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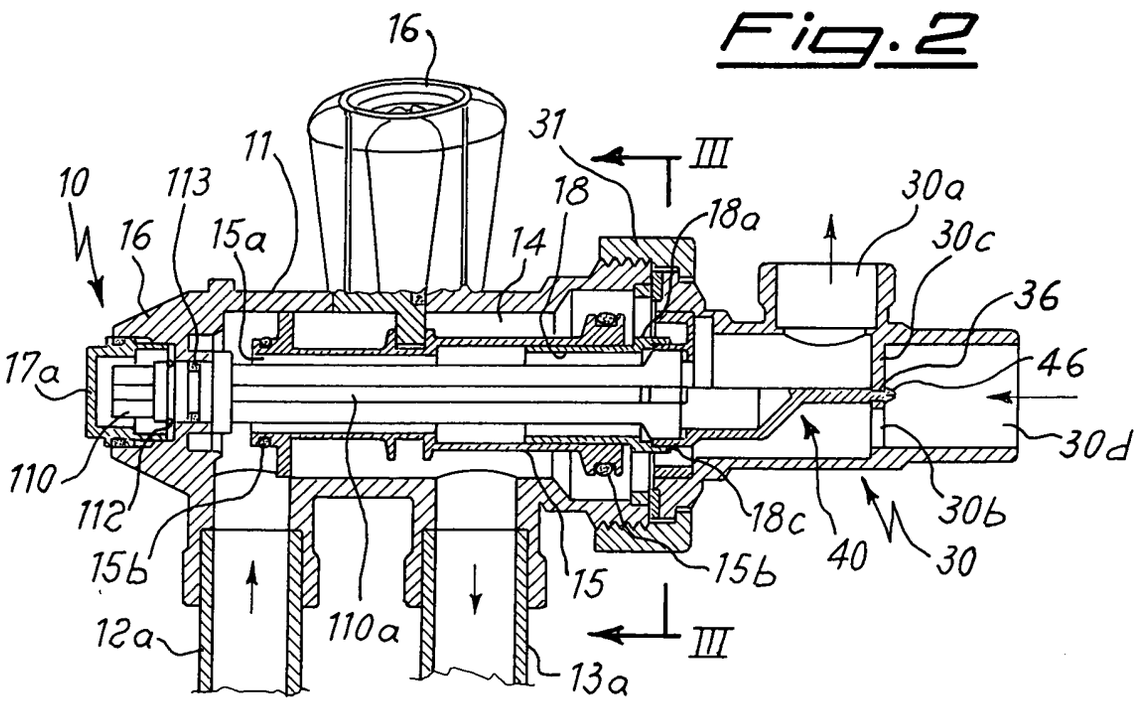
(54) Deviator for valve unions, able to be rotationally operated, associated union and valve equiped with sealed internal means for operation of said deviator

(57) Deviator (40) for unions (30) in particular of valves (10) for intercepting the supply of a fluid to radiator elements (20), comprising a flat body (41) having, engaged thereon, a tubular section (42) which is cut in the longitudinal direction so as to define an opening (42a), a semicircular collar (43) at right angles to and integral with one end of the said surface (41) comprising a projection (43a) extending radially outwards from said semicircular collar (43) at one of the opposite diametral ends situated on the said surface (41), a first annular external collar (44) of suitable depth in the axial direction, having an end surface open in the form of a semicircular recess (44a) for allowing the fluid to pass through, and a second internal collar (45) which is concentric with the first collar, has a smaller diameter and is connected to the first collar by means of the said end surface.

Fig.2



EP 1 445 555 A1

Description

[0001] The present invention relates to a deviator able to be rotationally operated and intended for unions which can be connected to fluid intercepting valves in recirculating systems and the like, a union for said deviator and a valve equipped with sealed internal means for rotationally operating said deviator.

[0002] It is known in the art relating to the distribution of hot water for heating purposes that there exists the need to cause recirculation of the water inside the radiator elements through which the water must enter at the top, in the hot state, and flow out from the bottom, in the cold state, after releasing its heat.

