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(54) An integral flow directing unit with two independent pumps and a common filter for washing machines and the like

(57) An integral flow directing and filter unit formed from a unitary body (1) integrally formed by moulding plastics material, having two axially aligned rotor housings (28, 29) of centrifugal pump impellers formed therein which are open at their outer axial ends, a suction chamber (27) positioned between the housings and in communication with them, two delivery outlets (11, 12) in communication with the said housings, a filter housing (21) in communication with the suction chamber and an inlet (15) in communication with the filter housing (21).

The structure is completed by a filter (2) lodged in the filter housing (21) and by two independent motor units (4, 5) with an associated impeller (6) coupled with the unitary body (1), each closing the open axial end of the rotor housing (28, 29) in such a way that the flow is directed into one or other of the outlets by activating one or other of the two motors.

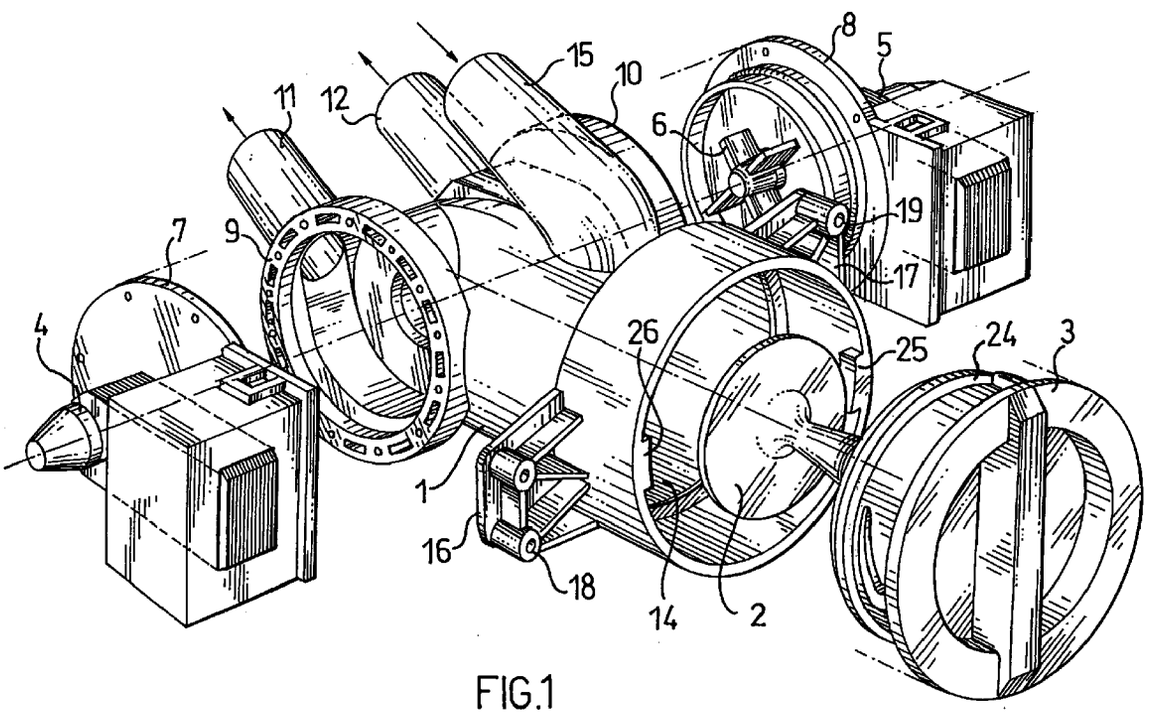

FIG.1

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Description

The present invention concerns an integral flow directing filter unit for washing machines and the like.

The current need to reduce the consumption of water for washing and concurrently the consumption of detergent and energy for heating is recognised.

To achieve this it is known that the wash bath is recirculated around a recirculation path.

Two approaches are employed in pursuit of this aim.

According to one approach a single pump is used in combination with a diverting valve to convey the wash liquid to a drainage outlet or alternatively to a recirculation path.

