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(71) Applicant: **INDUSTRIE ZANUSSI S.p.A.**
Via Giardini Cattaneo 3
I-33170 Pordenone(IT)

(72) Inventor: **Cimetta, Silvano**
via Cacciatori 3
I-31100 Treviso(IT)

(72) Inventor: **Regazzo, Olindo**
via *Gasparinetti* 5
I-31100 Treviso(IT)

(72) Inventor: **Soligo, Gabriele**
via III Armata 42
I-31050 Vedelago (Treviso)(IT)

(74) Representative: **Patentanwälte Grünecker, Dr. Kinkeldey, Dr. Stockmair, Dr. Schumann, Jakob, Dr. Bezold, Meister, Hilgers, Dr. Meyer-Plath**
Maximilianstrasse 58
D-8000 München 22(DE)

(54) Detergent supply unit for a laundry washing machine.

(57) A detergent supply unit for laundry washing machines comprises a container (20) formed with compartments (23-26) for detergents and additives, and a distributor (21) removably secured to the container (20) and provided with internal passages communicating with the individual compartments. A displaceable piston (22) actuated by the program unit of the machine is effective to divert the water to selected compartments (23-26) via the mentioned internal passages. The compartments (23, 24) for the pre-laundering and main laundering detergents are in addition provided with water conduit means (27) terminating close to the bottom of the respective compartment. The container (20) is finally provided with lateral guide measn (26) and a tubular connector portion (33) connected to a flexible conduit (18) leading to the filter unit (9) of the machine. In this manner, use is made of the pressure of the water collected by said guide means (36) and said tubular connector portion (33) for returning to the washign tub any detergent accumulated in the filter unit.

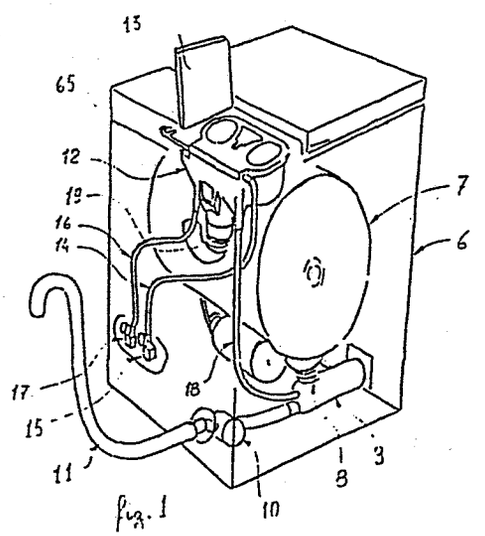

Fig. 1

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Detergent Supply Unit for a Laundry Washing Machine

Description

The present invention relates to a detergent supply unit for a laundry washing machine for the supply of particulate and/or liquid detergents and of additives to the washing tub of the machine.

At present all laundry washing machines are provided with a detergent supply unit disposed in an upper portion of the machine and formed with a number of separate compartments for containing additives and detergent in particulate and/or liquid form, said compartments being connected to a conduit leading to the washing tub.

The detergent supply unit is provided with per se known control devices adapted to intercept the water fed to the supply unit and to selectively divert it to individual compartments for removing therefrom the detergent or additive contained therein and transferring it to the washing tub.

For achieving this effect, the introduction of the water into the actually employed detergent supply units is carried out in two different modes.

According to a first mode, the water is separately supplied to each compartment of the supply unit so as to impinge on the bottom and/or on a part of the interior wall surface of the respective compartment. This system makes use of the dynamic pressure of the water for removing the detergents from the compartments within a sufficiently short time, but is incapable of ensuring a thorough cleaning of the supply unit, so that the individual compartments have to be periodically cleaned.

According to the second mode, the water is supplied to a distributor disposed above the compartments of the supply unit and provided with a number of separate internal passages communicating with individual compartments through nozzles or the like.

According to this system, the water is thus suppied in the form of a number of jets impinging on substantially the entire interior wall surface of the respective compartments so as to ensure thorough cleaning thereof. As on the other hand the cinetic energy of the water is dispersed over a relatively large area, emptying the various compartments of their contents takes a considerably long time.

In addition, both of the described systems are only suitable in the case of compartments having a large cross-sectional area and a limited height, and are thus badly suited for employ in laundry washing machines of the top-loading type or of compact construction.

It is an object of the present invention to eliminate the above noted shortcomings by providing a detergent supply unit permitting the detergents and additives contained therein to be rapidly and completely transferred to the washing tub of the laundry washing machine, so as to ensure optimum utilization of these substances.

