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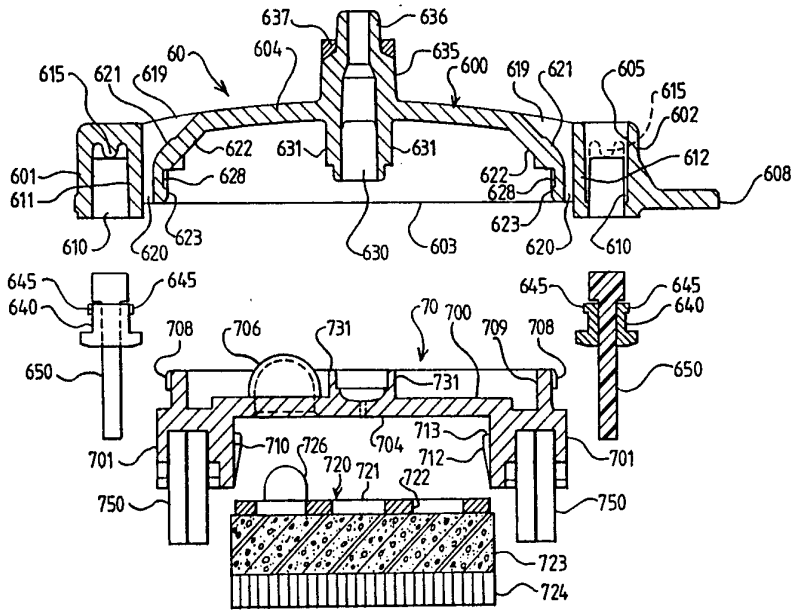
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(54) Title: APPLICATOR HEAD FOR SURFACE CLEANING APPLIANCES



(57) Abstract

A cleaning head (50) for a floor cleaning appliance is provided with a plurality of interchangeable cartridges (60; 90; 90A; 90B) to enable different types of cleaning operation to be carried out. One type of cartridge (60) may include interchangeable liquid applicators (70, 80) for assembly therewith. In alternative arrangement different cartridges (90) are each provided with different types of liquid applicator. The cleaning head (50) preferably includes a suction chamber (520) and suctions slots (620) are formed in the cartridge at opposite sides of the liquid applicator so as to pick-up liquid delivered to the surface being cleaned by the applicator. Squeegee blades (650) may be provided outwardly of the suction slots (620).

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Title:- "Applicator head for surface cleaning appliances"

Description of invention

This invention relates to appliances for use in surface cleaning operations wherein a cleaning liquid (which may be water or a suitable cleaning solution) is applied to a floor surface (afforded by a floor or a floor covering) or to other surfaces such as those afforded by walls or windows by means of a cleaning head. Such an appliances may also be operable to pick-up liquid by suction from the surface either simultaneously with the application thereof or separately so as to perform a drying operation, by means of the same, or a different, head.

It is usual for appliances used for dry suction cleaning (i.e. vacuum cleaners) to be provided with several interchangeable suction heads adapted for a variety of different types of cleaning operation, e.g. on hard surfaces and on carpets of varying pile height, as well as crevice tools and upholstery tools. However, wet cleaners tend to be specialised machines which are not readily adapted for different types of cleaning operation. For example, US Patent specification 2986764 shows a domestic wet suction cleaner having a single non-interchangeable suction head, and German Patent specification 1703220 shows a similar domestic suction cleaner with provision for dry and wet suction cleaning, but with only a single cleaning head associated with the wet cleaning set-up.

Only in more complex machines of a commercial/industrial type is the provision of interchangeable applicator assemblies for different types of wet cleaning processes contemplated. For example, US Patent specification 3316579 proposes the use of interchangeable "dollies" fitting beneath the motor drive unit to enable various rotary brushes or pick-up units to be fitted.

By contrast, the present invention seeks to provide a wet cleaning operation for a range of different types of floor surface in a simple and effective manner suitable for a primarily domestic type of appliance.

In accordance with the invention we provide a cleaning head for use with a cleaning appliance having means for delivering a cleaning liquid to said head, the cleaning head comprising a body having means for mounting the body

in an operative position at one end of a supporting member which affords a handle at the opposite end to enable the user to move the head over a surface, a liquid inlet for the supply of cleaning liquid and a liquid applicator to receive such liquid and allow it to be applied to the surface to carry out a cleaning operation thereon, characterised in that the body defines an open mouth which receives releasably therein a cartridge which is releasably coupled to the liquid inlet and comprises said liquid applicator.

The term "cartridge" is intended to mean an assembly comprising a body which is releasably secured within the body of the head by any suitable means providing for quick-release, such as one or more fasteners of a quick-release type, snap-catches operable by the user, or resilient latching means which yield in response to a predetermined force applied to the cartridge in the direction required to remove it from the head.

Several such cartridges comprising respective different liquid applicators may be provided for assembly interchangeably with the same cleaning head to enable the head to be used for a range of different cleaning operations, or alternatively the cartridge which is releasably received within the body may itself afford a housing which receives releasably therein a sub-cartridge comprising one of a plurality of said liquid applicators, adapted for different cleaning operations, again so as to enable the head to be used for a range of different cleaning operations.

Preferably, the cleaning head also defines a suction chamber which is provided with means for connection to a source of suction, and at least one suction opening for picking-up liquid. There may be one such suction opening in the form of a slot at opposite edges of the applicator, and preferably a respective squeegee blade is also provided adjacent to each suction slot at the side thereof further from the applicator.

When the cleaning head defines such a suction chamber, in one arrangement the cartridge may carry only the liquid applicator, the suction

openings being afforded by the cleaning head body and said squeegee blades, where provided, being carried by the cleaning head body.

Alternatively, in a preferred arrangement, the cartridge may carry not only the liquid applicator, but also the cartridge may afford said suction openings and carry said squeegee blades, where provided. In this case, several such cartridges comprising respective different liquid applicators may be provided for assembly interchangeably with the same cleaning head to enable the head to be used for a range of different cleaning operations, or alternatively the cartridge which is releasably received within the body may itself afford a housing which receives releasably therein a sub-cartridge comprising one of a plurality of said liquid applicators, adapted for different cleaning operations, again so as to enable the head to be used for a range of different cleaning operations.

The cartridge may include a flow restricting orifice and a liquid distribution duct which includes a plurality of outlets spaced across the width of the liquid applicator. Where different cartridges comprise different applicators, the rate of flow of liquid to the head may be controlled by said flow-restricting orifice in accordance with the characteristics of the specific applicator provided in each cartridge.

At least one of the liquid applicators may comprise a compressible pad of porous material having a facing layer. In one case the facing layer may be formed from a pile fabric comprising closely packed thin filaments, e.g. a plush material, as disclosed and claimed in our British Patent specification 2206478. Different applicators of this type may be provided with differing pile characteristics.

In another case the facing layer may comprise a hard looped fabric material for producing a scouring action.

Such an applicator may also include rows of bristles disposed at opposite edges of the pad, the facing layer of the applicator pad normally protruding beyond the ends of the bristles, which in use serve to limit inward compression of the porous material.

A further type of liquid applicator may comprise, instead of such pads, agitating means in the form of an array of bristles, conveniently in association with liquid retaining means at opposite edges of the array as described in our co-pending British Patent Application 9219500.7 filed 15th September 1992.

A still further type of applicator may comprise an open-mouthed liquid delivery compartment whereby liquid is applied directly onto the floor surface, and such an applicator may be incorporated into a cartridge which further includes a suction compartment surrounding the delivery compartment, or adjacent thereto on at least one side thereof, and one or more passageways extending between said suction compartment and the suction chamber within the head, to enable a cleaning operation to be performed on a carpet or other fabric surface. The suction compartment and delivery compartment may be constructed generally as shown and claimed in our European Patent specifications 0316848 or 0316849.

Such a cartridge may also include bristles and/or liquid retaining means on opposite sides of the delivery compartment.

An additional type of cartridge may be provided without a liquid applicator for the purpose of picking-up liquid or drying the floor surface, the cartridge in this case comprising either a suction chamber for use on fabric surfaces, or one or more suction slots in combination with squeegee blades for use on hard surfaces.

The invention further resides in a cleaning appliance incorporating such a cleaning head in combination with at least two interchangeable applicators.

The invention further resides in a floor cleaning appliance comprising a supporting member having at one end thereof a handle to enable the user to move the appliance over a floor surface, and at the opposite end thereof a cleaning head comprising a body having a liquid inlet, characterised in that the body of the cleaning head defines an open mouth having means for releasably receiving therein a cartridge comprising one of a range of interchangeable liquid applicators, and in that the range of such applicators provided includes at least

two of the following, a liquid applicator which comprises a compressible pad of porous material, a liquid applicator which comprises a compressible pad of porous material having a facing layer formed from a pile fabric comprising closely packed thin filaments, a liquid applicator which comprises a compressible pad of porous material having a facing layer formed from a hard looped fabric material for producing a scouring action, and a liquid applicator comprising agitating means in the form of an array of bristles.

Each of said liquid applicators may be incorporated into a respective cartridge so that a range of different cartridges is provided, and in this case the range may further include a cartridge incorporating an applicator comprising an open mouthed liquid delivery compartment, and/or a cartridge incorporating only means for picking-up liquid.

Alternatively at least one of said cartridges affords a housing which receives releasably therein a sub-cartridge comprising one of a plurality of said liquid applicators, each adapted for a different type of cleaning operation.

The invention further resides in a floor cleaning appliance comprising a supporting member having at one end thereof a handle to enable the user to move the appliance over a floor surface, and at the opposite end thereof a cleaning head comprising a body having a liquid inlet, characterised in that the body of the cleaning head defines an open mouth having means for releasably receiving therein one of a range of interchangeable cartridges, and in that the range of said cartridges provided includes at least two of the following, a cartridge incorporating a liquid applicator which comprises a compressible pad of porous material, a cartridge incorporating a liquid applicator which comprises a compressible pad of porous material having a facing layer formed from a pile fabric comprising closely packed thin filaments, a cartridge incorporating a liquid applicator which comprises a compressible pad of porous material have a facing layer formed from a hard looped fabric material for producing a scouring action, a cartridge incorporating a liquid applicator comprising agitating means in the form of an array of bristles, a cartridge incorporating a liquid applicator

comprising an open mouthed liquid delivery compartment, and a cartridge incorporating only means for picking-up liquid.

