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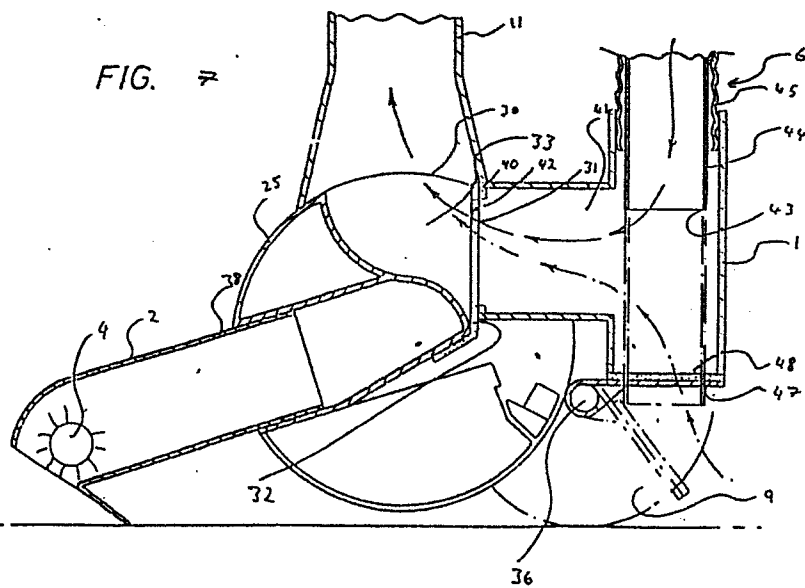
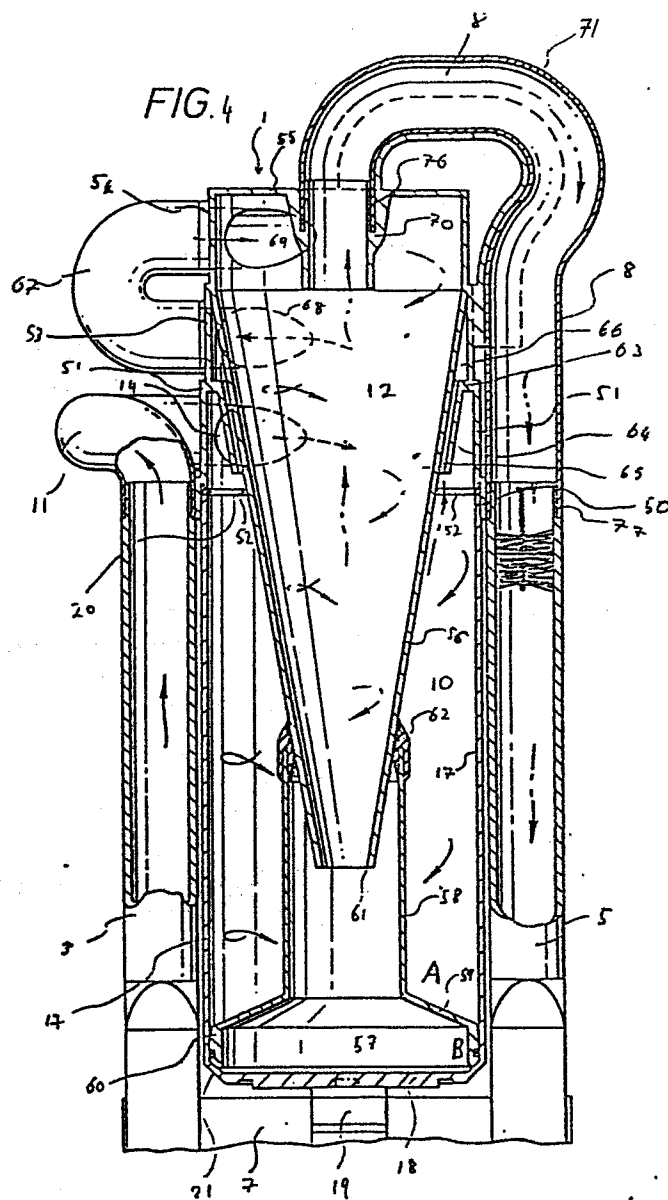
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54 **Improvements in vacuum cleaners.**

57 A vacuum suction cleaning appliance has a casing (1) which accommodates one or more cyclone units, a motor driven fan unit for generating air-flow from a dirty air inlet tract (11) through said cyclone unit(s), a ground engaging cleaning head (2 and 4) rotatably mounted in the casing (1), a pipe (6, 44 and 45) connectable to a suction tool, and an air-flow control device. The air-flow control device and the motor driven fan unit are located within the lower end (7) of the casing (1). The air-flow control device is adapted to selectively direct dirt laden air into the dirty air inlet tract (11), from either the ground engaging cleaning head (2 and 4) or the suction tool via the pipe (6, 44 and 45), said air-flow control device being operated by rotation of the cleaning head (2 and 4) relative to the casing (1).



IMPROVEMENTS IN VACUUM CLEANERS

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DESCRIPTION

This invention relates to a vacuum suction cleaning
appliance, and in particular to a portable domestic
appliance of the kind described in our published
10 European Patent Specification No. 0 042 723.

European Patent Specification No. 0 042 723 describes
a vacuum suction cleaning appliance which comprises
two cyclone units in series operating successfully to
15 extract dirt particles (dust and other extraneous matter)
from the air-flow therethrough. In the appliance
described in this EPC Patent Specification one of the
two cyclone units has a body of substantially frusto-
conical shape, this shape serving to maintain the
20 velocity of the dirt particles swirling therein and
hence render the cyclone capable of depositing fine
dirt particles of small diameter. Such a cyclone unit

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with means to maintain the velocity of the fine dirt particles is referred to as a "high efficiency" cyclone, efficiency being regarded as a measure of the capability to deposit finer particles. The other of
5 the two cyclone units is deliberately constructed with a non-accelerating configuration, so that it does not serve to maintain the velocity of the dirt swirling therein and is thus not capable of dealing with very fine particles. This second cyclone is thus referred
10 to as being of lower efficiency and is incorporated in the air-passage upstream relative to the high efficiency cyclone unit and downstream of the inlet for dirty air.

15 In both these types of cyclone dirty air is caused to enter the cyclone unit tangentially at an end, usually the upper of the cyclone body; cleaned air is exhausted from the cyclone body through an axially located exhaust port in the upper half of the body and
20 dirt particles collect at the bottom of the cyclone body.

The "low efficiency" cyclone is not ultimately capable of dealing effectively with the finest particles, i.e.
25 particles of 50 microns diameter or under, and carries

out a primary cleaning action of the dirty air-flow by depositing all but some of these finer particles.

Because of its construction the "low efficiency" cyclone is extremely proficient at separating objects other than fine dust, for example fluff, polystyrene beads, ball bearings and the like, from the air flowing therethrough. The high efficiency cyclone is then left to function in its own optimum conditions with comparatively clean air and only particles of very small size.

In EPC Specification No. 0 042 723 an appliance was described wherein this low efficiency was contrived by omitting the frusto-conical formation and constructing the cyclone casing in a cylindrical form with the normal tangential or scroll type air inlet adjacent one end.

