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(54) Valve unit for filling machines

(57) The present invention relates to a valve unit for container filling machines, and particularly for bottle fillers.

More particularly, the present invention relates to a valve unit (1), particularly for machines for filling containers (7), comprising a hollow body (2) in which a plug (3) is slidably housed, a passage (8) for a fluid (6) for filling the said container (7) being formed in the said hollow body (2), characterized in that the said valve unit comprises means of directing a secondary fluid towards and/or from the container (7), these means being separated from the said passage (8) for the filling fluid (6).

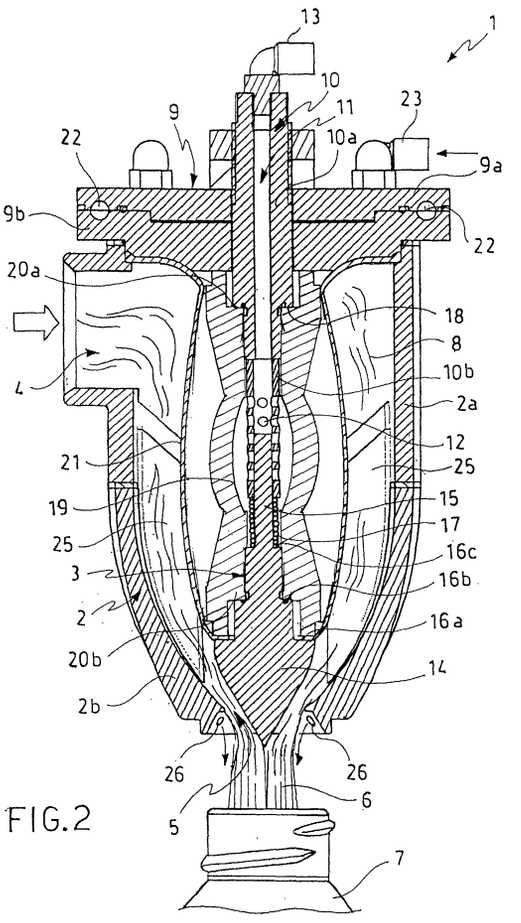

FIG.2

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Description

[0001] The present invention relates to a valve unit for container filling machines, and particularly for bottle fillers.

[0002] In the field of equipment for bottling beverages, it is known that it is essential to ensure the greatest possible sterility in all parts of the machine which come into contact with the beverage, and to prevent the flow of the beverage from corresponding reservoirs from coming into contact with external contaminants in the course of its flow into the container. For example, the supply nozzle can be subject to a risk of contamination, both due to the fact that it has a supply aperture - and therefore exposure to the external air - and because its very structure comprises moving mechanisms and parts which are difficult to clean. To overcome this problem, supply nozzles have been designed with a physical barrier (in practice a seal) between the beverage flow channel and the valve plug. These devices ensure that an adequate degree of sterility is maintained along the whole of the beverage flow path within the filling machine.

[0003] However, the beverage also flows along a path which, though short, is totally exposed to the external environment, between the supply aperture of the nozzle - which is normally not inserted into the neck of the container, but positioned above it - and the container itself. It is possible, therefore, that the beverage may be contaminated by external agents during this flow, thus negating the measures taken in the upstream equipment to maintain an aseptic environment.

[0004] The problem tackled by the present invention is therefore that of providing a method for the aseptic filling of containers, and a valve unit for filling machines which is specifically designed for the application of this method, in order to overcome these drawbacks.

[0005] This problem is resolved by a method for the aseptic filling of containers and by a corresponding valve unit as specified in the attached claims.

[0006] Further characteristics and advantages of the valve unit for filling machines according to the present invention are made clearer by the following description of a preferred embodiment, provided below for guidance and without restrictive intent, with reference to the following figures, in which:

> Figure 1 shows a perspective view in longitudinal section of the valve unit according to the invention;
> Figure 2 shows a side view in longitudinal section of the valve unit of Figure 1, in the operating condition.

