in presence of combustion air so to transform the chemical energy contained in the combustible gas into pressure energy, and a cylinder 4 (also only partially shown) of axis A fluidically connected to the combustion chamber 3 and adapted to transform the aforementioned pressure energy into mechanical energy.

[0017] The head 2, moreover, accommodates a feeding unit (not shown) adapted to bring forward, into the combustion chamber 3, a mixture comprising the combustible gas and the combustion air, and an exhaust unit 5 adapted to carry away the burnt gas and air from the combustion chamber 3 itself towards an environment external to the engine 1.

[0018] In greater detail, the cylinder 4 comprises a liner 6 and a piston 7, which is sliding under the action of the pressure of the fuel inside the liner 6 itself according to an alternating motion directed along the axis A and is

operatively connected in a way not shown to an engine member to transform the pressure energy into mechanical energy.

[0019] The combustion chamber 3 is axially delimited by an end wall 8 and is open, on axially opposite part with respect to the end wall 8, towards the cylinder 4.

[0020] The end wall 8 of the combustion chamber 3 presents a pair of circular and through openings, only one of which is shown and indicated with 9, and arranged symmetrically with respect to the axis A. More in particular, the opening not shown is adapted to allow the passage of the mixture comprising the combustible gas and the combustion air coming from the feeding unit to the inside of the combustion chamber 3; the opening 9 is adapted to allow the passage of burnt gas and air from the combustion chamber 3 to the exhaust unit 5.

[0021] The exhaust unit 5 and the feeding unit are entirely similar; the present description makes reference, for simplicity, to the exhaust unit 5 only.

[0022] In greater detail, the exhaust unit 5 comprises an exhaust pipe 11 extending from opening 9 towards the environment external to the engine 1, and an exhaust valve 12 adapted to engage, according to predetermined time laws, the opening 9 so as to adjust the flow of burnt gas and air from the combustion chamber 3 to the exhaust pipe 11.

[0023] The valve 12, shown in detail in figure 2, is accommodated in a seat 14, which is made on the head 2 and normally contains lubricant oil.

[0024] More precisely, the seat 14 is extended symmetrically with respect to an axis B, transversal with respect to the axis A, and is open, at its own axial terminal portion 15 with respect to the exhaust pipe 11.

[0025] Furthermore, the valve 12 comprises a tubular guiding element 16 interferencely fitted inside the terminal portion 15 of the seat 14, one stem 17 slidingly mobile in opposite directions along the axis B within the guiding element 16, and a gasket 18 coaxially surrounding the stem 17 and the guiding element 16 so as to prevent the flow of oil from the seat 14 towards the combustion chamber 3.

[0026] In greater detail, the stem 17 protrudes on opposite sides from the guiding element 16. The stem 17, moreover, comprises at its opposite axial ends, a shutter section 20 intended to fluidtightly engage the opening 9 and a section 19 adapted to receive an actuating force via a control mechanism 21, in the case shown of the cam and tappet type.

[0027] The valve 12, moreover, comprises a spring 22, in the case shown of the helical type, which is fastened, at its mutually opposite axial ends, to a delimitation wall of the seat 14 and the section 19, and is adapted to generate an elastic return force on the stem 17 during the alternating motion of the stem 17 itself.

[0028] With particular reference to figure 2, the gasket 18 presents an annular conformation according to an axis coinciding, in assembly conditions, with the axis B.

[0029] More precisely, the gasket 18 comprises an annular shaped elastomeric element 25, and a supporting element 26 coaxially fastened onto the elastomeric element 25 to press the elastomeric element 25 itself, in the radial direction with respect to the axis B, onto the stem 17 and onto the guiding element 16.

[0030] The elastomeric element 25 defines, proceeding along the axis B towards the combustion chamber 3, firstly a seal of the dynamic type adapted to allow the passage of a minimum flow of oil needed to lubricate the coupling between the stem 17 and the guiding element 16, and then a seal of the static type to prevent a second flow of oil towards the combustion chamber 3.

[0031] In greater detail, the elastomeric element 25 comprises two mutually opposite discoid and axial end sections 27, 28, an internal circumferential surface 29 adapted to cooperate in part with the stem 17 and in part with the guiding element 16 to make the abovementioned seals, and an external circumferential surface 30 adapted to couple with the supporting element 26 and with an annular collar 31 so as to press the internal circumferential surface 29 onto the stem 17 and onto the guiding element 16.