[0003] Numerous valves for controlling the water flow are also known, said valves being arranged between the supply pipes which are laid in the floor or in the wall and said radiator elements. These known valves include those which are suitable for so-called one-pipe systems, namely those where the radiator elements are arranged in series and the return of one element acts as the delivery for the next element.

[0004] In these types of valves delivery of the hot water and return of the cold water take place inside the same valve body inside which separate supply and return ducts are provided.

[0005] These valves, although performing their function, nevertheless have a major drawback consisting in the fact that, during preliminary laying of the piping, it is essentially not possible to maintain in a reliable manner the orientation of the delivery pipe and, upon connection of the valve, it may happen that the pipe which projects from the wall and is intended for delivery is instead the return pipe; in this case the connection of the one-pipe valve produces a flow of hot water which instead of rising upwards enters directly into the radiator element at the bottom, causing only partial heating of the radiator with a consequent large wastage of energy in order to obtain the temperature required in that specific environment.

[0006] Similarly, the same phenomenon may occur in so-called two-pipe systems where the radiators are arranged in parallel along the two pipes, one of which is the delivery pipe and the other the return pipe: in this case the amount of energy used would be even greater since the hot water leaving a radiator flows out directly into the return pipe which does not supply the next radiator.

[0007] In order to overcome this drawback it was proposed in EP 0,862,026 in the name of the same present Applicants providing a union for intercepting valves containing a deviator able to be rotated through 180° so as to cause channelling of the delivery flow of the fluid towards the corresponding aperture whatever the direction of origin of the flow from the associated intercepting valve.

[0008] Although performing its function, this union has the drawback that it needs to be disassembled in order to be able to carry out rotation of the deviator.

[0009] In the art, unions provided with internal rotatable deviators are known, said deviators being able to be operated by means of a special tool inserted coaxially through the intercepting valve connected to the union. In this case also the drawback exists that it is required to empty the heating water from the system before being able to open the valve in order to insert the tool, since otherwise the water would flow out from the valve and risk flooding the surrounding environment.

[0010] The technical problem which is posed therefore is that of designing a deviator which is able to be inserted into a union arranged between a valve for intercepting fluids, such as hot water and the like, and is rotatable inside the said union; a union able to contain said deviator and allow rotation thereof; as well as a intercepting valve which comprises means for rotationally operating a deviator inserted inside a union arranged between the said valve and the radiator of the heating system.

[0011] Within the context of this problem a further requirement is that said connecting valve should be simple and inexpensive to manufacture, should be adaptable to all the ready installed systems without the need for complex adjustments and should not require substantial modifications upon reversal of the flow.

[0012] These technical problems are solved according to the present invention by a deviator able to be rotationally operated, according to the characteristic features of Claim 1, a union provided with an internal deviator according to the characteristic features of Claim 7 and a valve which can be associated with said union and has sealed internal means for rotational operation of the said deviator according to Claim 21.

[0013] Further details may be obtained from the following description of a non-limiting example of embodiment of the invention provided with reference to the accompanying drawings in which:

- Figure 1 shows a partially sectioned view of the valve according to the present invention with coaxial internal means for rotationally operating a flow deviator;
- Figure 2 shows a cross-section along the plane indicated by II-II in Fig. 1;
- Figure 3 shows a cross-section along the plane indicated by III-III in Fig. 2;
- Figure 4 shows a perspective view of the deviator of the union according to the present invention;
- Figure 5 shows a schematic cross-sectional view of the union with deviator according to the present invention in a first working position;
- Figure 6 shows a schematic cross-sectional view of the union with deviator according to the present invention in a second working position with the flow reversed compared to the first working position;
- Figure 7 shows a perspective view of an operating tool according to the present invention;
- Figure 8a shows a view through the union according

to the present invention with the associated shaped fixing ring; and

- Figure 8b shows a perspective view of the shaped ring according to Fig. 8a.