[0007] With reference to the figure, the valve unit for filling machines according to the invention, indicated as a whole by the number 1, comprises a hollow body 2 in which a plug 3 is slidably housed.

[0008] The hollow body 2 comprises an inlet aperture 4 and an outlet aperture 5 for the fluid 6 for filling the container 7. The said inlet aperture 4 is located in the upper portion of the lateral surface of the hollow body 2, while the outlet aperture 5 is formed on the lower surface of the hollow body 2, in alignment with the plug 3. Thus a passage 8 for the filling fluid 6 is formed within the said hollow body 2, and, since the cavity is coaxially occupied by the plug 3, this passage is essentially tubular in shape.

[0009] The hollow body 2 comprises an upper portion 2a of essentially cylindrical shape and a lower portion 2b which is tapered downwards, with an outward-facing convexity.

[0010] A plurality of fins 25, having the function of preventing torsional motions of the flow of filling fluid, extend from the inner surface of the hollow body 2.

[0011] The top of the hollow body 2 is closed by a plate 9, pierced centrally to provide a housing for a hollow cylinder 10.

[0012] The cylinder 10 houses in a coaxial way a duct 11 and comprises an upper portion 10a, which extends both above and below the plate 9, and a lower portion 10b. Normally, the said upper and lower portions 10a and 10b are made in two separate pieces. On the cylindrical surface of the lower portion 10b of the cylinder 10 there is a plurality of apertures 12 which allow the duct 11 to communicate with the outside of the hollow cylinder 10.

[0013] The outer end of the upper portion 10a of the cylinder 10 is connected to an L-shaped connector 13 which in turn is connected by a suitable line (not shown) to a source of compressed air.

[0014] The outer surface of the upper portion 10a of the cylinder 10 has a downward facing shoulder 18 in the part lying below the plate 9.

[0015] The plug 3 comprises a stopper element 14 designed to interact with the edge of the outlet aperture 5 of the hollow body 2. The stopper element 14 is ogival in section and is connected to a stem 15 by a stepped portion, forming a set of three shoulders 16a, 16b and 16c of decreasing diameter.

[0016] The stem 15 has a diameter essentially equal to the diameter of the duct 11 and is inserted slidably into the duct, in the lower portion 10b of the cylinder 10. Thus the lower portion 10b of the cylinder 10 also acts as a guide means for the plug 3, to ensure that it remains coaxial as required during the whole operating phase of the valve unit.

[0017] Return means 17, in the form of a spring in this example, are placed between the lower edge of the cylinder 10 and the shoulder 16c of smallest diameter of the plug 3.

[0018] The valve unit according to the invention comprises means of actuating the plug 3. These actuator means comprise a deformable tubular cylinder 19, made from an elastic material such as a rubber tube. The tubular cylinder 19 is positioned in the hollow body 2, outside the stem 15 of the plug 3 and outside the hollow cylinder 10, and is retained at its upper end by bear-

ing against the shoulder 18 of the upper portion 10a of the cylinder 10, and at its lower end by bearing against the intermediate shoulder 16b of the plug 3.

[0019] More specifically, the deformable tubular cylinder 19 extends between the lower surface of the plate 9 and the lower shoulder 16a, of greatest diameter, of the plug 3, bearing on the corresponding surfaces. The tubular cylinder 19 also has flanges 20a, 20b projecting inwards. The upper flange 20a has a shoulder facing upwards, designed to engage with the said shoulder 18 of the upper portion 10a of the cylinder 10. The lower flange 20b, on the other hand, has a shoulder facing downwards, designed to engage with the intermediate shoulder 16b of the plug 3.

[0020] Outside the tubular cylinder 19 there is placed a membrane 21, which is fixed at its top to the plate 9 and at its bottom to the plug 3, and which is retained between the lower shoulder 16a of the plug and the lower edge of the tubular cylinder 19. The function of this membrane 21 is to isolate the passage 8 for the filling fluid from the other parts of the valve unit, in order to prevent the possibility of external contamination (which might be caused, for example, by the compressed air injected through the apertures 12).