The appliance of European Patent Specification No. 0 042 723 is adapted for use in two modes: in the first mode dirt laden air enters the appliance via a ground engaging cleaning head which forms a part of the lower end of the cleaner's casing and incorporates an elongate axially rotatable brushing member; and in the second, pure suction, mode dirt laden air enters

the appliance through a pipe which may be connected to other suction tools.

5 It is an object of the present invention to provide an air flow control device which serves to open the inlet of the cyclone system to either the ground engaging cleaning head, or the pipe, dependent upon whether the cleaner is to be operated in the first or second mode.

10 According to the present invention there is provided a vacuum suction cleaning appliance comprising a casing which accommodates one or more cyclone units, means for generating air-flow from a dirty air inlet through said cyclone unit, a ground engaging cleaning head
15 rotatable relative to the casing, a pipe connectable to a suction tool, and an air-flow control device characterised in that the air-flow control device comprises means adapted to selectively direct dirt laden air into the dirty air inlet from either the
20 ground engaging cleaning head or the suction tool via the pipe, said means being operated by rotation of the cleaning head relative to the casing.

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In an embodiment a low efficiency cyclone unit and a high efficiency cyclone unit are arranged in series and the air-flow control device comprises a generally cylindrical drum having an axially extending sectoral appendage, a first passage extending diametrically through said drum between a first inlet port and a first outlet port, said ports being formed through the curved surface of the drum, and a second passage extending from a second outlet port, which port being formed through the curved surface of the drum displaced about 30° from the first outlet port, to a second inlet port formed through a radial face of the sectoral appendage.

It is envisaged that air-flow control devices of the type herein described will find use in vacuum suction cleaning appliances which include alternative dirt retaining means other than, or in addition to cyclone units.

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In further embodiments the low efficiency cyclone unit is no longer cylindrical, but has a substantially frusto-conical form, tapering towards its dirty air inlet; the arrangement being such that the low

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efficiency cyclone has a reverse taper with respect to the taper of the high efficiency cyclone.

Thus the shape of the low efficiency cyclone does not
5 serve to maintain the velocity of the dirt particles
swirling therein in the same way as does the shape of
the high efficiency cyclone. In fact the reverse
taper of the low efficiency cyclone unit causes the
velocity of the dirt particles to be reduced rapidly
10 as they descend within the cyclone.

Thus in one embodiment a vacuum cleaner casing comprises
a generally frusto-conical low efficiency cyclone with
an inlet for dirty air and concentrically within the
15 low efficiency cyclone a high efficiency cyclone, a
passage way being provided to allow air from the low
efficiency cyclone to enter an end part of the high
efficiency cyclone. Clean air can then be withdrawn
centrally from the high efficiency cyclone and exhausted
20 if necessary through a final filter.

It is a yet further object of the present invention to
provide means whereby the separated dirt is prevented
from becoming entrained in the axially upwardly moving
25 air-flow in a cyclone. According to a further aspect

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of the present invention there is provided a vacuum suction cleaning appliance, characterised in that a dirt collecting region is provided at the end of a cyclone remote from the dirty air inlet to said cyclone, within which dirt collecting region dirt previously entrained in said air-flow is allowed to settle out and collect.

In an embodiment, the dirt collecting region is defined by structure which extends radially outwardly from the portion of the cyclone body immediately adjacent to said dirt collecting region. In this embodiment the dirt enters the dirt collecting region, after descending within the cyclone body in a spiral path adjacent to the wall thereof, and is allowed to move radially outwardly from the axis of the cyclone under the influence of a centrifugal force. The dirt thus accumulates at the radial extremity of the region spaced a substantial distance from the upwardly moving axial air current, where the air-flow velocity is substantially reduced.

In a further embodiment said dirt collecting region in addition to being defined by radially outwardly extending structure, has a greater cross-sectional area in

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the radial direction than the region within the cyclone body immediately adjacent to said dirt collecting region. The dirt collecting region in this embodiment has a reverse effect on the air-flow and dirt movement as does the frusto-conical part of a conventional cyclone. When the fast moving air and dirt from the bottom part of the cyclone enters the dirt collecting region, the velocity maintaining effect of the tapering cyclone body is removed and the velocity of the swirling air and dirt is consequently reduced. The result is that the dirt becomes dis-entrained from the air-flow.

Particular embodiments of all the aspects of the present invention will now be described by way of example only with reference to the accompanying drawings wherein:-

- Figure 1 is a side view of a cleaner in accordance with the present invention;
- Figure 2 is a side view of the cleaner in the first mode;
- Figure 3 is a side view of the cleaner in the second mode, showing the opposite side of the cleaner from that shown in Figures 1 and 2;
- Figure 4 is a section on A-A in Figure 1;

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Figure 5 is a perspective view of the air-flow control device from the cleaner shown in Figures 1-3;

Figure 6 is a schematic sectional diagram of the lower part of the cleaner shown in Figures 1-3, showing the

5 position of the air-flow control device, when the cleaner is in the first mode as shown in Figure 2;

Figure 7 is a schematic sectional diagram showing the position of the air-flow control device when the cleaner is in the second mode as shown in Figure 3;

10 Figure 8 is a vertical section of a second embodiment of the present invention; and

Figure 9 is a section on I-I in Figure 1.

The cleaner shown in Figure 1 is generally as described

15 and illustrated in European Patent Specification No. 0 042 723. With particular reference to Figures 1, 2, 3 and 4, the cleaner comprises a main casing 1 which houses two concentric cyclones; an outer low efficiency cyclone 10 and an inner high efficiency
20 cyclone 12. At the lower end part 7 of the casing 1 a pivotal cleaning head 2 is provided, which head 2 houses an elongate transversely extending brushing member 4 (more clearly shown in Figures 5 and 6). A motor driven fan unit is located within the lower end

part 7 of the casing 1, said motor being connected to the brushing member 4 by a flexible belt.

5 A wand assembly 6 upstands along the back of the casing 1 and serves as a handle, or for a connection to other suction tools. A dirty air passage 11 communicates between the entry port 14 (more clearly shown in Figure 4) of the outer low efficiency cyclone 10 and the cleaning head 2, or the wand assembly 6.

10 An air-flow control device 22 is located in the lower end part 7 of the casing 1. Said air-flow control device 22 is rotatable to close air-flow from the cleaning head 2 and to open the air passage to the pipe 6.

15 The arrangement of a concentric cyclones and their associated air passages located within and surrounding the casing 1 will now be described as orientated in Figure 4 and with particular reference to that Figure, together with Figures 1, 2 and 3.

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Two rigid tubular members 3 and 5 upstand from the lower end part 7 of the casing 1. Tubular member 3 forms part of the dirty air passage 11 and tubular member 5 forms part of a clean air passage 8 which

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communicates between the motor driven fan unit and the high efficiency cyclone 12.

