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54 Improvements in or relating to washing machines.

57 A washing machine includes a drum (3) formed by two portions (4, 5) joined together by undulating flanges (7) to form apertures around the join. The drum (3) is accommodated within a tub (8), rear portion (10) of the tub (8) being blow-moulded from plastics material and having leg portions (20, 27) integrally moulded therewith, to provide support for the tub (8). The rear wall of rear portion (10) may be provided with radial ridge members (24, 25) radiating from central hub (26) around main bearing (14) for the drum (3).

Front tub portion (9) is formed with a water outlet (11), which is connected to a sump tank assembly. Coinciding drum opening (6) and tub opening (12) are closed by a glass door (13).

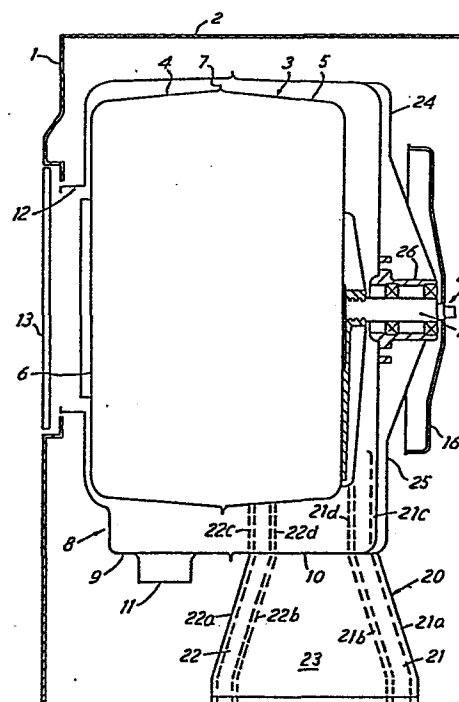


Fig.1

: 1 :

IMPROVEMENTS IN OR RELATING TO WASHING MACHINES

This invention relates to washing machines.

Washing machines are generally provided with an inner drum having an opening so that clothes to be washed may be placed thereinto. The drum generally has a number of holes provided
5 in the surface thereof to allow water to enter the drum, or to drain therefrom, during certain stages of the wash programme.

However, it may prove relatively time-consuming, and thus expensive, to machine the holes required in the drum during manufacture of the washing machine.

10 Furthermore, most domestic washing machines known hitherto tend to be relatively large, having a load capacity of at least 4.5 kgs., thereby causing the machine to accommodate a substantial amount of space, which may not be particularly desirable.

15 It is therefore an object of the present invention to provide a relatively compact washing machine, which is substantially easier to manufacture than those provided heretofore.

20 According to one aspect of the invention there is provided a washing machine including a drum for accommodating clothes to be washed, apertures being provided in the surface of the drum to permit water to flow into, and out of, the drum,

characterised in that said drum is formed from a first and a second portion, adjoining circumferential edges of each of said portions being shaped to form co-operating flange members to be joined together during manufacture of the machine, thereby
5 causing said portions to be joined, said flange members being shaped so as to define said apertures when said portions are so joined.

Preferably, the flange members are each shaped into an undulating configuration.

10 According to a second aspect of the invention there is provided a washing machine as set forth in one of the two preceding paragraphs, including a static tub within which said drum is housed for rotation, said tub being provided with leg portions so as to render the tub substantially free-standing and
15 self-supportive.

A rear portion of the tub is preferably blow-moulded from a plastics material, the leg portions being integrally moulded therewith and the rear wall of the tub is preferably shaped, such as with a number of radial ridge members, so as to
20 strengthen the plastics portion thereof.

The rear portion of the tub is also preferably provided with one or more weights mounted thereon, so as to aid in maintaining the tub in a static condition, whilst the inner drum is rotating, during operation of the washing machine.

25 The washing machine preferably includes a sump tank assembly comprising a sump tank for collecting water from said drum, the tank acting as a water filter, and including pressure sensing and switching means for sensing the level of water within the tub and for causing the washing machine to implement
30 a subsequent operation in a set wash program when the level reaches a predetermined height.

The washing machine is also preferably provided with a one-piece glass door having a coloured screen on the inside surface thereof, a central portion of the surface being left
35 transparent, the portion coinciding with an opening to the drum

for insertion of clothes thereinto.

The invention will now be further described by way of example only with reference to the accompanying drawings, wherein:-

- 5 Figure 1 shows a sectional view of a major part of the washing machine, in accordance with the invention,
 Figure 2 shows a side view of a drum therefor,
 Figure 3 shows a view in the direction of arrow "A" in Figure 2,
- 10 Figure 4 shows a rear view of the tub, in accordance with one embodiment of the invention,
 Figure 5 shows a part section and part side view along line "B-B" in Figure 4,
 Figure 6 shows a front view of the tub,
- 15 Figure 7 shows a top view thereof,
 Figure 8 shows a plan view of a sump tank assembly and,
 Figure 9 shows a sectional view along the line "Y-Y" in Figure 8.

Referring to Figure 1, a housing for a washing machine
20 includes a front panel 1 and a top panel 2. There is provided, within the housing, a drum 3 formed of two half portions, 4 and 5, portion 4 having a circular opening 6, through which clothes to be washed can be inserted into the drum 3. Portions 4 and 5 are joined together by alternate portions of an undulating
25 flange, one such portion being shown at 7, spaced around the circumference of the drum 3, forming apertures (not shown) therebetween. This feature is described in greater detail hereinafter.