Original arrangements embodying this approach are described in Italian patent application no. MI92A002596 filed on 12 November 1992, and in Italian patent application no. M192A002562 filed on 9 November 1992.

In accordance with the second approach two separate pumps are utilised to convey the washing liquid respectively to a drainage outlet or into the recirculation path.

The first approach necessitates the use of a diverting valve which must satisfy the requirement of providing a perfect seal at the diversion point, failing which, after repeated operation liquid lost through the drain results in the gradual emptying of the washing vessel during recirculation, with the risk of failure of the washing machine due to insufficient residual liquid in the washing vessel.

This requirement is difficult to satisfy even if a filter, upstream of the diverting valve, can give relative protection by preventing threads and particles of a certain dimension from interfering at the diversion point and preventing a liquid-tight seal from being made.

The formation of encrustations and solid deposits of particles having dimensions smaller than those caught by the filter cannot be prevented and this can lead to the escape of liquid, and mechanical blockage of the diverting valve.

The effectiveness of the valve can therefore be assured only by proper maintenance.

These disadvantages are not present in the second approach but, on the other hand, it is considerably more expensive due essentially to the more complex operations needed to assemble two separate pumping units.

In addition the dual hydraulic circuit does not allow the use of an appropriate single filter acting both in the drainage and the recirculation circuit.

The dual hydraulic circuit also removes a certain quantity of water from the washing circuit which can be considered lost for washing purpose.

To avoid such disadvantages the integral flow-directing unit with two independent pumps and a common filter which is the subject of the present invention provides a filter and a pair of structurally independent pumping means combined in a single monobloc structure.

The unit requires a single mechanical support rather than separate supports for separate functional units.

According to a further aspect of the invention the unit has a single attachment on the body for connecting the wash vessel directly to the unit so as to reduce pipework to a minimum, and consequently to reduce also the volume of liquid which is not directly involved in the washing process.

There is therefore an indirect reduction in energy consumption.

The design of the unit is such that it can be made by moulding plastics materials using relatively simple methods with a reduced number of dies and related operations.

This result is attained by aligning the three flow ports on a first axis and aligning the body which houses the two pumps on a second axis perpendicular to the first. The filter housing is aligned on a third axis perpendicular to the second.

In practice, a first part of the unit is made as a housing body for the pumps which are separated by a common delivery chamber communicating with a second part of the unit in which a housing for a filtration element is formed.

This can be made in various ways, such as a barrier filter, in alignment with a self cleaning circuit with a filter opening, or as a conventional mesh filter.

Brackets are formed integrally with the body to join the unit to the moving part of the washing machine.

The characteristics and advantages of the invention will become clear from the following description of a preferred embodiment and from the accompanying drawings in which:

Figure 1 is an exploded perspective view of a preferred embodiment of the integral flow directing unit with two independent pumps and a common filter in accordance with the present invention;

Figure 2 is an end view of the body of the unit of Figure 1;

Figure 3 is a side view of the body of the unit of Figure 1;

Figure 4 is a sectional side view along a median plane of the body of Figure 2;

Figure 5 is a sectional view on the line ABC of Figure 3;

Figure 6 is a sectional plan view of the unit of Figure 1; and

Figure 7 is a sectional side view on a median plane of the unit of Figure 1.

With reference to Figure 1 the integral flow directing unit according to the present invention comprises a moulded body 1 in plastics material, a removable filter 2 with a front closure plug 3 and two motor units 4, 5 which drive the pump impeller 6, provided with flanges

7, 8 for coupling to the body 1 and closing the associated impeller housings.

Two portions can be essentially distinguished in the unitary body 1.

A first portion forms two axially aligned cylindrical housings, open at their outer ends, with annular flanges respectively 9, 10 for coupling to respective flanges 7, 8 of the motor units.

Each of the two housings comprises the body of a centrifugal pump with an impeller 6, driven respectively by the two motor units 4, 5 and a peripheral delivery outlet respectively 11, 12 and an axial intake opening one of which 30, visible in Figure 1, allows the two housings to communicate with a chamber located axially between them which opens into a cylindrical filter housing 14 to the peripheral wall of which is connected an intake opening 15.