These and other features of the invention will be described by way of example with reference to the accompanying drawings wherein:-

FIGURE 1 shows in side view one embodiment of a floor cleaning appliance in accordance with the invention;

FIGURE 2 shows a top plan view of a cleaning head forming part of such appliance;

FIGURE 3 shows a front elevation of the head having in position therein a cartridge for use in cleaning and drying a floor, partly broken away and partly in section;

FIGURE 4 shows a top plan view of the cartridge partly broken away to show a sub-cartridge therein;

FIGURE 5 shows a vertical section on the line V-V of Figure 4 on a larger scale and with component parts thereof shown prior to assembly with one another;

FIGURE 6 shows an underneath plan view of the cartridge partly broken away;

FIGURE 7 shows an end view of the cleaning head with a cover member in position.

FIGURE 8 shows a vertical section on the line VIII-VIII of Figure 2 with the cartridge shown within the body of the head and with an alternative sub-cartridge in position;

FIGURE 9 shows a partial vertical section through the cleaning head with a further form of cartridge in place having a further form of applicator for use on carpets and other fabrics;

FIGURE 10 is a view similar to Figure 9 showing an alternative cartridge of the form shown in Figure 9 for drying carpets or other fabrics; and

FIGURE 11 is a view similar to Figure 9 showing a further alternative cartridge of the form shown in Figure 9 for drying floors or other hard surfaces.

A suction cleaner embodying the present invention, as illustrated in Figure 1 by way of example, includes a body 10 comprising a rear casing 110, an upper front casing 120 and a lower front casing 125 which in combination define a housing for the various operative components, including a motor/impeller unit 100 which provides a source of suction to draw air through a suction duct 180 and into an air/liquid separator and valve assembly 20. The casing components also define at the upper end of the body a handle 130 which is equipped with an electrical switch 131 to control energisation of the motor, and a trigger 132 which is coupled by means of a mechanical linkage system indicated diagrammatically at 133 to control the operation of a delivery valve 340 whereby a cleaning liquid can be dispensed from a removable container 30, by way of a delivery pipe 280 to a suction head 50 which is mounted by means of a swivel joint 40 within a lower extension 140 of the rear casing 110. The suction head 50 includes a removable cartridge 60 whereby liquid delivered through pipe 280 can be applied to a floor surface to be cleaned. The suction head 50 also includes suction slots which communicate with the suction duct 180 whereby the floor surface may be dried.

The container 30 is removably located within an open-fronted recess 150 and affords an inner compartment 350 which is connected to the air/liquid separator and valve assembly 20 to receive recovered water, and engages abutment ribs 213 to facilitate pivotal movement of the lower end of the container 30 into the lower end of the recess 150.

For the purposes of the present invention, the provision for collecting recovered liquid is not essential and only the liquid delivery features might be provided.

Likewise, whilst the illustrated embodiment incorporates a motor/impeller unit 100 for generating the required suction at the head 50, this unit may be omitted and instead the cleaner may be adapted for connection to an external source of suction, either as a free-standing unit or as a remote

installation including one more suction points within the premises to be cleaned, in either case coupled to the cleaner by means of a flexible hose.

Thus, whilst the embodiment illustrated is of the type in which the suction head is integrated with the body of the cleaner so that the whole appliance is supported and moved by the operator, the invention as hereinafter described may be incorporated into a suction head which is carried at the lower end of a supporting member which affords a handle at its upper end to enable the user to move the head over the floor, the head being coupled to a free-standing unit, which houses the collection container, by means of a flexible hose in well-known manner, with the supporting member in some cases forming a suction duct to which the hose is connected. Similarly the invention may be incorporated into an applicator head which is likewise carried at the lower end of a supporting member and is associated with a separate free-standing unit which houses the container 30 from which liquid is delivered to the applicator head by means of a flexible pipe.

The suction head 50, as can be seen more clearly in Figures 2 and 3, comprises a casing 500 which comprises an upper wall 504 which is hollow and defines therein a shallow transversely extending suction chamber 520 which communicates by way of an outlet spigot 530 with the suction duct 180 within the body 10 of the cleaner.

The upper wall 504 of the casing 500 is formed with an internal inlet boss 510 to receive the end of the delivery pipe 280, and the casing 500 at its lower side affords a rectangular opening defined by a peripheral flange comprising a front wall 501, rear wall 502 and end walls 503 depending from the upper wall 504. The rectangular opening receives a replaceable cartridge assembly 60 which in the illustrated embodiment includes means for applying cleaning liquid and carrying out a cleaning operation, as well as means for drying the floor or floor covering, and the boss 510 at its lower end affords a releasable fluid-tight connection with the cartridge 60 as hereinafter described.

Various interchangeable cartridges may be provided as hereinafter described but the assembly 60 as illustrated in Figures 4 - 7 is adapted to receive any one of several interchangeable sub-cartridges with respective different applicators for use with different types of floor or floor covering. One such sub-cartridge 70 includes an applicator which is intended for use on relatively smooth but soft surfaces, such as afforded by linoleum or wood. Another such sub-cartridge 80 includes an applicator which may be used on harder surfaces such as afforded by ceramic tiles.

The cartridge 60, as illustrated in Figures 3 to 7, comprises a hollow rectangular body 600 comprising a top wall 604 having at its underside a peripheral flange comprising outer front and rear walls 601 and 602 joined by transversely extending end walls 603. Inner front and rear walls 611, 612 extend parallel to the respective outer walls 601, 602 and each pair of outer walls 601, 602 and inner walls 611,612 between them define a downwardly open longitudinal slot 610 which is shaped to receive a squeegee blade 650 which extends substantially across the entire width of the cartridge adjacent to the front and rear edges thereof and is secured within the slot 610 by means of a retainer member 640.

The retainer member 640 is assembled with the body 600 by means of longitudinally spaced laterally projecting nibs 645 thereon engaging in corresponding recesses 605 formed through the top plate 604 and into the walls 601,611;602,612 so as to terminate adjacent the lower ends thereof and thereby form internal shoulders on which the underside of the nibs 645 are retained.

At its underside, between the pairs of front and rear walls 601 and 611, 602 and 612 the top wall 604 is formed with a respective rib 615 which serves to bear down on the upper end of the squeegee blade 650 and hold it firmly within the retainer member 640.

The cartridge assembly 60 also includes respective longitudinally extending slots 620 disposed adjacent to the slots 610, each defined between the respective inner wall 611, 612 and a respective angled wall 621 which includes an

oblique part 622 extending downwardly towards the adjacent inner wall 611,612 and terminating in a downwardly extending rib 623 parallel to the adjacent inner wall 611,612. Spacer ribs 619 extend at longitudinally spaced intervals between the angled walls 621 and the adjacent inner walls 611.

Additionally, at its underside, the top wall 604 is formed centrally with a pair of longitudinal ribs 631, which define the upper portion of a transversely extending liquid delivery duct 630 as hereinafter described. Adjacent to the opposite ends of the top wall 604 the longitudinal ribs 631 are joined by transverse ribs 632 to define the end of the duct 630.

Centrally of the duct 630, the top wall 604 is formed with an upstanding tubular spigot 635 which includes a reduced-diameter nose portion 636 adapted to enter the lower end of the inlet boss 510. The nose portion 636 carries a sealing ring 637 to establish a liquid-tight seal with the inlet boss 510, which itself is formed internally with the calibrated aperture 515 adjacent to its lower end.

The cartridge 60 may be retained within the head 50 by any appropriate quick-release means. In the illustrated embodiment, as shown in Figure 3, the end walls 503 of the head casing 500 are formed with shallow internal recesses 506 to receive corresponding rounded protuberances 606 formed externally on the end walls 603 of the body 600 for this purpose. To facilitate removal of the cartridge 60, finger pieces 608 are formed to extend outwardly from the lower edge of the outer rear wall 602 of the body 600 through recesses 508 formed at the lower edge of the rear wall 502 of the casing 500.

However, other means may be provided for securing the cartridge 60 within the head casing. For example, one or more turn-buckle or quick-release type threaded fasteners may be captively associated with the head casing so as to be operable on the upper side thereof, to engage complementary formations provided on the body of the cartridge 60. In a further example, quick-release catches may be provided either at opposite ends of the cartridge assembly or at

spaced positions along the front and rear sides, to engage suitable complementary formations on the head casing.

The cartridge 60, as mentioned above is completed by one of several applicators according to the nature of the surface to be cleaned, such applicators being formed as sub-cartridges for releasable assembly with the body 600. For this purpose the underside of the body 600 is formed as a housing to receive the sub-cartridge, and recesses 628 are formed internally of the ribs 623 to co-operate with corresponding latch elements provided on the interchangeable sub-cartridges 70,80 etc as hereinafter described.

As shown in Figures 3,4 and 5 the cartridge 60 is provided with an applicator sub-cartridge 70 which, as previously mentioned is intended for use on relatively smooth but soft surfaces, such as afforded by linoleum or wood and the like.

The applicator sub-cartridge 70 as shown in Figures 3 to 6 comprises a body 700 generally in the form of a shallow inverted channel-shaped member with wide side walls 701 spanned at their upper ends by a top wall 704 which in combination form a rectangular-section channel 710 which extends along the entire length of the body 700 and receives a sponge pad assembly 720 as hereinafter described.

At its upper side the body 700 carries a peripheral flange 709 which along the longitudinal edges of the body affords spaced external nibs 708 which engage within the corresponding spaced recesses 628, which are formed internally of the ribs 623 which form the lower part of the angled walls 621 of the body 600, to hold the sub-cartridge 70 in position. Finger-grip portions 702 at the ends of the side walls 701 are formed to facilitate removal of the sub-cartridge 70 from the body 600 when required for example for cleaning or replacement of the sponge pad assembly 720.