The drum 3 is contained within a tub 8, which also consists
30 of two portions 9 and 10. Back portion 10 may be blow-moulded from a plastics material and front portion 9 may be made from a stainless steel for holding other components (not shown), such as a heater to heat water in the drum 3, thermostat, etc.

Front tub portion 9 also has formed therein a water outlet
35 11, which is connected to a sump tank (not shown in Figure 1),

and an opening 12, arranged to coincide with opening 6 of the drum 3.

The two openings, 6 and 12, through which clothes may be inserted into the drum 3, are closed by a one-piece glass door 13 having a coloured screen (not shown) on the inside surface thereof, a circular central portion, which coincides with the two openings, 6 and 12, being left transparent, so that the inside of the drum 3 is visible.

Hinges and a catch (not shown) for the door 13 are secured by a fixing through holes bored in the glass, the design of the hinges permitting the door 13 to open through 180° , thereby avoiding the risk of fracture of the door 13 which might arise if it were constrained to open at an angle of substantially 90° to the front panel 1.

The main bearing for the drum 3 is shown generally at 14, the drum 3 being connected to a spindle 15, which is connected to a circular rotatable member 16. Member 16 has a belt (not shown) secured around its circumference, the belt being driven by a motor (also not shown) of conventional construction, thereby providing rotation of member 16 and consequently of the drum 3, during operation of the machine, the tub 8 remaining stationary.

The drum 3 is also preferably provided with three plastics paddles (not shown) which are intended to be clipped into the inner surface of the drum, so as to agitate or move the clothes whilst they are being washed therewithin.

Figure 2 shows a side view of front portion 4 of the drum 3, showing the opening 6 thereinto. The circumferential edge of the drum portion 4 is corrugated, during manufacture, so as to produce an undulating flange 17 having alternate portions either at a first level substantially perpendicular to the surface of the drum portion 4, such as 18, or at a substantially lower level to the edge, such as at 19.

Figure 3, which is a view in the direction of arrow "A" in Figure 2, also shows the undulating flange 17, around the

circumferential edge of the drum portion 4, having alternate portions, 18 and 19, at their respective levels.

The circumferential edge of the drum portion 5 is correspondingly corrugated to form an undulating flange substantially identical to that shown in Figures 2 and 3, with respect to drum portion 4.

During manufacture of the drum 3, the two drum portions 4 and 5 are joined together by spot-welding the corresponding flange portions 18 on each drum portion 4 and 5. This causes each of the two corresponding flange portions 19, which are consequently disposed side-by-side, to form apertures around the joining edge of the drum, alternately positioned between the spot-welded 18 of the undulating flange 17.

As shown in Figure 1, the tub 8 is preferably supported at the rear portion 10 by leg portions, one being shown generally at 20, which consists of two legs 21 and 22, joined together by a common back plate 23. The legs, 21 and 22, comprise flanges, 21a and 21b, and, 22a and 22b, extending out orthogonally from the backplate 23. Flanges 21a, 21b, 22a and 22b extend upwardly around the circumference of the tub, into flanges 21c, 21d, 22c and 22d, respectively, so as to cradle the base portion of the tub on one side thereof.

Figure 1 also shows a number of ridges, two being shown at 24 and 25, which radiate outwardly from the central hub 26.

The rear portion 10 of the tub 8 is preferably injection-moulded from a plastics material, so that the radial ridges 24 and 25 strengthen the back of the tub and the leg portions, one being shown at 20, which are preferably integrally moulded with the portion 10, provide support therefor.

Figures 4 to 7 show various views of the rear portion 10 of the tub 8, illustrating the major features thereof. The rear end, shown in Figure 4, is provided with a number, preferably seven, of radial ridges, two being shown at 24 and 25, which radiate from the central hub 26, so as to strengthen the back of the tub portion 10, four of these being integrally formed with

the leg portion 20 and a second leg portion 27. Brackets 28 and 29 which are mounted at the top rear end of the portion 10 are for mounting a removeable detergent dispenser and one or more weights, respectively. The weights assist in maintaining the tub 8 in a static condition, whilst the drum 3 is rotating during operation of the washing machine.

Figure 5 shows a flange 30 which is provided around the periphery of the open end of the portion 10 and also shows two housings 31 and 32, which are provided adjacent the sump tank outlet 11, for accommodating temperature sensors, to provide control of the temperature of the water within the machine.

The leg portion 27 consists of a back plate 33 and two orthogonally-disposed flanges, 34 and 35, which extend upwardly, around the circumference of the tub, into flanges, 34a and 35a, so that these flanges cradle the opposite side of the tub to the flanges 21c, 21d, 22c and 22d.

Figure 6 shows the open end of the portion 10 that joins with the front portion 9 to form the complete tub 8.

Figure 7, which illustrates a top view of the portion 10, shows a removeable detergent dispenser 36, which may be arranged to dispense powder and/or liquid detergent into the drum 3.

In the preferred arrangement, as shown, the portion 10 is provided with three legs 21, 22 and 27, which co-operate with each other so as to balance the tub 8, should it be positioned on an uneven surface. However, any number of legs may be employed, in accordance with the invention.