For attaining this object, the invention makes use of the principle of contemporaneously introducing the water into the supply unit in two directions, so that a first portion of the water impinges on the bottom with considerably dynamic energy so as to promote the discharge of the detergent or additive from the compartment, while another portion of the water sweeps the interior wall surface of the respective compartment so as to ensure its being thoroughly cleaned.

The supply unit according to the invention is additionally provided with a conduit for diverting part of the water

supplied thereto so as to achieve recirculation thereof under pressure for permitting any detergent accumulated in the discharge portion of the machine to be efficiently recuperated.

These and other objects are attained according to the invention in a laundry washing machine comprising a detergent supply unit provided with respective inlets for the supply thereto of cold and hot water from the water mains and connected to a washing tub the lower portion of which communicates with a discharge unit, said detergent supply unit comprising a container divided into a number of separate compartments adapted to contain detergetns and additives, and a disstributor adapted to be removably mounted on said container and provided with separate internal passages communicating with the various compartments, a control piston being adapted to be actuated by the program unit of the machine for selectively diverting the water to each of said internal passages.

According to the invention, a detergent supply unit of the type defined above is characterized in that at least one of said compartments is provided with conduit means adapted to introduce the water also adjacetn the bottom of said compartment, collector means being connected to said discharge unit for causing a part of the supplied water to recirculate therethrough.

The invention will be more clearly understood from the following description of an exemplary embodiment with referance to the accompanying drawings, wherein:

fig. 1 shows a diagrammatic perspective view of a laundry washing machine including a detergent supply unit according to the invention,

fig. 2 shows a partially sectioned exploded perspective view of the supply unit according to the invention,

fig. 3 shows a partially sectioned perspective view of the supply unit of fig. 2 on a larger scale,

fig. 4 shows a detail of the supply unit of fig. 3 sectioned along the line A-A,

fig. 5 shows a further detail of the supply unit sectioned along the line B-B in fig. 3, and

fig. 6 shows the detail of fig. 5 sectioned along the line C-C.

With reference to fig. 1, a laundry washing machine of the top loading type comprises, for the purpose of the present invention, a housing 6 surrounding a washing tub 7 the lower portion of which is connected to a bellows-type conduit 8 leading to a filter unit 9 itself connected to a discharge pump 10 and a discharge conduit 11 leading therefrom.

Mounted in the upper portion of housing 6 is a detergent supply unit 12 provided with a closure lid 13 hingedly mounted on the upper plane of housing 6. Supply unit 12 is connected respectively to a cold water supply mains through a conduit 14 including a solenoid valve 15, to a hot water supply source through a conduit 16 including a solenoid valve 17, and to filter unit 9 through a conduit 18.

Supply unit 12 furthe r communicates with a transfer conduit 19 connecting it to washing tub 7.

With referecne to fig. 2, detergent supply unit 12 basically consists of three main components: a container 20, a distributor 21, and a piston 22. Container 20 is integrally foremd of a synthetic resin or the like and comprises compartments 23 and 24 for the detergents for a first and a second washing phase, and compartments 25 and 26 for additives, generally in liquid form. Formed on the interior

wall surface of each compartment 23 and 24, according to a specific characteristic of the invention, are water conduit means 27 comprising a wall member 28 vertically slidable between guides 29, as particularly shown in fig. 3.

Compartments 25 and 26 on the other hand each contain a siphon 30 and 31, respectively, for discharging the liquid additives into tub 7.

Container 20 is additionally formed with tubular projections 32, 33, and 34 for connection to conduits 16, 18 and 19, respectively (fig. 1).

Container 20 has a further opening 35 through which the interior of tubular connector projection 34 communicates with the surrounding environment.

Container 20 is finally formed with a lateral guide 36 for slidably receiving piston 22 therein. The latter is provided with a first conduit 37 for diverting the cold water to the compartments of container 20, and a second conduit 38 located adjacent first conduit 37 and serving to divert the hot water in an analogous manner.

Piston 22 further comprises a rod 39 having a bifurcate end portion 40 for connection to (not shown) control elements operable to displace piston 22.

Distributor 21 is formed with three openings 41, 42 and 43 corresponding respectively to compartments 23, 24 and 25,26 when distributor is mounted on container 20 and releasably secured thereto by means of hook members 44 engaging apertured projections 45.

Distributor 21 is further provided with a nozzle 46 connected to conduit 14 for the supply of cold water (fig.1). Nozzle 46 is coaxially aligned with conduit 37 of piston 22 in the operative position thereof.

The system of the selective water supply to distributor 21 by means of displaceable piston 22 corresponds to that described in Italian Patent 1,045,343 in the name of the present applicant.