Two journal blocks 13 are provided, one on each of the tubular members 3 and 5, at the upper end parts of said members. The casing 1 comprises, in addition to the lower end part 7, an upper end part 15 and a central section 16. The upper end part is supported by two spigots 75, each of which extends from the upper end part 15 and is swivelably located in one of the journal blocks 13. The central section 16 is clamped between the upper end part 15 and the lower end part 7.

The central section 16 of the casing 1 is substantially cylindrical, comprising a side wall 17 upstanding from a frusto-conical portion 21 which extends upwardly and outwardly from the radial periphery of a circular base 18. The circular base 18 is seated on the lower end part 7 of the casing 1, and engaged thereto by a releasable latching mechanism 19. A circular rim 20 is defined at the upper extremity of the side wall 17.

The upper end part 15 of the casing 1 has a first cylindrical sleeve portion 50 slidably engaged over the rim 20 and the upper part of the side wall 17 of

the centre section 16. The spigots 75 extend radially outwardly from the first sleeve portion 50 to swivelably locate in the journals 13. A second cylindrical sleeve portion 51 extends upwardly from the top of the first sleeve portion 50, concentric with said first sleeve portion 50. Said second sleeve portion 51, has substantially the same diameter as the side wall 17, and is thus of a marginally smaller diameter than the first sleeve portion 50. An annular sealing ring 52 is fixed to the lower end of the second sleeve portion, radially inwardly of the first sleeve portion 50. Said sealing ring is clamped between the rim 20 of the wall 17 and the lower end of the second sleeve portion 51.

A third cylindrical sleeve portion 53, having a smaller diameter than the second portion 51 extends upwardly from the top of said second portion 51, and a fourth cylindrical sleeve portion 54 of similarly reduced diameter extends upwardly from the top of said third portion 53. A substantially circular top plate 55 extends across the top end of the fourth sleeve portion 53 to form a fixed cover for the upper end part of the casing 1. A substantially frusto-conical casing 56 tapers downwardly within the cleaner casing

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1, extending into the centre portion 16 thereof, from the junction of the third and fourth cylindrical portions 53 and 54 of the upper end part 15.

5 The substantially frusto-conical casing 56, the fourth sleeve portion 54 and the top plate 55 comprise the body of the high efficiency cyclone 12.

10 The body of the low efficiency cyclone 10 comprises the second sleeve portion 51 and the side wall 17 of the centre casing section 16.

15 A dirt collection box 57 is formed in the centre section 16 of the casing 1. The dirt collection box 57 comprises a first cylindrical portion 58, a frusto-conical portion 59 which extends radially outwardly and downwardly from the lower end of the first cylindrical portion 58, to a second larger diameter cylindrical portion 60. The lower end part of the high efficiency cyclones frusto-conical casing 56 is engaged in the first cylindrical portion 58 of the dirt collection box 57, so that the opening 61 at the bottom of the frusto-conical casing 56 lies within the confines of the first cylindrical portion 58. The larger diameter cylindrical portion 60 is at least three

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times the diameter of the opening 61. An annular sealing ring 62 is interposed between the top of the first cylindrical portion 58 and the frusto-conical casing 56 of the high efficiency cyclone 12. The second cylindrical portions 60 of the dirt collection box 57 is rigidly located within the lower part of the central casing section 16, in sealing engagement with the side wall 17; the base of the dirt collection box 57 being provided by the base 18 of the central section 16 of the casing 1.

The dirty air passage 11 communicates through the second sleeve portion 51 via the entry port 14 so as to make a tangential entry to the low efficiency cyclone 10 and to facilitate the setting up of the swirling cyclonic flow of air within said cyclone 10. An annular flange 63 extends from the juncture of the second and third sleeve portions 53 and 54 radially inwardly into the upper end portion 15 of the casing 1, to form a support for a dependent frusto-conical sleeve 64. Said sleeve 64 surrounds the frusto-conical casing 56, an annular passage 65 being formed between said sleeve 64 and said casing 56. The passage 65 communicates between the interior of the low efficiency cyclone 10 and an annular chamber 66 formed within the

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third sleeve portion 53 radially outwardly of the frusto-conical casing 56.

5 An air transfer passage 67 extends from a port 68 through the third sleeve portion 53 to an entry port 69 formed through the fourth sleeve portion 54 so as to give a tangential entry to the high efficiency cyclone 12, thereby facilitating the setting up of a swirling cyclonic flow of air in said cyclone 12.

10

A tubular sleeve 70 depends from the top plate 55 coaxially with the casing 1 into the high efficiency cyclone 12 and provides a clean air outlet from said high efficiency cyclone 12. The clean air passage 8 extends from the top of sleeve 70, through the plate 15 55 and down to the motor driven fan unit, via the tubular member 5. The upper part of the clean air passage 8 is embodied by a flexible tube 71 a first end 76 of which is engaged in an annular groove surrounding the top of sleeve 70. The flexible tube 20 71 extends from its first end part 76 to the top of the tubular member 5; where the second end part 77 of the tube 71 is frictionally engaged over the end part of the tubular member 5.

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The dirt separating operation of the concentric cyclones and associated components will now be described with reference to Figure 4. Reference will be made to the air-flow designated by arrows differently marked to show the successive progress of dirty air through the interior of the cyclone unit.

—————→ represents dirty air, ———→ air cleaned by the low efficiency cyclone, ———→ air cleaned by the high efficiency cyclone, and finally ———→ represents air flowing through passages which are hidden by structure in Figure 4. Dirty air carrying dust and other particles is drawn into the dirty air inlet passage 11. The air stream carrying the dirt particles makes a tangential entry into the upper part of the low efficiency cyclone unit 10 through port 14 and performs a cyclonic swirling movement generally along the line of the arrows and thereby deposits the majority of the dust particles in the lower part of the low efficiency cyclone as indicated at A. The low efficiency cyclone has no taper and thus the angular velocity of the dirt particles is not maintained as they fall within the cyclone unit 10. The air stream carrying only the finer particles then rises under the influence of the general air-flow developed by the fan, passes through the annular

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passage 65, the annular chamber 60 and the air transfer passage 67. The air then makes a tangential entry to the high efficiency cyclone 12, through the inlet port 69, where the cyclonic cleaning process is repeated, only with high efficiency and greater particle velocity thereby contriving to deposit the finer particles.

Once the air and dirt entrained therein enters the dirt collection box 57 from the cyclone 12 via the opening 61, the dirt is thrown outwardly from the axis of the cyclone and collects at B. Additionally, the velocity of the swirling air is reduced by the reverse taper of the frusto-conical portion 59 of the dirt collection box 57 thus preventing the dirt at B from becoming re-entrained within the air-flow. The ultimately clean air rises under the influence of the air-flow to the upper part of the high efficiency cyclone and is drawn through the dependent tube 70 and the clean air passage 8 to the motor fan, where it is then exhausted.