Referring now to Figure 8, there is shown a plan view of a sump tank assembly for the washing machine. A sump tank 37 is provided with a water inlet 38 and a water outlet 39. A diaphragm fixing plate 40 is held in place by four self-tapping screws or rivets, one shown at 41, and has a microswitch mounting 42 spot-welded thereon. A microswitch 43 is mounted on the mounting 42 so that, when the level of water within the tub 8 reaches a predetermined level, the microswitch 43 is actuated, thereby permitting a set wash program for the washing

machine to continue.

A sectional view of the sump tank assembly is shown in Figure 9. A base plate 44 and the sump tank 37 are sealed together by means including a rolled edge, at 51, and the outlet
5 tube 39 is formed with an aperture 50.

Below the diaphragm fixing plate 40 is a diaphragm 46 which is bonded to a diaphragm plate 47, this plate being in contact with an operating screw 45, which contacts a lever 48.

Consequently, when the water level within the sump tank 37
10 reaches a level which causes the diaphragm 46 to move, the operating screw 45 causes lever 48 to actuate the microswitch 43, thereby allowing the wash program to continue. When a drain pump (not shown) is actuated at a certain stage in the program the water level in the sump tank 37 will only be caused
15 to drop to just below the aperture 50, thereby ensuring that there is a constant minimum amount of water within the sump tank in which sediment can collect.

Adjusting nut 49 is included, to tighten or slacken the screw 45 which consequently compresses or releases a spring 52,
20 so as to provide adjustment of the pressure at which the microswitch 43 is actuated.

In operation of the washing machine, in accordance with the present invention, clothes to be washed are placed in the drum 3 and, during the wash programme, water is pumped into tub 8 and
25 flows into the sump tank 37 and the drum 3, through the apertures disposed around the circumference of the drum, until a water level is reached at which the microswitch 43 is actuated. The water is subsequently heated in the drum to wash the clothes, the drum being rotated by the motor and the clothes
30 being agitated by the paddles therewithin.

During a stage in the programme at which water is expelled from the drum 3, such as at the end of washing or during spinning, the water passes from tub 8 into the sump tank 37, via outlet 11 and inlet 38, and flows out of outlet 39 until the
35 water level is just below the level of the aperture 50, thereby

ensuring that any sediment present in the water remains in the sump tank 37, hence protecting the pump (not shown) which is connected to the outlet 39.

5 A further feature, which may be incorporated within the present invention, is an electronic switch, such as a mercury switch, for detecting undesirable movement of the machine, due to uneven distribution of the clothes contained therein, and consequently for causing the machine to stop and to revert to a distribution mode in the programme, so as to attempt to
10 re-distribute the clothes. Furthermore the switch can cause the machine to stop if it were overturned, or substantially tilted.

Preferably, the washing machine, in accordance with the invention, is intended to hold a load of approximately 2.7 kgs.
15 and to have a full programme capability, either under mechanical or microprocessor control. The spin speed is preferably approximately 500 or 550 revolutions per minute and the drum is filled with cold water only, which is subsequently heated therewithin.

20 There is also preferably provided a conventional air break to prevent back pressure on the water line.

As an alternative to the ridged design at the rear end of the portion 10, which strengthens the tub 8, a series of alternate protruding segments may be provided, so as to produce
25 a "greek fret" design around the periphery of the rear end.

A supportive "A" frame (not shown) may be provided, upstanding from the base at the rear of the machine, to aid in providing support for the main bearing 14.

It can therefore be envisaged that the present invention
30 provides a compact washing machine, which can be manufactured relatively quickly and easily, and thus relatively inexpensively, the additional feature of a substantially free-standing and self-supportive tube obviating the need for a strong, supportive outer casing by which the tub is
35 conventionally supported.

CLAIMS

1. A washing machine including drum (3) for accommodating clothes to be washed, apertures being provided in the surface of the drum (3) to permit water to flow into, and out of, the drum (3), characterised in that said drum (3) is formed from a first
5 (4) and a second (5) portion, adjoining circumferential edges of each of said portions (4,5) being shaped to form co-operating flange members (17) to be joined together during manufacture of the machine, thereby causing said portions (4,5) to be joined, said flange members (17) being shaped so as to define said
10 apertures when said portions (4,5) are so joined.

2. A washing machine as claimed in Claim 1 wherein said flange members (17) are each shaped into an undulating configuration.

3. A washing machine as claimed in Claim 1 or 2 including
15 a static tub (8), within which said drum (3) is housed for rotation, said tub (8) being provided with leg portions (20,27) so as to render the tub (8) substantially free-standing and self-supportive.

4. A washing machine as claimed in Claim 3 wherein a rear
20 portion (10) of said tub (8) is blow-moulded from a plastics material, said leg portions (20,27) being integrally moulded therewith.

5. A washing machine as claimed in Claim 3 or 4 wherein a rear wall of said tub (8) is provided with a number of radial
25 ridge members (24,25).

6. A washing machine as claimed in Claim 3, 4 or 5 wherein said tub (8) is provided with one or more weights mounted thereon to aid in maintaining said tub (8) in a static condition, during rotation of the drum (3).

30 7. A washing machine as claimed in any preceding claim including a sump tank assembly comprising a sump tank (37) for collecting water from said drum (3), the tank (37) acting as a water filter, and including pressure sensing and switching means

(40, 43, 45-49, 52) for sensing the level of water within the tub (8) and for causing the washing machine to implement a subsequent operation in a set wash program when the level reaches a predetermined height.

- 5 8. A washing machine as claimed in any preceding claim including a one-piece, glass door (13) having a coloured screen on the surface thereof, a central portion of said surface being left transparent, said portion coinciding substantially with an opening (6) to the drum (3) for insertion of clothes therein.