At its upper side, the body 700 is additionally formed centrally with a pair of upstanding longitudinal ribs 731 which engage the lower edges of the ribs 631 to define in combination therewith the liquid delivery duct 630 previously

mentioned. Holes 705 formed in the top wall 704 at spaced intervals along the length of the duct 630 enable liquid from the inlet boss 510 and the spigot 635 when assembled therewith to be applied to the sponge pad assembly 720 mounted in the channel 710 of the applicator sub-cartridge 70.

On opposite sides of the channel 710, the body 700 supports staggered rows of bristles 750 located in holes formed at the underside of the side walls 701, which are rebated at their lower ends to allow greater flexibility of the bristles. The bristles 750 in combination with the sponge pad assembly 720 forms an applicator for applying the cleaning liquid to the surface to be cleaned and agitating the liquid to provide a thorough cleaning action.

The sponge pad assembly 720 comprises a rectangular mounting plate 721 which is formed with an array of longitudinally extending slots 722, and a sponge pad 723 which is adhesively secured to the mounting plate 721 and carries a plush or other pile fabric facing layer 724. The slots 722 on the longitudinal centre line of the plate 721 register with the holes 705 so that liquid from such holes is delivered to the sponge pad 723 and thus percolates to the facing layer 724.

The sides of the channel 710 are formed with a number of longitudinally spaced downwardly tapering ribs 712 which terminate at their upper ends in transverse abutment faces 713 spaced downwardly from the top wall 704 by a distance corresponding to the thickness of the mounting plate 721 of the sponge pad assembly 720.

Certain of the slots 722 in the mounting plate 721 register with the ribs 712 so as to allow marginal portions 725 of the mounting plate 721 to be deflected inwardly (as shown in dotted lines by Figure 6) by the ribs 712 as the plate 721 is inserted into the channel 710, and the resilience of the plastics material from which the plate 721 is formed allows such marginal portions 725 to expand outwardly and engage over the abutment faces 713, thereby retaining the sponge pad assembly 720 within the channel 710.

To facilitate proper location of the sponge pad assembly 720 within the channel 710, the mounting plate 721 is also formed with two rounded protuberances 726 on the face thereof which is directed away from the sponge pad 723. Such protuberances 726 are adapted to enter into correspondingly shaped downwardly open hollow domes 706 formed in the top wall 704 of the body 700. Engagement of the protuberances 726 in the domes 706 also prevents the sponge pad assembly 720 moving longitudinally of the channel 710, which as shown is open at its ends so as to enable the sponge pad 723 to extend across the full width of the applicator sub-cartridge 70.

To enable the sponge pad assembly 720 to be removed from the applicator body 700 for cleaning or replacement, the mounting plate 721 may be provided with a tab at one or both ends (not shown) to project beyond the ends of the channel 710.

As can be seen, the external faces of the side walls 701 of the body 700 align with the external faces of the ribs 623 of the body 600 and are spaced inwardly from the squeegee blades 650 so that the suction slots 620 open at their lower ends into the space between the bristles 750 and the squeegee blades 650, and at their upper ends into the suction chamber 520.

Air can thus be drawn from beneath the head 50 through the slots 620, through the suction chamber 520 and the outlet spigot 530.

The upper surface of the top plate 604 between the slots 620 is of curved form so as to allow any liquid which becomes deposited thereon to drain gravitationally back towards the slots 620, and the oblique parts 622 of the angled walls 621 further ensure that such liquid runs into the slots so as again to become entrained in the air flow. However, the suction chamber 520 defined by the upper wall 504 of the head is as shallow as possible in order to reduce the volume of the chamber 520 to a minimum, thereby minimising the reduction in the velocity of the air flow leaving the suction slot 620.

In operation, cleaning solution supplied along pipe 280 is fed through inlet boss 510 and spigot 635 at a rate determined by the dimension of the

calibrated aperture 515 and into the duct 630, and thence through the holes 705 to the sponge pad assembly 720 for application to the surface to be cleaned by means of the pile fabric facing layer 724. The rows of bristles 750 on each side of the sponge pad assembly 720 are of such a stiffness that they provide a mild scrubbing action and also prevent excessive compression of the sponge pad 723.

At the same time, suction is applied through the slots 620 so as to draw up soiled cleaning solution as the head is moved to-and-fro, the squeegee blades 650 further assisting in drying the surface.

A cover member 550 as shown in Figure 7 is preferably provided to be engaged over the lower side of the casing 500 when the cleaner is not in use. The cover member 550 may be in the form of a shallow tray of flexible plastics material adapted to clip over the open lower side of the head 50 when a cartridge is present. The tray includes a front wall 551 with an inwardly directed lip 555 to engage over an external lip 505 at the lower edge of the front wall 501 of the casing, a rear wall 553 with an inwardly directed lip 557 to engage over an external lip 507 at the lower edge of the casing rear wall 502, side walls 554, and a rearwardly projecting handle 558.

The cover member 550 serves to collect any liquid which may drain back down the suction duct 180 when the cleaner is put away after use, and to prevent the ingress of dust whilst the cleaner is not in use.

In use, the entire cartridge 60 may be removed by means of the finger pieces 608 for cleaning the interior of the suction chamber 520 and also to facilitate interchange of the various applicator sub-cartridges for use on different surfaces. One other such sub-cartridge (not illustrated) may be generally similar to the sub-cartridge 70, but with the omission of the bristles 750, so as to provide a gentler cleaning action for more delicate surfaces. Another such sub-cartridge (also not illustrated) may also be generally similar to the sub-cartridge 70, but with the pile fabric facing layer 724 of the sponge pad assembly 720 replaced by a harder looped fabric material of the well known kind for producing a scouring

action, or by other suitable abrasive material, in either case to provide a more intense cleaning action as may be required for heavily soiled areas.

Another sub-cartridge 80, which has an applicator adapted to perform a scrubbing operation, is illustrated in section in Figure 8. The sub-cartridge 80 is generally similar to the sub-cartridge 70, but the sponge pad assembly 720 and bristles 750 of the sub-cartridge 70 are replaced respectively by an array of bristles 820 and a pair retaining elements 850. Each retaining element 850 comprises a backing strip 851 carrying a pile fabric material 852 such as a plush material comprising densely packed thin flexible filaments. Additionally, a thin flexible blade 853 runs centrally along the length of the element 850. The retaining elements 850 assist in the retention of the cleaning liquid in the vicinity of the array of bristles 820, to which the liquid is delivered in the same manner as described above relative to the sponge pad assembly 720. The combination of an array of bristles and such retaining elements is described in more detail in our co-pending application No. 9219500.7 filed 15th September 1992.

As can be seen, other details of the sub-cartridge 80 are similar to those of the sub-cartridge 70 and are designated by corresponding numerals in the 800.... series; accordingly these will not be specifically described further.

Generally, in the case of porous pad applicators, such as afforded by the sub-cartridge 70, which directly engage the surface over an extensive area, it is not necessary to provide shielding means similar to the retaining elements 850 because suction applied through the slots 620 will not induce any significant air flow beneath the applicator pad 720 in view of its intimate contact with the surface. However, where required such retaining elements could be provided instead of the rows of bristles 750 for example.

Whilst the various applicators as above-described and illustrated are each formed as part of a separable sub-cartridge within the removable cartridge 60, and the body 600 of the cartridge 60 defines the suction slots 620 and also carries the squeegee blades 650 directly, various alternative arrangements are possible. For example, the body 600 may be incorporated into the casing 500 as

an effectively permanent base so that the squeegee blades are then carried directly by such modified head casing instead of by the cartridge 60, the interchangeable cartridges in such a case then being equivalent to the sub-cartridge described above.

In another variation, the squeegee blades may be carried directly by the head casing and the interchangeable cartridges may then be equivalent to only the central portion of the body 600 between the suction slots 620 in combination, integrally or separably, with respective applicator assemblies such as those of sub-cartridges 70 or 80. This arrangement would enable the width of the suction slots to be varied according to width of the modified cartridge, the slot being defined by the gap between the side walls of the cartridge (equivalent to walls 621 as illustrated) and the inner walls (equivalent to the walls 612 as illustrated) of the squeegee blade mountings incorporated into the head casing in accordance with this modification. This would also facilitate cleaning of the suction slots by removal of the modified cartridge.

In a further modification, the various applicators may themselves be integrated with squeegee blade mountings and the body 600 in a manner which does not facilitate ready separation therefrom, so as to form a range of interchangeable cartridges, each of which comprises a respective applicator together with an associated pair of squeegee blades.

The cartridge 60 itself may be interchanged with further forms of cartridge as illustrated in Figures 9 - 11.

The cartridge 90 illustrated in Figure 9 is for use in cleaning carpets or other fabric surfaces, and comprises an upper component in the form of a plate 904 which is generally similar to the plate 604 except that the outer and inner longitudinal walls 601,611; 602,612 are replaced by shorter ribs 901,911; 902,912, and the angled walls 921 do not terminate in downwardly extending ribs. Otherwise, the plate 904 is similar to the plate 604 and will not be described in further detail.

The cartridge 90 is completed by a lower component 950 which is preferably connected non-releasably thereto and includes an outer housing 960 comprising inwardly inclining outer walls 961 having at their upper ends upwardly extending spaced flanges 962,963 which are secured as by welding to the ribs 901,911;902,912. At their lower ends the outer walls terminate in downward extensions 964 which define a suction inlet 965 to which suction is applied through the slots 920 between the ribs 911,912 and the respective angled walls 921.

The lower component also includes an inner compartment 970 comprising a pair of inner walls 971 which are secured as by welding to longitudinal ribs 931 at the underside of the plate 904, and equivalent to the ribs 631 of the plate 604.