With reference also to fig. 3, it is noted that between the inlet opening of conduit 37 and nozzle 46 there always remains a free space (air break) to be crossed by the jet of the water supply as required by safety regulations.

Cold water is supplied to any of compartments 23 to 26 by displacing piston 22 into alignment with the openings of corresponding passages formed in distributor 21 and indicated by phantom lines in fig. 3. Hot water on the other hand can only be supplied to main washing phase detergent compartment 23 after moving piston 22 to a position in which conduit 38 is aligned with tubular connector projection 32.

The passages of distributor 21 associated with compartments 25 and 26 open directly into the latter. The passages associated with compartments 23 and 24 feed the water to a collector 47 extending around the upper edge of the corresponding opening 41 and 42, respectively, of distributor 21. Collector 47 associated with compartment 23 is visible in fig. 3.

From the respective collector 47, water enters the respective compartment through a number of peripherally located nozzles 48 and through the already mentiones conduit means 27 communicating with a passaeg 49 integrally formed within distributor 21.

By means of a partition 50, the interior of conduit means 27 is formed to the shape of a venturi nozzle effective to impart a higher energy to the water jet. Conduit means 27 opens proximate the bottom of the respective compartment 23 or 24 so as to ensure the complete removal therefrom of the detergent, in cooperation with the water jets issuing

from nozzles 48 and impinging on the interior wall surface of the respective compartments. Tubular connector projection 33 connected to filter unit 9 vie conduit 18 (fig.1) is located below and in communication with nozzle 46 so as to divert part of the cold water supply for creating a circulation of this water through filter unit 9 and bellows conduit 8 to tub 7. In this manner, any detergent deposited in filter unit 9 and/or bellows conduit 8 is effectively recuperated so as not to be discharged without having been utilized. The wall of tubular connector projection 33 is formed with a vertical slot 51 and a passage 52 located therebelow, slot 51 and passage 52 communicating with a chamber 53 formed below guide 36 and itself communicating with conduit 34. The dimensions of slot 51 are selected so as to permit the pressure of the water within conduit 18 to be kept between predetermined limits, while passage 52 permits any air bubbles entrained by the water to escape from conduit 18. Chamber 53 in addition serves for collecting any water leakage from the air break between nozzle 46 and piston 22 as well as part of the hot water supply via a passage 66 associated with tubular connector projection 32. With reference to fig. 4, compartment 25, similar to compartment 26, is in free communication with tubular connector projection 34 leading towards tub 7 and formed with opening 35 defined by an interior wall 54. Shown in fig. 4 is an arrangement for securing a splash cover 67 on top of the detergent supply unit. This is accomplished by means of resilient clamps 55 engaging seats 56 and 57 formed on splash cover 67 and container 20, respectively. In this manner, the detergent supply unit is readily accessible without requiring the entire splash cover or the top cover of the machine to be dismounted. With reference to figs 5 and 6 there is shown a preferred embodiment of means permitting the employ of liquid detergents in the pre-laundering and main laundering compartments without modifying the structural and functional characteristics of the supply unit according to the invention. Considering for instance the compartment 23 for the main laundering detergent, there

is provided a cup-shaped element 58 to be inserted therein and having an enlarged upper rim 59 adapted to rest on the edge of distributor 21. Integrally formed with cup-shaped element 58 is a vertical tube 60, while its bottom is provided with openings for receiving therein respective valve poppets 61 biased towards their closure positions by a spring 62. An inverted cup-shaped element 63 is inserted over vertical tube 60, with its lower edge resting on valve poppets 61.

The described arrangement forsm a sifon for the transfer of liquid detergents to the washing tub as water is supplied to cup-shaped element 58 via passage 47 of distrib utor 21 and a further passage 64 formed opposite an opening 65 in the wall of cup-shaped element 58.

For discharging any liquid detergent remaining within cup-shaped element 58 below the level of inverted cup-shaped element 63, valve poppets 61 may be opened by simply depressing inverted cup-shaped element 63 against the action of spring 62.

This simple operation should always be carried out before supplying the liquid detergent preparatory to a subsequent washing cycle.

In summary, the detergent and additive supply unit for laundry washing machines according to the invention is of simple and compact construction and highly efficient in use, ensuring an improved and faster supply of detergents and additives to the tub of the machine as well as the complete discharge thereof from the respective compartments so as to avoid any incrustation and sedimentation forming therein.

In addition, the described supply unit is highly versatile in use as it may be employed in washing machines of the top-loading as well as of the front-loading type and even permits the employ of liquid detergents by the provision of

accessories adapted to be installed in a simple manner.