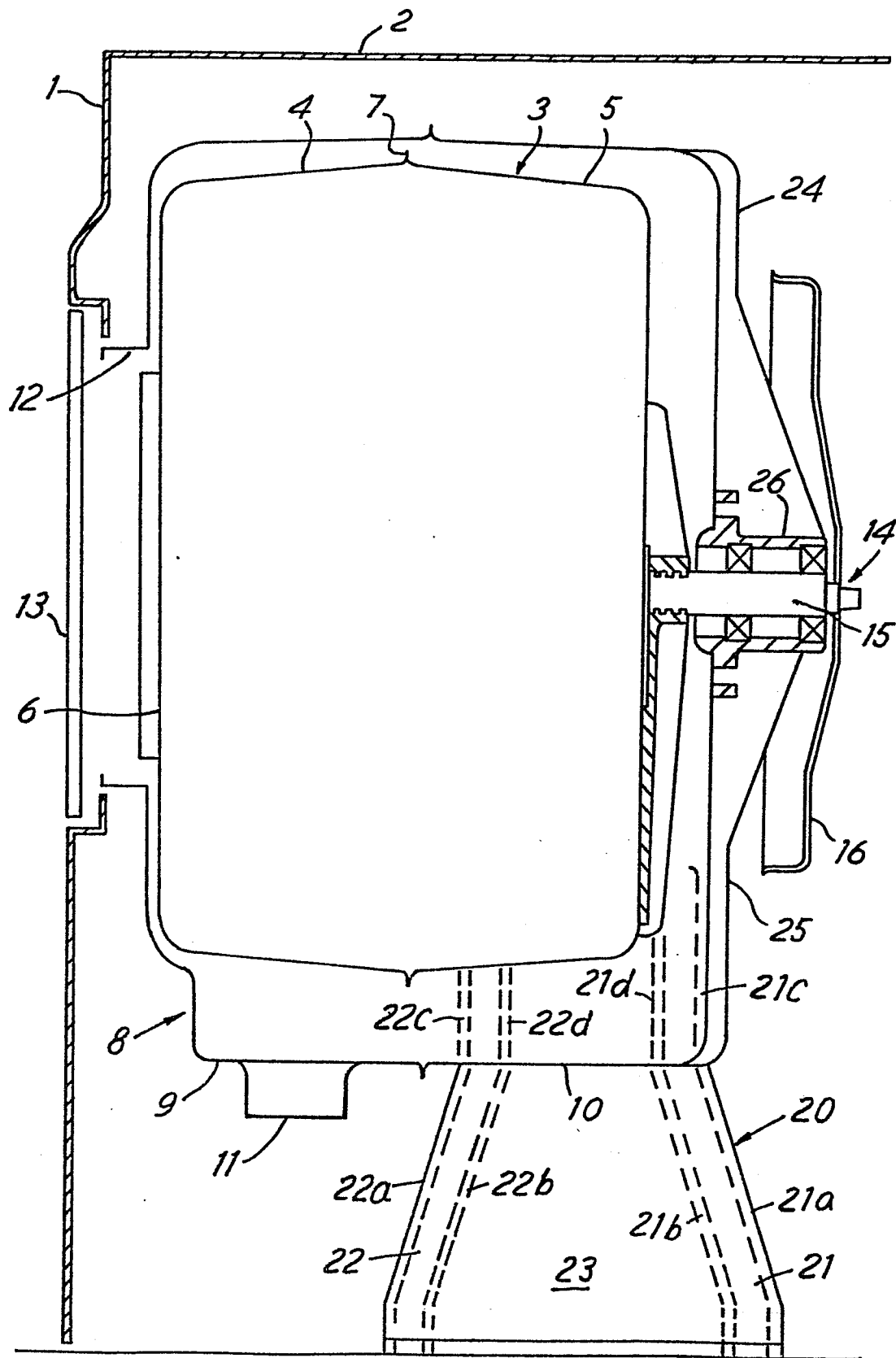
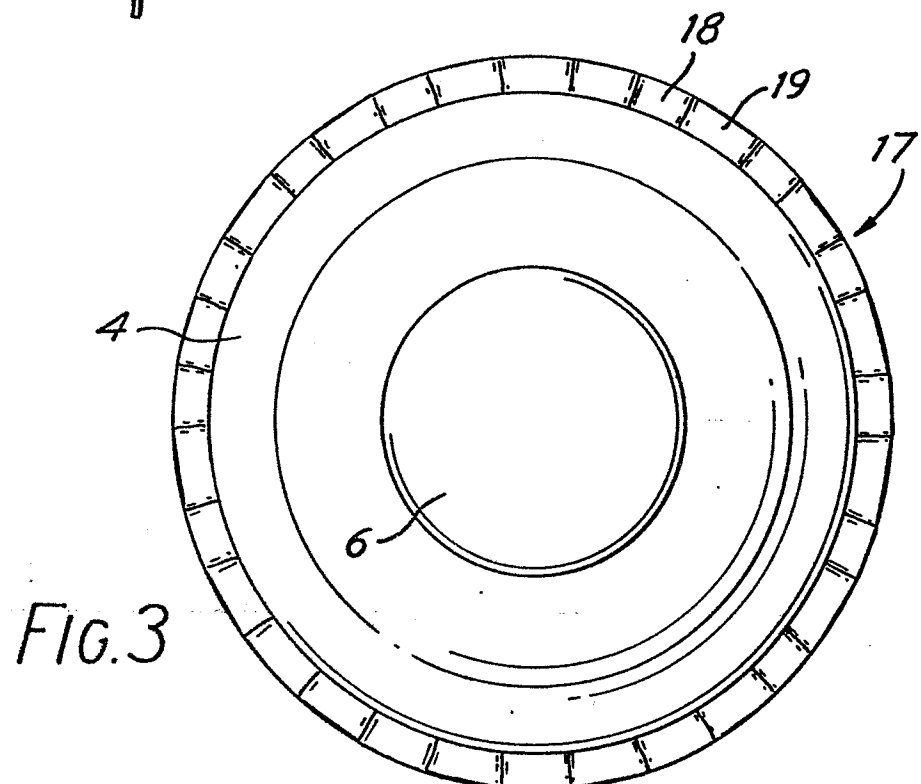