The inner compartment 970 is divided by a T-section member 972 into an upper part which, in combination with the ribs 931 at the underside of the plate 904, defines a delivery duct 930 to which liquid is delivered from the inlet spigot 935, and a lower part through which liquid is applied to the surface being cleaned whilst shielded from the air-flow induced in the outer housing, for example, in an arrangement similar to that described in our European Patent Specification No. 0316849. The web 973 of the member 972 is formed with fine grooves 974 along the edges thereof to allow liquid to pass in a controlled manner from the duct 930 into the lower part of the inner compartment 970.

As will be appreciated, other cartridges of this modified type, interchangeable with the cartridge 90, may be constructed with applicators similar to those of the sub-cartridges 70 and 80 for example. Such additional cartridges may utilise the same form of top plate as the top plate 904 of the cartridge 90 in combination with respective lower components each equipped with squeegee blades and the appropriate applicator. Indeed still further cartridges of this modified type may be constructed to enable drying operations alone to be carried out, and two such cartridges are illustrated in Figures 10 and 11.

Figure 10 shows a cartridge 90A comprising a top plate 904, as previously described, in combination with a lower component 950A which defines

a housing 960A have a suction inlet 965A to which suction is applied through the slots 920 in the top plate 904, to enable liquid to be extracted from a carpet or other fabric. The housing 960A includes at its upper side spaced outer and inner walls 962A, 963A which are secured as by welding to the top plate 904, and webs 961A, which extend between the inner walls 963A mid-way along the length thereof, carry a plug 935A which enters an seals the inlet spigot 935 of the plate 904.

The cartridge 90B as shown in Figure 11 is adapted for picking up liquid from a floor or relatively hard, smooth floor covering and again comprises a top plate 904, in this case in combination with a lower component 950B comprising a pair of squeegee blades 960B located at their upper ends in channels formed by respective spaced walls 962B,963B forming part of the lower component 950B and secured as by welding to the top plate 904. A rib 915 at the underside of the top plate 904 is adapted to engage the top edge of the squeegee blade 960B and hold it firmly in position as shown. In a manner similar to that described above, webs 961B, support a plug 935B which enters and seals the inlet spigot 935 of the plate 904. Alternatively, the plate 904 may be modified for the purposes of forming cartridges 90A and 90B so that the spigot 935 does not have a through bore but itself enters and seals the inlet boss 510 of the casing 500.

In a similar manner other cartridges may be designed to allow cleaning operations to be carried out on surfaces other than floors or floor coverings, for example walls, windows, or venetian blinds.

Whilst the embodiments of cleaning head described above and illustrated in the accompanying drawings are for use with cleaning appliances with facilities for both applying a cleaning liquid and for drying the surface after wetting by the cleaning liquid, it will be appreciated that an appliance of the type adapted only for the application of a cleaning liquid may usefully be provided with a cleaning head adapted to receive a range of interchangeable cartridges with different liquid applicators to suit different types of surface.

CLAIMS:-

1. A cleaning head (50) for use with a cleaning appliance having means for delivering a cleaning liquid to said head, the cleaning head comprising a body (500) having means (40) for mounting the body in an operative position at one end of a supporting member (10) which affords a handle (130)at the opposite end to enable the user to move the head over a surface, a liquid inlet (510) for the supply of cleaning liquid and a liquid applicator (70;80;970) to receive such liquid and allow it to be applied to the surface to carry out a cleaning operation thereon, characterised in that the body (500) defines an open mouth which receives releasably therein a cartridge (60;90) which is releasably coupled to the liquid inlet (510) and comprises said liquid applicator (70;80;970).

2. A cleaning head according to Claim 1 wherein several such cartridges (60;90) are provided for assembly interchangeably therewith, each such cartridge comprising a respective different liquid applicator so as to enable the cleaning head to be used for a range of different cleaning operations.

3. A cleaning head according to Claim 1 wherein said cartridge (60) which is releasably received with the body itself affords a housing (600) which receives releasably therein a sub-cartridge (70;80) comprising one of a plurality of liquid applicators, adapted for different cleaning operations, so as to enable the cleaning head (50) to be used for a range of different cleaning operations by interchange of said different liquid applicators.

4. A cleaning head according to Claim 1 which further defines a suction chamber (520) provided with means (530) for connection to a source of suction, and at least one suction opening (620;920) for picking-up liquid.

5. A cleaning head according to Claim 4 wherein one such suction opening, in the form of a slot (620;920), is provided at opposite edges of the liquid applicator (70;80;920).

6. A cleaning head according to Claim 5 wherein a respective squeegee blade (650) is provided adjacent to each suction slot (620) at the side thereof further from the liquid applicator (60;70).

7. A cleaning head according to Claim 6 wherein said cartridge carries only the liquid applicator, and the or each suction opening is afforded by the cleaning head body and the squeegee blades, are carried by the cleaning head body.

8. A cleaning head according to Claim 6 wherein said cartridge (60) carries the liquid applicator (70;80), and the cartridge body (600) affords the or each suction opening (620) and carries said squeegee blades (650).

9. A cleaning head according to Claim 8 wherein several such cartridges (60;90) are provided for assembly interchangeably therewith, each such cartridge comprising a respective different liquid applicator so as to enable the cleaning head to be used for a range of different cleaning operations.

10. A cleaning head according to Claim 8 wherein said cartridge (60) which is releasably received with the cleaning head body (500) itself affords a housing (600) which receives releasably therein a sub-cartridge (70;80) comprising one of a plurality of liquid applicators, adapted for different cleaning operations, so as to enable the cleaning head to be used for a range of different cleaning operations by interchange of said different liquid applicators.

11. A cleaning head according to Claim 1 wherein the cartridge includes a flow-restricting orifice and a liquid distribution duct which includes a plurality of outlets spaced across the width of the liquid applicator.

12. A cleaning head according to any one of the preceding claims wherein at least one said liquid applicators (70) comprises a compressible pad of porous material (723) having a facing layer (724).

13. A cleaning head according to Claim 12 wherein said facing layer (724) is formed from a pile fabric comprising closely packed thin filaments, such as a plush material.

14. A cleaning head according to Claim 12 wherein said facing layer (724) comprises a hard looped fabric material for producing a scouring action.

15. A cleaning head according to Claim 12 wherein said liquid applicator (70) includes rows of bristles (750) disposed at opposite edges of the pad (723), the facing layer (724) of the applicator pad normally protruding beyond the ends of the bristles (750), which serve in use to limit inward compression of the porous material (723).

16. A cleaning head according to any one of Claims 1 to 11 wherein one of said liquid applicators (80) comprises agitating means in the form of an array of bristles (820) in association with liquid retaining means (850) at opposite edges of the array.

17. A cleaning head according to Claim 4 wherein one of said applicators (970) comprises an open-mouthed liquid delivery compartment whereby liquid is applied directly to the floor surface.

18. A cleaning head according to Claim 17 wherein said applicator (970) is incorporated into a cartridge (90) which further includes a suction compartment (960) surrounding the delivery compartment (970), or adjacent thereto on at least one side thereof, and one or more passageways (920) extending between said suction compartment (960) and the suction chamber (520) within the head (50), to enable the cleaning operation to be performed on a carpet or other fabric surface.

19. A cleaning head according to Claim 4 wherein a further cartridge (90A) is provided which comprises a suction chamber (960A) for use on fabric surfaces without any liquid applicator.

20. A suction head according to Claim 4 wherein a further cartridge (90B) is provided which comprises one or more suction slots (920) in combination with an adjacent squeegee blade (960B) for use on hard surfaces, without any liquid applicator.

21. A cleaning appliance incorporating a cleaning head (50) according to any one of the preceding claims.

22. A floor cleaning appliance comprising a supporting member (10) having at one end thereof a handle (130) to enable the user to move the appliance over a floor surface, and at the opposite end thereof a cleaning head (50) comprising a body (500) having a liquid inlet (510), characterised in that the body (500) of the cleaning head (50) defines an open mouth having quick-release means (506,606) for releasably receiving therein a cartridge (60;90) comprising one of a range of interchangeable liquid applicators (70;80;970), and in that the range of such applicators provided includes at least two of the following, a liquid applicator which comprises a compressible pad of porous material (723), a liquid applicator which comprises a compressible pad of porous material (723) having

a facing layer formed from a pile fabric comprising closely packed thin filaments (724), a liquid applicator which comprises a compressible pad of porous material having a facing layer formed from a hard looped fabric material for producing a scouring action, a liquid applicator comprising agitating means in the form of an array of bristles (820).

23. A floor cleaning appliance according to Claim 22 wherein each of said liquid applicators is incorporated into a respective cartridge and a range of different cartridges is provided.

24. A floor cleaning appliance according to Claim 23 wherein said range of cartridges further includes a cartridge (90) incorporating an applicator comprising a open-mouthed liquid delivery compartment (970), and/or a cartridge (90A;90B) incorporating only means for picking-up liquid.

25. A floor cleaning appliance comprising a supporting member (10) having at one end thereof a handle (130) to enable the user to move the appliance over a floor surface, and at the opposite end thereof a cleaning head (50) comprising a body (500) having a liquid inlet (510), characterised in that the body (500) of the cleaning head (50) defines an open mouth having quick-release means (506,606) for releasably receiving therein one of a range of interchangeable cartridges (60;90), and in that the range of said cartridges provided includes at least two of the following, a cartridge (60) incorporating a liquid applicator (70) which comprises a compressible pad of porous material (723), a cartridge (60) incorporating a liquid applicator (70) which comprises a compressible pad of porous material (723) having a facing layer (724) formed from a pile fabric comprising closely packed thin filaments, a cartridge (60) incorporating a liquid applicator (70) which comprises a compressible pad (723) of porous material have a facing layer (724) formed from a hard looped fabric material for producing a scouring action, a cartridge (60) incorporating a liquid applicator (80) comprising

agitating means in the form of an array of bristles (820), a cartridge (90) incorporating a liquid applicator comprising an open mouthed liquid delivery (970) compartment and/or a cartridge (90A;90B) incorporating only means for picking-up liquid.

