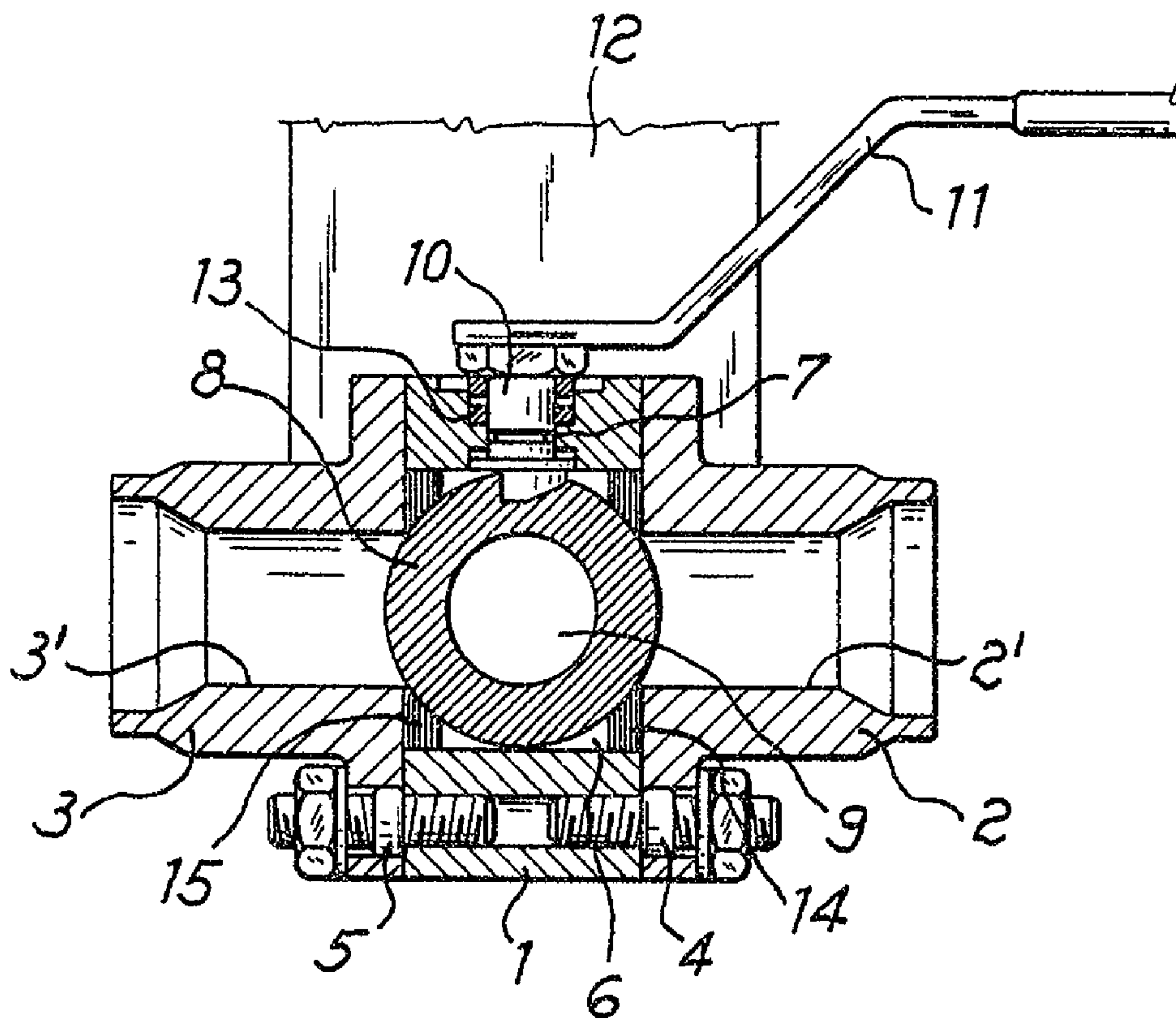




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 (54) Title: BALL VALVE FOR FLUIDS WITH SEATINGS COMPRISING LAMINATED RINGS



(57) Abrégé/Abstract:

Ball valve for fluids, with sealing seatings comprising rings, disposed between the spherical surface of the valve and the interior of the valve body, composed of rings formed of superimposed layers of plates of pure graphite alternating with plates of stainless steel sheet, the whole being contained in a casing of metal sheet covering the outer sides of the seating, except that in contact with the spherical sealing surface.