The body 1 is provided on the outer sides of the filter housing 14 with two mounting brackets 16, 17 reinforced with ribs and having bosses 18, 19 for self-tapping screws.

Figures 2 to 5 represent various views and sections of the body 1 to show more clearly the structural characteristics and its formation using a relatively simply constructed mould with a reduced number of moving parts.

The filter housing is constructed from two axially aligned cylindrical bodies 20, 21 (Figure 5) the outermost one 20, of greater diameter, being connected to the other by means of a shoulder 22 which has an annular ridge 23 for cooperation with a seal 24 (Figure 1) on the filter plug to ensure sealing of the filter housing.

The body 20 comprises a plug housing and has on its edge two opposing retaining teeth 25, 26 for the engagement and bayonet fitting of the plug 3 which has in its turn ribs (as 25, Figure 1) for cooperation with the teeth 25, 26.

The inner body 21 constitutes the filter housing and the intake opening 15 is joined to and opens into its periphery.

Internally the body 21 is joined to and communicates with a suction chamber 27 positioned between the two impeller housings 28, 29 and communicates with these through two apertures 30, 31.

The filter and plug housing, the suction chamber and the front part of the mounting brackets 16, 17 can be easily obtained with a die closed in the direction indicated by the arrow 32 which is provided with a pair of retractable teeth to form the necessary undercuts for the teeth 25, 26. The impeller housings 28, 29 and the associated flanges 9, 10 having sites for screw engagement, and possible registration pins are easily made using two opposing mould dies which are closed in the direction indicated by the arrows 33, 34.

The impeller housings 28, 29 of a generically cylindrical shape, communicate with the suction chamber positioned between them via the axial apertures 30, 31.

The delivery outlets 11, 12 respectively are connected to their periphery.

When one of the motor units 4, 5 is activated, the liquid is sucked from the inlet 15, enters into the filter chamber through the filter, passes into the suction chamber 27 and from there to the impeller housing corresponding to the activated motor from where it is expelled through the associated outlet 11 or 12 to be directed to the drainage outlet or into the recirculation circuit.

The outlets 11, 12 and inlet 15 are advantageously positioned along parallel axes, with a degree of inclination relative to the axis of the filter chamber.

Their interior and part of their exterior can be formed with a die closed in the direction of the arrow 35, being clearly along the axes of the openings.

A fifth die closed in the direction of the arrow 36 allows the formation of the lower part of the body 1, which is undercut with respect to the pump bodies and associated flanges 9, 10.

Preferably, but not necessarily, to facilitate the separation of the body from the various dies, the upper exterior part of the inlet 15 is formed by a die closed in the direction indicated by the arrow 37.

To form the integral flow directing filter unit according to the invention, the unitary body 1 is completed by attaching the two flanged motor units 4 and 5.

These are conveniently but not necessarily of the synchronous type, and made from a permanent magnet submersed rotor to the shaft of which is fitted an impeller 40, 41.

The rotor housing is externally enclosed by the extensions of field poles 42, 43 which extend in two stator columns closed with a yoke.

On the stator columns are two electrical excitation coils supplied by the alternating mains voltage.

It is clear that the invention is susceptible to many variants.

For example, a conventional mesh or labyrinth filter may be substituted for the diaphragm filter shown in Figure 2.

In addition, in the case of the filter being superfluous, or where its separate production is preferred, the structure of the flow directing unit can be simplified by eliminating the filter housing completely and attaching the intermediate suction chamber directly to the inlet 15, in this case positioned at an angle or in relative opposition to the outlets 11 and 12.

In other words the filter housing is replaced by the inlet 15, the diameter of which must be sufficient to form at its end, and as an extension of itself, an intake chamber with dimensions suitable to keep the pressure drop between predetermined limits for a predetermined flow rate of liquid.