GRÜNECKER, KINKELDEY, STOCKMAIR & PARTNER

PATENTANWÄLTE
EUROPEAN PATENT ATTORNEYS

A. GRÜNECKER, DIPL.-ING.
DR. H. KINKELDEY, DIPL.-PHYS.
DR. W. STOCKMAIR, DIPL.-ING. (M.I.T.) (CALTECH)
DR. K. SCHUMANN, DIPL.-PHYS.
P. H. JAKOB, DIPL.-ING.
DR. G. BEZOLD, DIPL.-CHEM.
W. MEISTER, DIPL.-ING.
H. HILGERS, DIPL.-PHYS.
DR. H. MEYER-PLATH, DIPL.-ING.

8000 MÜNCHEN 22
MAXIMILIANSTRASSE 58

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Detergent Supply Unit for a Laundry Washing Machine

Patent Claims

1. A detergent supply unit for a laundry washing machine provided with connections for the supply respectively of cold mains water and hot water and including a washing tub the lower portion of which communicates with a discharge assembly, said supply unit being provided with a container divided into a number of separate compartments for containing detergetns and additives, and with a distributor removably secured to said container and formed with separate internal passages communicating with respective ones of said compartments, a control piston being adapted to be actuated by the program unit of the machine for selectively divert the supplied water to each of said internal passages, characterized in that at least one of said comp-

artments (23 - 26) is provided with conduit means (27) adapted to introduce at least part of the water adjacent the bottom of the respective compartment, collector means (33, 36, 53) of said supply unit being connected to said discharge assembly (8, 9) for causing part of the supplied water to be recirculated therethrough.

2. A detergent supply unit according to claim 1, characterized in that said conduit means (27) comprises a wall member (28) retained for vertical sliding movement between guides (29) formed on the interior wall surface of the respective compartment (23, 24), and is in communication with a passage (49) of said distributor (21).

3. A detergent supply unit according to claim 2, characterized in that said conduit means (27) is internally provided with baffle means (50) for forming a venturi passage therein.

4. A detergent supply unit according to claim 1, characterized in that said collector means include a lateral guide (36) in which said piston (22) is slidably guided, and a chamber (53) located therebelow in communication with a tubular connector portion (33), said tubular connector portion (33) communicating with a nozzle (46) for the supply of water to the supply unit.

5. A detergent supply unit according to claim 4, characterized in that said tubular connector portion (33) is formed with a vertical slot (51) and a passage (52) both in communication with said chamber (53), said chamber (53) itself being open towards a tubular connector portion (34) connected to said washing tub (7).

6. A detergent supply unit according to claim 1, characterized in that said container (20) is formed with an opening (35) communicating with the environment and internally delimited by a wall (54).

7. A detergent supply unit according to claim 1, characterized in that there is provided a liquid detergent container (58) adapted to be removably inserted into at least one of said compartments (23, 24) and provided with siphon means (60-63) and at least one opening (65) opposite a passage (64) formed in said distributor (21).

8. A detergent supply unit according to claim 7, characterized in that said siphon means comprise a vertical tube (60) located internally of said container (58) and communicating with the respective compartment, and a cup-shaped element (63) removably slipped over said vertical tube (60) and adapted to cooperate with valve poppets (61) inserted into respective openings in the bottom of said container (58) and biased to their closed positions by resilient means (62).

9. A laundry washing machine according to any of the preceding claims, substantially as described with reference to the accompanying drawings and for the stated purposes.