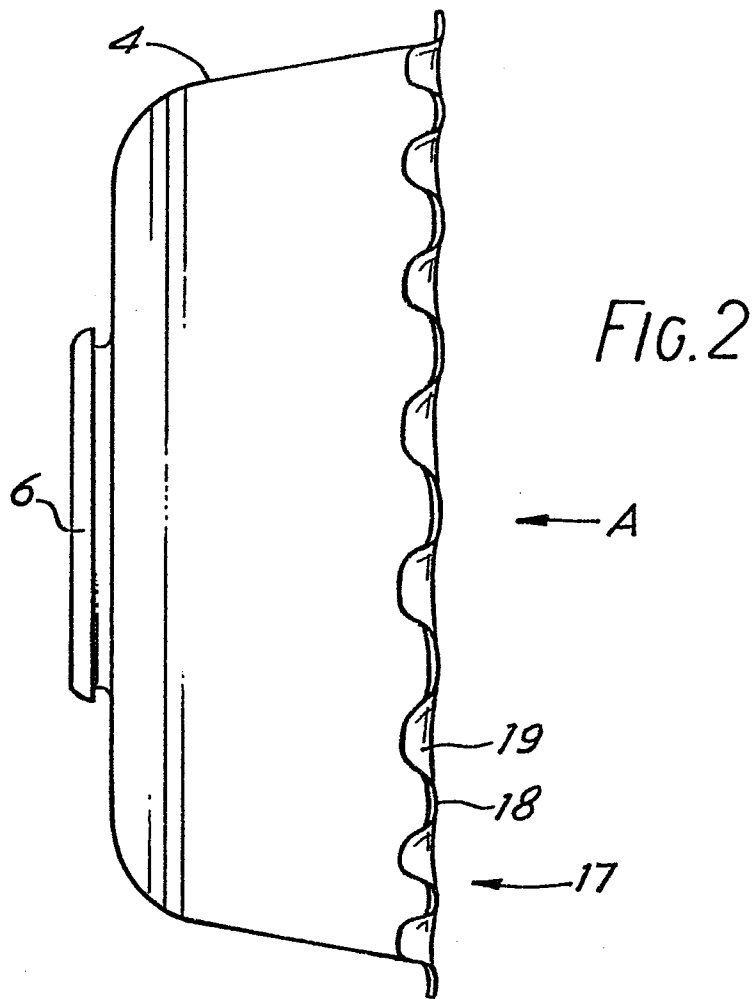
