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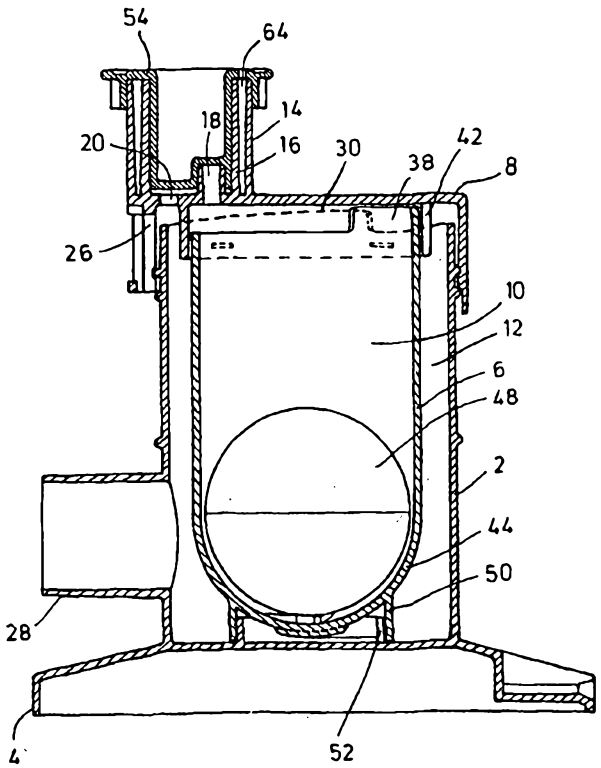
(54) Bezeichnung: ATEMTRAININGSGERÄT ZUR VERBESSERUNG DER VITALKAPAZITÄT

(57) Abstract

Disclosed is a breathing exercise device comprising two chambers (10, 12) which are placed into one another and which are formed by cylindrical vessels (2, 6) that have an open top and cannot be turned against each other. Said vessels are closed by a turnable dosing lid (8). The inner and outer chamber are provided with several openings (18, 20, 22, 26, 28) for the inlet, separation and outlet of the inspiration flow or the expiration flow. The breathing exercise device can be used as inspiration or expiration exercise device by accordingly arranging a breathing tube and a stenosis plug (54) at a selection of openings and by accordingly turning the dosing lid in order to reverse the separated air flows. The main flow of the inspiration air or expiration air is guided through the outer chamber between the inner and outer cylinder.



(57) Zusammenfassung

Vorgesehen ist ein Atemübungsgerät, mit zwei ineinanderstehenden Kammern (10, 12), wobei diese nach Maßgabe der Erfindung durch gegeneinander verdrehfeste, oben offene zylindrische Gefäße (2, 6) gebildet sind, die durch einen drehbaren Dosierdeckel (8) verschlossen sind, wobei sowohl die innere als auch die äußere Kammer mehrere Öffnungen (18, 20, 22, 26, 28) für die Einleitung, Aufteilung und Ausleitung des Inspirationsflows bzw. Exprirationsflows aufweisen, wobei durch entsprechendes Anbringen eines Atemschlauches sowie eines Stenosestopfens (54) an einer Auswahl der Öffnungen und entsprechendes Verdrehen des Dosierdeckels zur Umsteuerung der aufgeteilten Luftströme das Atemübungsgerät sowohl als Inspirations- als auch als Expirationsübungsgerät verwendbar ist. Durch die äußere Kammer zwischen Innen- und Außenzylinder wird dabei der Hauptflow der Inspirations- bzw. Expirationsluft geleitet.

BREATHING EXERCISE DEVICE FOR IMPROVING THE VITAL CAPACITY

Field of the Invention

The present invention concerns a breathing exercise device to improve the vital capacity. More particularly the invention concerns breathing exercise devices with two chambers positioned one within another.

Background Art

Breathing exercise devices to improve the vital capacity following, for example, the SMI (Sustained Maximal Inspiration) method have been known for a long time and are widespread. According to this method by the continuous maximum inhalation an improved ventilation of the lungs of a human is achieved, in particular of the periphery of the lungs, having an advantageous effect on the overall condition of the relevant person.

A device to carry out such breathing exercises is known, for example, from the document US 4,232,683. This document shows a body with an external wall and an internal wall, separated from one another by a passage, an inner chamber that is defined by the internal wall, a gas outlet to convey a gas from the chamber, as well as a gas inlet device to introduce the gas into the chamber. A component to vary the flow velocity of the gas either through the gas inlet or through the gas outlet and a registering device connected with the inner chamber to register the flow velocity of the gas through the chamber.

On the other hand, in the case of patients with, for example, chronic obstructive illnesses of the respiratory tract, breathing exercises against a definite resistance (PEP = Positive Expiratory Pressure) are recommended for the purpose of helping to loosen and transport secretions in the lower respiratory tract and to improve the ventilation of the periphery of the lungs.

The disadvantage, presently existing, of all devices known to be used for these two breathing exercises, is that they are intended merely for one of the exercises, so that different devices need to be obtained, making corresponding logistics and expenses necessary.