[0021] The valve unit according to the invention comprises means of directing a secondary fluid towards and/or from the container 7. In practice, an annular channel 22 is formed in the body of the plate 9, this channel extending in a plane essentially orthogonal to the longitudinal axis of the valve unit, in a position near the perimeter of the plate 9. For this purpose, the plate 9 is formed from two half-plates 9a, 9b which are mated together. Half-channels are formed on the surfaces of the corresponding half-plates 9a, 9b designed to be mated together, these half-channels forming the annular channel 22 when the plate 9 is assembled. This annular channel 22 is connected by means of an L-shaped sleeve 23 to an external source of sterile inert gas (not shown) or, in a way which can be selected as desired, to the said source of sterile inert gas and to suction means (not shown).

[0022] A plurality of longitudinal channels 24 originate from the annular channel 22, these channels being formed in the lower half-plate 9b and continuing in the thickness of the walls of the hollow body 2. These longitudinal channels 24 open outwards at the lower edge of the portion 2b of the hollow body 2 in a plurality of corresponding apertures 26, which form a ring surrounding the outlet aperture 5 of the valve unit.

[0023] The two half-plates 9a, 9b and the hollow body 2 are held together by known fixing means, consisting of a screw and nut system 27 in the example.

[0024] The operation of the valve unit according to the invention will now be described, again with reference to the figures.

[0025] The valve unit 1 is opened by raising the plug 3. This operation requires the injection of compressed air into the hollow cylinder 10 and then, through the apertures 12, into the space between the plug 3 and the tubular cylinder 19. The compressed air causes the tubular cylinder 19 to swell and therefore to contract in the axial direction. Since the tubular cylinder 19 is fixed to the plug 3, the latter is raised by a sufficient amount to permit the supply of the filling fluid, as shown in Figure 2.

[0026] Throughout the supply phase at least, the secondary fluid directing means described above operate in the blowing mode, by injecting through the L-shaped sleeve 23 a sterile inert gas which, after flowing through the annular channel 22 and being distributed from there into the longitudinal channels 24, emerges from the apertures 26, thus creating a tubular flow of sterile gas around the flow of supplied filling fluid. Thus the fluid 6 is isolated from the external environment by means of the aseptic barrier created by the sterile gas, enabling the filling phase to be carried out in conditions of optimal hygiene.

[0027] At the end of the supply, the valve unit is closed, simply by interrupting the injection of compressed air through the sleeve 13. Thus the tubular cylinder 19 ceases to be contracted, and consequently, with the assistance of the return spring 17, it returns to its normal length, thus lowering the plug 3 until it blocks the outlet aperture 5 of the valve unit.

[0028] In particular applications, it is necessary to suck out the foam formed on the surface of the supplied liquid, which would impede the completion of the filling of the container. In such a case, it is possible to select the suction mode, instead of the blowing mode, for the said secondary fluid directing means. The foam is thus sucked out by the apertures 26 and passes through the longitudinal channels 24, thus freeing the surface of the liquid.

[0029] The valve unit according to the invention also makes it possible to carry out a sterilizing cycle, using a flow of a suitable sterilizing fluid. This can be done simply by inserting the valve unit into a suitable container, injecting the sterilizing fluid through the inlet aperture 4, and selecting the suction mode for the secondary fluid directing means. In this way a flow of sterilizing fluid is created through the valve unit, enabling the unit to be cleaned thoroughly.

[0030] The advantages of the valve unit according to the invention as compared with the known art are clear from the above description.

[0031] In the first place, the arrangement of the secondary fluid directing means, in other words the longitudinal channels 24 and the corresponding apertures 26, in a ring around the filling fluid outlet aperture 5 makes it possible to create a jacket of sterile gas, flowing in co-current parallel to and around the flow of supplied fluid. This arrangement provides the greatest degree of sterility in the filling stage.

[0032] Furthermore, since these secondary fluid directing means are connecting for operation on command to the said suction means or to a source of sterile inert gas, the device according to the invention provides

a remarkable versatility of application, as fully described above.