Ball valve for fluids with seatings comprising laminated rings

Abstract

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BALL VALVE FOR FLUIDS WITH SEATINGS COMPRISING LAMINATED RINGS

5 The subject of the present invention is a ball valve for the shutting-off and/or deviation of fluids, including at high temperatures and pressures, of which the sealing seating for the ball is composed of ring seatings, each formed both from particular arrangements of laminated elements and from different materials, variously arranged.

10 As is well known, the valves known as "ball" valves are composed of a valve body having a cylindrical cavity, into which lead two or more ducts connected to the supply of fluids to be distributed or intercepted, according to requirements, and of a ball inside said cylindrical cavity having an axial or cruciform duct and capable of being operated from outside, this ball being situated between the inlet and delivery ducts in such a way as to dispose the axial duct of the ball in alignment with the inlet and delivery ducts or to close one or the other of these ducts, and also
15 to bring into communication with one another the various channels for a specific distribution of the fluid.

20 The problem that arises in said ball valves is concentrated especially in the ring seatings which surround the ball and which must make a seal both between the inlet and outlet ports in both directions and between both the ports and the control shaft leading to the outside.

25 Said seatings are, moreover, not subject to being compressed between the fixed and movable part, except during initial assembly, for which reason any wear must be avoided which might give rise to play between the parts, which cannot be taken up.

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The seatings are also subject both to high temperatures, such as those of saturated and superheated steam, and to high differential pressures, while in these conditions also it must be possible to operate them without the need
5 to apply excessive torque.

The valve having the seatings forming the subject of the present invention solves the aforementioned problems, while also permitting classes of use at high temperatures
10 and pressures.

In accordance with one embodiment of the present invention, there is provided a valve comprising:

15 a valve housing provided with a flow passage, the housing comprising upstream and downstream parts spaced apart along the passage, each of the parts formed with:

20 a respective inner annular wall delimiting the passage, and

a respective annular end face, the annular end face extending radially outwardly from the respective
25 inner wall;

a valve ball received in the housing along the passage and rotatable about an axis transverse to the flow passage between an open position and a
30 closed position of the valve, the valve ball being formed with:

an inner bore provided with an inner annular surface flush with the annular inner walls of the flanges
35 and forming a continuous peripheral wall of the passage in the open position of the valve, and

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an outer spherical surface extending outwardly of the inner annular walls of the flange and forming respective widening outwardly gaps with the end faces; and

5

annular seats mounted in the gaps, each of the seats comprising:

10

a respective metal casing having a side juxtaposed with the end face of the respective flange,

a plurality of layers of graphite plates, and

15

a plurality of layers of hard metal plates alternating with the layers of graphite plates, the pluralities of juxtaposed plates extending transversely to the passage and forming a respective sealing surface shaped complementary to and in contact with the spherical surface.

20

According to an aspect of the present invention, each seating of the valve is composed of a series of layers of pure graphite plates, reinforced with stainless steel sheet of a few hundredths of a millimetre in thickness, and is contained in an appropriate casing of stainless steel, which may cover the entire seating with the exception of the contact surface with the moving part, or the remaining three sides or only two of them.

30

Each graphite plate, according to this invention, must be composed of graphite having a density of 1.4 to 2 kg/dm³, preferably from 1.6 to 1.8 kg/dm³, obtained by a pressure of 1.4 to 2 bar.

35

Instead of the stainless steel, each reinforcing sheet could be of nickel sheet, also of thickness from 0.07 to

-2b-

0.01 mm.

The aforementioned casing containing said seating may extend over the three sides that are not in contact with the movable part or over only two sides, but in any case with application of a layer of pure graphite of 0.5 to 1.5 mm thickness, bonded onto the annular surface facing towards the fixed side.