[0014] As shown, a valve 10 for intercepting a heating fluid for radiators 20 comprises a body 11 having, formed therein, two apertures 12 and 13 with their axis substantially at right angles to the longitudinal axis of the valve and able to receive, inserted therein, the pipes 12a and 13a which, in the example shown, form respectively the delivery and the return, as indicated by the arrows. Said pipes 12a and 13a are restrained to the valve body using means which are known per se and not shown nor described.

[0015] In a direction substantially coaxial with the valve body a third opening 14 is formed for supplying the fluid to the radiator body 20 to which the valve is connected via a union 30 which is screwed with known means to the delivery pipe 22, to the return duct 23 from the radiator 20 and to the valve body 11 and inside which a device 40 for deviating the flow of the fluid is arranged, as described in detail below.

[0016] The valve body 11 also has, coaxially arranged inside it, an obturator 15 which can be displaceably operated by means of a usual control knob 16 which causes opening/closing of the valve which, in the figures, is always shown open; the obturator 15 is provided at each of its ends with an external sealing member 15b of the O-ring type for ensuring a seal between the obturator 15 and the valve body 10.

[0017] The obturator 15 also has an internal duct 15a which connects the valve 10 to the union 30.

[0018] The means 100 for rotationally operating the said deviator 40 are coaxially housed inside said duct 15a.

[0019] Said operating means 100 comprise a rod 110 substantially in the form of a cross with arms 110a extending in the longitudinal direction at least at the opposite ends of the said rod.

[0020] In greater detail, the longitudinal arms 110a project axially from the end directed towards the deviator (referred to as "front" end below) so as to be able to be inserted axially into corresponding seats 45a formed in a first front collar 45 of the deviator 40 (Fig. 4). In a preferred embodiment (Fig. 3) said valve 10 is provided with an obturator guide 18 coaxially inserted inside the duct 15a and having a front end control wheel 18a with radial spokes 18b connected in the region of the longitudinal axis to a hollow collar 18c. As will appear more clearly below, said collar 18c forms the element for coupling the valve to the deviator 40 contained in the union 30.

[0021] On the opposite side to the deviator 40 the axial arms 110a have a smaller transverse dimension so as to allow them to be housed inside a nose-piece 16 of the valve body, said nose-piece being in turn closed at the front by a threaded plug 17 with a hexagonal head 17a.

[0022] The rod 110 is retained in the axial direction by conventional elastic means of the Seeger type 112 which are accessible from the side where the nose-piece 16 is situated and removable so as to allow assembly/disassembly of the rod in the event of the valve requiring maintenance.

[0023] Annular rings 113 of the O-ring type, able to prevent the fluid from leaking from the valve, are arranged between the rod 110 and the valve body 11.

[0024] In addition to the aperture 14 for introduction of the fluid from the valve 10, said union 30, which is substantially T-shaped, has a first hole 30a (see Fig. 2) with its centre on an axis substantially at right angles to the longitudinal axis of the valve body 11 and able to connect the union 30 with the pipe 22 for delivery of the fluid to the radiator panel 20, as well as a second hole 30b with its axis substantially parallel, but not coinciding with said longitudinal axis of the valve body and formed in a baffle 30c for reducing the aperture 30d for return of the fluid supplied from the duct 23 of the radiator 20.

[0025] On its front end surface engaging with the valve 10, the union 30 has a semicircular, lowered, internal seat 34 (Fig. 5), the opposite diametral surfaces 34a of which form the end-of-travel stops for rotation of the deviator 40 once the latter has been inserted inside the said union.

[0026] The deviator 40 (Fig. 4) according to the present invention consists of a flat body 41 on which a tubular section 42 is engaged, said section being cut in the longitudinal direction so as to form an opening 42a; on the side where it is engaged with the valve 10 (referred to below as "front" side for the sake of convenience of the description) the surface 41 is delimited frontally by a semicircular collar 43 which, at one of its opposite diametral ends, has a tooth 43a extending radially outwards and able to be housed inside said semicircular seat 34 of the union 30 (Fig. 5).

[0027] The deviator 40 is completed in its front end part by an annular collar 44 of suitable depth in the axial direction, having an end surface open in the form of a semicircular recess 44a through which the fluid is able to pass.