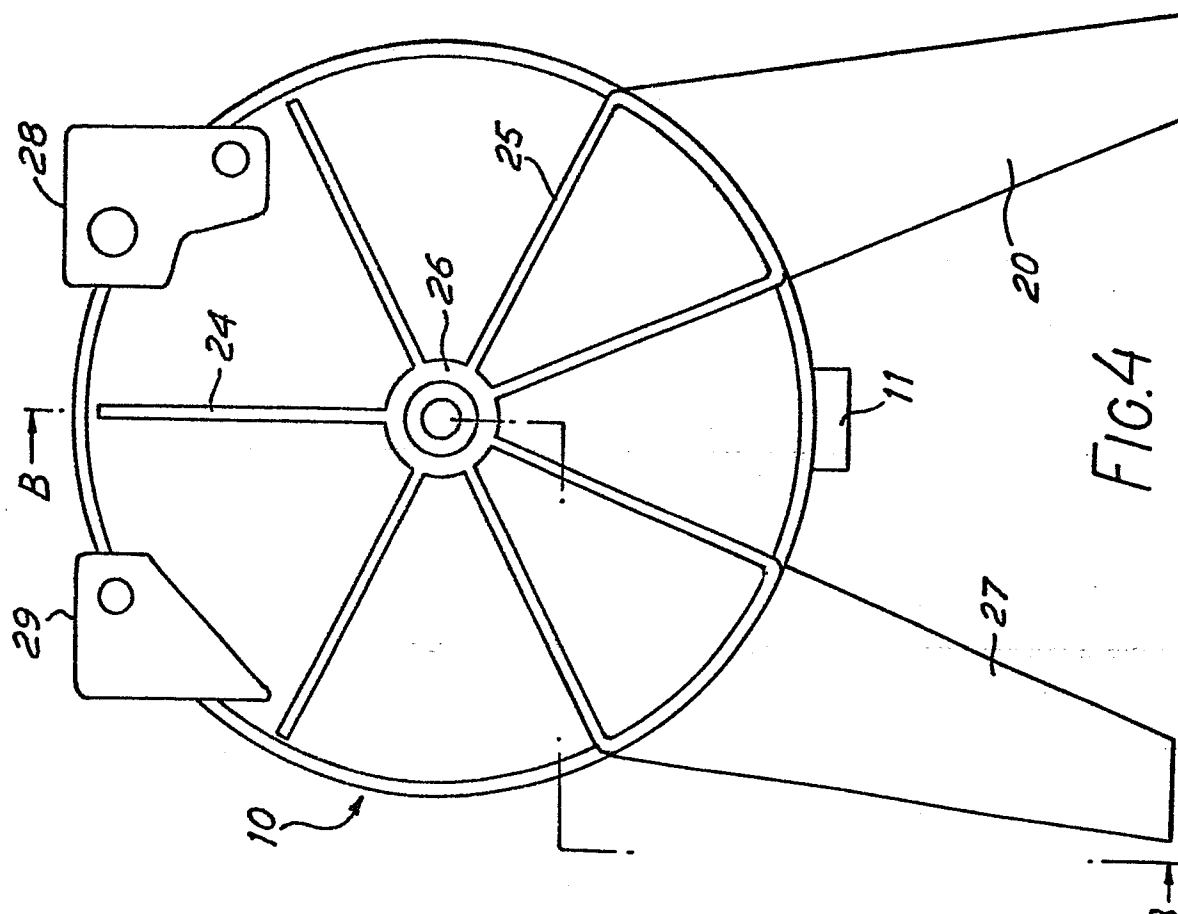
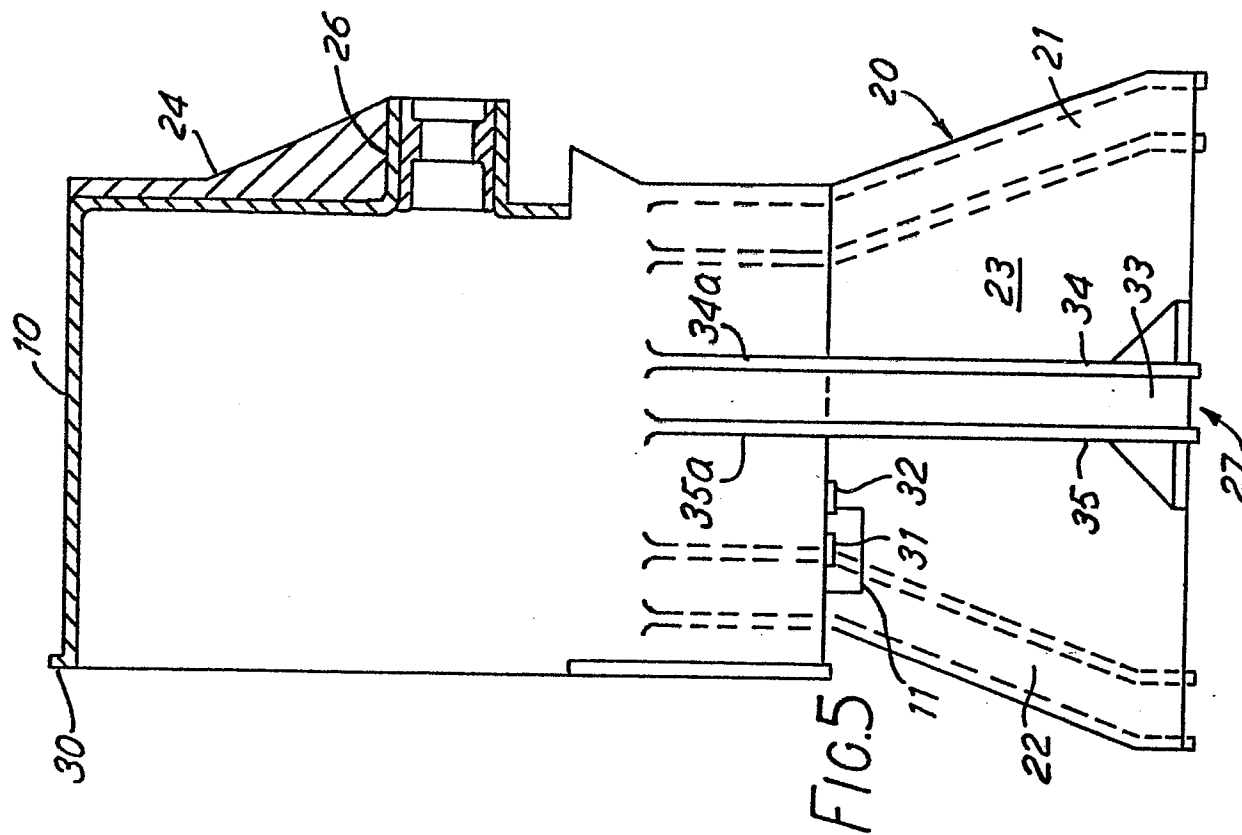