In order to discharge the dirt particles trapped in the cyclone 10 and dirt collection box 57 the central section of the casing 16 must be removed from the

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remainder of the cleaner. Firstly a catch 72 fixed to the wand assembly 6 must be disengaged from the upper part 15 of the casing 1, so that the wand may be removed to the position shown in Figure 3. The latching mechanism 19 should be disengaged from the base 8 of the central casing section 16, and the assembled central section 16 and upper end part 15 then should be swivelled about spigots 75 to a position where the central section 16 can be pulled away from the upper end part 15 without fouling on any part of the cleaner. Once the central section 16 has been so separated from the remainder of the cleaner, the dirt collected in said section 16 may then be tipped out and the cleaner reassembled for use.

The air-flow control device 22 will now be described in detail with particular reference to Figure 5. An air-flow control device 22 comprises a cylindrical drum 25 having an axially extending sectoral appendage 26. A first passage 27 extends diametrically through the drum 25 from a first inlet port 28 to a first outlet port 29, both ports 28 and 29 being formed through the outer surface of the drum 25. A second outlet port 30 is formed through the curved surface of the drum 25, displaced about 30° from the first outlet

port 29. A second inlet port 31 is formed through a radial face 32 of the sectoral appendage 26. Said second outlet port 30 and said second inlet port 31 communicate via a cranked passage 33.

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A hole 34 is formed through the sectoral face 35 of the sectoral appendage 26 into the first passage 27.

10

The function of the air-flow control device 22 will now be described with particular reference to Figures 2, 3, 6 and 7. The air-flow control device 22 is located to one side of the lower part of the casing 1, directly below the lower end of the dirty air passage 11. The device 22 is rotatable about the axis of rotational symmetry of the drum part 25, which axis passes through the hole 34 and lies across the cleaner, parallel to that of the brushing member 4.

15

One end part of the cleaning head 2 is located by a bearing assembly 36 and an arm 37; the rotational axis of the bearing 36 being the same as that about which the air-flow control device 22 is rotatable. The other end part of the cleaning head is rigidly fixed to the air-flow control device 22 by a dirty air passage 38 which extends from the cleaning head 2, and

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- 20 -

is spigotted into the first passage 27, via the first inlet port 28.

When the cleaner is in use in the first mode the
5 air-flow control device 22 is in the position shown in
Figure 5, where the dirty air passage 11, the first
air passage 38 are all in alignment. When the motor
driven fan is activated the air-flow from the cleaning
head 2 into the dirty air passage 11 would follow the
10 direction indicated by arrows: , as shown in
Figure 6.

When the cleaner is in use in the second mode the air
flow control device 22 is in the position shown in
15 Figure 7. The open lower end of the dirty air passage
11 is aligned with the second outlet port 30 and the
radial face 32 of the sectoral appendage 26 is in
abutment with a bulkhead 40, which bulkhead 40 forms
part of the lower end part 7 of the casing 1. The
20 bulkhead 40 is formed at one end of an internal
passage 41 and defines an outlet port 42 from said
passage 41.

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The passage 41 extends from the outlet port 42, through the casing 1 of the cleaner to the lower open end 43 of the wand 6.

5 The wand 6 comprises concentric inner tube 44 and an outer tube 45, the inner tube 44 being rigid and slidably mounted within the flexible and extensible outer tube 45. The lower end part of the outer tube is fixed to the lower end part 7 of the casing 1, 10 whereas the inner tube 44 is free to slide. When the wand 6 is in use as a handle and at all times when it is attached to the cleaner, as shown in Figures 1 and 2, the inner tube 44 of the wand 6 extends to a lower position, shown in chain dotted lines in Figure 7.

15 A flap 47 is hingedly mounted to an axle 36, said flap 47 is spring biased to abut the underside of the casing 1, so as to seal an orifice 48 in the casing 1. The orifice 48 leads into the internal passage 41 20 directly below the wand 6. When the inner tube 46 of the wand 6 extends to the lower, chain dotted, position, the flap 47 is held away from the orifice 48 by the open end of the inner tube 46; in Figure 7 the flap is shown in said position in chain dotted lines. 25 When the orifice 48 is open, and the motor driven fan

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is activated the air would enter the cleaner through said orifice 48 and flow through the passages 41 and 33 and into the dirty air passage 11 as shown by the arrows:---→. As soon as the inner tube 44 of the wand 6 is moved up from its lower position, for instance when in use as shown in Figure 3, the flap 48 springs up to close the orifice 47, thus the air-flow would follow the solid arrows:→, down the wand 6, through the passages 41 and 33 and into the passage 11.

A pair of wheels 9 are located on the end parts of the axle 36, which axle is fixed to the rear part of the cleaner casing 1. The wheels 9 provide the means whereby the cleaner may be moved about, when it is in use in the first mode, and, in conjunction with the axle 36, the wheels 9 provide a pivot about which the cleaner casing 1 is rotated when its mode of operation is being changed.

In order to change the mode of the cleaner from, for example the first mode as shown in Figure 2 to the second mode as shown in Figure 3, the following needs to be done: the cleaner should be pivotted from the inclined position, as shown in Figure 2, to the

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upright position as shown in Figure 3; the wand 6 should be then disengaged from the cleaner, and the inner tube 44 extended from the outer tube 45 to the position shown in Figure 3. A reversal of this
5 procedure would obviously have the effect of converting the cleaner from the second mode to the first mode.

The air-flow control device 22 is caused to rotate
10 relative to the cleaner casing 1, when said casing 1 is rotated from the inclined position to the upright position, because the cleaning head 2 is in abutment with the ground and cannot be rotated any further in the direction which is anti-clockwise in Figures 2, 5
15 and 6. Additionally the air-flow control device 22 is caused to rotate relative to the cleaner casing 1, when said casing is rotated from the upright position to the inclined position, because the cleaning head 2 is caused to remain in abutment with the ground by
20 virtue of its mass.

The cleaning appliance illustrated in Figures 8 and 9 comprises a low efficiency cyclone unit 101, a high efficiency cyclone unit 102, a dirt collecting box 103
25 and a motor driven fan unit 104. The apparatus will

be described as orientated in Figure 8. The low efficiency cyclone unit 101 has a substantially frusto-conical casing comprising a side wall 105 upstanding from the radial periphery of a circular base 106. The low efficiency cyclone casing tapers upwardly from the base 106. A dirty air inlet passage 107 communicates through the upper part of the side wall 105 so as to make a tangential entry and to set up a swirling cyclonic flow of air. The end part 108 of the dirty air inlet passage, remote from the low efficiency cyclone, is joined via a flexible tube (not shown) to a cleaner head (not shown) for contacting a dirty surface.

A semi-circular cross-sectioned flange 109 extends radially outwardly from the upper end part of the side wall 105. A cover 110, circular in plan, having a peripheral recess 111 dimensioned to engage the flange 109, is engaged by said recess on the flange 109 so as to close the top of the low efficiency cyclone.