[0032] The section 27, in assembly conditions, is facing towards the control mechanism 21 and is crossed by the stem 17; the section 28, in assembly conditions, is facing towards the combustion chamber 3, and is crossed by both the stem 17 and the guiding element 16.

[0033] The internal circumferential surface 29 of the elastomeric element 25 comprises a section 33 of minimum diameter, arranged next to the section 27 and adapted to be radially pressed by the collar 31 against the stem 17 to define a circumferential sealing line of the dynamic type, which allows, thanks to the sliding coupling between the stem 17 and the section 27, the leakage of a minimum flow of oil.

[0034] The internal circumferential surface 29 of the elastomeric element 25 further comprises an essentially cylindrical portion 32, arranged next to the section 28 and adapted to be radially pressed by the supporting element 26 against the fluidtightly guiding element 16 so as to define a cylindrical sealing area of the static type.

[0035] The circumferential external surface 30 of the elastomeric element 25 presents, in the proximity of the section 27, a recess 36 (whose function will be explained below), which splits the external circumferential surface 30 itself into an accommodation seat 34 of the collar 31, and an elongated portion 35 extending towards the section 28 and adapted to couple with the supporting element 26.

[0036] Advantageously, the supporting element 26 comprises a portion 42 extending transversally to the axis B and adapted to receive an action with component parallel to the axis B to facilitate the assembly of the gasket 18 on the valve 12, and a portion 41 elongated towards the axis B starting from the portion 42 and in turn comprising a segment 45 having increasing radial dimensions towards the portion 42 itself so as to reduce the volume of the elastomeric element 25.

[0037] More precisely, the portion 41 is adapted to cooperate with the segment 35 of the elastomeric element 25, and comprises a segment 43 and a segment 44, having a radial dimension higher than that of the segment 43, which define opposite axial ends of the portion 41 itself.

[0038] The segments 43 and 44 present cylindrical conformation and are both connected to the segment 45, which presents conical conformation.

[0039] In the case shown, the segment 43 and the segment 44 present higher extensions than the segment 45 in the direction of the axis B.

[0040] Furthermore, the segment 43 presents a free axial end 46 bent back towards the axis B so as to axially withhold the elastomeric element 25.

[0041] The portion 42 has discoid shape, and comprises a fraction 50 accommodated inside the recess 36 to fasten the supporting element 26 to the elastomeric element 25; the portion 42 also comprising a fraction 51, radially more external with respect to the fraction 50, adapted to cooperate axially with the elastomeric element 25 on the side of the section 28 and to remain free, on the axially opposite part, to allow the application of the action directed along the axis B in assembly conditions.

[0042] From an examination of the features of the gasket 18 made according to the present invention are apparent the advantages that it allowed to obtain.

[0043] In particular, the gasket 18 permits to obtain a two-fold advantage: the amount of elastomeric material required is lower inasmuch the segment 45 presents decreasing radial dimensions towards the portion 42, and the assembly of the gasket 18 itself on the valve 12 is facilitated inasmuch it is possible to apply an action directed parallelly to the axis B on the fraction 51, once the supporting element 26 is fitted onto the elastomeric element 25.

[0044] Furthermore, the gasket 18 allows to contain the elastomeric element 25 in the correct assembly position because the end 46 is bent back towards the axis B.

[0045] It is finally apparent that changes and variations can be implemented to the gasket 18 described and illustrated without departing from the scope of protection of the claims.

[0046] In particular, the gasket 18 could be used, in an entirely similar way, on the feeding unit suction valves.

[0047] Furthermore, the portion 42 of the supporting element 26 might also be entirely free from one or both the axial segments 43 and 44 and therefore have, in the latter case, an entirely tapered pattern with respect to the axis B.

Claims

1. A gasket (18) for a valve (12) of an internal combustion engine (1) comprising:

- a supporting element (26) having tubular conformation according to an axis (B); and
- an elastically deformable element (25) adapted to be placed between said valve (12) and said supporting element (26);

characterised in that said supporting element (26) comprises a first portion (42) extending transversally to said axis (B) and adapted to receive an action with a component parallel to the axis (B) itself to facilitate the assembly of said gasket (18) on said valve (12), and a second portion (41) elongated according to said axis (B) starting from said first portion (42) and in turn comprising at least one segment (45) having increasing radial dimensions towards the first portion (42) itself (46) so as to reduce the volume of said elastically deformable element (25).