FIG. 1





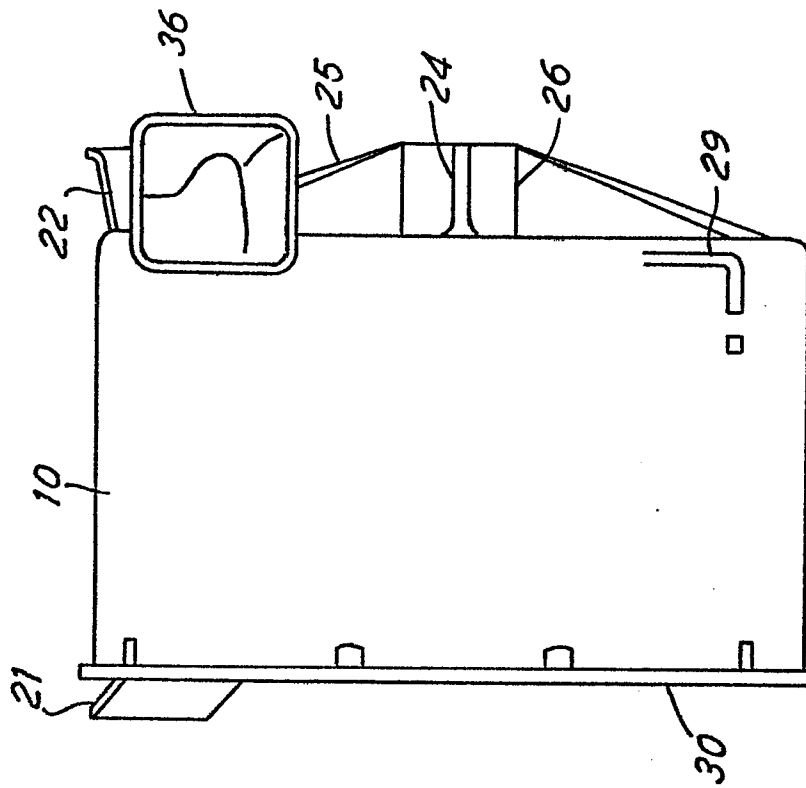


FIG. 7

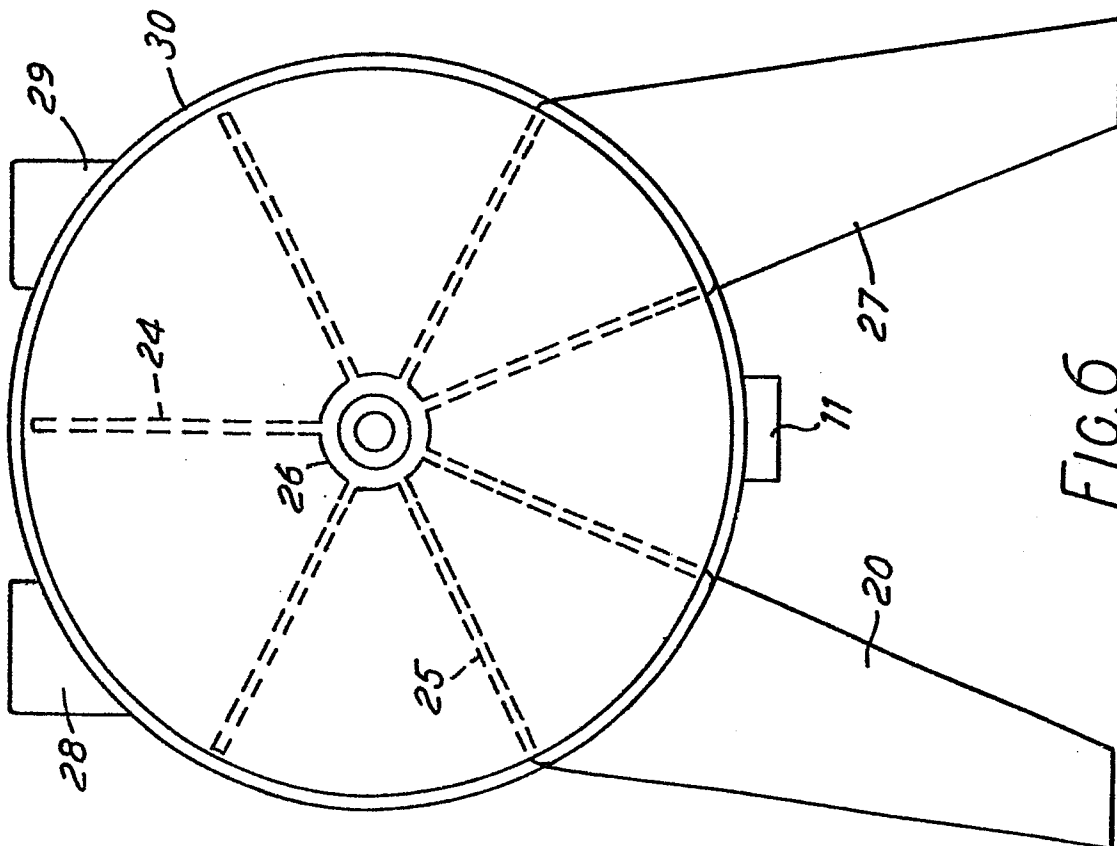