[0028] Said external collar 44 is concentric with said internal collar 45 provided with seats 45a for receiving the arms 110a.

[0029] It is envisaged moreover that the rear free end of the surface 41 has two lugs 46 which extend in the longitudinal direction and are resiliently deformable in the transverse direction and have free ends formed in the manner of a tooth 46a.

[0030] Said lugs are able to snap-engage inside a special hole 36 in the baffle 30c of the union in order to maintain stably the axial position of the deviator 40.

[0031] The operating principle of the union is as follows:

- once the valve 10 and the union 30 are coupled to-

gether in the axial direction by means of the ring 31,

- so that the internal collar 45 of the deviator is axially inserted inside the annular seat 18c of the control wheel 18a and the axial arms 110a of the rod 110 have engaged inside the seats 45a of the internal collar 45 of the deviator 40,
- the assembly is installed, connecting the apertures 12 and 13 of the valve 10 to the respective ducts as well as the apertures 30a and 30d of the union 30 to the delivery and return pipes of the radiator 20.

[0032] If delivery of the hot fluid is envisaged via the pipe 12a (Figs. 1 and 2), then the deviator 40 must be arranged with the opening 42a upwards (Figs. 4 and 5); if this should not be the case it would be sufficient to:

- unscrew the threaded plug 17 using a spanner 200 which engages with the hexagonal head 17a so that the operating end of the rod 110 with the associated arms 110a is accessible;
- operate said arms, rotating the rod 110 and therefore the deviator 40 engaged with it at the opposite end;
- continue rotation until the tooth 43a inserted inside the semicircular seat 34 comes into contact with the opposite stop surface 34a, causing rotation to stop;
- rotation through 180° causes reversal in the flow of the fluid which follows the correct path again, automatically compensating for reversal of the delivery/return ducts 12a,13a.

[0033] Since the end-of-travel surfaces 34a of the seat 34 are arranged at opposite diametral ends of the said seat, the deviator 40 will rotate only through 180°, thus preventing any possibility of error in angular positioning of the deviator.

[0034] It is thus pointed out how the valve according to the invention allows operation of a device for deviating the internal flow to a union connecting the valve to a radiator without the need to empty the system and without the need to disassemble the valve or the union which may remain assembled during the operation, with obvious advantages in terms of safety and reduced amount of time required.

[0035] In addition to this, the particular cross-shaped form of the rod 110 ensures a high robustness thereof without an excessive loss of head of the delivery fluid.

[0036] It is envisaged moreover (Fig. 7) that the operating tool may consist of a control knob 200 which has a hexagonal seat 201 suitable for engagement with the head 17a of the plug 17 and a coaxial extension 202 having formed inside it a cross-shaped seat 202a corresponding to the cross formed by the axial arms 110a of the actuating rod 110.

[0037] In this way the said control knob provided with the valve allows the actuating rod to be accessed and operated without the user needing to have working tools *in situ* .

[0038] In particular by envisaging that the plug 17 remains inside the nose-piece 16 and has suitable dimensions, said plug may be operated only by means of the special spanner 200 (Fig. 7), thus preventing the possibility of the valve settings being tampered with by non-specialized personnel.

[0039] According to the present invention it is also envisaged (Fig. 8) that the ring 31 for locking the union 30 to the valve 10 is designed with a circular through-hole 31a having two slots 31b arranged symmetrically with respect to the axis of rotation of the ring so as to allow insertion of the latter on the delivery duct 30a of the union, while limiting the external dimensions of the said ring and ensuring a corresponding saving in material and hence reduced weight.

Claims

1. Deviator (40) for unions (30) in particular of valves (10) for intercepting the supply of a fluid to radiator elements (20), comprising a flat body (41) having, engaged thereon, a tubular section (42) which is cut in the longitudinal direction so as to define an opening (42a) and a semicircular collar (43) at right angles to and integral with one end of the said surface (41), **characterized in that** it comprises:

   - a projection (43a) extending radially outwards from said semicircular collar (43) at one of the opposite diametral ends situated on the said surface (41);
   - a first annular external collar (44) of suitable depth in the axial direction, having an end surface open in the form of a semicircular recess (44a) for allowing the fluid to pass through;
   - a second internal collar (45) which is concentric with the first collar, has a smaller diameter and is connected to the first collar by means of the said end surface.