[0033] The valve unit according to the invention is also compact and of simple construction.

[0034] Clearly, only one particular embodiment of the valve unit to which the present invention relates has been described, and a person skilled in the art will be able to make any necessary modifications for the adaptation of the invention to particular applications, without departure from the scope of protection of the present invention.

[0035] For example, the actuator means of the plug 3 can alternatively be chosen from those generally used in filling valves of this type.

[0036] The fins 25 can be formed directly on the membrane 21 instead of on the inner walls of the hollow body 2.

[0037] The membrane 21, although particularly advantageous for the purpose of ensuring the sterility of the operation, could also be omitted.

Claims

1. Valve unit (1), particularly for machines for filling containers (7), comprising a hollow body (2) in which a plug (3) is slidably housed, a passage (8) for a fluid (6) for filling the said container (7) being formed in the said hollow body (2), **characterized in that** the said valve unit comprises means of directing a secondary fluid towards and/or from the container (7), these means being separated from the said passage (8) for the filling fluid (6).

2. Valve unit according to Claim 1, in which the said secondary fluid directing means are connected to a source of sterile inert gas.

3. Valve unit according to Claim 1 or 2, in which the said secondary fluid directing means are connectable, on command, to the said source of a sterile inert gas or to suction means.

4. Valve unit according to any one of Claims 1 to 3, in which the said secondary fluid directing means comprise a plurality of longitudinal channels (24) opening to the outside in a plurality of corresponding apertures (26), which form a ring surrounding the outlet aperture (5) of the valve unit.

5. Valve unit according to Claim 4, in which the said plurality of longitudinal channels (24) are connected to an annular channel (22) which acts as a manifold and which is in fluid communication with the said source of sterile inert gas or with the said suction means.

6. Valve unit according to Claim 4 or 5, the said valve unit comprising a plate (9) positioned to cover the top of the said hollow body (2) and consisting of an upper half-plate (9a) and a lower half-plate (9b), in which the said annular channel (22) comprises two half-channels, one formed in the said upper half-plate (9a) and one in the lower half-plate (9b), which when joined together form the annular channel (22), and in which the said longitudinal channels (24) are formed in the lower half-plate (9b) and continue in the thickness of the walls of the hollow body (2).

7. Valve unit according to any one of Claims 1 to 6, in which a plurality of fins (25), acting as flow stabilizers, extend from the inner surface of the hollow body (2).

8. Valve unit according to any one of Claims 1 to 7, in which the said hollow body (2) houses coaxially a hollow cylinder (10) in which a duct (11) is formed, the stem (15) of the said plug (3) being slidably inserted into the said duct (11).

9. Valve unit according to Claim 8, in which the said duct (11) is in flow communication with a source of compressed air, a plurality of apertures (12) being formed on the cylindrical surface of the lower portion (10b) of the cylinder (10), and in which a deformable tubular cylinder (19) is placed outside the stem (15) of the plug (3) and outside the hollow cylinder (10), this tubular cylinder being fixed at the top to the said plate (9) and/or to the said hollow cylinder (10) and at the bottom to the said plug (3), in such a way that, when the compressed air is injected through the duct (11) and the apertures (12), the said tubular cylinder (19) swells, causing it to shorten and to raise the said plug (3).

10. Valve unit according to any one of Claims 1 to 9, in which a membrane (21), for isolating the said passage (8) for the filling fluid (6), is fixed at its top to the plate (9) and at its bottom to the plug (3).

11. Method for filling a container (7) comprising the step of making a sterile inert gas flow parallel to and in co-current with the supplied filling fluid (6), this gas forming a tubular jacket of gas around the jet of the said filling fluid (6).

