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(71) Applicant: **Elettroplastica S.p.A.**
25039 Travagliato (BS) (IT)

(72) Inventor: **Chiarini, Renato**
25134 Brescia (IT)

(74) Representative: **Ripamonti, Enrico**
Giambrocono & C. S.p.A.,
Via Rosolino Pilo, 19/B
20129 Milano (IT)

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(54) **Hot humidifier**

(57) The hot humidifier (10; 30) comprises a boiler (12; 32) in communication with the environment, and a water tank communicating with the boiler (12; 32) such that the water covers a heating means (41) of electrical resistance type contained in the boiler (12; 32) to produce

steam. The tank (18; 38) and the boiler (12; 32) are spaced apart such that the temperature of the water in the tank (18; 38) does not attain dangerous values for the user, the tank (18; 32) surrounding the boiler (12; 32), hence enabling small-dimension humidifiers (10; 30) to be produced.

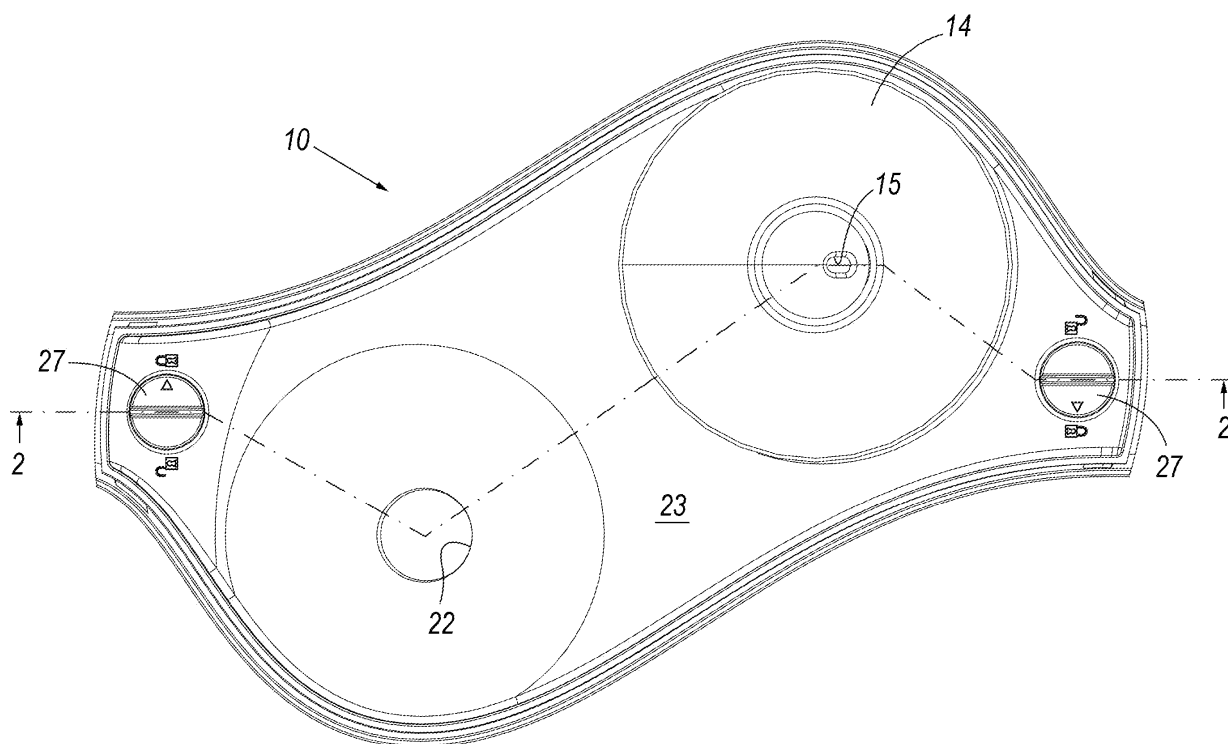


Fig. 1

Description

[0001] The present invention relates to a hot humidifier, i.e. a device for generating steam by heating water.