2. Deviator according to Claim 1, **characterized in that** said second internal collar (45) has at least one seat (45a) extending in the axial direction and suitable for engagement with corresponding means for performing rotation of the said deviator (40).

3. Deviator according to Claim 2, **characterized in that** said seats (45a) are four in number and angularly arranged at 90° with respect to each other.

4. Deviator according to Claim 1, **characterized in that** said surface (41) has a free end provided with means (46) for stably positioning the deviator in the axial direction.

5. Deviator according to Claim 4, **characterized in that** said stable positioning means consist of two

lugs (46) extending longitudinally from said end and resiliently yielding in the transverse direction.

6. Deviator according to Claim 5, **characterized in that** said lugs have a free end formed in the manner of a tooth (46a).

7. Union for deviating the flow of fluids, in particular for valves (10) for intercepting the supply to radiator elements (20), comprising a body (30) in which at least one supply aperture, at least one delivery aperture (30a) and at least one fluid return aperture (30d) are formed and which has, arranged inside it coaxially, a deviator (40) able to be rotated into different angular positions, **characterized in that** the front surface of the union corresponding to the fluid supply aperture has, formed therein, a seat (34) with a semicircular profile with two stop surfaces (34a), said semicircular seat being able to contain a radial projection (43a) of the said deviator (40) and cause a precise rotation thereof from a first position with the projection (43a) resting on the first stop surface (34a) into a second position with the projection (43a) resting on the second stop surface (34a).

8. Union according to Claim 7, **characterized in that** said seat (34) has an angle at the centre of 180°.

9. Union according to Claim 7, **characterized in that** the stop surfaces (34a) of said seat are arranged in diametrically opposite positions suitable for causing a rotation of the deviator (40) through 180°.

10. Union according to Claim 7, **characterized in that** said return aperture (30b) is formed in a baffle (30c) for partially throttling a return duct (30d).

11. Union according to Claim 7, **characterized in that** said baffle (30c) is coaxial with the longitudinal axis of the union.

12. Union according to Claim 7, **characterized in that** said baffle (30c) has a coaxial hole (36) suitable for engagement with corresponding means (46) for stably positioning the deviator (40) in the axial direction.

13. Union according to Claim 7, **characterized in that** said return aperture (30b) has its centre on an axis parallel to, but not coinciding with the longitudinal axis of the union.

14. Union according to Claim 13, **characterized in that** said deviator (40) comprises a flat body (41) having, engaged thereon, a tubular section (42) cut in the longitudinal direction so as to define an opening (42a), a semicircular collar (43) at right angles to and integral with one end of the said surface (41), there being provided:

- a projection (43a) extending radially outwards from said semicircular collar (43) at one of the opposite diametral ends situated on the surface (41);
- a first, annular, external collar (44) of suitable depth in the axial direction, having an end surface open in the form of a semicircular recess (44a) through which the fluid is able to pass;
- a second internal collar (45) concentric with the first collar and of smaller diameter, connected to the first collar by means of said end surface.

15. Union according to Claim 14, **characterized in that** said second internal collar (45) has at least one seat (45a) extending in the axial direction and suitable for engagement with corresponding means for performing rotation of said deviator (40).

16. Union according to Claim 15, **characterized in that** said seats (45a) are four in number and angularly arranged at 90° with respect to each other.

17. Union according to Claim 12, **characterized in that** the free end of said surface (41) of the deviator (40) is provided with means (46) for stably positioning the deviator in the axial direction.

18. Union according to Claim 17, **characterized in that** said stable positioning means consist of two lugs (46) extending longitudinally from said end and resiliently yielding in the transverse direction.

19. Union according to Claim 18, **characterized in that** the free end of said lugs is formed in the manner of a tooth (46a).