The high efficiency cyclone unit 102 comprises a frusto-conical body portion 112 and a dependent inlet scroll 113. The inlet scroll 113 comprises a tubular sleeve 114 (see Figures 8 and 9), which depends from

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the cover 110 to a horizontal annular web 115. The web 115 extends between the upper end part of the frusto-conical body portion 112 and the lower end part of the sleeve 114, and is perforated by a plurality of slots 116. The scroll 113 is completed by a second dependent sleeve 117, which extends between the cover 110 and the upper end part of the frusto-conical body portion 112 and the web 115. The second sleeve 117 is located radially inwardly of the tubular sleeve 114 and through the majority of the its length, (see Figure 9), upstands from the top of the frusto-conical body 112 where the latter joins the inner periphery of the web 115. A portion 118 of the second sleeve 117 extends, in the form of a spiral, from the junction of the frusto-conical body 112 and the web 115 to the tubular sleeve 114 thereby completing the scroll 113 and providing a tangential entry to the high efficiency cyclone in order to be capable of setting up a swirling cyclonic flow of air.

The dirt collection box 103 comprises a first cylindrical portion 129, a frusto-conical portion 121 which extends radially outwardly and downwardly from the lower end of the first cylindrical portion 120, to a second larger diameter cylindrical portion 122. The

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lower end part of the high efficiency cyclone body 102 is engaged in the first cylindrical portion 120 so that the opening 123 at the bottom of the cyclone body lies radially inwardly of the frusto-conical portion 121 of the dirt collection box 103. The larger diameter cylindrical portion 122 is at least three times the diameter of the opening 123. A flexible annular sealing member 124 is provided between the first cylindrical portion 120 and the high efficiency cyclone body 102, immediately above the opening 123. Interposed between the larger diameter cylindrical portion 122 and the base 16 is a second flexible annular sealing member 125.

The motor driven fan unit 104 is located on the cover 110, above the high efficiency cyclone unit 102 and is arranged so as to draw air from said cyclone unit 102 through a dependent tube 126. The dependent tube 126 extends downwardly from the cover 110 substantially coaxially with the high efficiency cyclone unit 2.

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Similar arrows to those shown on Figure 4 are shown on Figure 8 to illustrate the progress of air and dirt through the embodiment shown in Figures 8 and 9, and since the operation of both embodiments is essentially

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the same a more detailed description of the air-flow
in this embodiment will not be given.

CLAIMS

1. A vacuum suction cleaning appliance comprising
a casing which accommodates one or more cyclone units,
5 means for generating air-flow from a dirty air inlet
through said cyclone unit(s), a ground engaging cleaning
head rotatably mounted in the casing, a pipe connectable
to a suction tool, and an air-flow control device
characterised in that the air-flow control device
10 comprises means adapted to selectively direct dirt
laden air into the dirty air inlet, from either the
ground engaging cleaning head or the suction tool via
the pipe, said means being operated by rotation of the
cleaning head relative to the casing.

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2. A vacuum suction cleaning appliance as
claimed in Claim 1 wherein a low efficiency cyclone
unit and a high efficiency cyclone unit are arranged
in series.

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3. A vacuum suction cleaning appliance as claimed
in Claim 2 characterised in that the air-flow control

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device comprises a generally cylindrical drum having an axially extending sectoral appendage, a first passage extending diametrically through said drum between a first inlet port and a first outlet port, said ports being formed through the curved surface of the drum, and a second passage extending from a second outlet port, which port being formed through the curved surface of the drum displaced about 30° from the first outlet port, to a second inlet port formed through a radial face of the sectoral appendage.

4. A vacuum suction cleaning appliance as claimed in any of the previous claims characterised in that the casing includes alternative dirt retaining means other than, or in addition to the cyclone units.

5. A vacuum suction cleaning appliance as claimed in Claim 2 characterised in that the lower efficiency cyclone unit is substantially cylindrical.

6. A vacuum suction cleaning appliance as claimed in Claim 2 characterised in that the lower efficiency cyclone unit is substantially frusto-conical, tapering towards its dirty air inlet; the arrangement being

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such that the lower efficiency cyclone has a reverse taper with respect to the taper of the high efficiency cyclone.

5 7. A vacuum suction cleaning appliance as claimed
in Claim 5 or Claim 6 characterised in that the casing
comprises a low efficiency cyclone with an inlet for
dirty air and concentrically within the low efficiency
cyclone a high efficiency cyclone, a passageway being
10 provided to allow air from the low efficiency cyclone
to enter an end part of the high efficiency cyclone.

8. A vacuum suction cleaning appliance as claimed
in any of the preceding claims characterised in that a
15 dirt collecting region is provided at the end of the
high efficiency cyclone remote from the dirty air
inlet to said cyclone; said dirt collecting region
being spaced a sufficient distance from the axis of
the cyclone to thereby allow dirt particles entering
20 therein to become disentrained from the air-flow
through the cyclone, and to settle out and collect in
said dirt collecting region.

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9. A vacuum suction cleaning appliance as claimed
in Claim 8 characterised in that the dirt collecting
region is defined by structure which extends radially
outwardly from the portion of the cyclone body
5 immediately adjacent to said dirt collecting region.

10. A vacuum suction cleaning appliance as claimed
in Claim 9 characterised in that the radially
outwardly extending structure has a diameter at least
10 three times that of the end of the cyclone located
within said structure, remote from the dirty air inlet
to said cyclone.