[0002] In known hot humidifiers, steam is generally produced by using electrically powered armoured resistance elements. These resistance elements are immersed in water contained in a so-called boiler, i.e. a vessel forming part of the humidifier and communicating upperly with the environment. The humidifier also comprises a water tank connected to the boiler via a small channel. The tank is provided with an upper aperture for water top-up

In known humidifiers the tank and water heater are two separate units which are spaced apart to reduce heat transmission from the water heater to the tank as much as possible. In this respect it should also be noted that the humidifier must be able to operate continuously even for several hours, hence the water in the tank could boil away if the said heat transmission is not reduced to the greatest possible extent.

[0003] As the tank must be accessible to the user for top-up, a high water temperature could represent a danger.

[0004] The fact of sufficiently spacing the tank from the boiler means that thermal energy is transferred from the boiler to the tank essentially only through said small channel connecting the two together, this being insufficient to enable the tank water to reach a dangerous temperature. This solution has however the drawback of forming rather bulky humidifiers.

[0005] The object of the present invention is to provide a humidifier which, although the water in the tank does not attain a dangerous temperature, is of smaller bulk than known humidifiers.

[0006] This object is attained by a hot humidifier according to the present invention, in which the tank is spaced from the boiler such that the temperature of the water in the tank does not attain dangerous values for the user, **characterised in that** the tank surrounds the boiler.

[0007] The invention will be more apparent from the ensuing description of two embodiments thereof. In this description reference is made to the accompanying drawings, in which:

Figure 1 is a plan view of a first humidifier according to the present invention;

Figure 2 is a vertical section therethrough on the line 2-2 of Figure 1;

Figure 3 is a coaxial vertical section through a second embodiment of a humidifier according to the present invention, roughly of egg shape externally;

Figure 4 is an enlarged detail 4 of Figure 3.

[0008] As can be seen from Figures 1 and 2, the hot humidifier 10 comprises a roughly frustoconical boiler 12 tapering upwards to form a circular (when seen in plan)

upper aperture closable by a cap or cover 14 provided with an aperture 15 through which steam can leave, this being produced in the boiler 12 by conventional armoured electrical resistance elements (not shown for simplicity) provided in its lower part to heat the water present in the boiler 12. The free surface of the water present in the boiler 12 must not be less than a predetermined minimum level (in practice it must not fall such as to uncover the armoured resistance elements). The humidifier 10 also comprises a water tank, indicated overall by 18. The boiler 12 and the tank 18 communicate via a short conduit 16 such that, by the principle of communicating vessels, the water level in the boiler 12 is the same as in the tank 18. This latter laterally surrounds the boiler 12, which is itself surrounded laterally by an interspace 20 open upperly such as to communicate with the environment. The presence of the interspace 20 enables heat transmission between the boiler 12 and tank 18 to be drastically reduced, so preventing the water temperature in the tank 18 from reaching values which could be dangerous for the user. However, the fact of having shaped the water tank such that it laterally surrounds the boiler 12 enables a hot humidifier to be obtained having small dimensions, making it much less bulky than known hot humidifiers.

[0009] When the humidifier 10 is in operation, the free surface of the water in the tank 18 gradually falls due to steam formation. When a predetermined minimum level is reached, a warning means (sound and/or light, not visible in the figures) which warns of the need to add water to the tank 18, while at the same time the electrical power to the armoured resistance elements is interrupted. The tank 18 is topped up through an upper aperture 22. As can be seen from Figures 1 and 2, that part of the external casing of the humidifier 10 which surrounds the aperture 22 is funnel shaped to facilitate operation.

[0010] As is apparent from Figure 2 in particular, the top of the humidifier 10 casing and that part of this casing which forms the interspace 20 form a single removable piece, indicated overall by 23, held in position by conventional knob means 27 (of which only one is shown in Figure 2).