20. Union according to Claim 19, **characterized in that** said means for fastening to the intercepting valve (10) consist of a locking ring (31) designed with a circular through-hole (31a) having two slots (31b) arranged symmetrically with respect to the axis of rotation of the ring.

21. Valve for intercepting fluids supplying radiator elements (20), suitable for engagement with unions (30) having an internal deviator (40) able to be rotationally operated, **characterized in that** it has sealed, coaxial, internal means (110) for rotational operation of said deviator.

22. Valve according to Claim 21, **characterized in that** said actuating means (100) are coaxially inserted inside the axial duct (15) for the through-flow of fluid.

23. Valve according to Claim 21, **characterized in that** said actuating means (100) consist of a rod (110)

substantially in the form of a cross with arms (110a) extending in the longitudinal direction at least at the opposite ends of the rod.

24. Valve according to Claim 23, **characterized in that** said longitudinal arms (110a) project in an axial direction from the end directed towards the deviator (40) so as to be able to be inserted axially into corresponding seats (45a) formed in a front internal collar (45) of the deviator (40).

25. Valve according to Claim 21, **characterized in that** it comprises a sleeve (18) which is coaxially inserted inside the duct (15) for through-flow of the fluid inside the valve and is provided with a front end control wheel (18a) having radial spokes (18b) connected in the region of the longitudinal axis to a hollow collar (18c).

26. Valve according to Claim 21, **characterized in that** said rod (110) is retained in the axial direction by elastic means of the Seeger type (112) which are accessible from the outside and removable.

27. Valve according to Claim 21, **characterized in that** fluid sealing means are arranged between the said actuating means (100) and the valve body (11).

28. Valve according to Claim 27, **characterized in that** said fluid sealing means consist of annular seals (113) of the O-ring type arranged between the rod (110) and the valve body (11).

29. Apparatus for intercepting and deviating the flow of a fluid supplying radiator elements (20), **characterized in that** it comprises a valve (40) provided with sealed, coaxial, internal means (110) according to Claim 21 for rotationally operating a deviator (40) according to Claim 1 arranged inside a union (30) according to Claim 11 connected to the said valve.