Claims

1. An integral flow directing unit with two independent pumps, comprising a unitary body (1) of moulded plastics, the said body forming two axially aligned housings (28, 29) each of a centrifugal pump impel-

ler (6), open at their outer axial ends, and a suction chamber (27) axially positioned between these two housings (28, 29) and in communication with them through two axial apertures (30, 31), two delivery outlets (11, 12) open at the periphery of the said housings (28, 29), two independent motor units (4, 5) with an impeller (6) coupled to the said body (1) and closing the said end apertures of the said impeller housings (28, 29), means connecting the said suction chamber (27) to an inlet (15) and means (16, 17) for fixing the said body (1) to a support.

2. A unit as in Claim 1 in which the said body (1) forms a cylindrical filter housing (21), with an axis perpendicular to the axes of the said rotor housings (28, 29), open at one end for the removable insertion of a filter (2) and in communication at the other end with the said suction chamber (27), and said connection means comprising an inlet (15) opening in the peripheral wall of the said filter housing (21).

3. A unit as in Claim 2 in which the said delivery outlets (11, 12) and the said inlet (15) have parallel axes, perpendicular to the axes of the said housings (28, 29) and inclined with respect to the axis of the said filter housing (21).

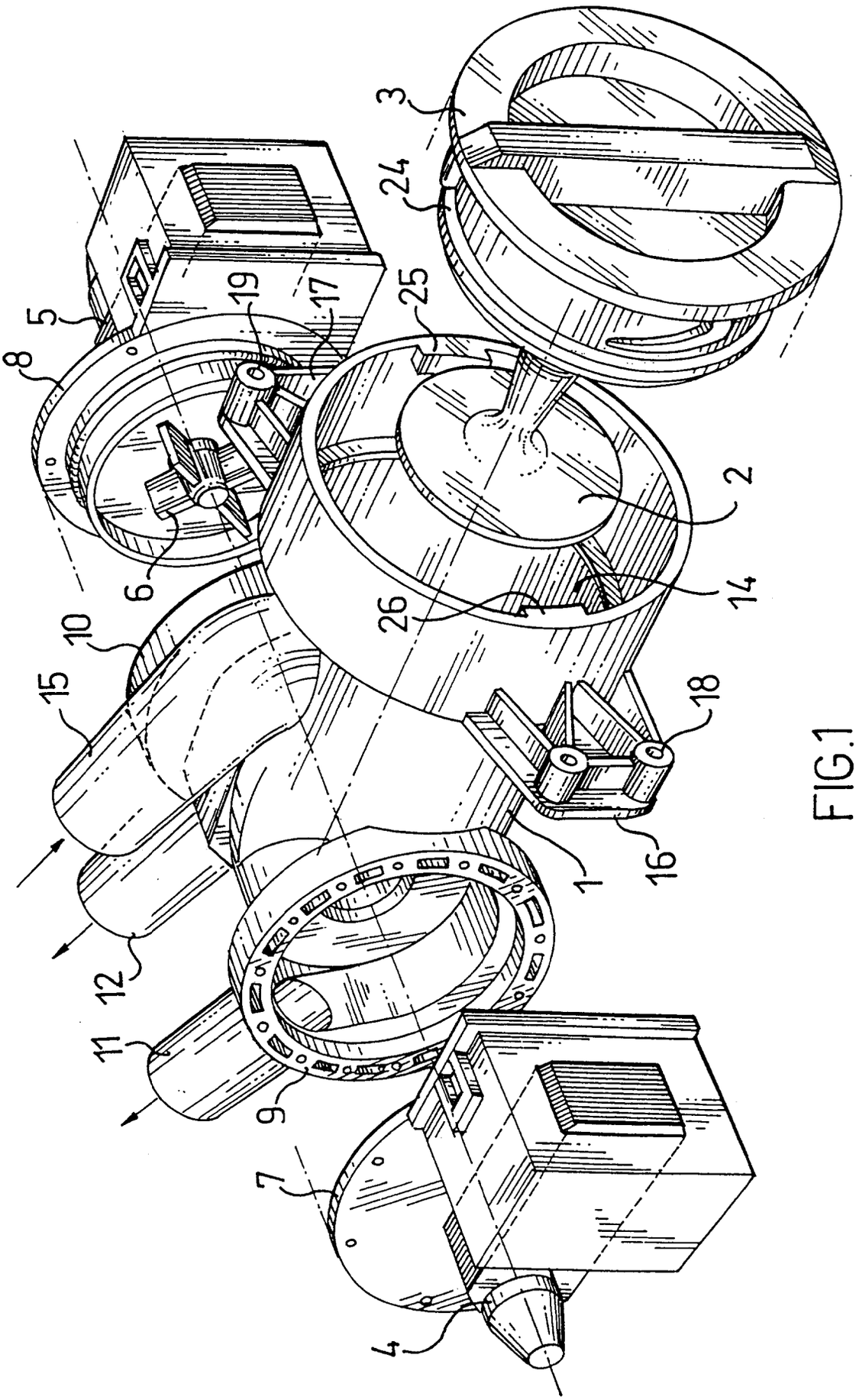

FIG.1

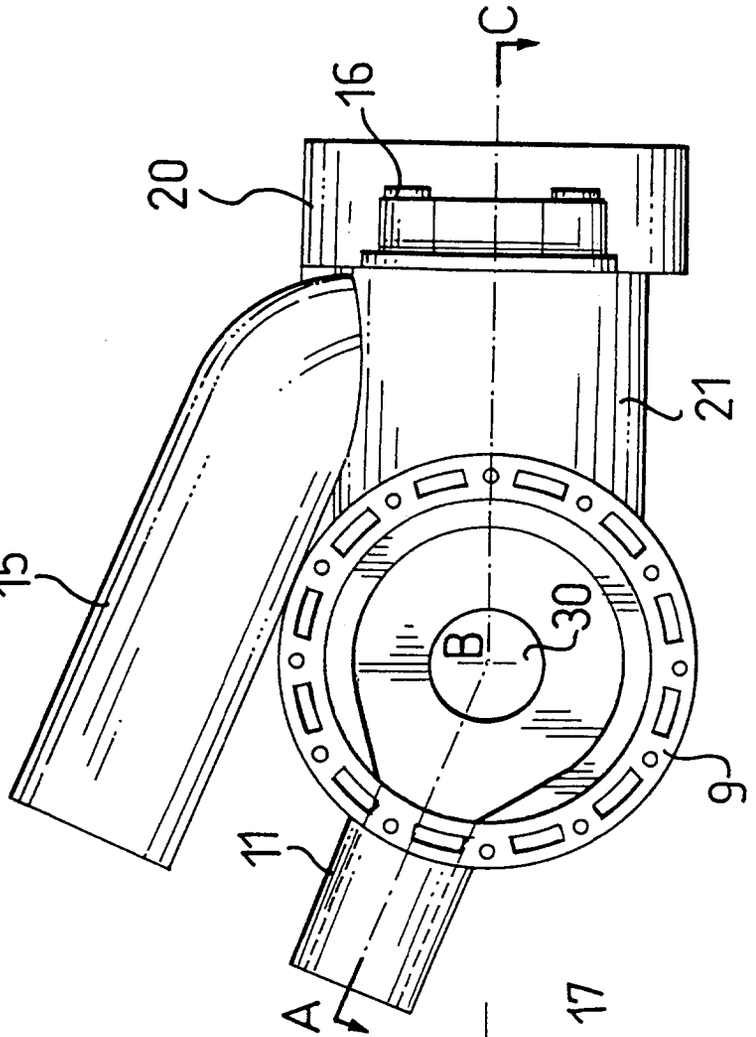

FIG.3

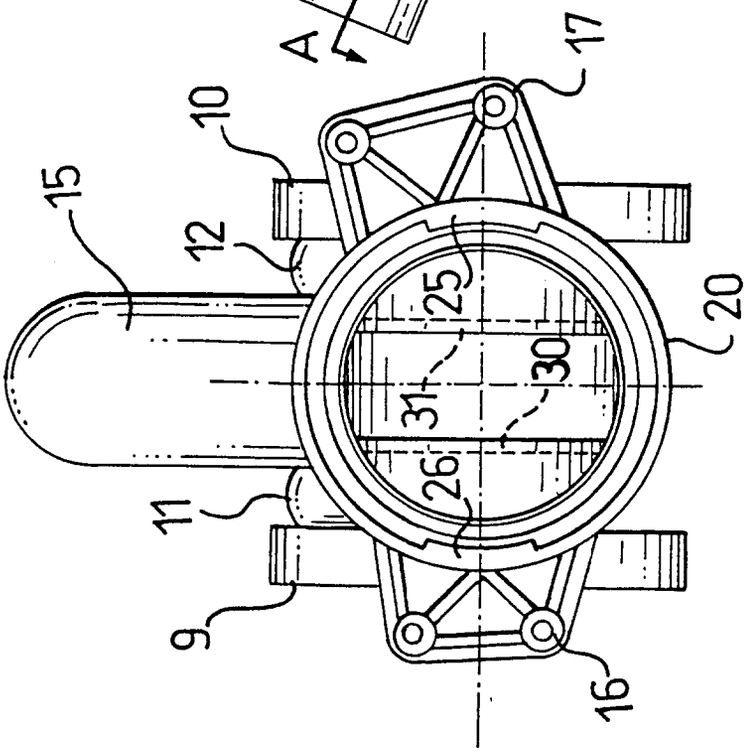

FIG.2

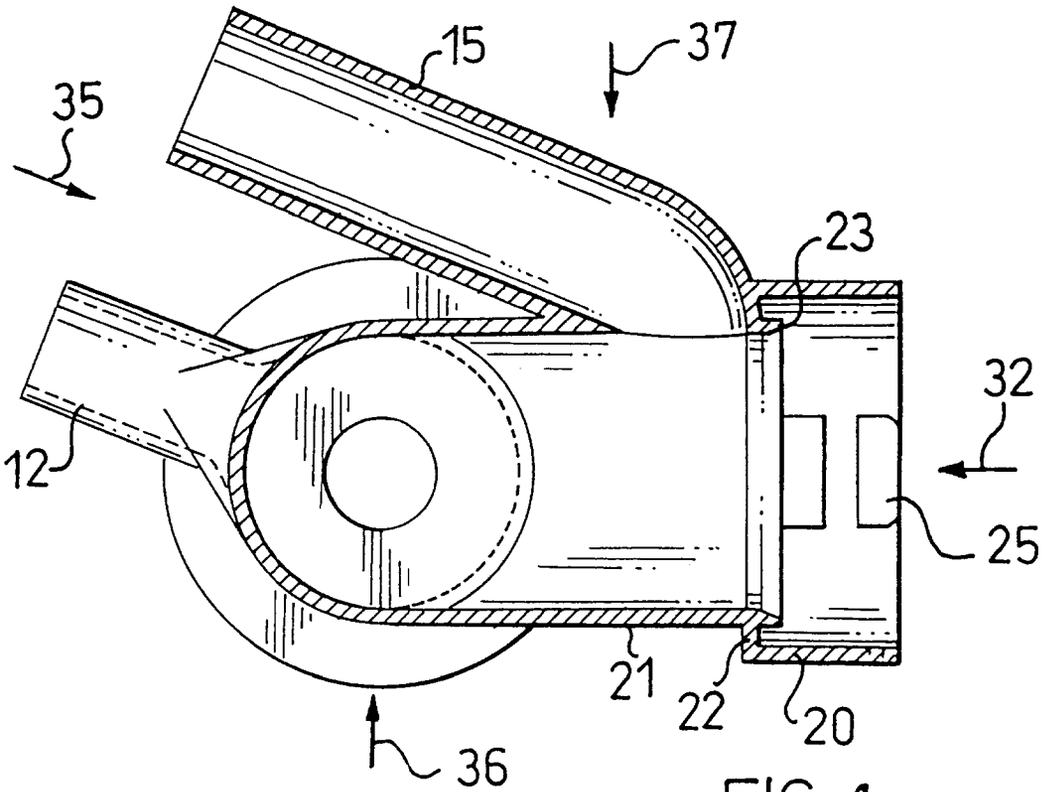
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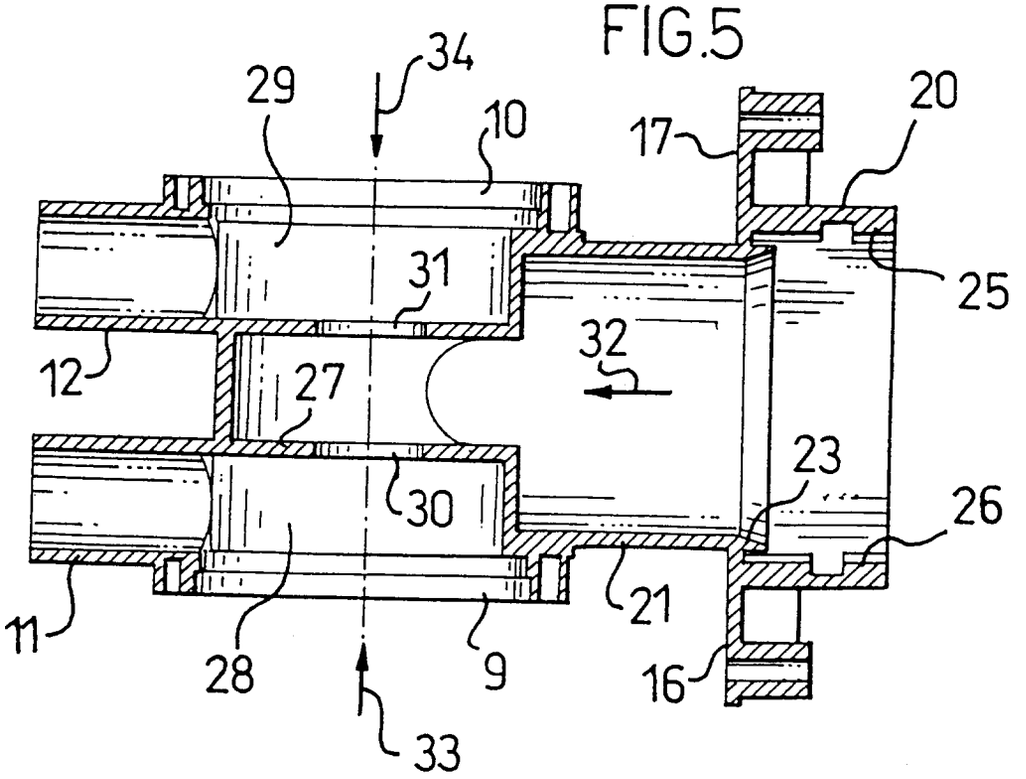
FIG.4