FIG. 6

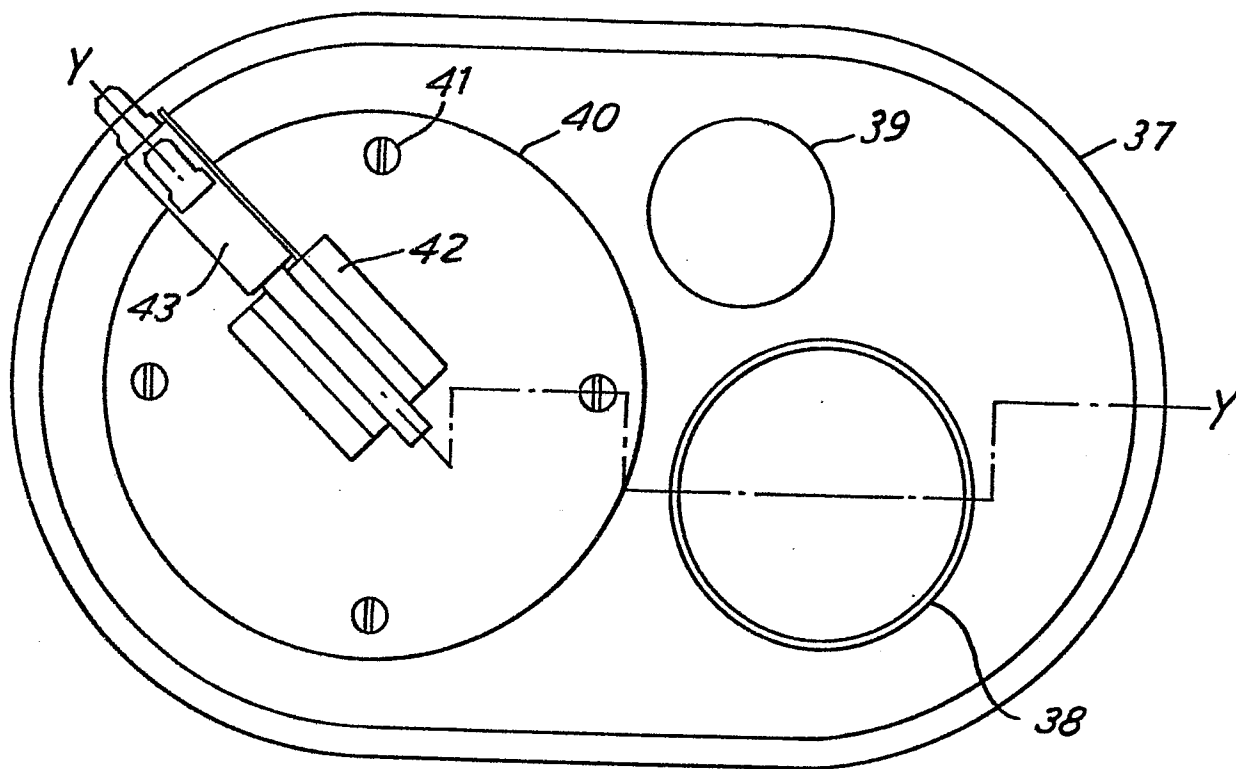


FIG. 8

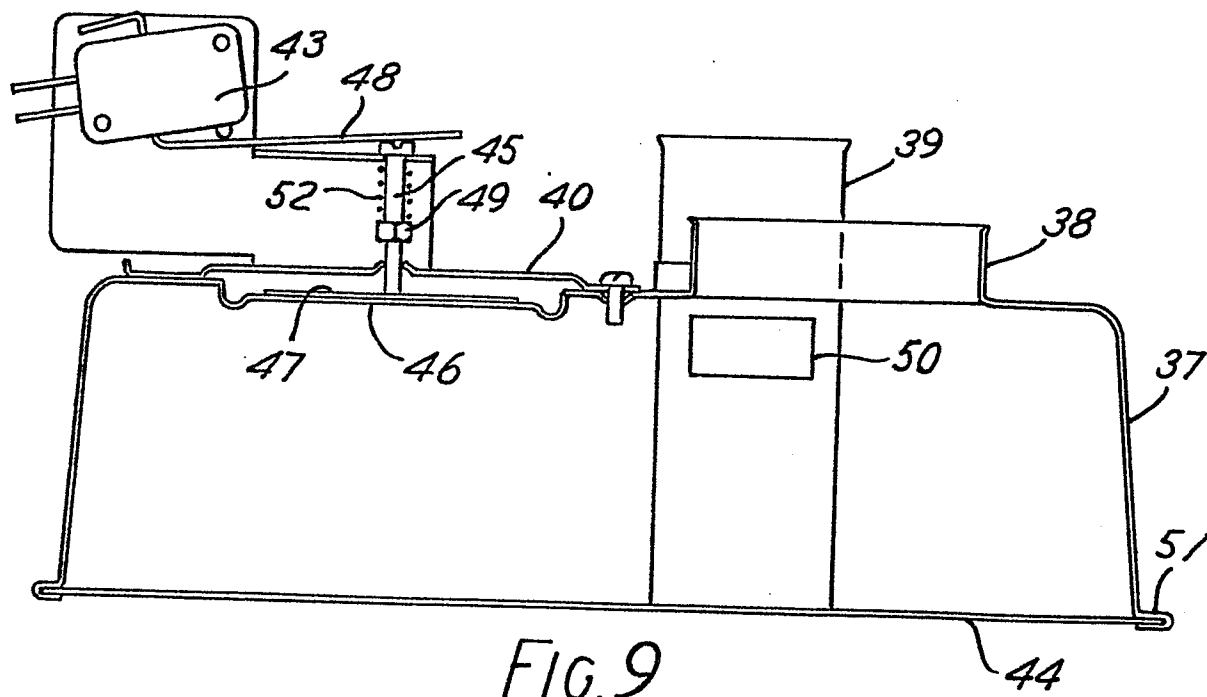


FIG. 9