It would be advantageous if at least some embodiments of the present invention provided a device that makes it feasible to carry out both above mentioned methods to carry out breathing exercises using only one device.

Summary of the Invention

The present invention provides a breathing exercise device with two chambers positioned within one another, characterised in that these chambers are formed by vessels that are open at the top and cannot rotate relative one another and are enclosed by a rotatable metering lid, wherein both the inner and the outer chambers have a plurality of openings to introduce, divide and let out the inspiration or expiration flows, wherein by appropriately attaching a breathing tube as well as a stenosis plug to a range of openings and appropriately rotating the metering lid to reverse the divided air flows the breathing exercise device can be used both as an inspiration and as an expiration exercise device. At the same time the main flow of the inspired and expired air is conveyed through the outer chamber between the internal and external vessels.

Preferably six openings are provided in the two chambers, three of which are constructed in the inside and three in the outside chamber, so that at any time five openings are available to introduce, divide and let out the inspiration or expiration flow.

Equally preferred the breathing exercise device is provided with a flow indicator, so that the patient can follow in a simple and clear manner whether the exercise is being carried out correctly and he can follow the progress of the exercise. In a particularly preferred manner the flow indicator is realised in the form of an

indicator ball contained in the inner chamber, that rises and floats when a certain flow prevails.

Furthermore, the vessels inserted into one another and open at the top are preferably provided as separate components, that are so manufactured that they fit into one another only in a defined position. The defined position of the vessels relative one another is preferably achieved by that on the inside bottom of the external vessel and on the outside bottom of the internal vessel interlocking sockets are provided which assure a tilt-free insertion of the internal vessel into the external vessel. The securing of both vessels against relative rotation is achieved by that an anti-rotational securing, comprising a web and a recess accommodating this web is provided. In an equally preferred manner the internal vessel has an elevated upper edge over 180° of its circumference, that closes off an opening in the sealing lip on the metering lid when it is in the expiration position.

Furthermore, the breathing exercise device is provided with a stenosis plug, that can be inserted into a defined opening in the socket of the rotating lid, preferably only in a certain position, and has additional bores that are so arranged that they are ineffective when the plug is seated in one opening, the plug thus assuring a sealing of this opening and are effective when the plug is seated in the other opening. It is further preferred so to dimension the cross-sections of the openings of the plug that in conjunction with the variable cross-section of the main inlet and outlet openings a build-up pressure of approx. 15 cm H_20 is indicated during the breathing exercises.

An additional advantage is to retain a coarse filter in the mouthpiece between the transverse web and the spigot of the mounting ring securing it against aspiration.

Brief Description of the Drawings

Further features, properties and advantages become apparent from the following description of a preferred embodiment in conjunction with the attached drawings, that show in:

Fig. 1 - a schematic cross-section of an embodiment of the breathing exercise device,

Fig. 2 - a side view of the external vessel of the embodiment according to Fig. 1,

Fig. 3 - a sectioned view of the external vessel of the embodiment according to Fig. 1,

Fig. 4 - a sectioned view of the metering lid of the embodiment according to Fig. 1,

Fig. 5 - a top view of the metering lid of the embodiment according to Fig. 1,

Fig. 6 - a side view of the metering lid of the embodiment according to Fig. 1,

Fig. 7 - a sectioned view of the internal vessel of the embodiment according to Fig. 1,

Fig. 8 - a side sectioned view of the external and internal vessel of the embodiment according to Fig. 1,

Fig. 9 - a top view of the external and internal vessel of the embodiment according to Fig. 1,

Fig. 10 - a sectioned view of the stenosis plug of the embodiment according to Fig. 1,

Fig. 11 - a top view of the stenosis plug of the embodiment according to Fig. 1, and

Fig. 12 – a side partially sectioned view of the embodiment according to Fig. 1.

Detailed Description of Preferred Embodiments

Fig. 1 shows a schematic cross-section of an embodiment of the breathing exercise device. According to this embodiment the breathing exercise device comprises an external vessel 2, open at the top, that has a base 4 on its underside. In this external vessel 2 a separately constructed second vessel 6, open at the top, stands in a manner that it cannot be rotated relative to the external vessel. Both the first vessel 2 and the second vessel 6, standing in it so, that they cannot rotate relative one another, are closed by a rotatable metering lid 8, so that an inner chamber 10 and an outer chamber 12 is produced between the internal and external vessels.

As this can be seen from Fig. 1 in conjunction with Fig.4, in a region bordering its circumference the rotatable metering lid 8 has a tapered connecting socket 14, that has a defined internal contour with a vertically extending sleeve 16, while openings 18 and 20 are provided both in the sleeve 16 and on the bottom of the socket 14 that pass through the metering lid 8. As this can be seen from Fig.5, in the closed state the metering lid 8 has a further opening 22 in that region which is

situated over the internal vessel, through which opening the internal vessel can communicate with the atmosphere. Finally, the metering lid 8 of this construction has an opening 26 in the apron 24 that in the enclosed state covers the upper edge region of the external vessel 2.