FIG.5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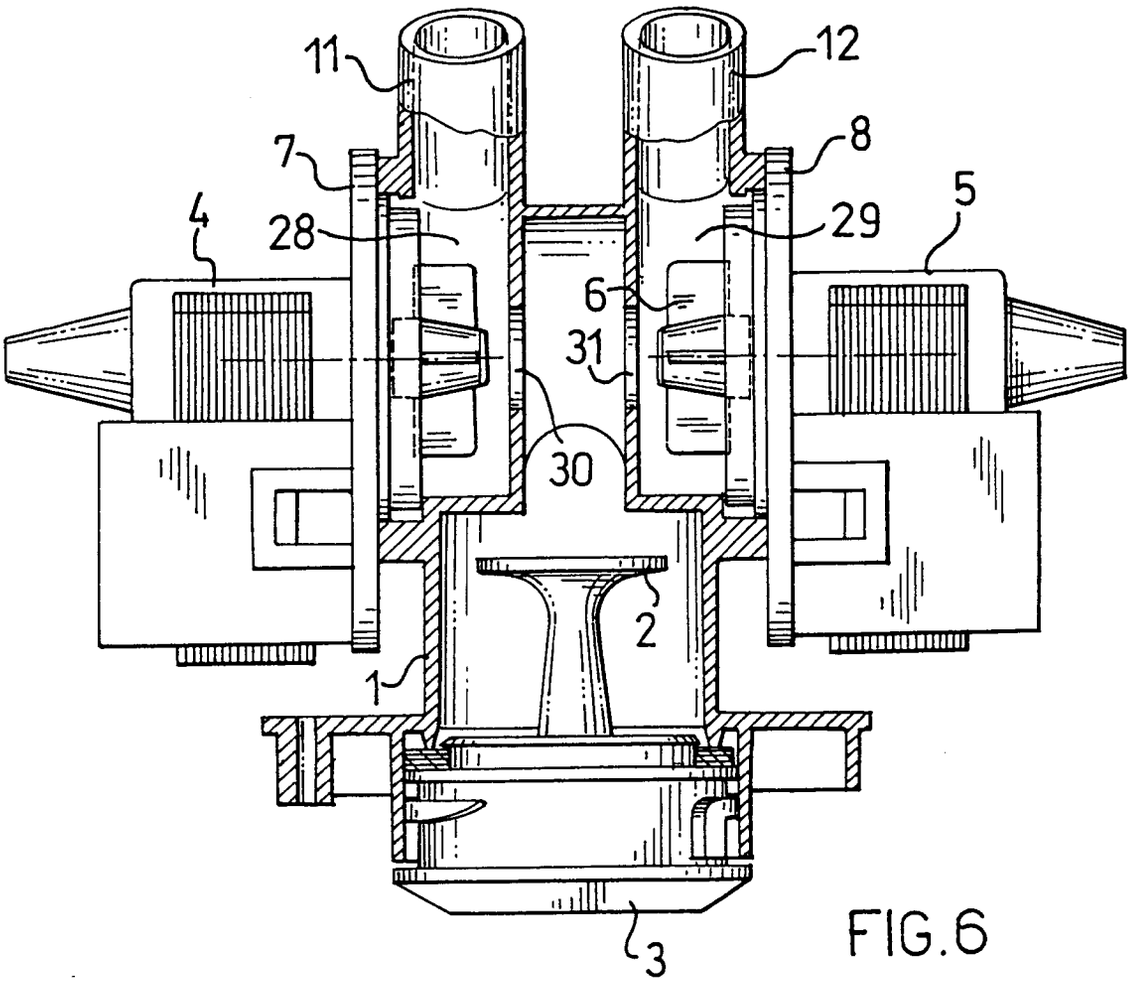