Fig.1

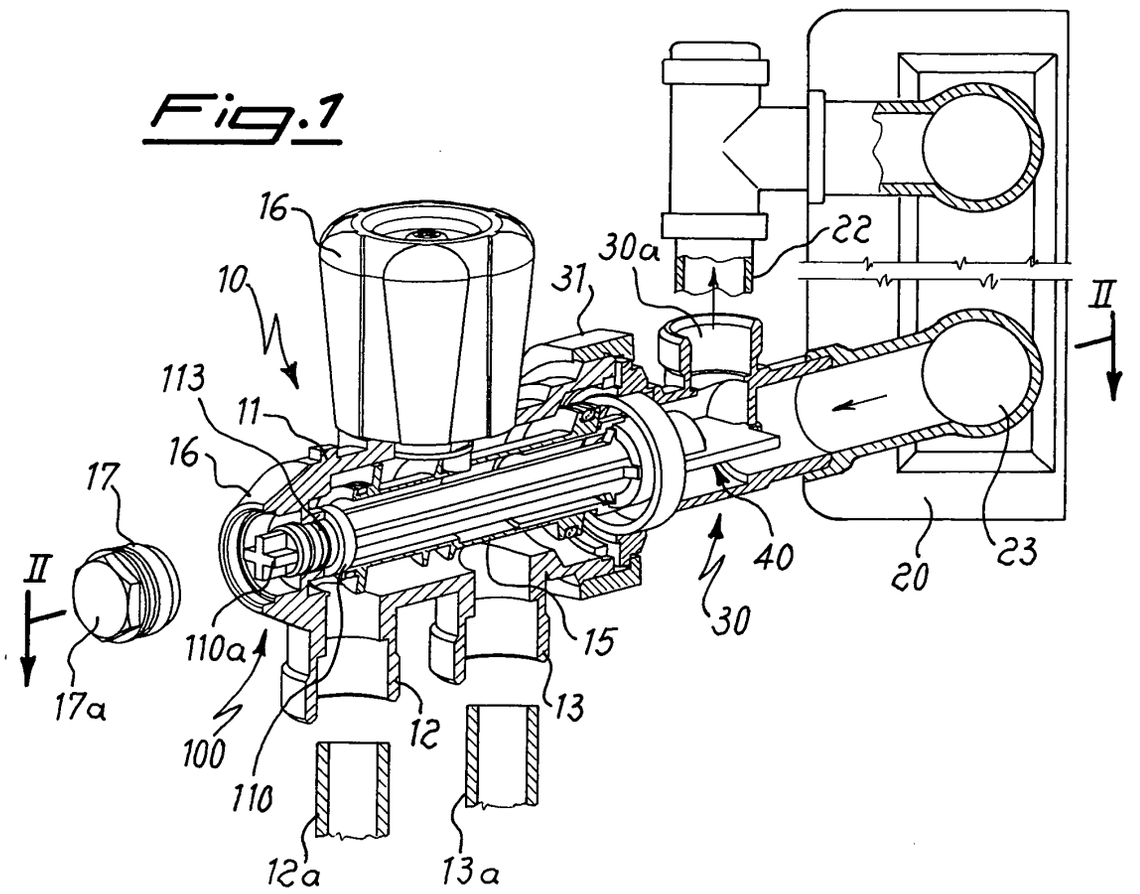

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Fig.2

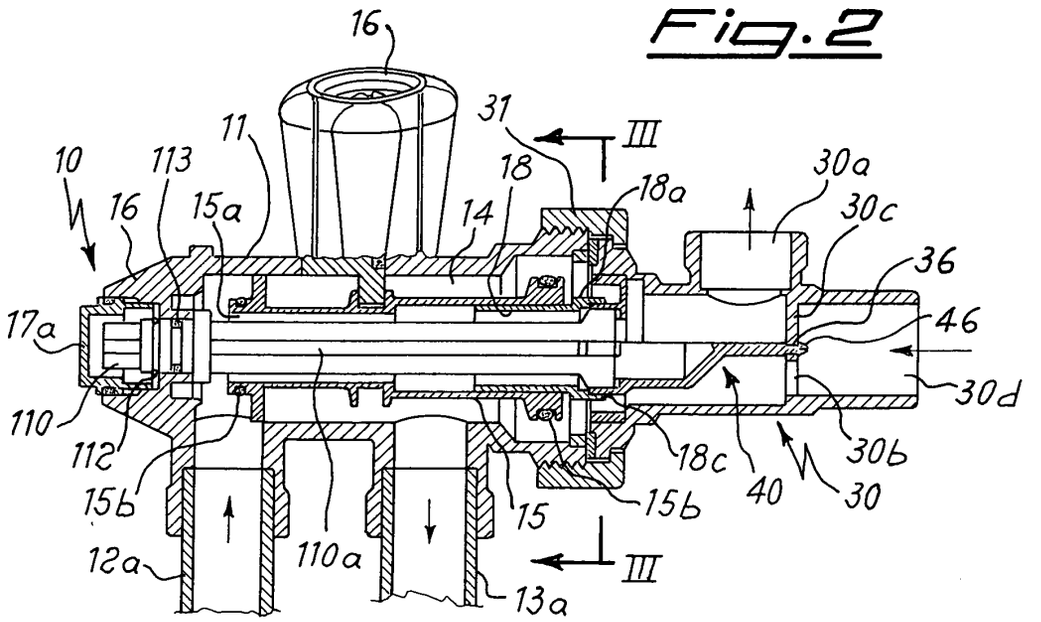
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Fig.3