12. Method according to Claim 11, comprising the step of providing a valve unit according to any one of Claims 1 to 10.

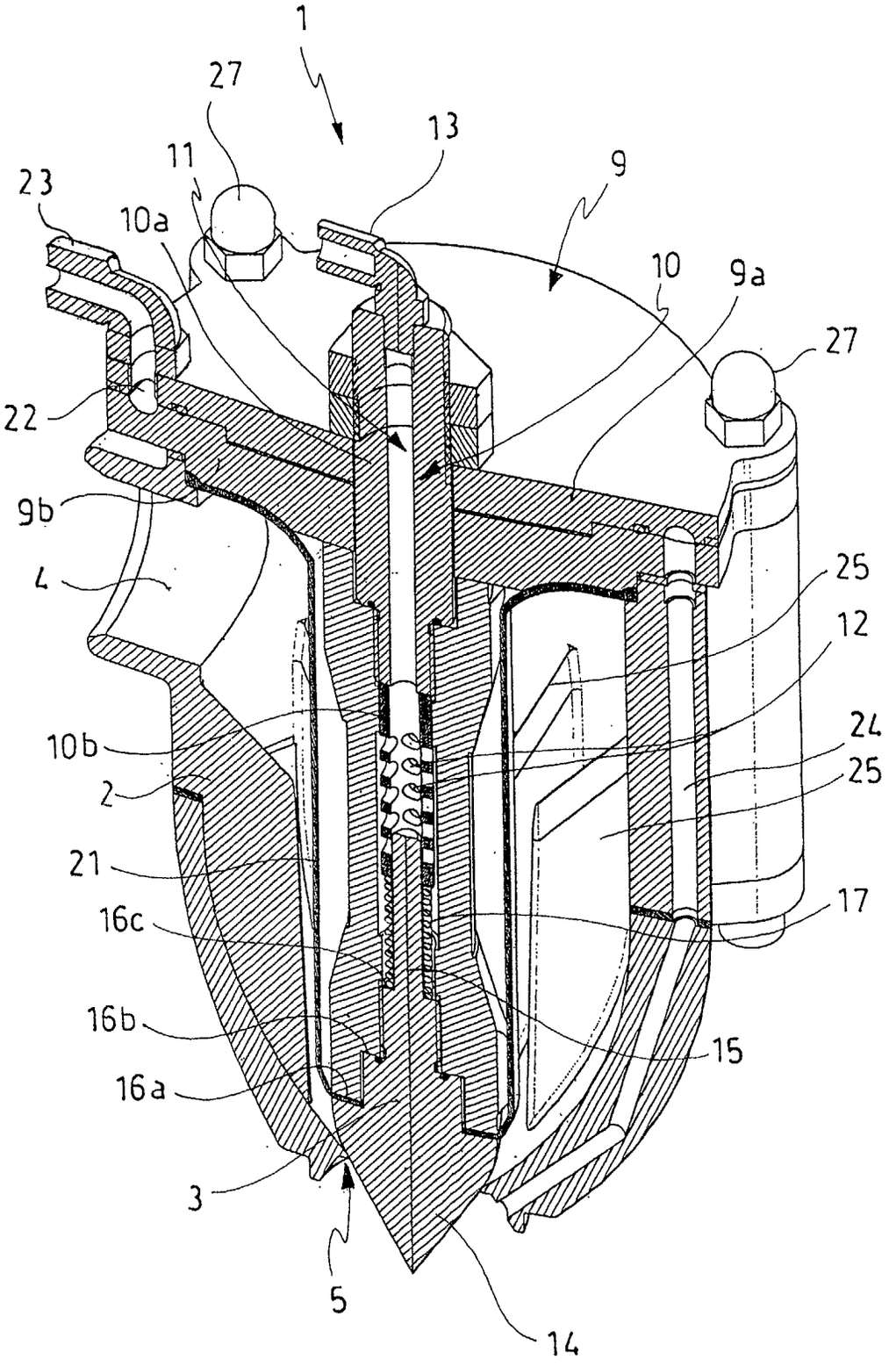
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FIG.1