FIG.6

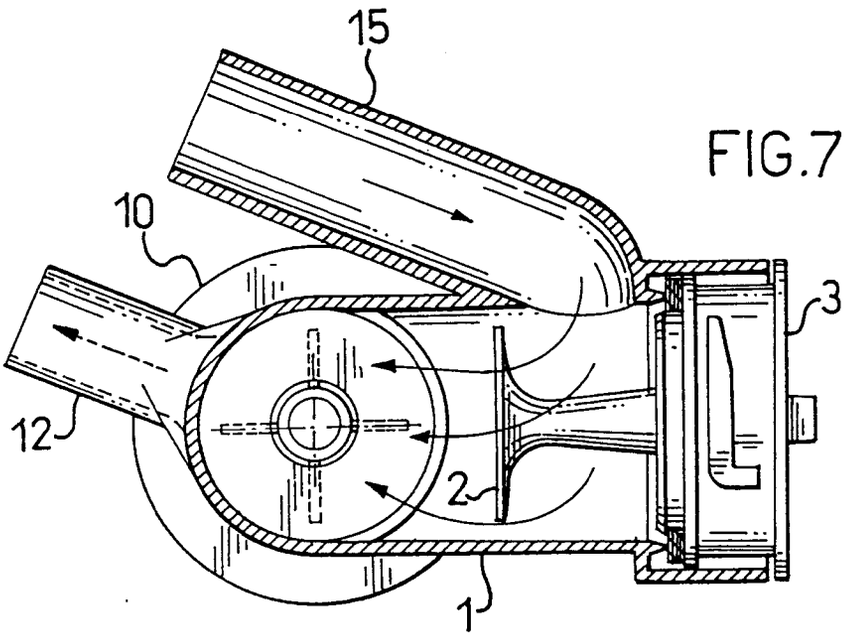

FIG.7