2. A gasket according to claim 1, **characterised in that** said second portion (41) comprises a first axial end segment (43) and a second axial end segment (44) extending parallelly to said axis (B), and mutually joined by said increasing radial dimension segment (45).

3. A gasket according to claim 1 or 2, **characterised in that** said supporting element (26) presents an axial end (46) opposite to said first portion (42) and bent back towards said axis (B) to axially withhold said elastically deformable element (25).

4. A gasket according to any of the preceding claims, **characterised in that** said first portion (42) comprises a first fraction (50) fastened to said elastically deformable element (25), and a second fraction (51), radially more external with respect to said first fraction (50), at least in part free in the direction of said axis (B) to receive said action with the parallel component to said axis (B).

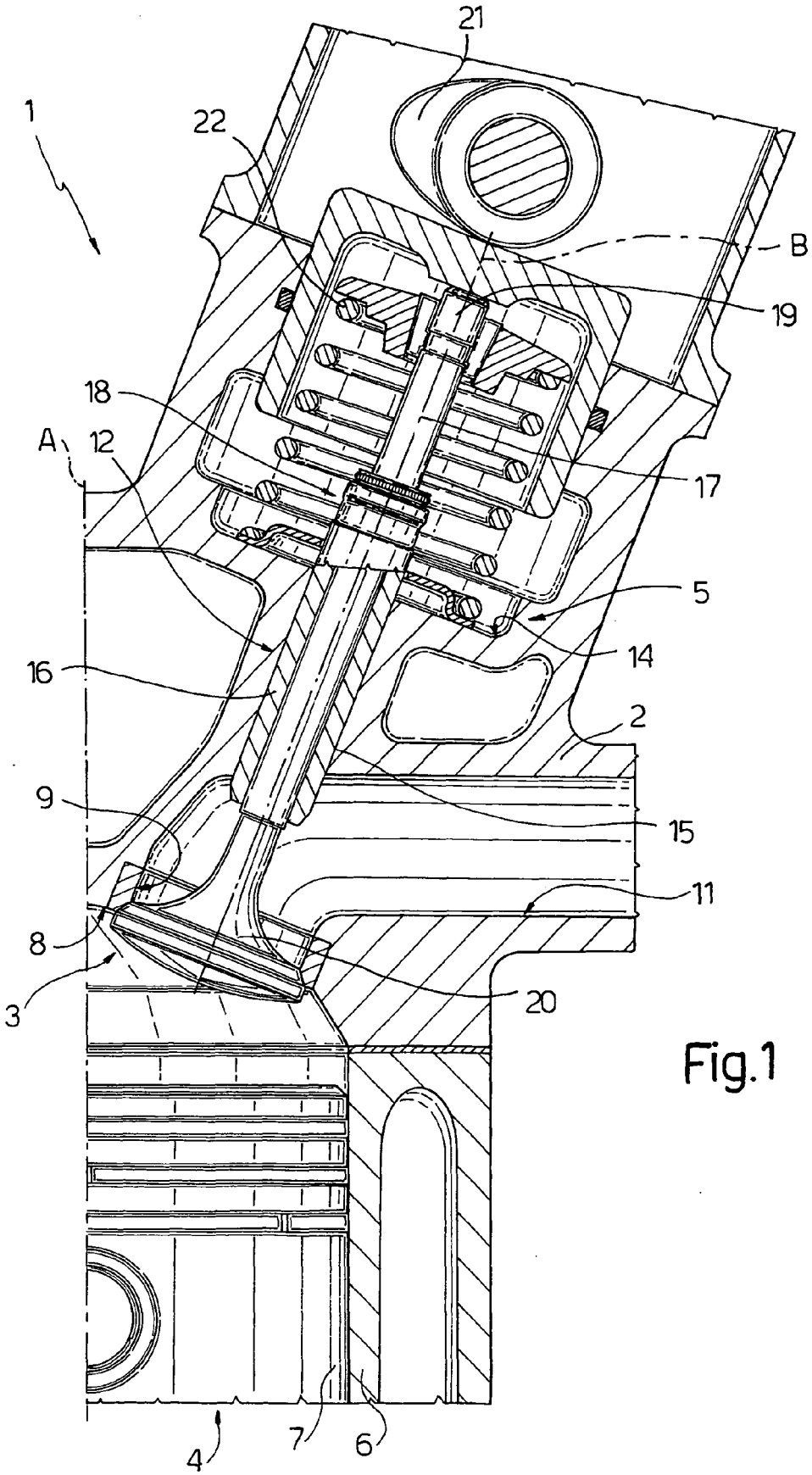

Fig.1

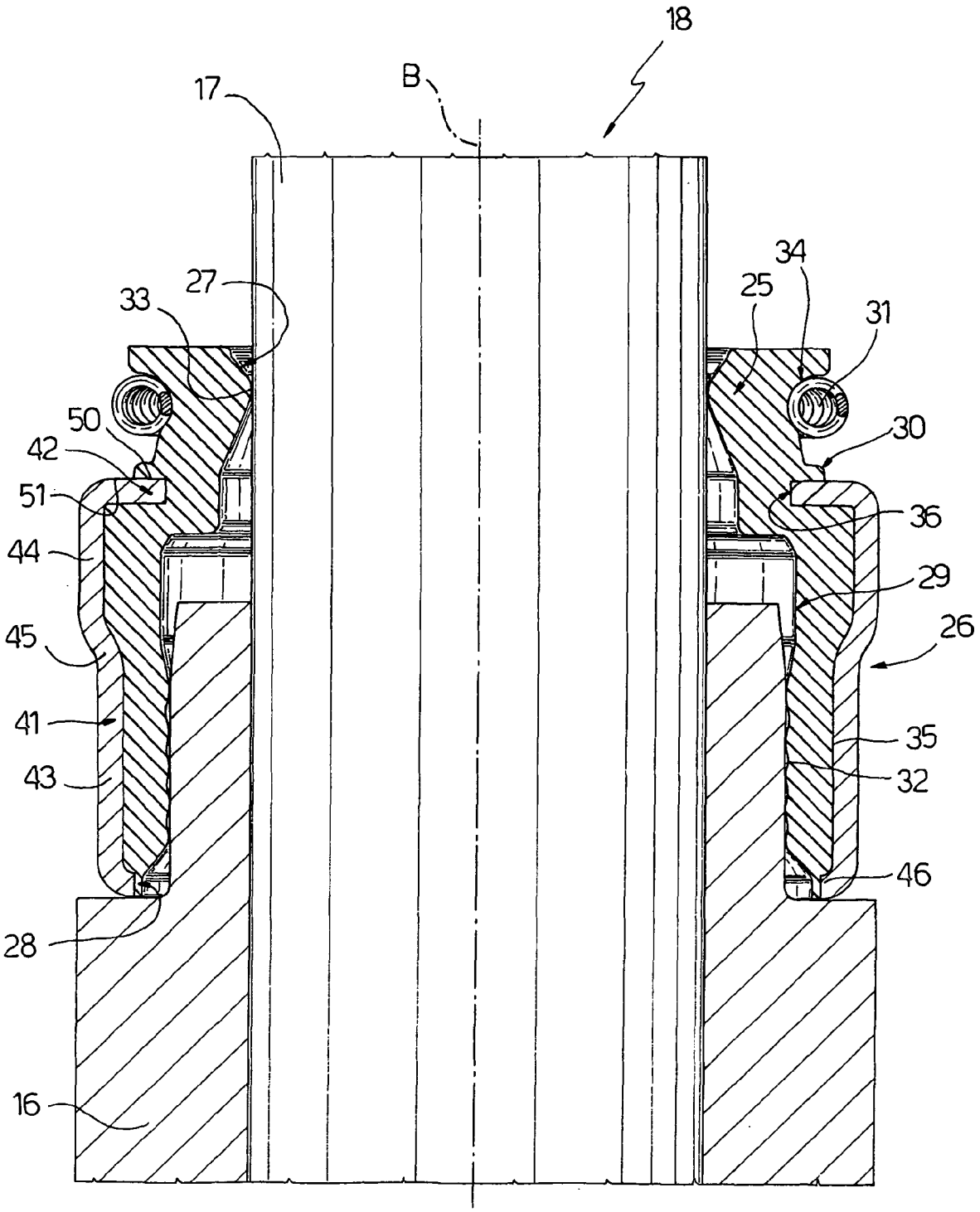

Fig.2

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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5571

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 January 2006	Paquay, J

CATEGORY OF CITED DOCUMENTS

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