[0011] The hot humidifier shown in Figures 3 and 4, and indicated overall by 30, is of circular shape in plan view. It is provided with an upperly open boiler 32, again of roughly frustoconical shape, in the lower part of which two armoured resistance elements 31 are provided to heat the water. Again in this case the boiler 32 is completely surrounded laterally by an interspace 40 closed upperly by a cover 34 provided with apertures, indicated by 35 in Figure 3, which enable the steam formed in the boiler 32 to escape into the atmosphere. The external and internal lateral walls of the tank 38 form a single piece, indicated overall by 33, essentially shaped as a ring, with the boiler located at the ring centre. However, in contrast to the tank 18 of the humidifier 10, the tank 38 does not communicate with the outside when the piece 33 is mounted, communicating instead with the lower part of the boiler 32 via a valve 37 (Figure 3) and an aperture

36 (better seen in Figure 4) through which the water can flow in the direction of the arrow W. The valve 37 is open when the piece 33 is mounted (for example by screwing), whereas it closes automatically when the piece 33 is removed from the remaining part (indicated overall by 42 in Figure 3) of the humidifier 30, to provide for filling the tank 38. For this purpose the piece 33, once demounted, is inverted and the part 39 (which in this case can be unscrewed), acting as the cover, is removed to be able to introduce water. The cover 39 is again screwed on and the piece 33 is finally remounted onto the remaining part 42 of the humidifier 30, to again attain the situation of Figure 3.

[0012] It should be noted that following water evaporation in the boiler 32, the tank 38 (not being in communication with the outside) goes under negative pressure, this enabling the level of the free water surface to remain unvaried in the boiler 32.

[0013] As in the case of the humidifier 10, the humidifier 32 can also be provided with warning means (sound and/or light), also not shown for simplicity, which are activated when the free surface of the water in the tank falls below a determined level, with simultaneous deactivation of the armoured resistance elements 41 positioned in the boiler 32.

[0014] As will be apparent from the foregoing, the present invention makes it possible to provide hot humidifiers of decidedly smaller dimensions than in the case of known humidifiers of this type.

ronment when the humidifier (30) is in operation, so that the tank (38) goes under negative pressure during operation of the humidifier (30).

- 5 6. A hot humidifier (30) as claimed in claim 5, wherein the tank (38) is shaped as a ring with the boiler (32) positioned centrally.
- 10 7. A hot humidifier (30) as claimed in claim 5, wherein the tank (38) is separable from the remaining part (42) of the humidifier (30), communication between the tank (38) and boiler (32) taking place via a valve (37) which is open when the tank (38) is mounted, whereas it is closed when the tank (38) is removed.

Claims

1. A hot humidifier (10; 30) comprising a boiler (12; 32) in communication with the environment, and a water tank (18; 38) communicating with the boiler (12; 32) such that the water covers a heating means (41) of electrical resistance type contained in the boiler (12; 32) to produce steam, the tank (18; 38) and the boiler (12; 32) being spaced apart such that the temperature of the water in the tank (18; 38) does not attain dangerous values for the user, **characterised in that** the tank (18; 32) surrounds the boiler (12; 32). 35
2. A hot humidifier (10; 30) as claimed in claim 1, wherein the tank (18; 38) surrounds the boiler (12; 32) only laterally. 45
3. A hot humidifier (10) as claimed in claim 1, wherein the tank (18) communicates with the environment via an upper aperture (22). 50
4. A hot humidifier (10) as claimed in claim 3, wherein that external casing part which surrounds the upper aperture (22) is of funnel shape. 55
5. A hot humidifier (30) as claimed in claim 1, wherein the interior of the tank (38) is isolated from the envi-