As it can be seen, once again, from Fig.1, the external vessel 2 according to the present construction has a further connection 28 in the region situated above the base 4, the inside bore of the connection passing through the wall of the first vessel 2. It can be further seen from Fig.1, in conjunction with Figs.2 and 3, that the upper edge of the first vessel 2 is constructed in the form of two slopes 30 and 32 that extend over 180° of the circumference of the edge, the slopes rising vertically at the end of the decreasing incline. It can be further seen from Figs.1, 2 and 3, that in the region of the apron 24 of the metering lid 8 the external vessel 2 has two continuous ribs 34 and 36 at a vertical distance from one another, which form between themselves a guide for a corresponding protrusion of the apron 24 of the metering lid 8, seen in Fig.1, to secure it in the attached state in the vertical direction without hindering its rotation.

It can be seen from Fig.1, in conjunction with Figs.7, 8 and 9, that the upper edge of the second vessel 6 has a vertically protruding region 38 over 180° of its circumference. Directly below this region 38 an outward projecting sealing lip 40 is provided that, when the metering lid 8 is attached, engages a sealing lip 42 that extends vertically downward on the underside of the metering lid, as this can be seen from Fig.1 in conjunction with Fig.4. Moreover, it can be seen from Fig.1, in conjunction with Figs.7, 8 and 9, that the internal vessel 6 has a semi-spherical bottom 44, on the lower inside region of which three vertically upward protruding projections 46, forming a plane, are provided, which serve as the mounting for a ball 48 positioned in the internal vessel 6. To the outside of the semi-spherical bottom of the vessel 6 a vertically downward extending circular cylindrical socket 50 is moulded on, the diameter of which is so chosen that it will sit with a press fit on a corresponding circular cylindrical socket 52 arranged on the bottom of the external vessel 2.

A radially extending web 47 on the outside of the bottom of the vessel 6 engages the recess 48 of the circular cylinder 52 in such a manner that only one position of the vessel 6 relative the vessel 2 is possible and no relative rotation can take place.

The external and internal vessels 2 and 6 form, in conjunction with the metering lid 8, two chambers 10 and 12, with altogether four openings 18, 20, 22 and 28, while the opening 26 in the apron 24 of the metering lid 8, in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2, forms a fifth opening of the two chambers 10 and 12, as well as the vertically projecting region 38 of the upper edge of the internal vessel 6 forms a sixth opening of the two chambers 10 and 12, while the inner sealing lip 42 of the metering lid 8 has a corresponding recess (not illustrated) in this region. At the same time of the six openings three are in the inner chamber 10 and three in the outer chamber 12. Depending from the positioning of the stenosis plug 54 (to be described in the following) either in the socket 14, as illustrated in Fig.1, or in the socket 28, there are at any time five openings available to introduce, divide and let out the inspiration or expiration flows. The inner chamber 10 contains the indicator ball 48, that rises and floats when a certain flow prevails.

The stenosis plug is described in Figs.10 and 11. Its construction is such that its contour matches perfectly the inside contour of the connecting socket 14 and yet it can be also inserted into the connecting socket 28. At the same time the stenosis plug has a region 56 that surrounds the sleeve 16, that region having an opening 58 corresponding with the bore 18 of the sleeve 16. Furthermore, bores 60, 62, 64 are provided that are ineffective when the plug 54 is placed in the connection 14, but are effective when the plug 54 is placed in the connection 28.

The main flow of the inspired or expired air is directed through the outer chamber 12. The cross-section of the opening of the outer chamber 12 formed by the opening 26 in the apron 24 of the metering lid 8, in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2, can be varied by rotating the metering lid 8. By slipping a breathing tube (not illustrated) onto the connecting socket 28 and the stenosis plug 54 into the connection 14, as well as by rotating

the metering lid 8 to a scale (not illustrated) marked "inspiration", the breathing exercise device operates as an inspiration exercise device according to the SMI method. The air is inspired through the cross-section variable opening formed by the opening 26 in the apron of the metering lid 8 in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2 and through the openings 18 and 22 and then through the downstream connected opening formed by the vertically protruding region 38 of the upper edge of the internal vessel 6, in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2. At the same time the opening 20 remains closed by the inserted stenosis plug 54. The opening of the outer chamber 12 formed by the opening 26 in the apron 24 of the metering lid 8 in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2, the cross-section of this opening being variable by rotating the metering lid 8, controls the quantity of additional air and thus allows an adaptation of the total inspiration flow to suit the capacity of the patients.

If the device is used for expiration exercises, the breathing tube (not illustrated) is slipped onto the connecting socket 14 with the openings 18 and 20, as well as the stenosis plug 54 is placed into the connecting socket 28, while the metering lid 8 is rotated to a scale (not illustrated) marked "expiration". By virtue of this rotation, the opening formed by the vertically protruding region 38 of the upper edge of the internal vessel 6 in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2 will be enclosed by the inner sealing lip 42 of the metering lid 8. The total expiration flow is divided into an indicator flow through the opening 18 to the opening 22 and the main flow through the opening 20 to the connection 28 as well as to the opening of the outside chamber 12 formed by the opening 26 in the apron 24 of the metering lid 8 in conjunction with the slopes 30, 32 of the upper edge of the external vessel 2, which opening can be varied by rotating the metering lid 8.