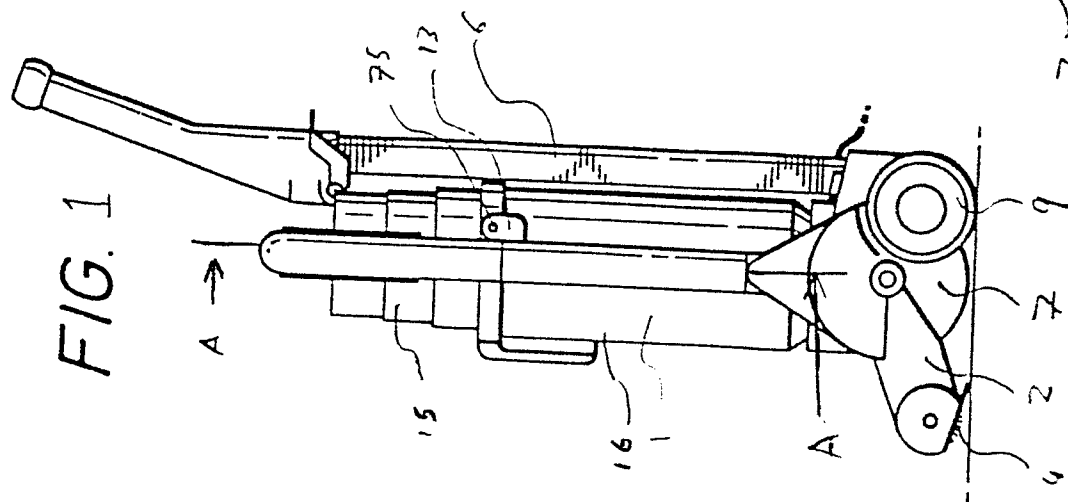


FIG. 1

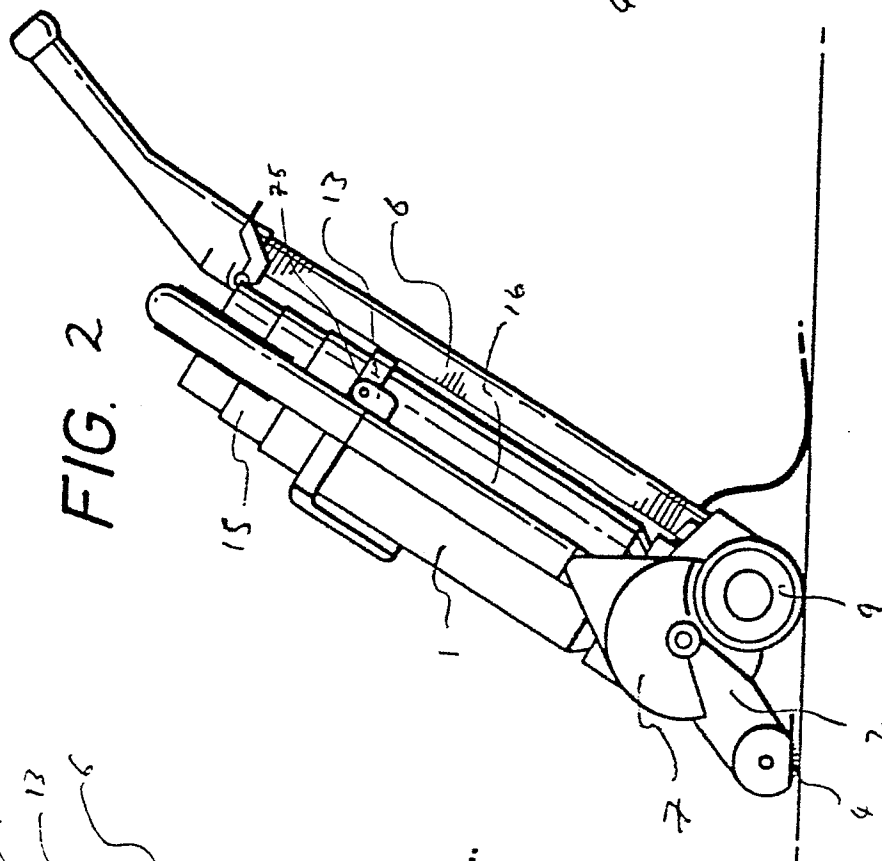


FIG. 2

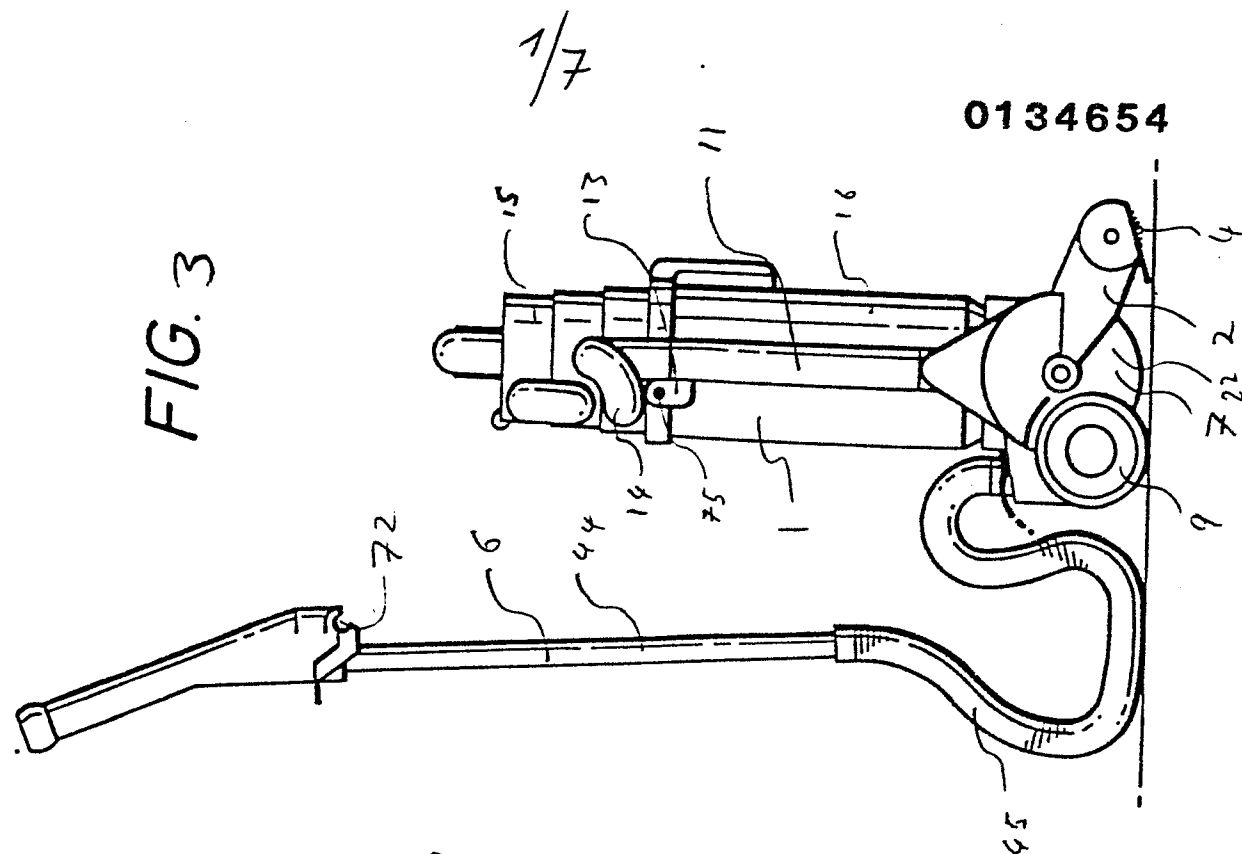


FIG. 3