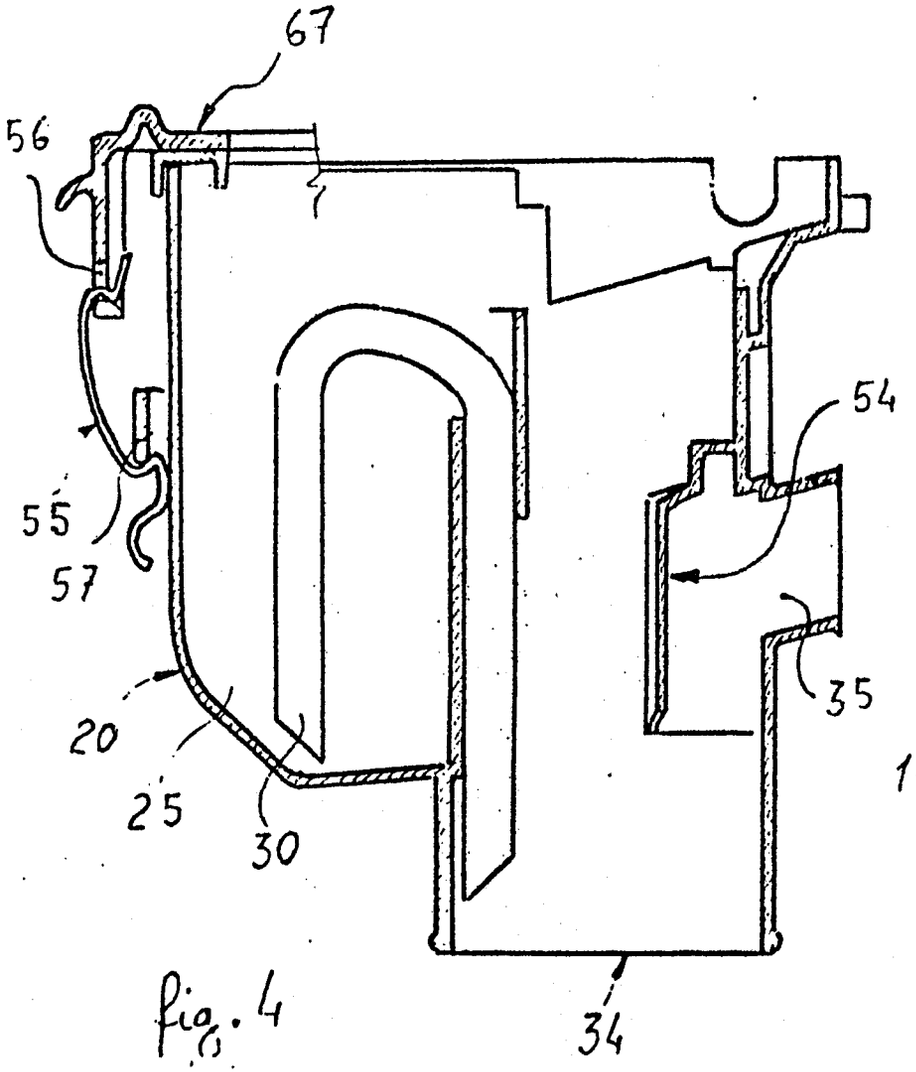

fig. 4

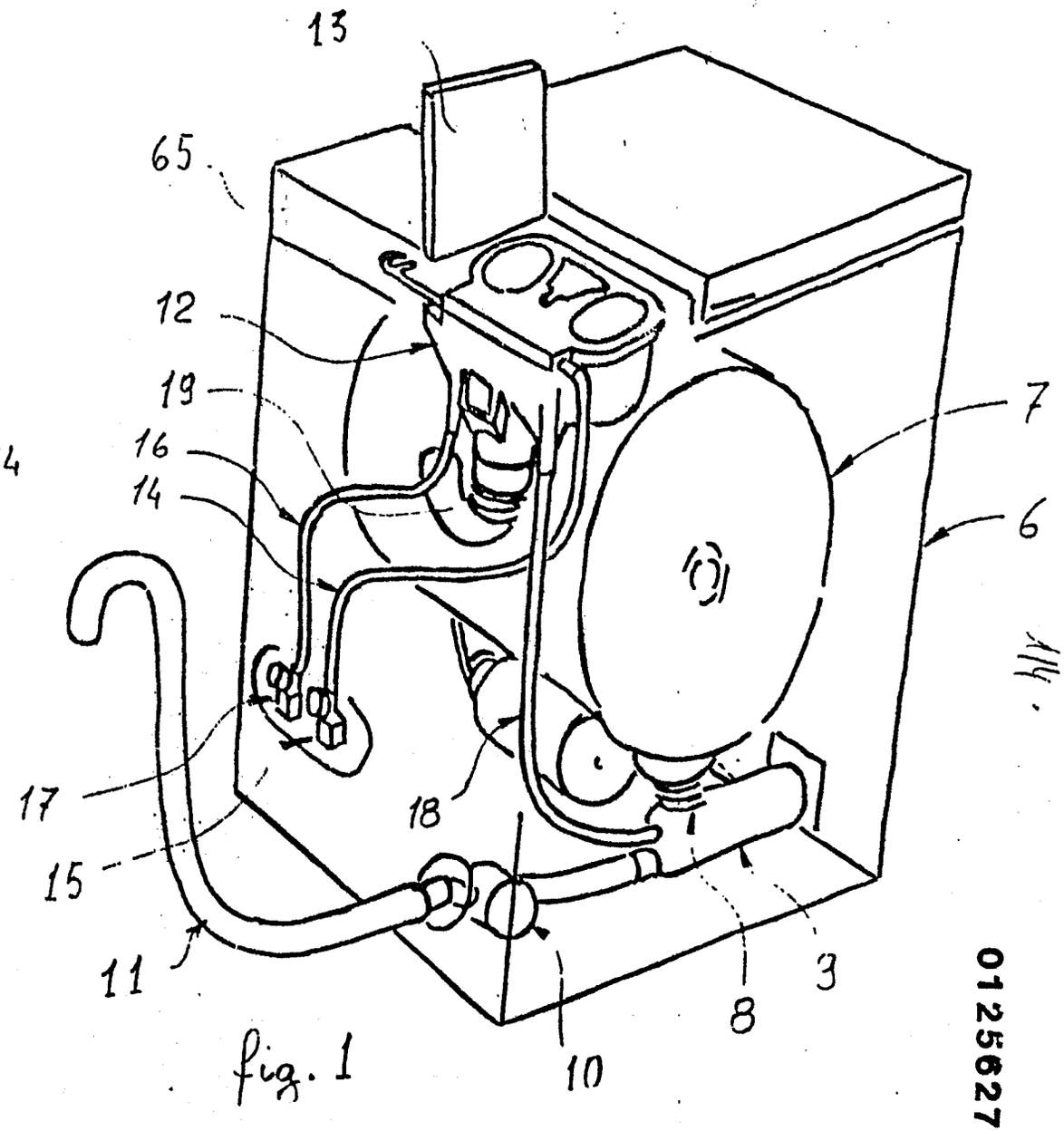

fig. 1

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