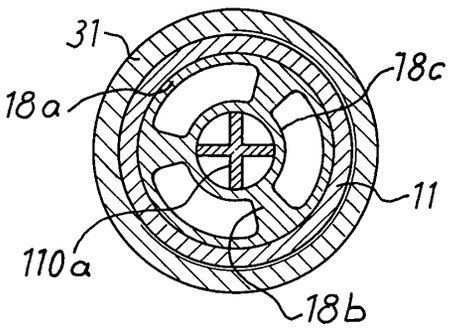


Fig.4

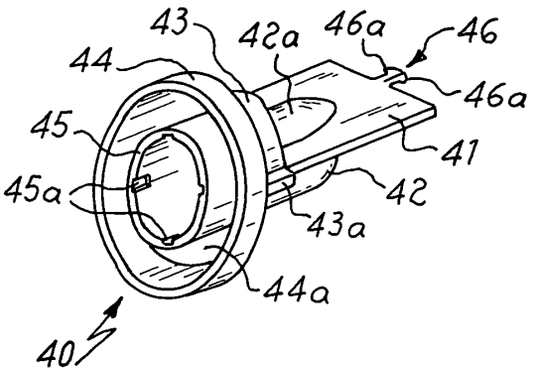


Fig.5

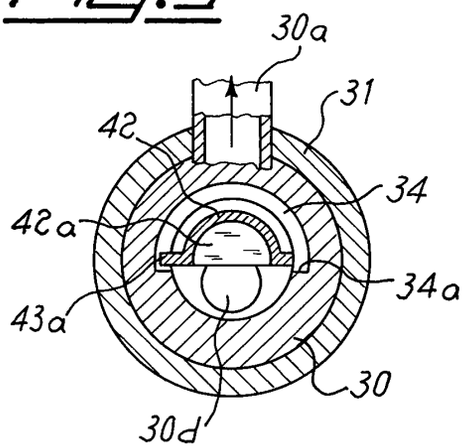


Fig.6

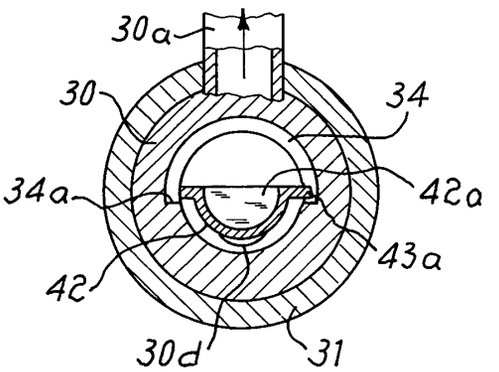


Fig.8a

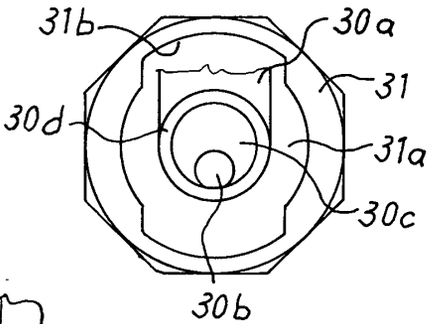


Fig.7

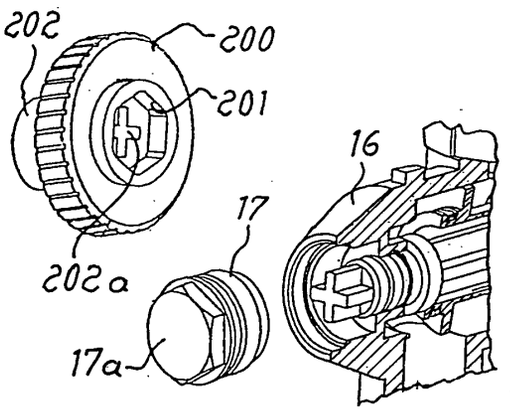
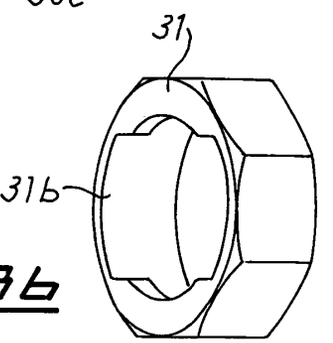


Fig.8b



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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 5254

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A,D	EP 0 862 026 A (FRACCHIA STEFANO) 2 September 1998 (1998-09-02) * abstract *	1,7,21, 29	F24H9/12
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F24H
F16K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 May 2004	Van Gestel, H

CATEGORY OF CITED DOCUMENTS

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