26. A cartridge for use with a floor cleaning appliance according to any one of Claims 22 to 25, comprising a body (600,900) having quick-release means (606;956) for releasable assembly with the mouth of the cleaning head (50), and liquid applicator (70;80).

27. A cartridge according to Claim 26 wherein the cartridge body (600) defines a housing and said liquid applicator (70,80) comprises a sub-cartridge for releasable assembly with the cartridge body (600) by means of quick-release means (628;708).

28. A cartridge according to Claim 26 or Claim 27 further comprising a respective suction slot (620) on opposed sides of the liquid applicator (70;80).

29. A cartridge according to Claim 28 further comprising a respective squeegee blade (650) adjacent to each suction slot (620) at the side thereof further from the liquid applicator (70;80).

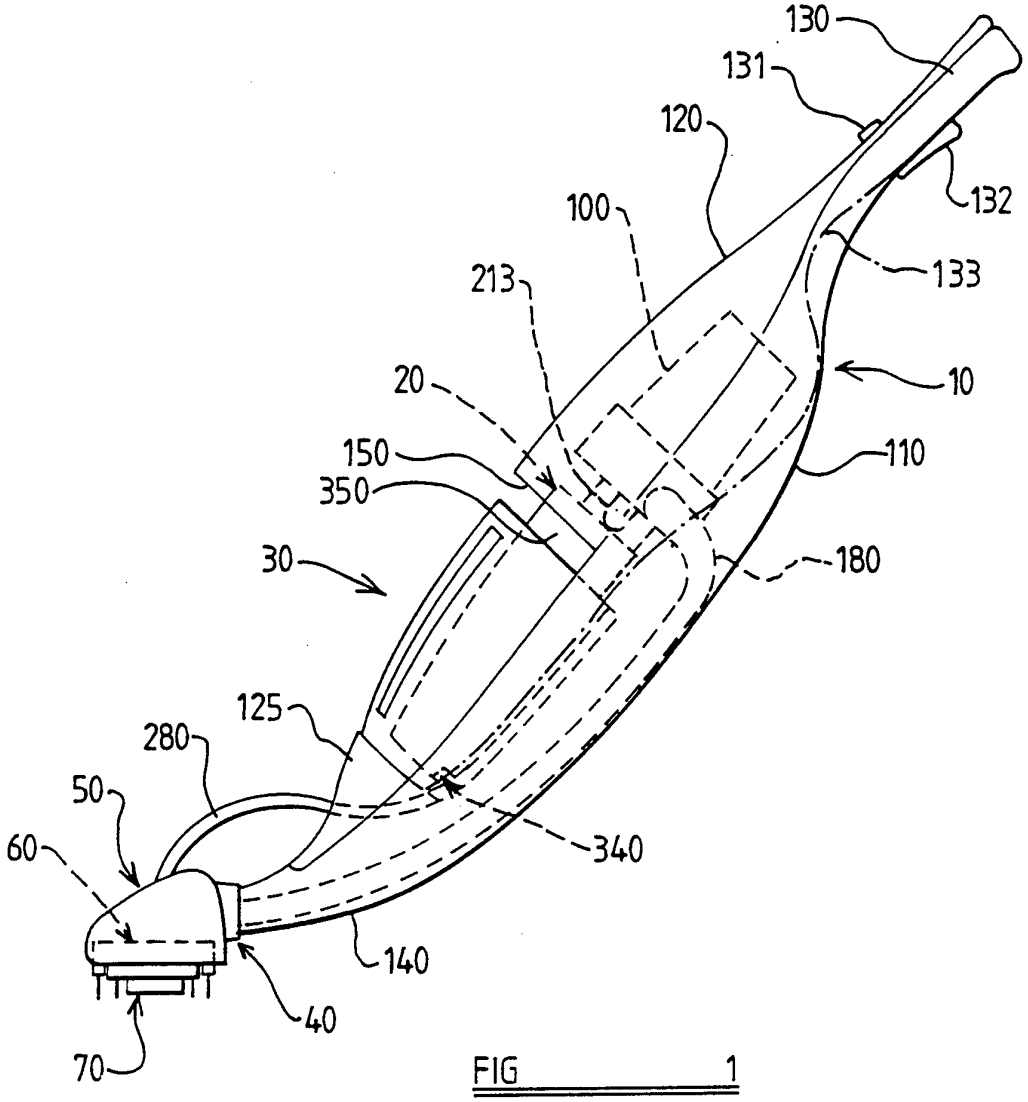

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FIG 1

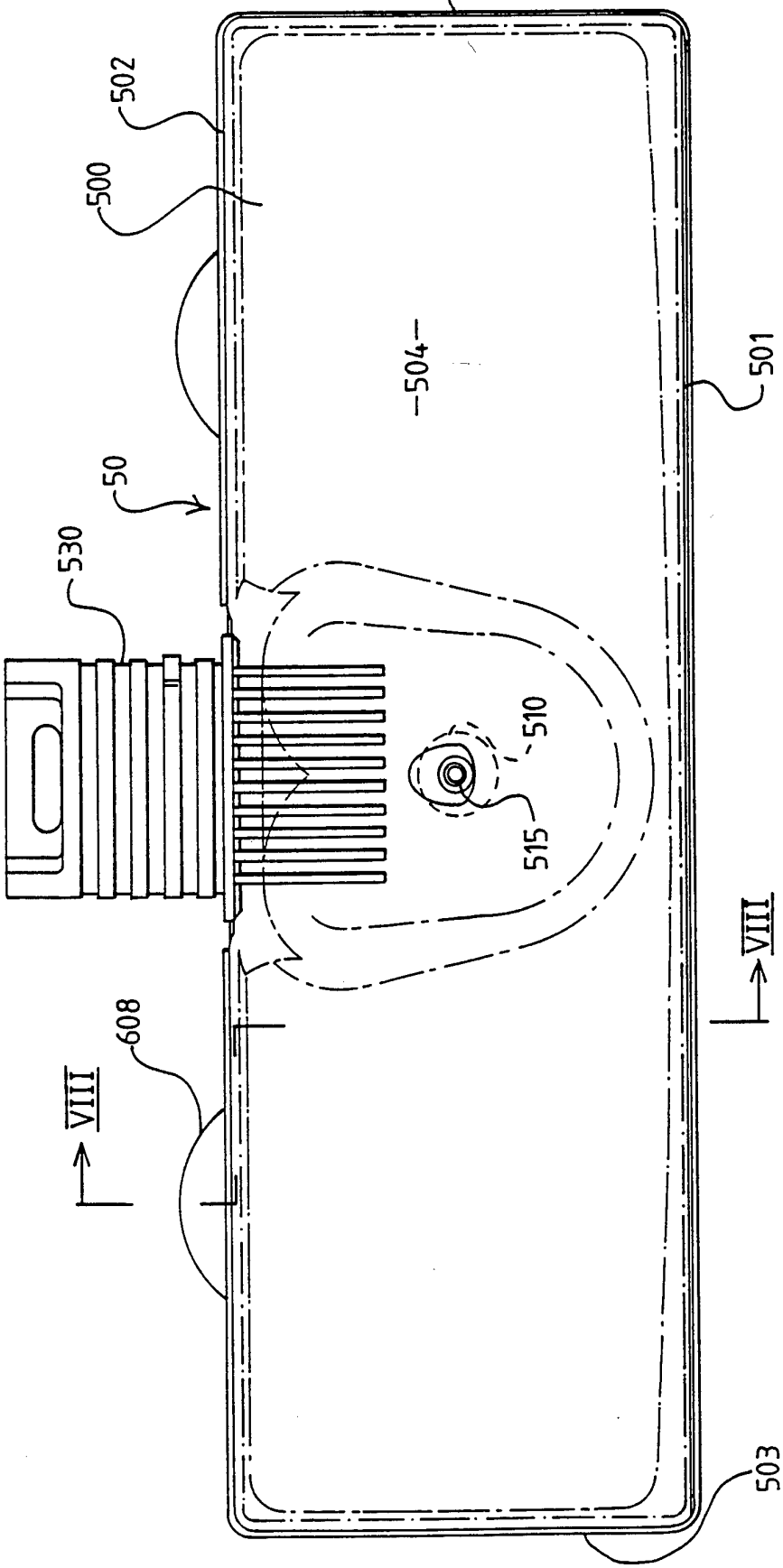


FIG 2

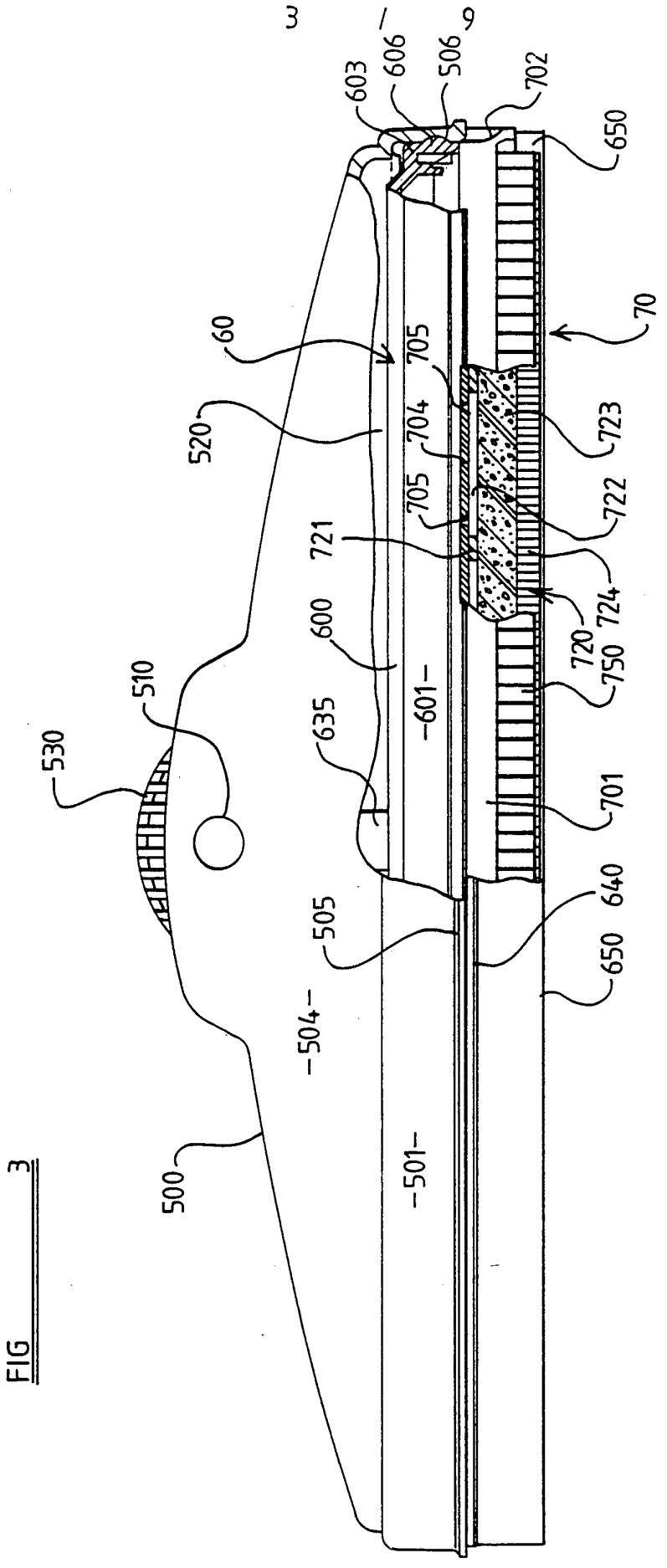

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FIG 3

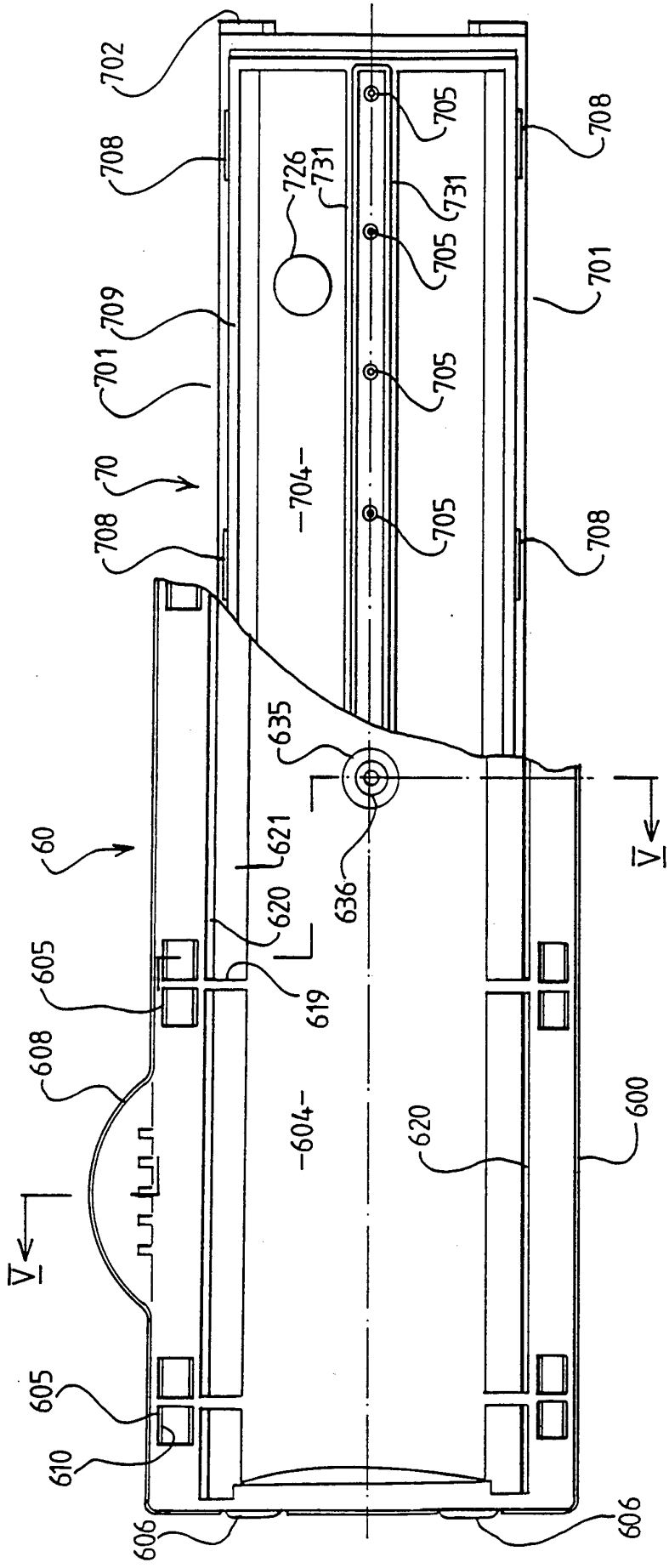

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FIG 4

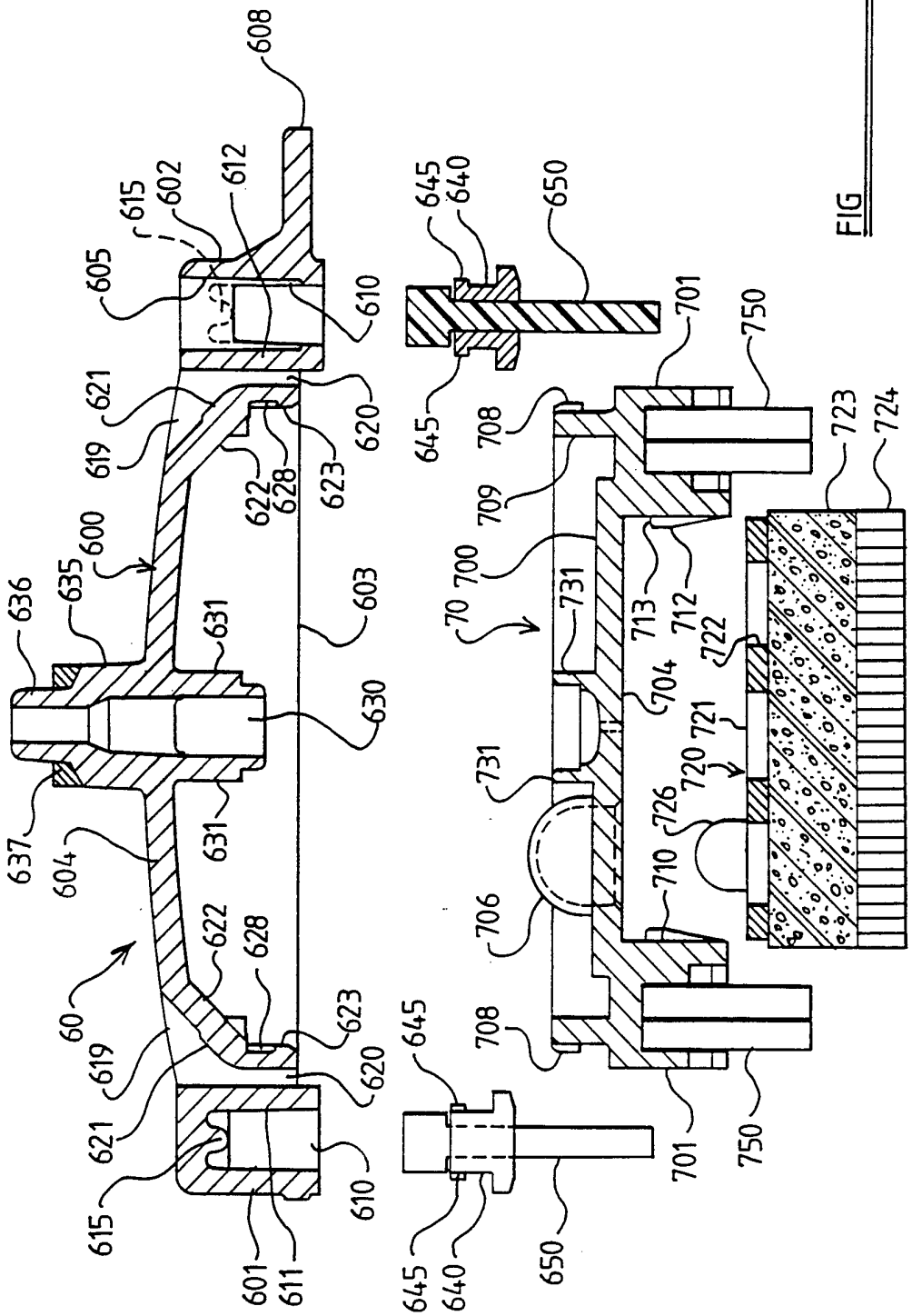

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645
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706
723
724