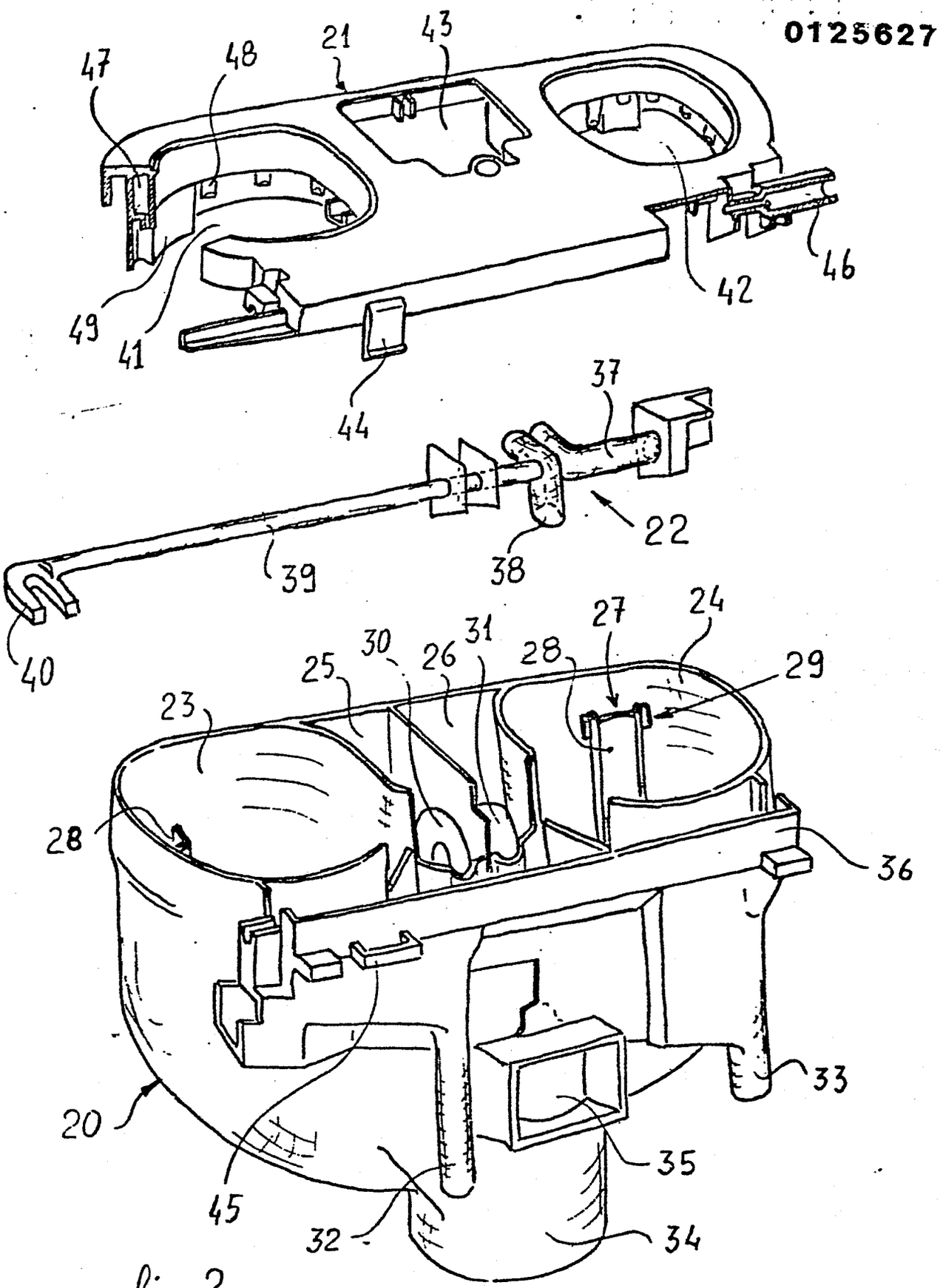
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fig. 2