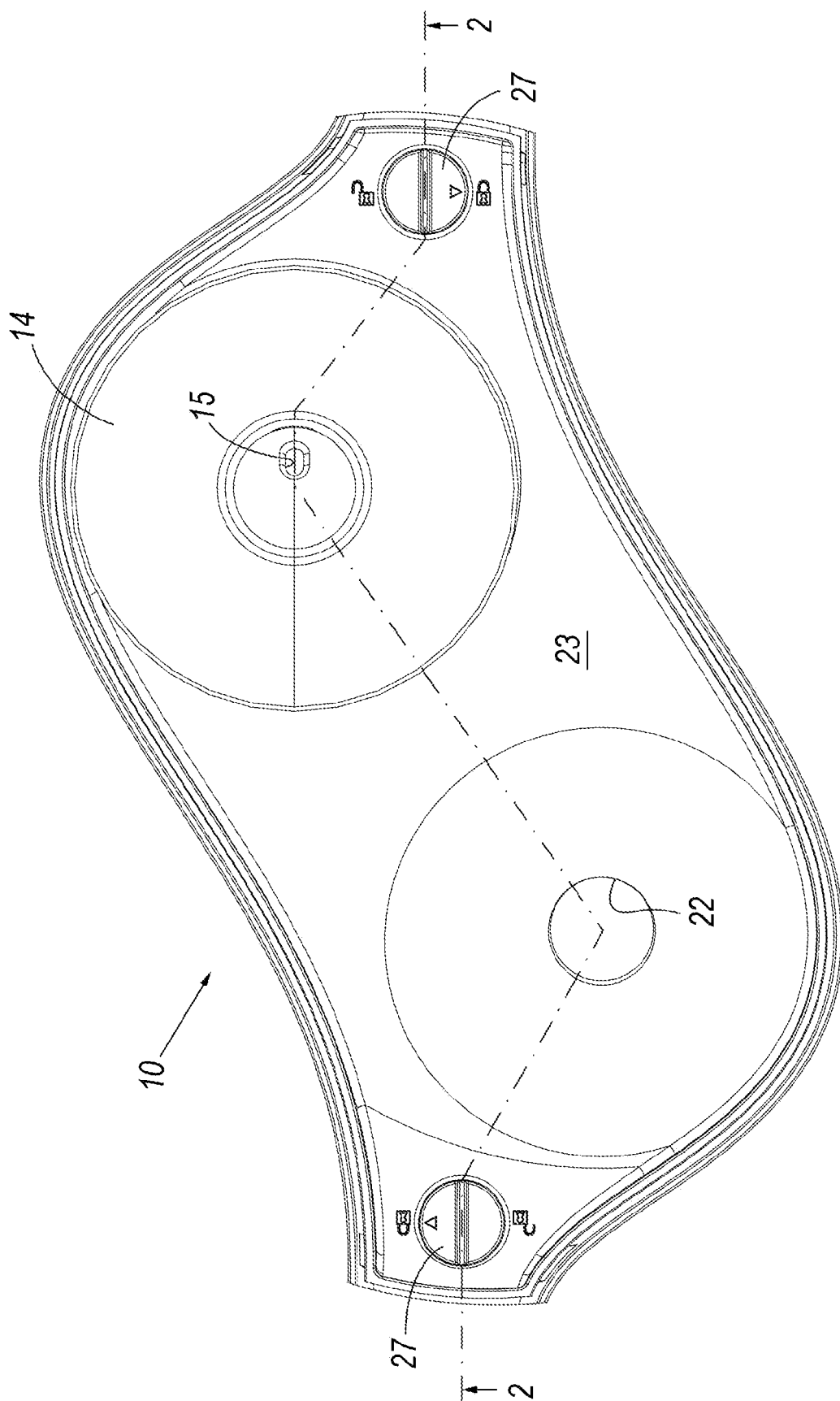


Fig. 1