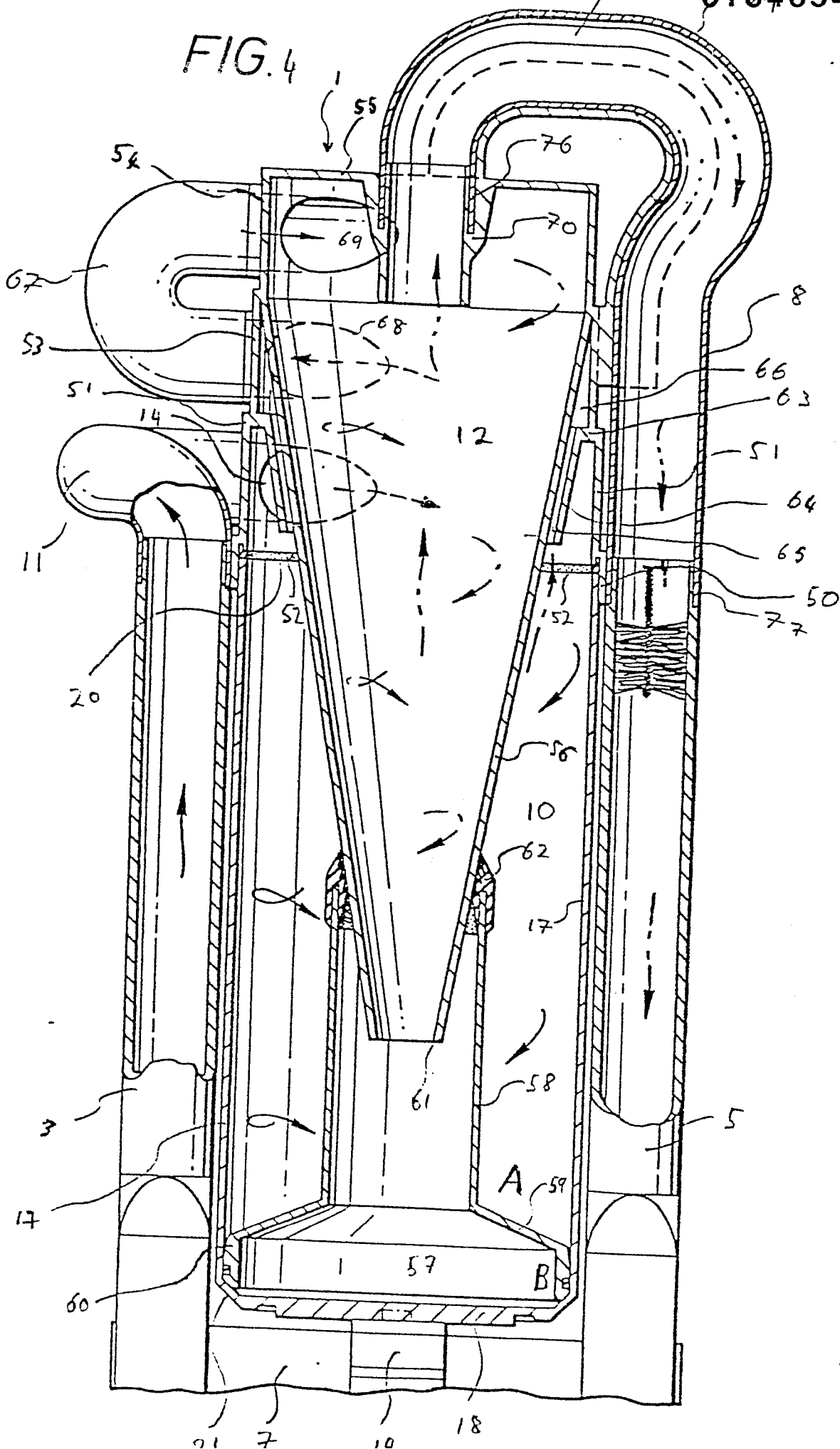
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FIG. 4



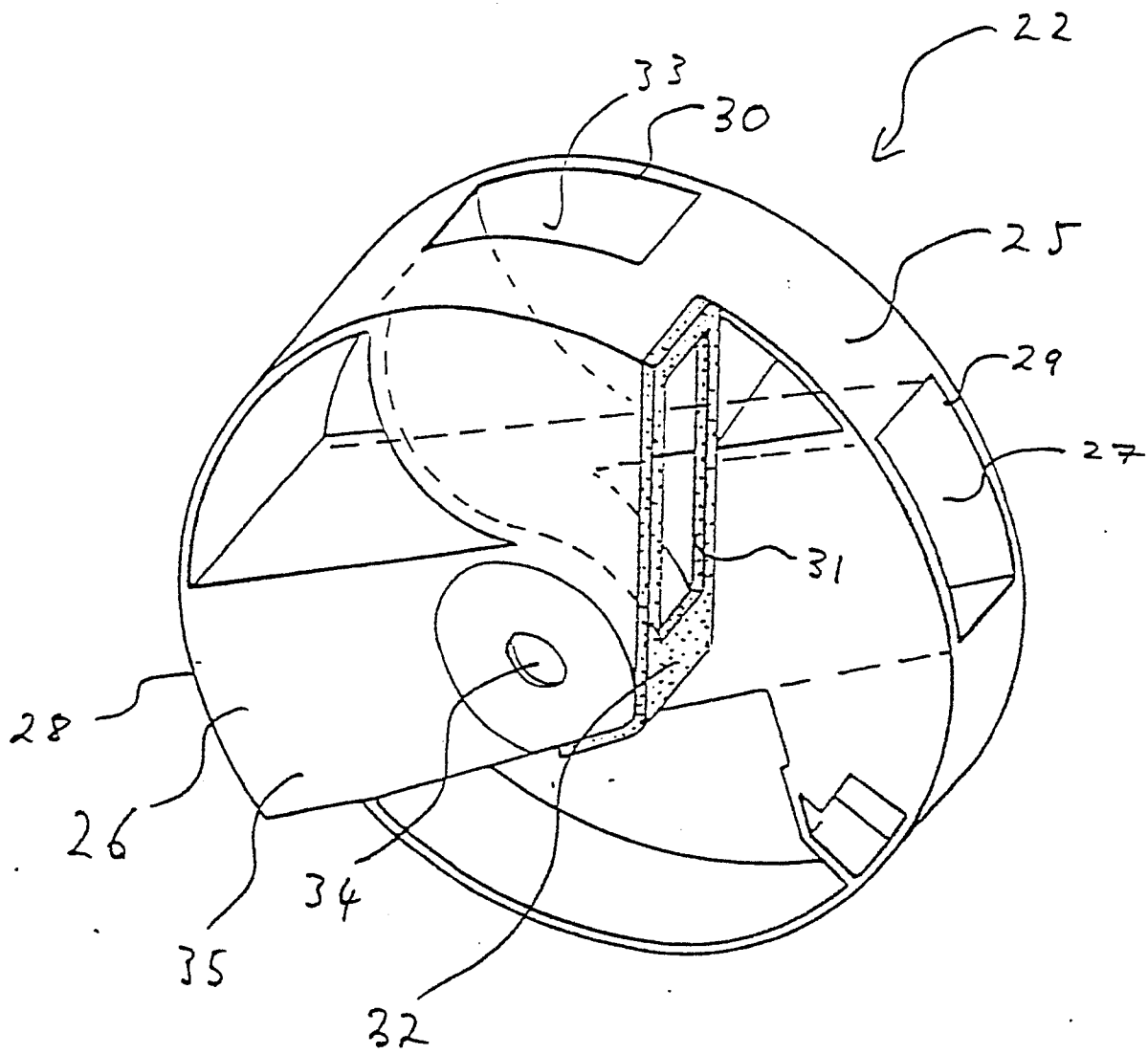
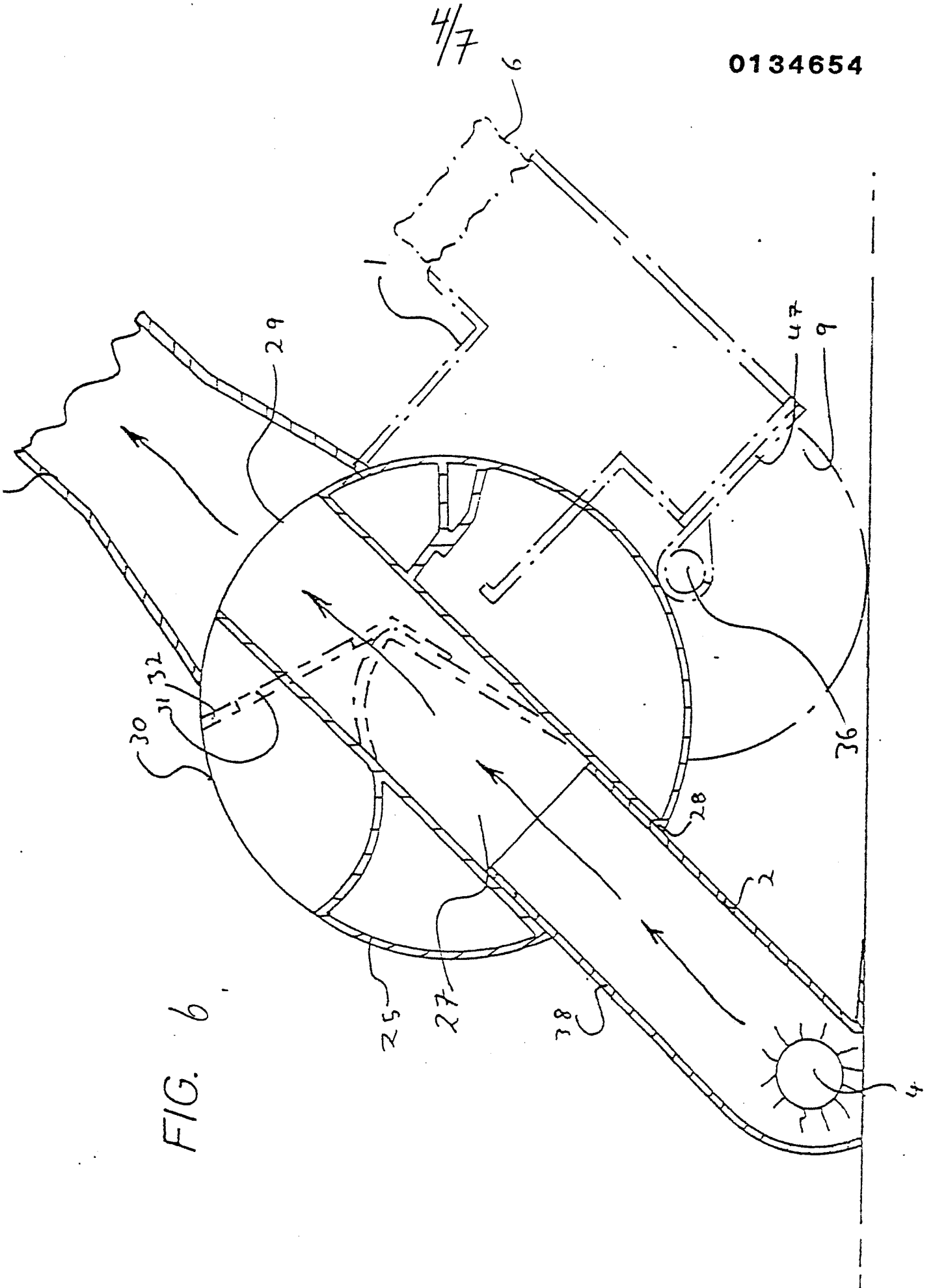