Preferably the metering lid 8 is so designed that it is suitable for inspiration on the one hand and for expiration on the other. At the same time two consecutive scales are provided, thus preventing a confusion, i.e. at any time only one scale (expiration or inspiration) can be used. Moreover, the entire device is so constructed that incorrect manipulations can be prevented as far as possible.

When the hose is on the expiration socket the stenosis plug 54 has to be on the inspiration socket and vice versa. Furthermore, only one position of the stenosis plug 54 is feasible, otherwise it cannot be pushed in. Here too, care has been taken to prevent an incorrect manipulation, i.e. to open the incorrect holes.

As Fig. 12 shows, it is of advantage when the mouthpiece 66 has a coarse filter 68, that is preferably retained in the mouthpiece between the transverse web 70 and the spigot of the mounting ring, securing it against aspiration.

While the invention has been described with reference to a number of preferred embodiments it should be appreciated that the invention can be embodied in many other forms.

It is to be understood that, if any prior art information is referred to herein, such reference does not constitute an admission that the information forms a part of the common general knowledge in the art, in Australia or any other country.

Patent claims

1. A breathing exercise device with two chambers positioned within one another, characterised in that these chambers are formed by vessels that are open at the top and cannot rotate relative one another and are enclosed by a rotatable metering lid, wherein both the inner and the outer chambers have a plurality of openings to introduce, divide and let out the inspiration or expiration flows, wherein by appropriately attaching a breathing tube as well as a stenosis plug to a range of openings and appropriately rotating the metering lid the breathing exercise device can be used both as an inspiration and as an expiration exercise device.

2. A breathing exercise device according to claim 1, characterised in that six openings are provided in the chambers, three of which are constructed in the inside chamber and three in the outside chamber.

3. A breathing exercise device according to claim 1 or 2, characterised in that the breathing exercise device is provided with a flow indicator.

4. A breathing exercise device according to claim 3, characterised in that the flow indicator is realised in the form of an indicator ball contained in the inner chamber that rises and floats when a certain flow prevails.

5. A breathing exercise device according to any one of the preceding claims, characterised in that the vessels inserted into one another and open at the top are provided as separate components.

6. A breathing exercise device according to claim 5, characterised in that on the inside bottom of the external vessel and on the outside bottom of the internal vessel, respective interlocking concentric sockets are provided which assure a tilt-free insertion of the components into one another.

7. A breathing exercise device according to claim 6, characterised in that a radially extending web is provided on the outside of the bottom of the internal vessel, which web can engage a recess of the socket of the internal vessel, so that only one position of the internal vessel relative to the external vessel is feasible.

8. A breathing exercise device according to any one of the preceding claims, characterised in that the internal vessel has an elevated upper edge over 180° of the circumference that engages and seals an opening in a sealing lip on the metering lid when it is in the "expiration" position.

9. A breathing exercise device according to any one of the preceding claims, characterised in that the stenosis plug has such a construction that it can be inserted into a defined opening in the metering lid only in a certain position, and has additional bores that are so arranged that they are ineffective when the plug is seated in one opening the plug thus assuring a sealing of this opening and are effective when the plug is seated in the other opening.

10. A breathing exercise device according to claim 8, characterised in that the cross-sections of the openings of the plug are to be so dimensioned that in conjunction with the variable cross-section of the main inlet and outlet openings a build-up pressure of approx. 15 cm H_20 is indicated during the breathing exercises.

11. A breathing exercise device according to any one of the preceding claims, characterised in that the metering lid has a marking relative the external vessel to mark the operating regions.

12. A breathing exercise device substantially as herein described with reference to the accompanying drawings.

Dated this 30th day of July 2003
MEDISIZE B.V.
By its Patent Attorneys
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FIG.1