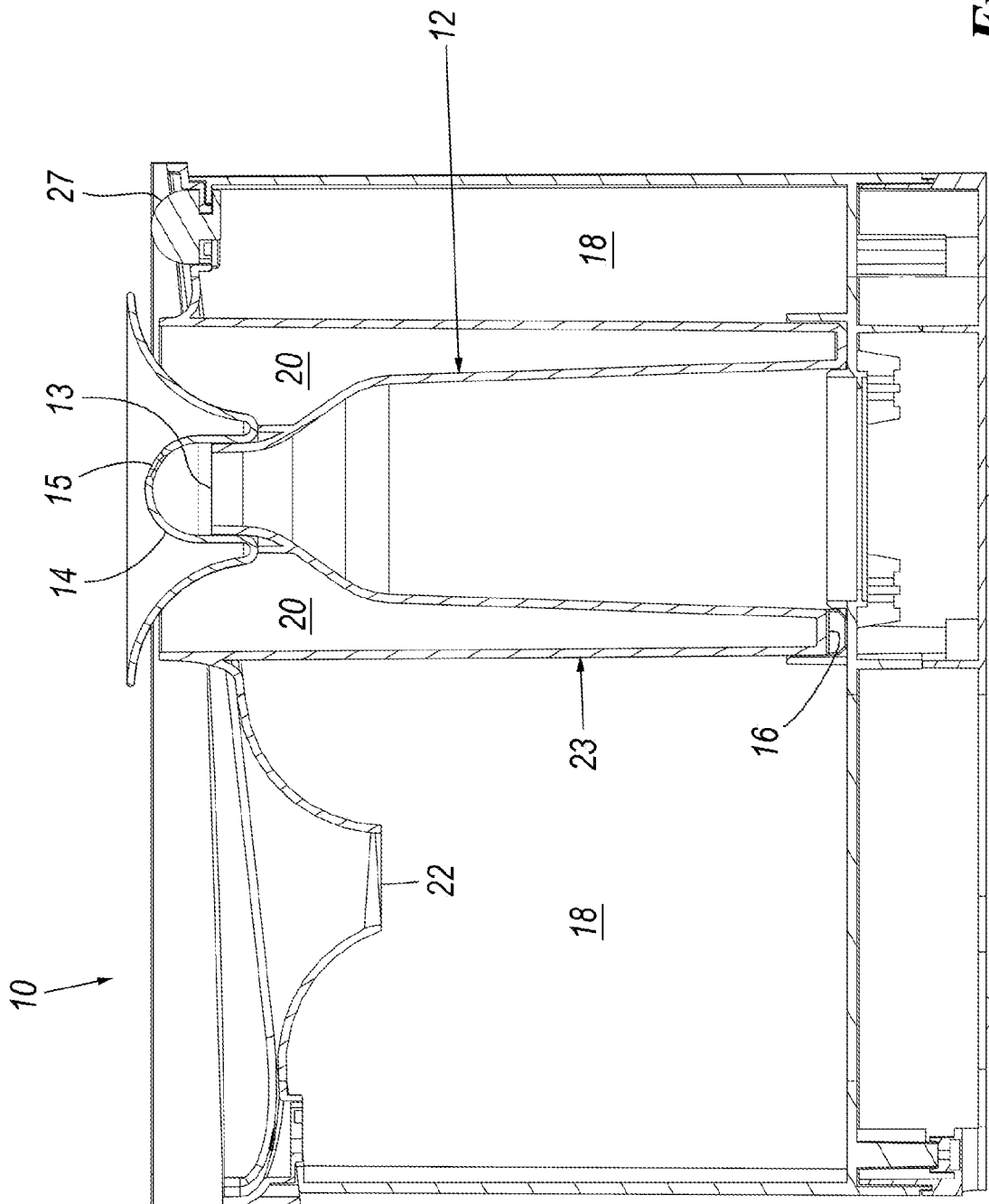


Fig. 2

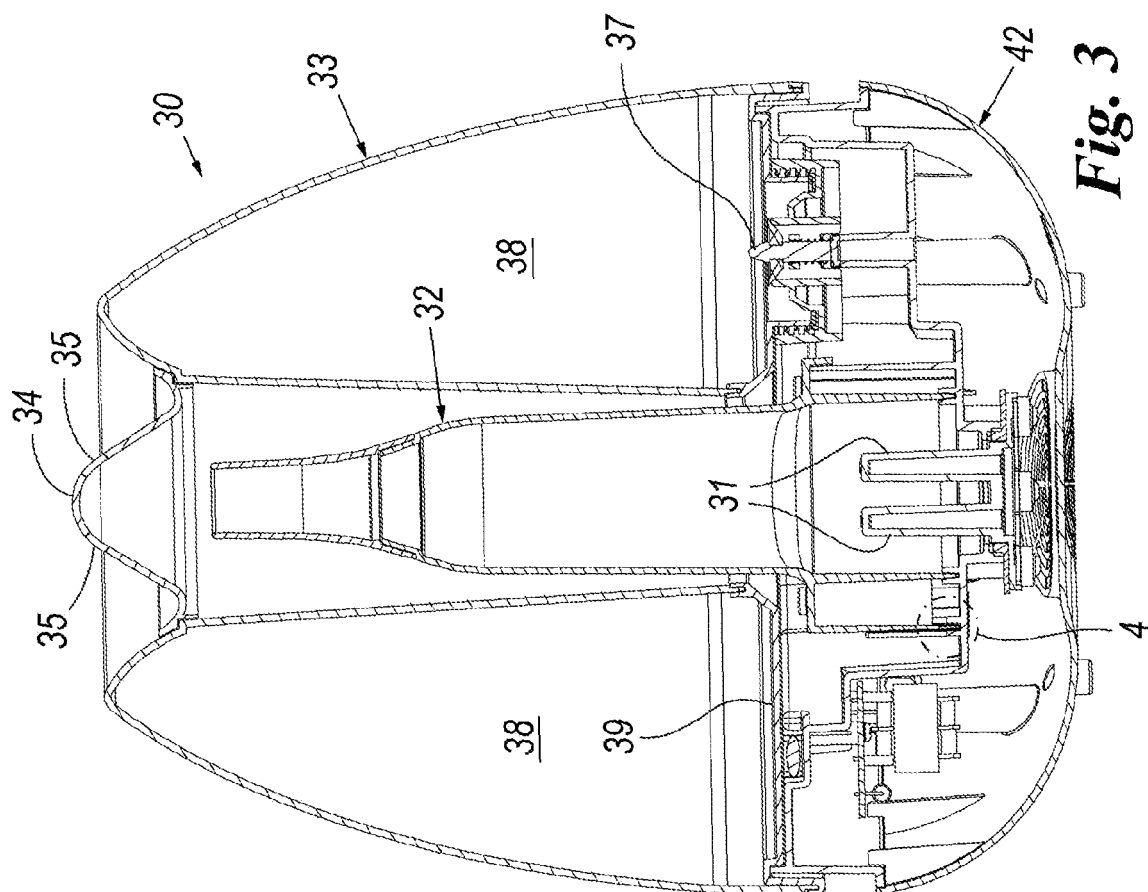