FIG 5

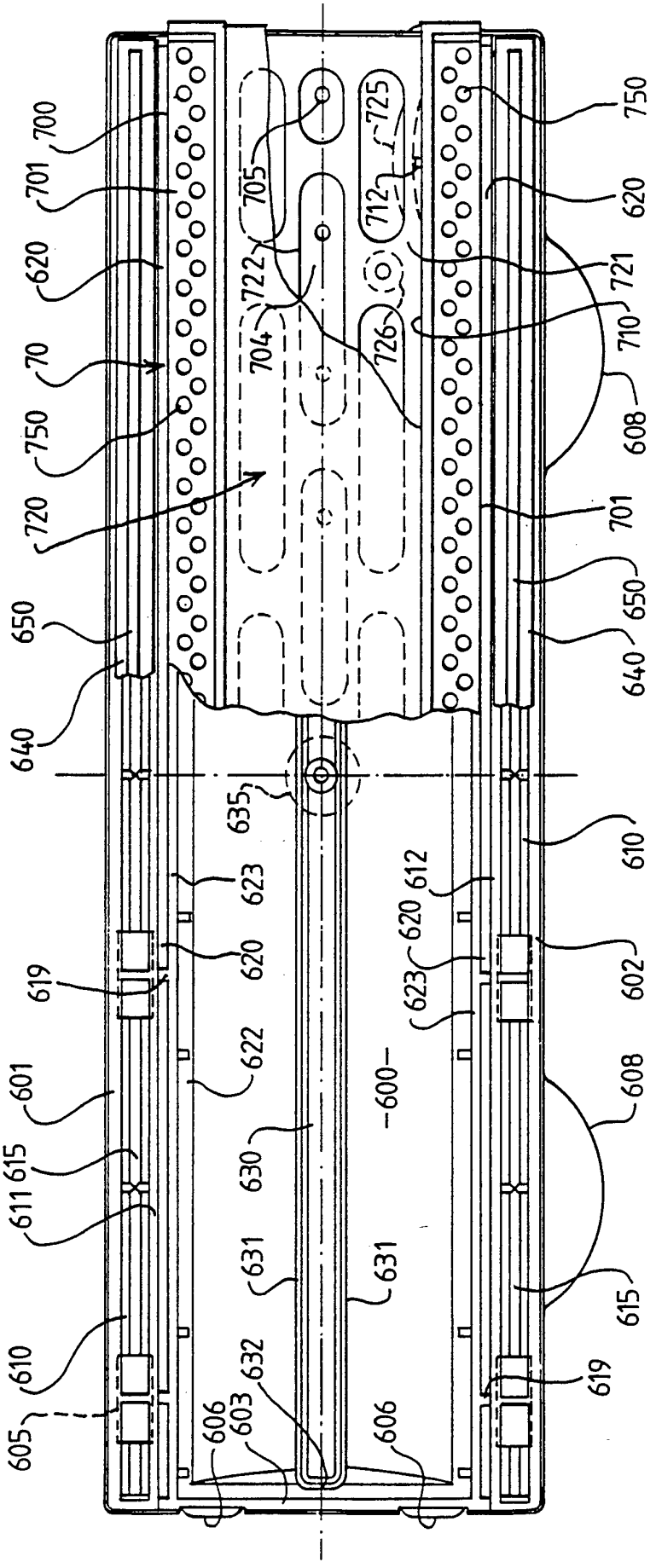

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FIG 6

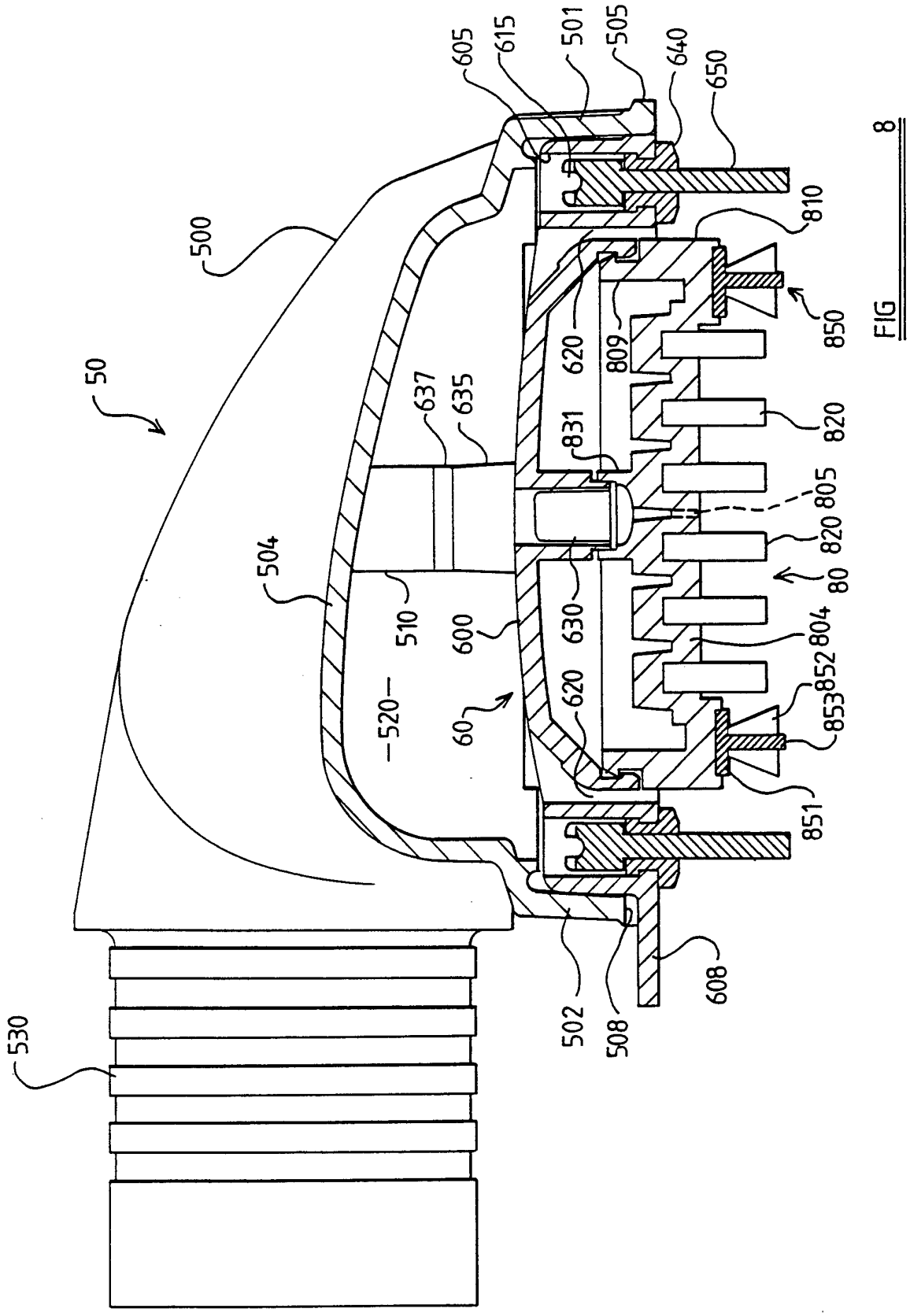

605
615
501
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650
810
500
50
620
809
850
637
635
831
820
805
820
504
80
510
600
630
804
852
620
60
520
853
851
502
508
608
530

FIG 8

FIG 9

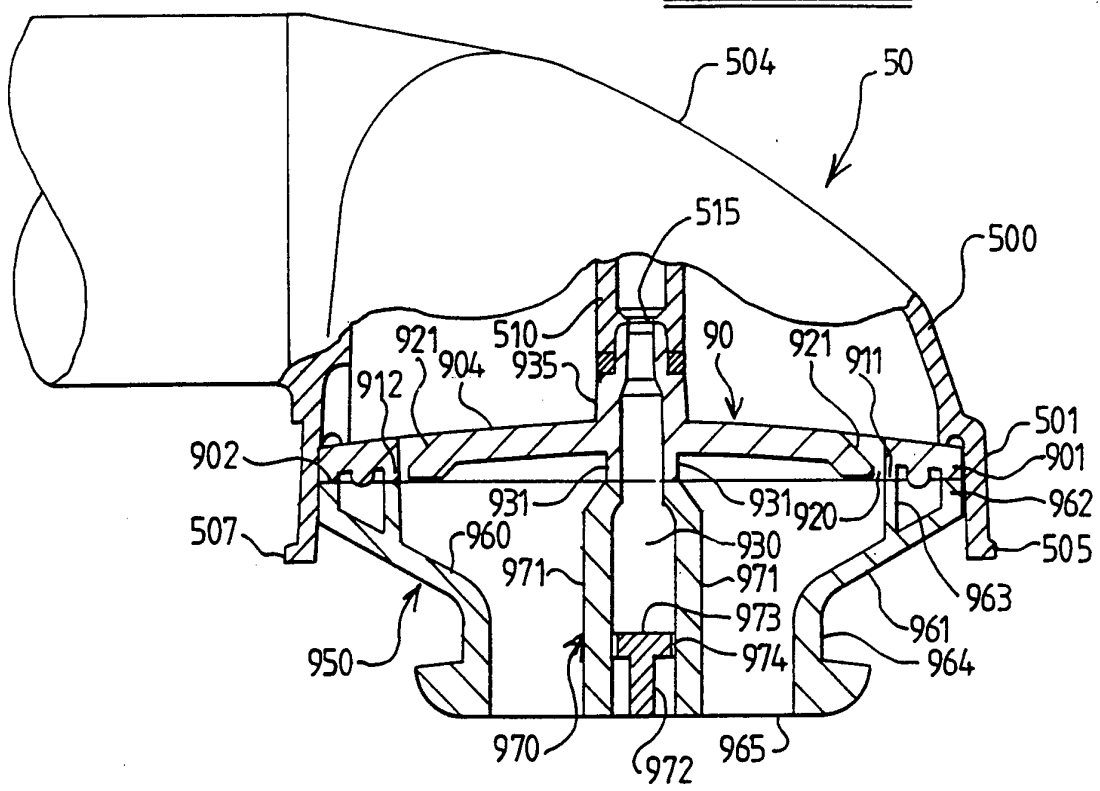

504
50
515
500
921
510
90
921
911
912
904
935
501
902
901
931
931
920
962
507
960
930
505
971
971
963
973
961
950
974
964
970
972
965