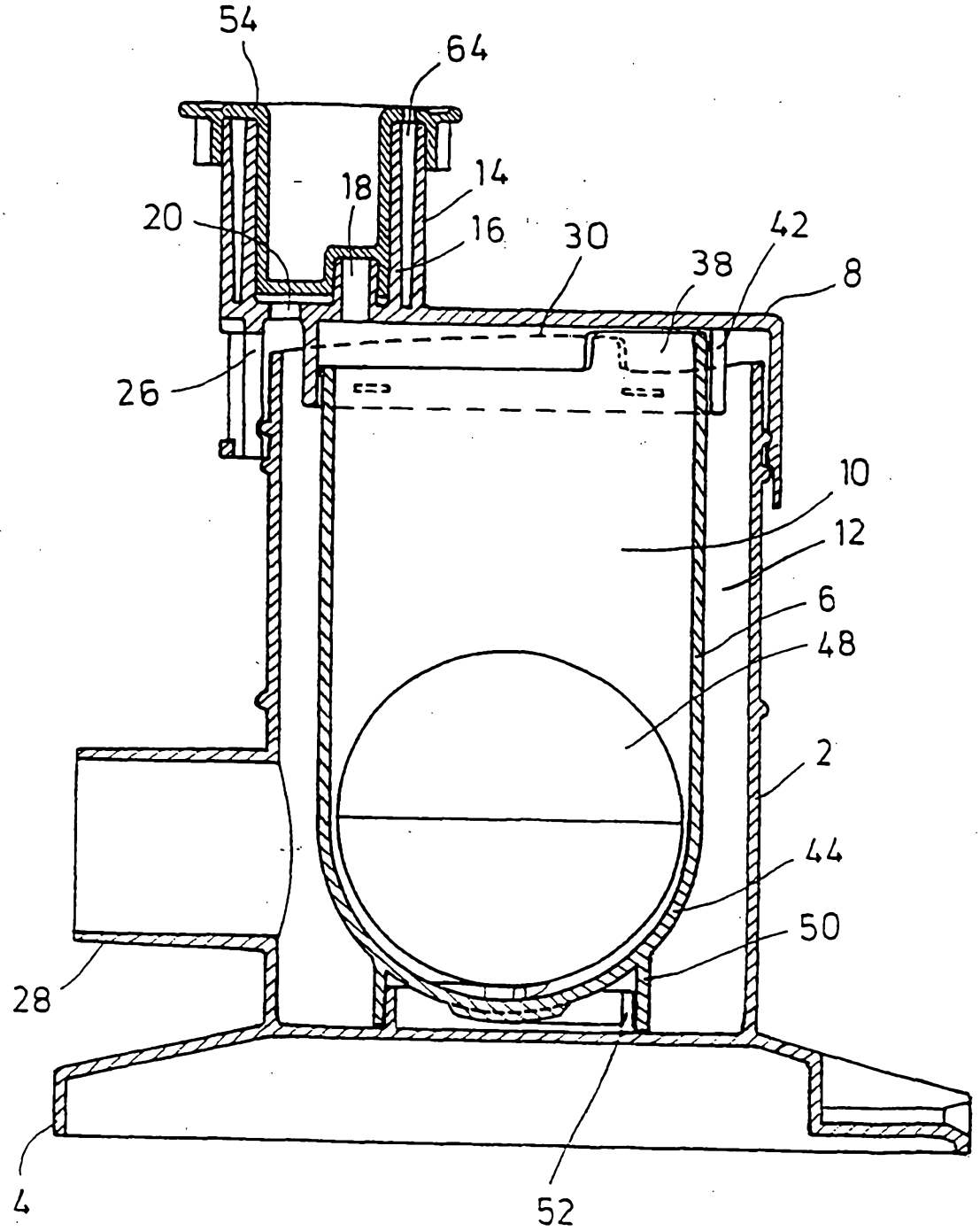


FIG.2

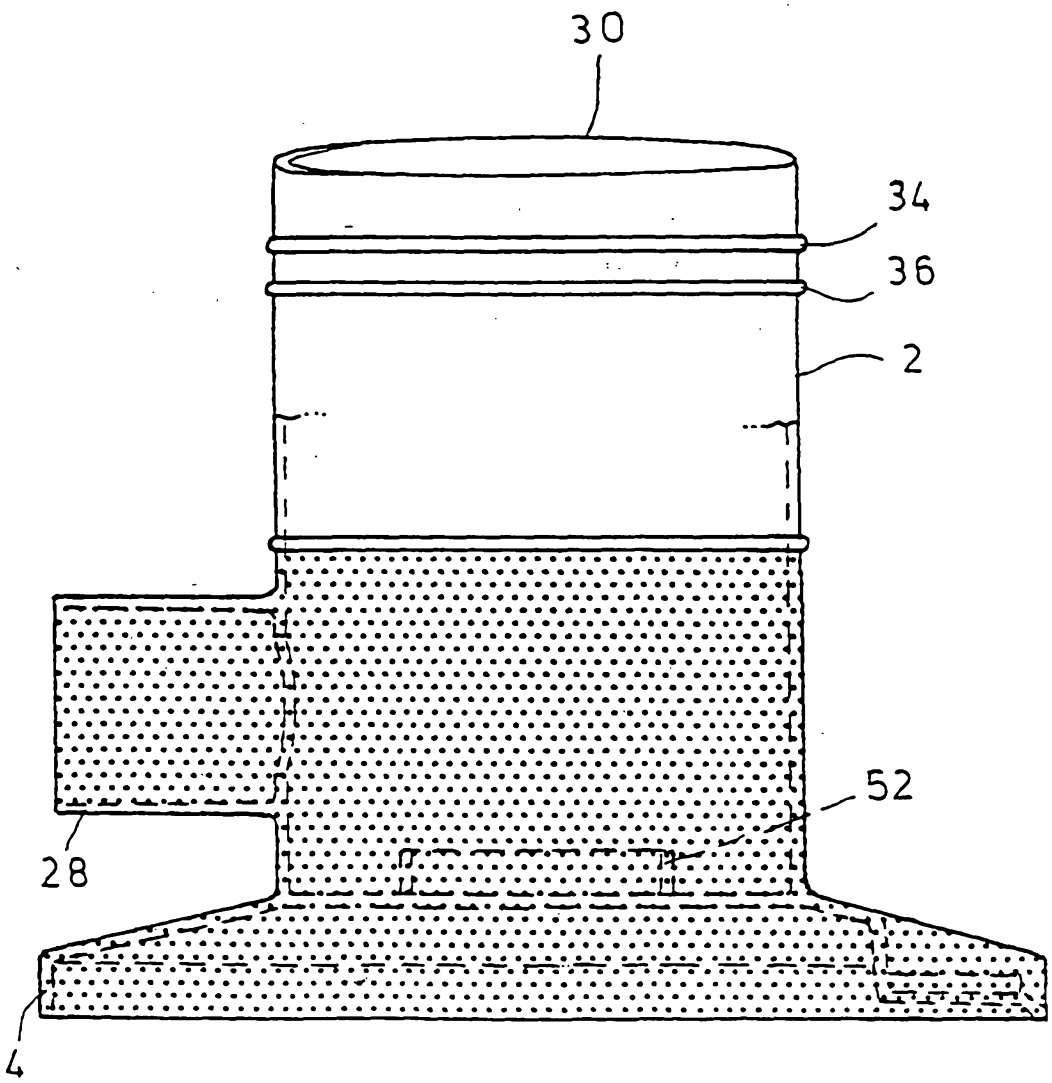


FIG. 3

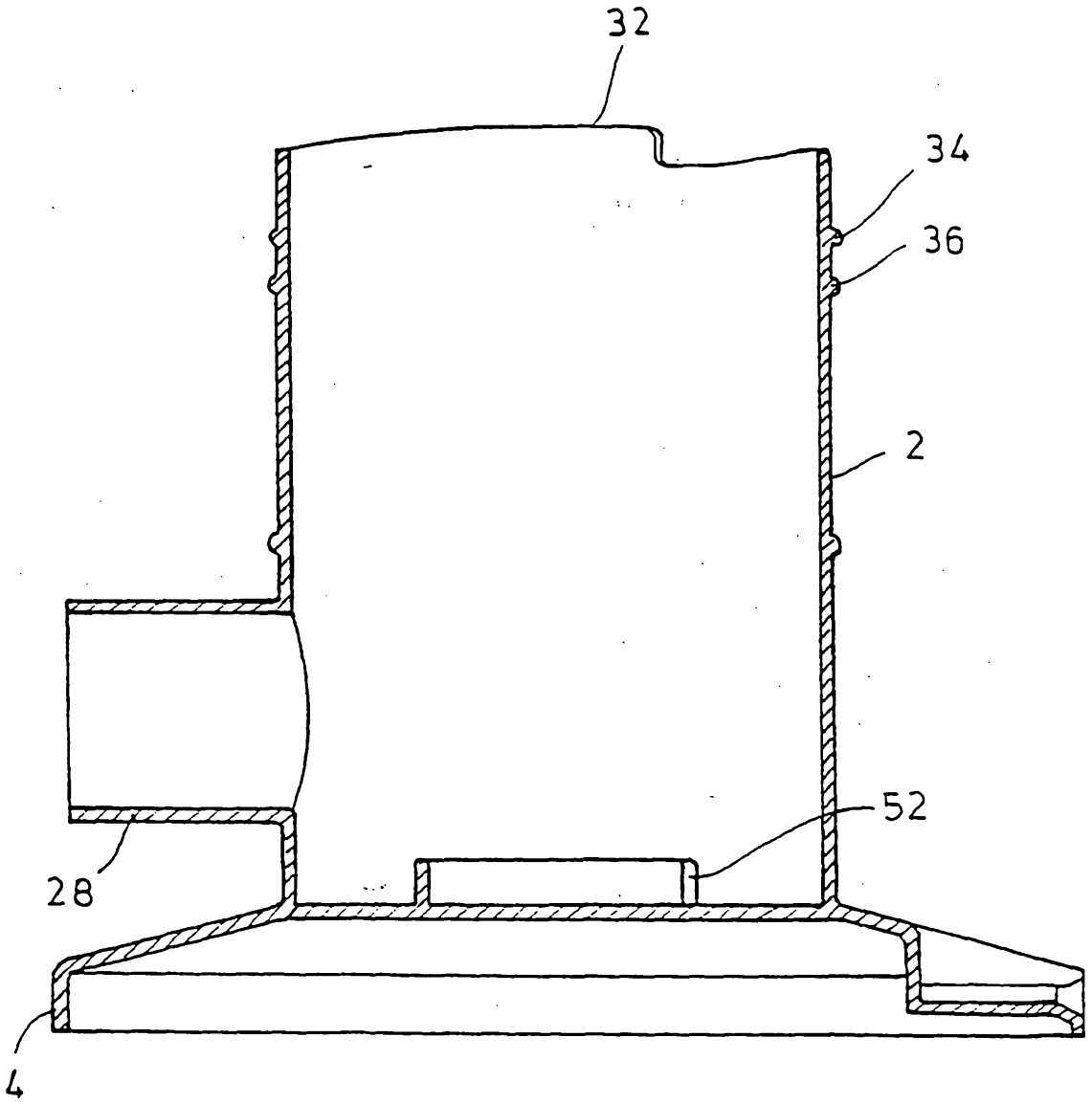


FIG.4