10 The side of the seating that is in contact with the movable part of the valve according to this invention is preferably inclined and rectilinear, so as to have only a single, circular line of contact with the spherical surface of the movable ball.

15

The characteristics of the valve according to this invention will be more apparent from the attached drawings, in which there are shown:

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in Fig. 1, the valve in the closed position;
in Fig. 2, the same valve in the open position and
in Figures 3a, b, c, enlarged sections of various seatings.

5 With reference to the figures, the valve is composed of a central body 1
and two flanged connections 2 and 3, disposed coaxially to the body 1 and
connected to it by screws or stud bolts 4 and 5.

10 The central body 1 has an internal cylindrical cavity 6 disposed in the
axial direction and a cylindrical bore 7 perpendicular to the axis.

15 The flanged connections 2 and 3 each have, inside them, an axial duct 2',
3', such that when said connections are fitted onto the central body 1,
the axes of the internal ducts 2' and 3' shall intersect the axis of the
cylindrical surface 6 of the central body 1.

20 Inside the cylindrical surface 6 and on the axis of the ducts 2' and 3',
is disposed the ball 8 equipped with a through hole 9 which, when the
ball is in position inside the cavity 6, is coaxial with and substantially
of the same dimensions as the ducts 2' and 3'.

25 The rotation of the ball 8 is effected by means of a shaft 10, which can
be operated from outside by a hand lever 11 or by motorized means, refer-
enced generally 12.

The drive shaft 10 for the ball 8, housed in the bore 7, is provided with
seatings of known ring type or the like 13, disposed along its axis.

30 The seatings 14, 15, of annular type, disposed with their axes coaxial
with the ducts 2' and 3' and blocked between the spherical surface of
the ball 8 and the flat surfaces of the flanges of the connections 2
and 3, act on the continuous spherical surface of the ball 8.

35 The surface of said seatings 14, 15 in contact with the movable part of
the ball is composed of the internal conical part, having a rectilinear
generatrix, so as to have the sealing contact between said internal

conical surface and the spherical surface of the valve solely along a continuous, circular line.

5 As will be seen in Figure 3, the seating 15, according to section a, is composed of a series of parallel layers 16 of sheet metal, of stainless steel, pure nickel or the like, as discussed above, alternating with parallel layers 17 of pure graphite or the like, the whole contained in a sheet metal casing 18, which surrounds the three outer sides of the seating, while the side in contact with the fixed part is covered by a
10 further layer of graphite 19, disposed on the outer surface of the sheet metal.

15 In Figures 3b and 3c there are illustrated, in section, further solutions of seatings having the same layered composition as the seating indicated at a), but with the outer, containing metal sheet limited on the broader side, see section b), or limited to only the two remaining sides.

20 As can be clearly seen from Figures 1 and 2, the sealing seatings 14, 15 are in contact with the spherical surface of the valve along continuous circular lines, coaxial with the ducts 2' and 3', so that the seal takes place not only between the ducts 2' and 3' but also between these ducts and the space which remains between the cylindrical surface 6 and the spherical surface of the valve.

25 This prevents residues of fluid passing through from being able to penetrate into the casing of the valve and escape to the outside along the operating shaft of said valve.

30 It will be understood that many variants of a constructional type may be applied to the valve described above, while still keeping the arrangement of the sealing seatings on the ball with the characteristics that form the subject of the present invention.

We Claim:

1. A valve comprising:

a valve housing provided with a flow passage, said housing comprising upstream and downstream parts spaced apart along said passage, each of said parts formed with:

a respective inner annular wall delimiting said passage, and

a respective annular end face, said annular end face extending radially outwardly from the respective inner wall;

a valve ball received in said housing along said passage and rotatable about an axis transverse to said flow passage between an open position and a closed position of said valve, said valve ball being formed with:

an inner bore provided with an inner annular surface flush with said annular inner walls of said flanges and forming a continuous peripheral wall of said passage in said open position of said valve, and

an outer spherical surface extending outwardly of said inner annular walls of said flange and forming respective widening outwardly gaps with said end faces; and

annular seats mounted in said gaps, each of said seats comprising:

a respective metal casing having a side juxtaposed with said end face of the respective flange,

a plurality of layers of graphite plates, and

a plurality of layers of hard metal plates alternating with said layers of graphite plates, said pluralities of juxtaposed plates extending transversely to said passage and forming a respective sealing surface shaped complementary to and in contact with said spherical surface.