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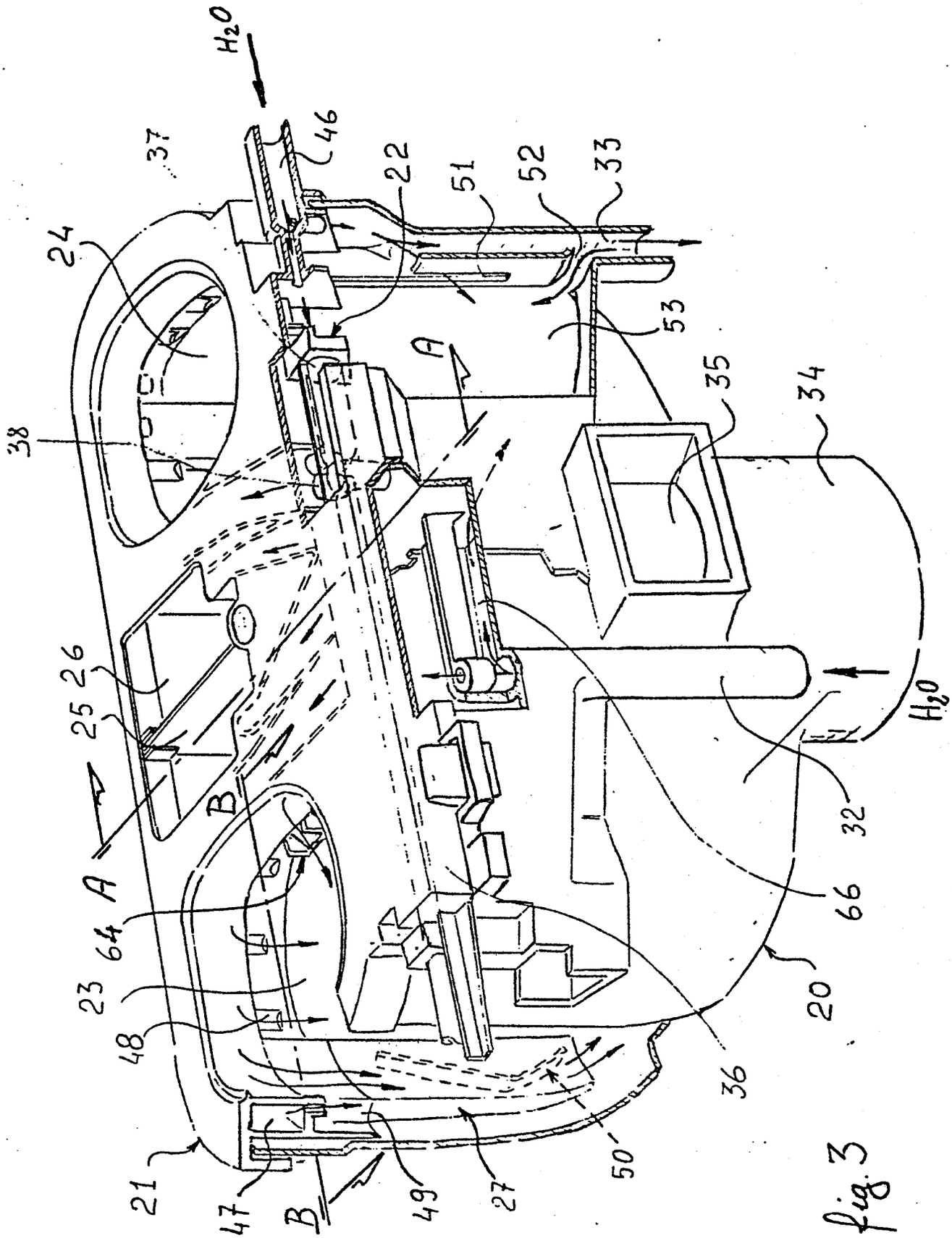