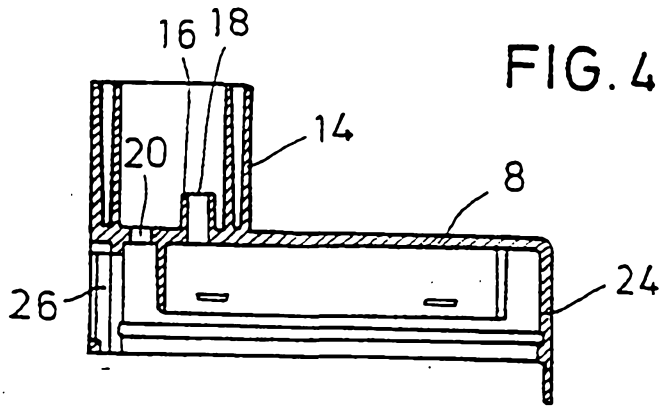


FIG.5

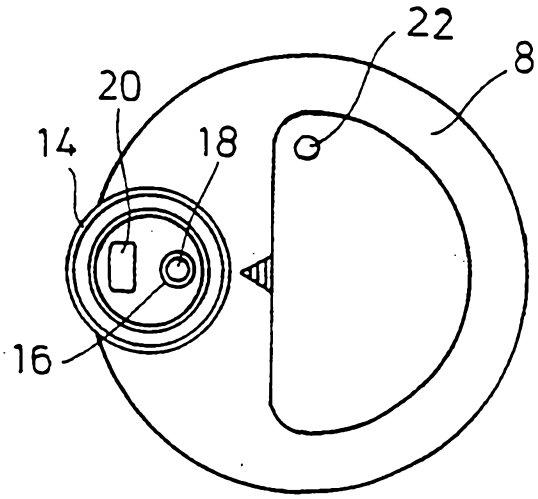


FIG.6

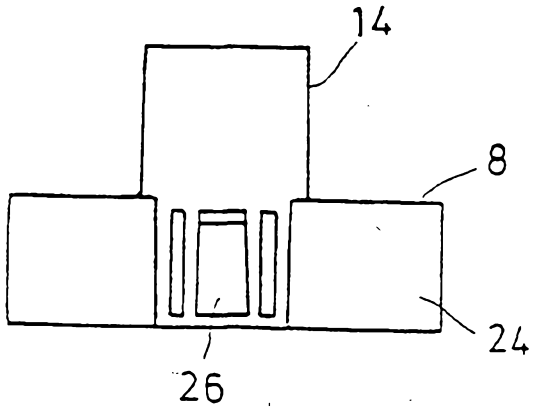