2. The valve defined in claim 1 wherein said side of the casing juxtaposed with the respective end face is covered with a layer of pure graphite having a thickness from 0.5 to 1.5 mm.

3. The valve defined in claim 1 wherein said sealing surface is formed by a straight line generatrix rotated about the axis along a closed path, so that respective seats and the valve ball contact one another along a respective continuous circular line.

Fig. 1

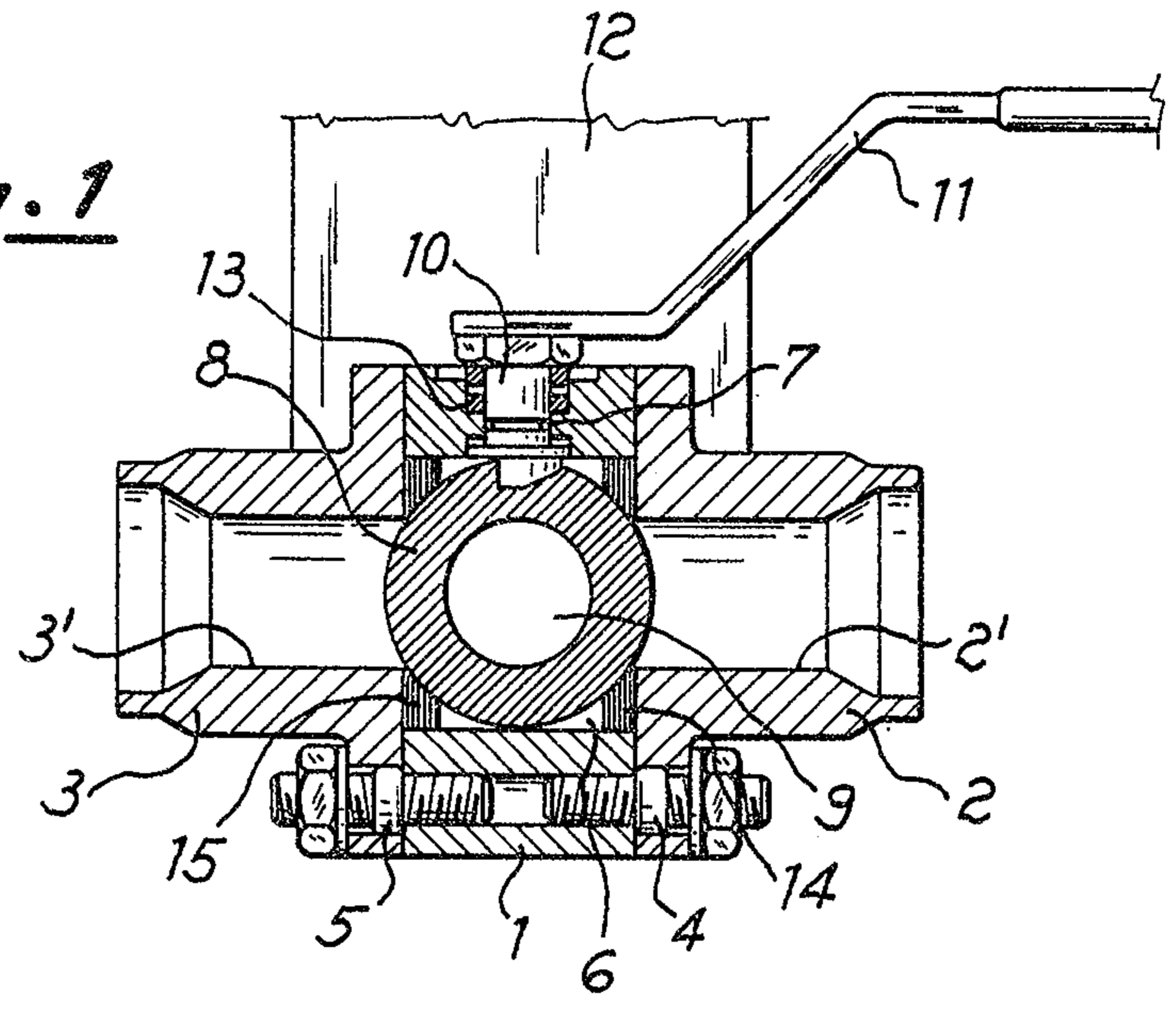


Fig. 2

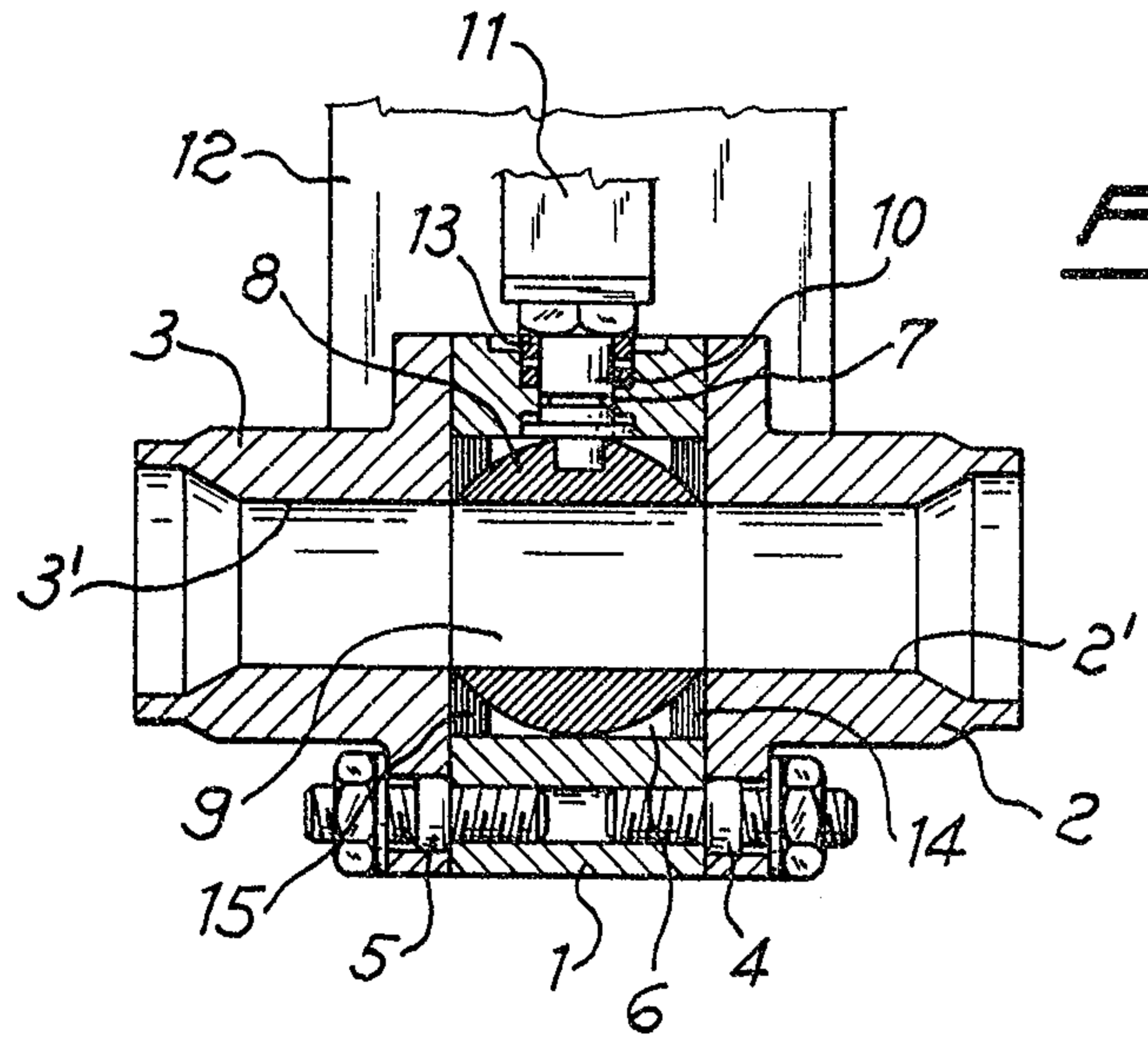
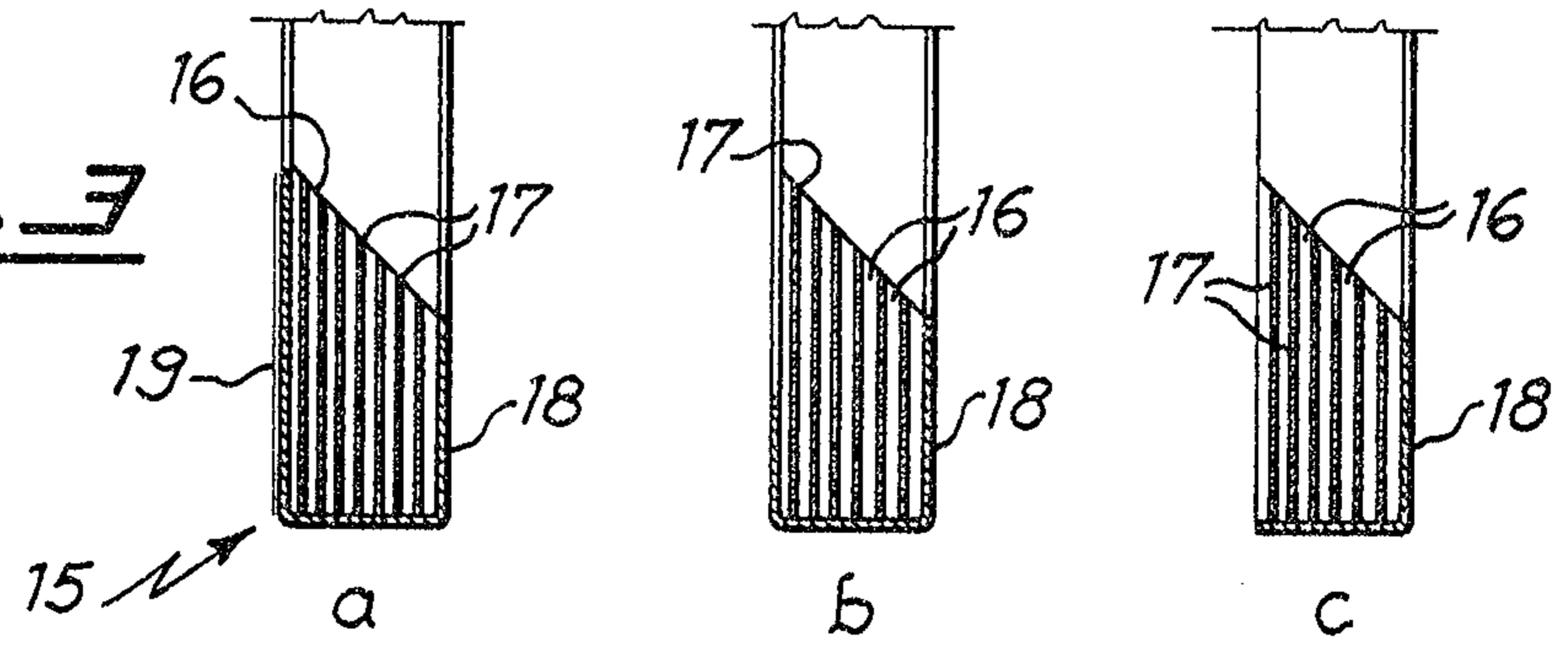


Fig. 3



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