Fig. 3

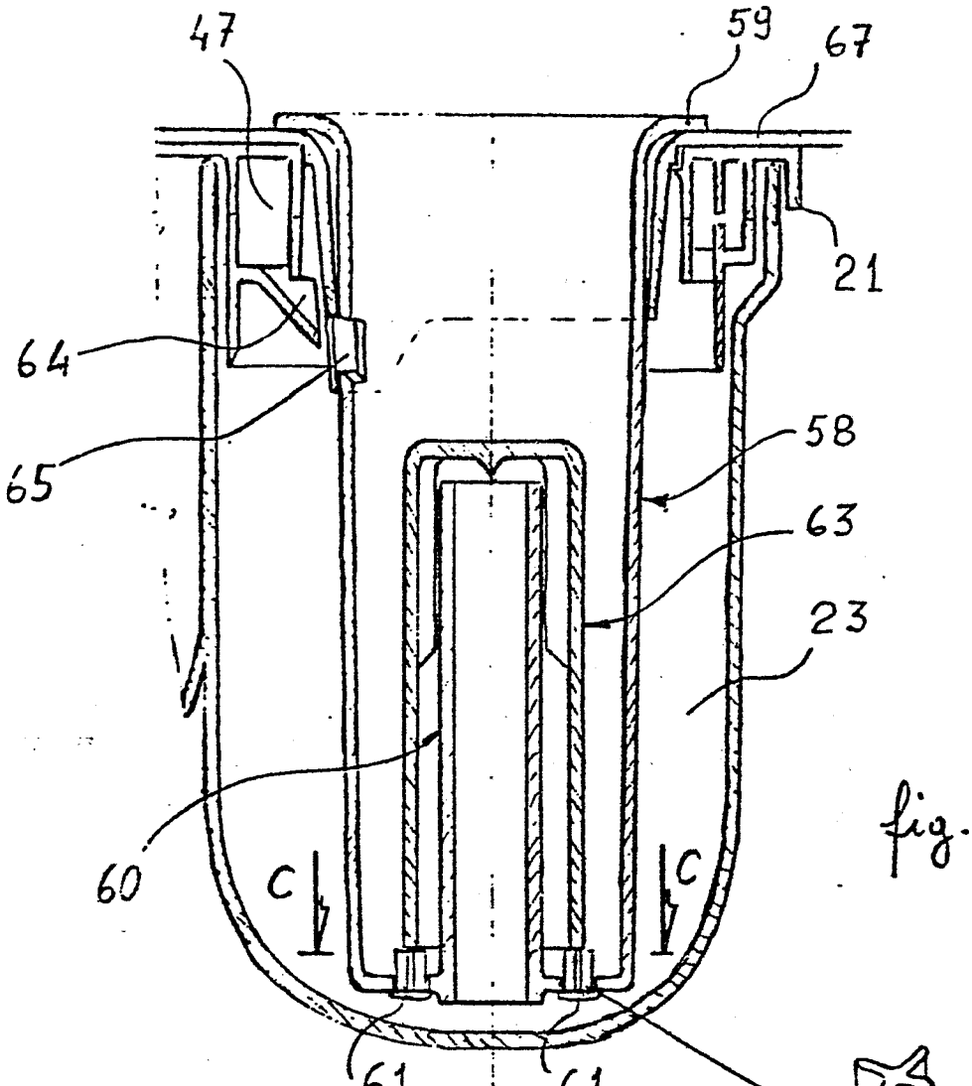

fig. 5

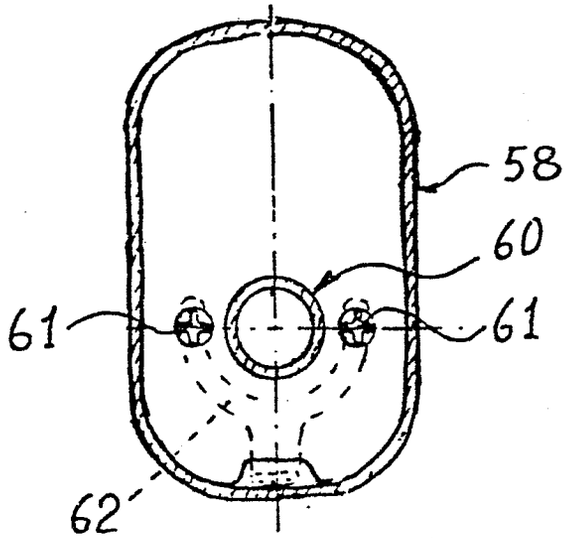

fig. 6