FIG.7

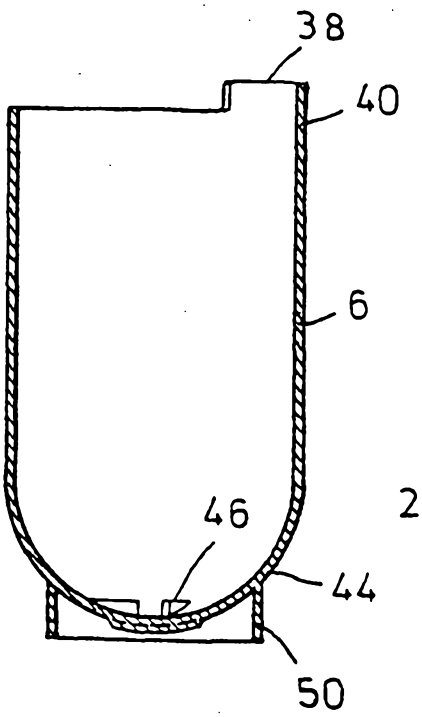


FIG.8

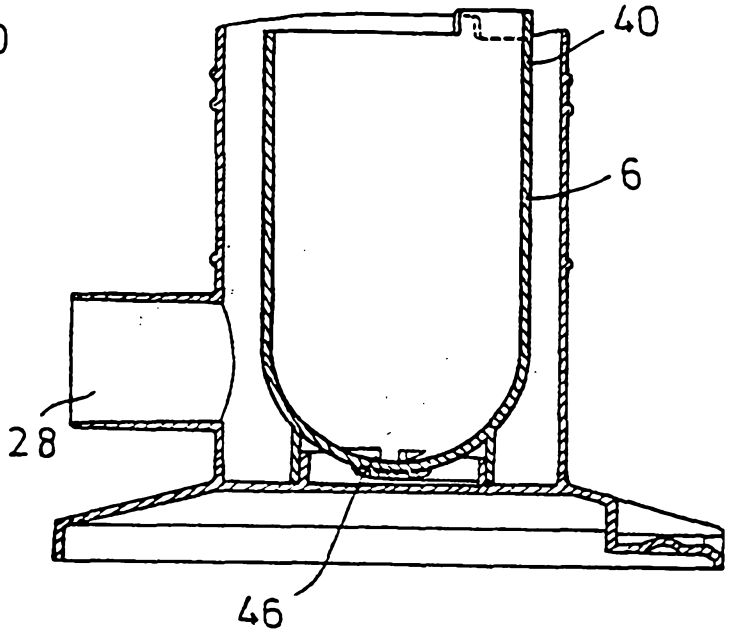
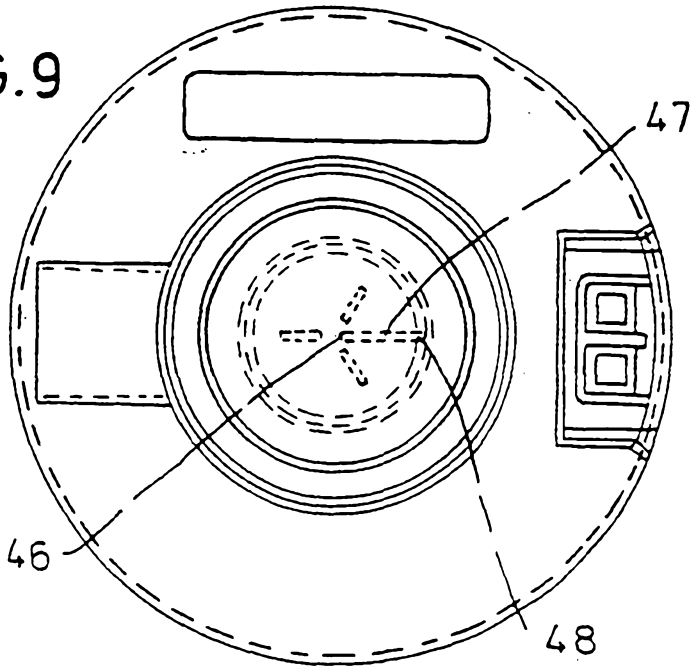


FIG.9