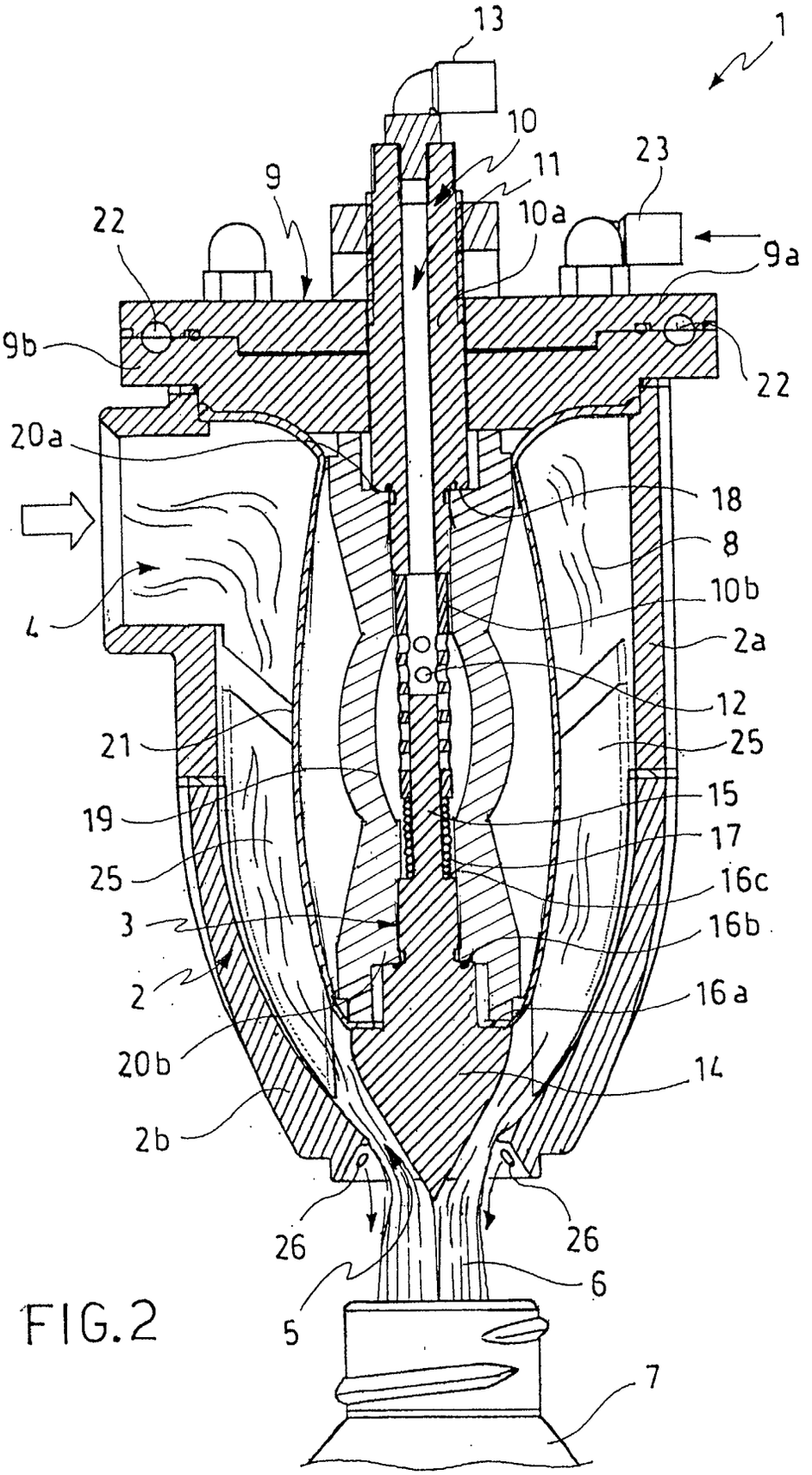
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FIG.2

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Application Number
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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	27 May 2002	Martínez Navarro, A.

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EUROPEAN SEARCH REPORT

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Place of search	Date of completion of the search	Examiner
THE HAGUE	27 May 2002	Martínez Navarro, A.

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