Fig. 3

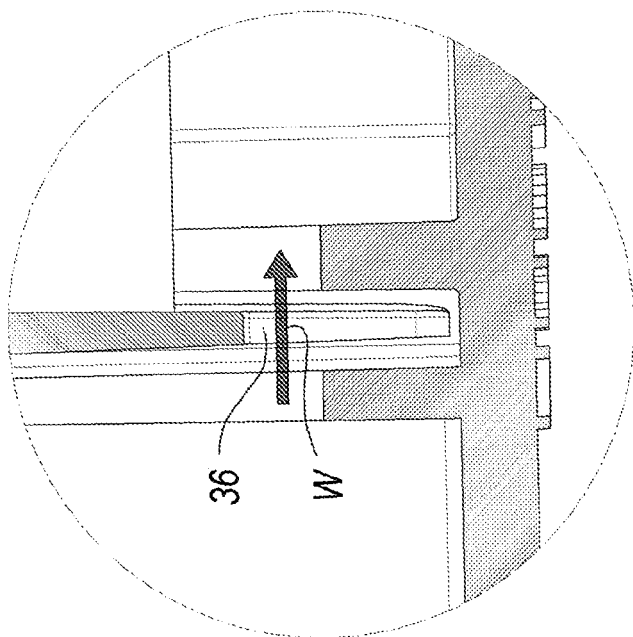


Fig. 4