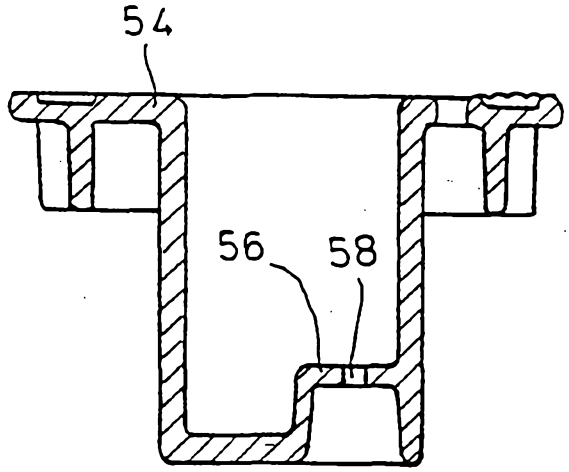


FIG.10

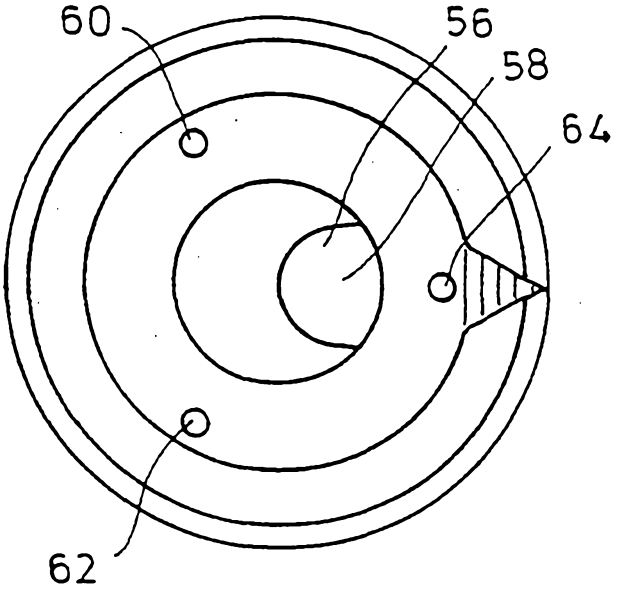


FIG.11

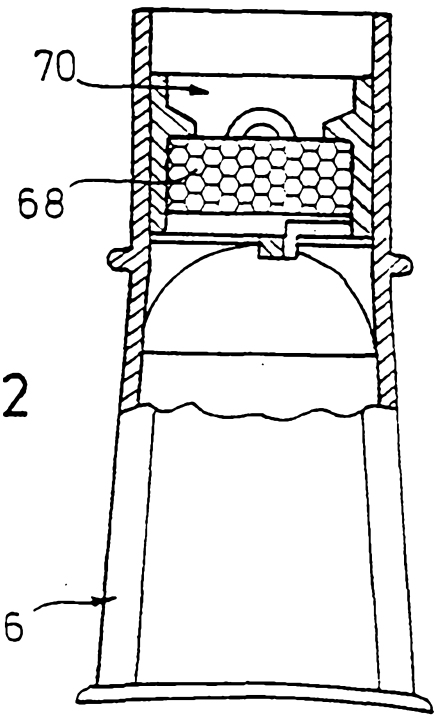


FIG.12