FIG 7

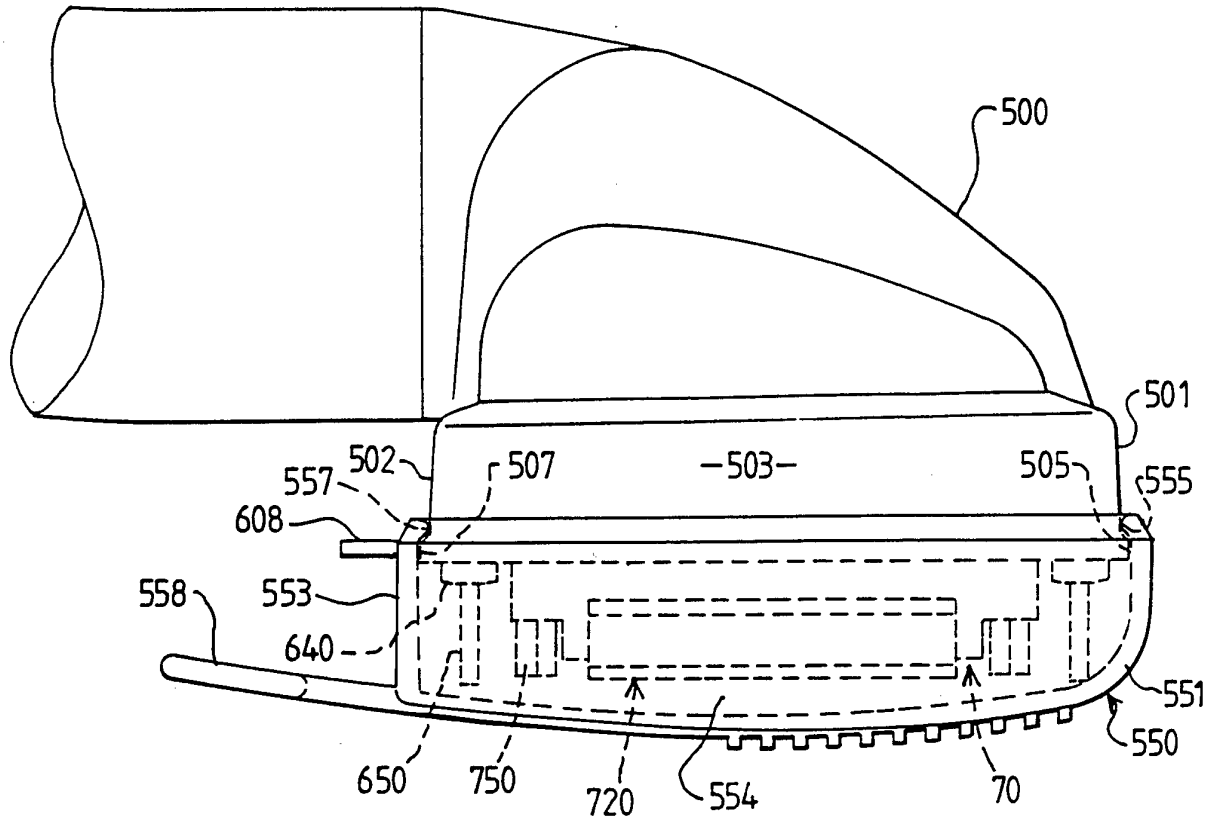

500
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650
750
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FIG 10

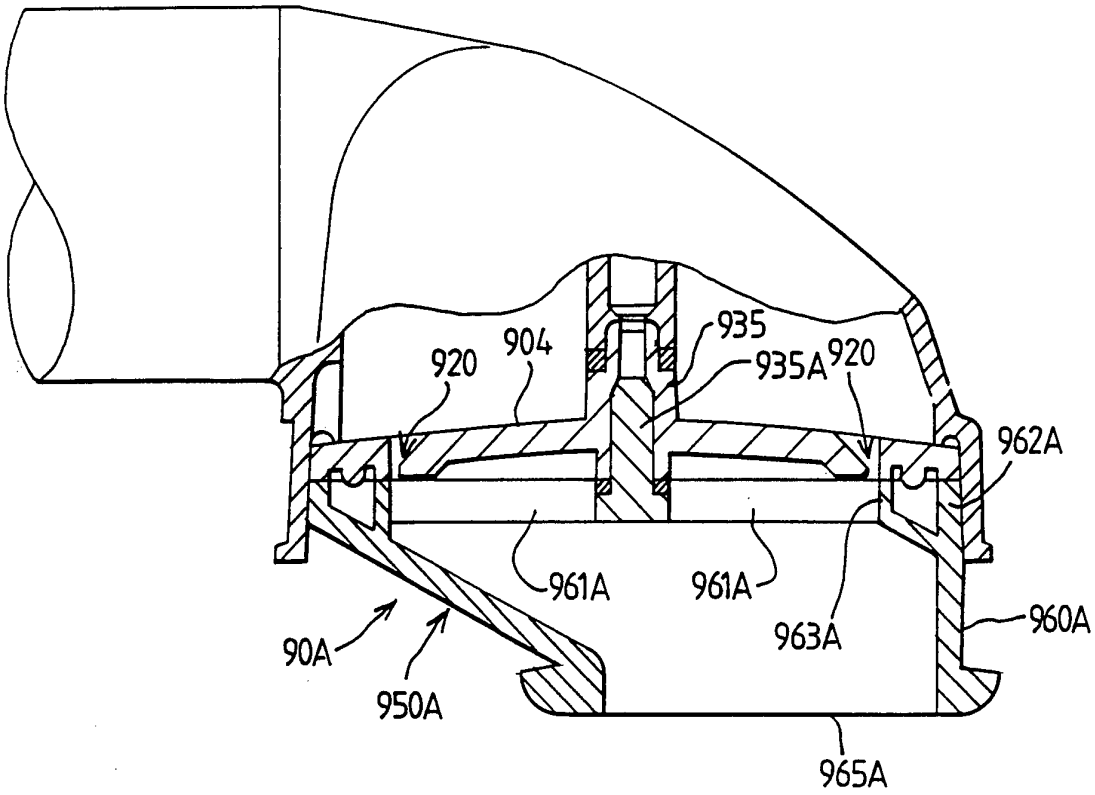
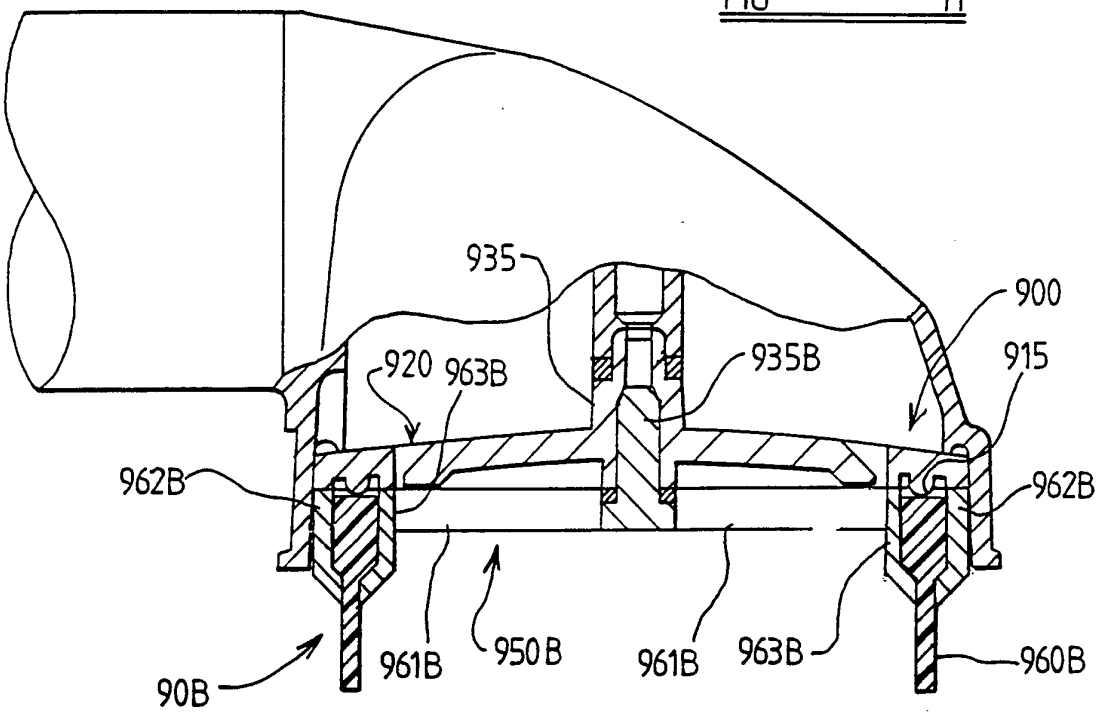

920
904
935
935A
920
962A
961A
961A
963A
960A
90A
950A
965A

FIG 11


935
900
920
963B
935B
915
962B
962B
961B
950B
961B
963B
960B
90B

INTERNATIONAL SEARCH REPORT

Interr al Application No
PCT/GB 93/01923

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A47L11/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 300 637 (VAX APPLIANCES LTD) 25 January 1989 cited in the application see the whole document ---	1,4-6, 12,13, 15,16,25
A	FR,A,2 554 340 (D. TOULON) 10 May 1985 see the whole document ---	1,2,22, 25
A	GB,A,2 145 620 (DURACLEAN INTERNATIONAL INC) 3 April 1985 see abstract ---	1,22,25
A	US,A,2 168 692 (C.H. VIDAL) 8 August 1939 see the whole document ---	1,22,23
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 November 1993	20. 12. 93

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	VANMOL, M

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 270 238 (R.L. SHALLENBERG & AL) 2 June 1981 see abstract; figures -----	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inten nal Application No
PCT/GB 93/01923

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0300637	25-01-89	GB-A-	2206478	11-01-89
		AU-B-	600153	02-08-90
		AU-A-	1980088	13-02-89
		DE-A-	3874444	15-10-92
		WO-A-	8900395	26-01-89
		JP-T-	1503685	14-12-89
		US-A-	5060342	29-10-91
FR-A-2554340	10-05-85	NONE		
GB-A-2145620	03-04-85	CA-A-	1245407	29-11-88
		US-A-	4974618	04-12-90
US-A-2168692		NONE		
US-A-4270238	02-06-81	NONE		