FIG. 5

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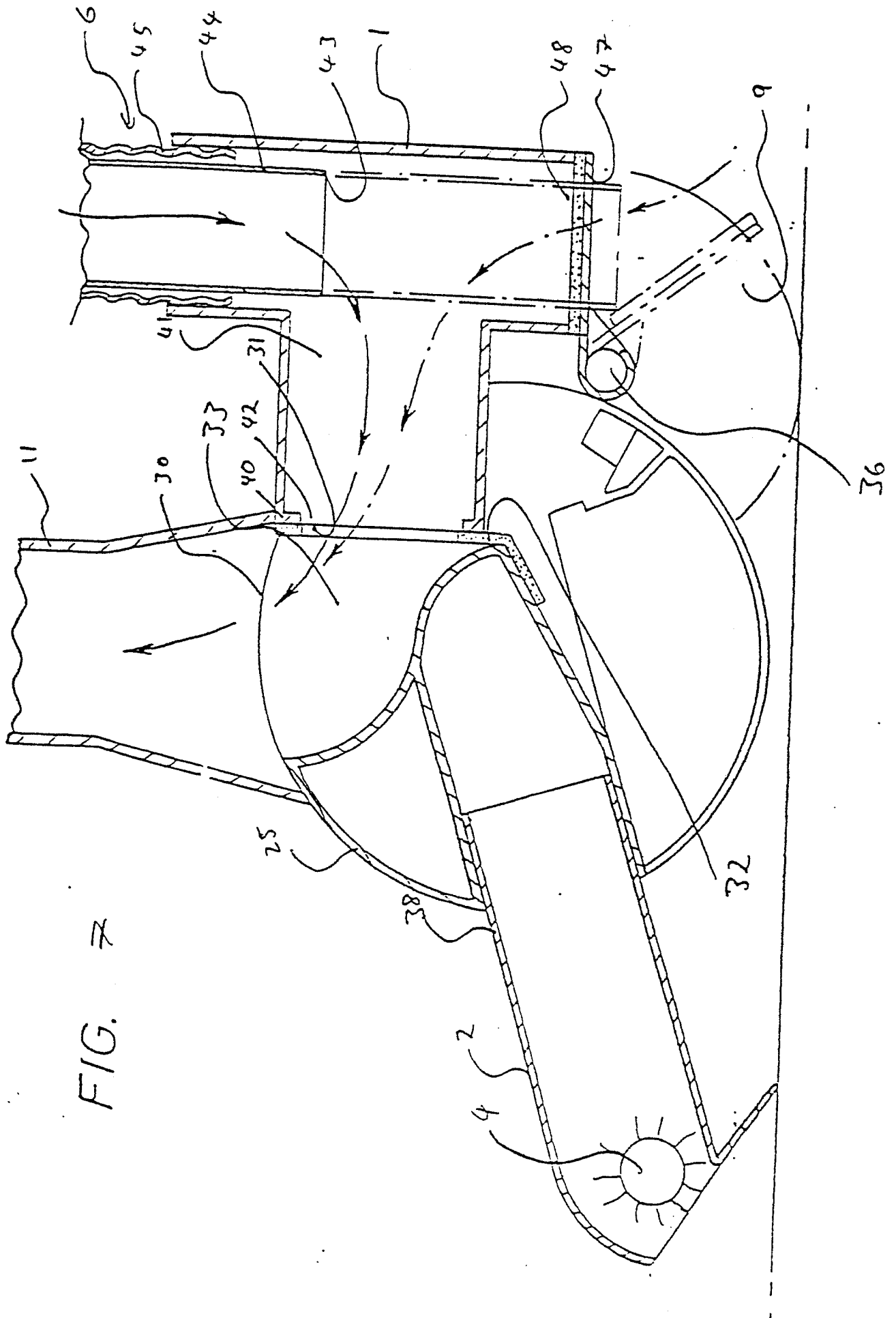
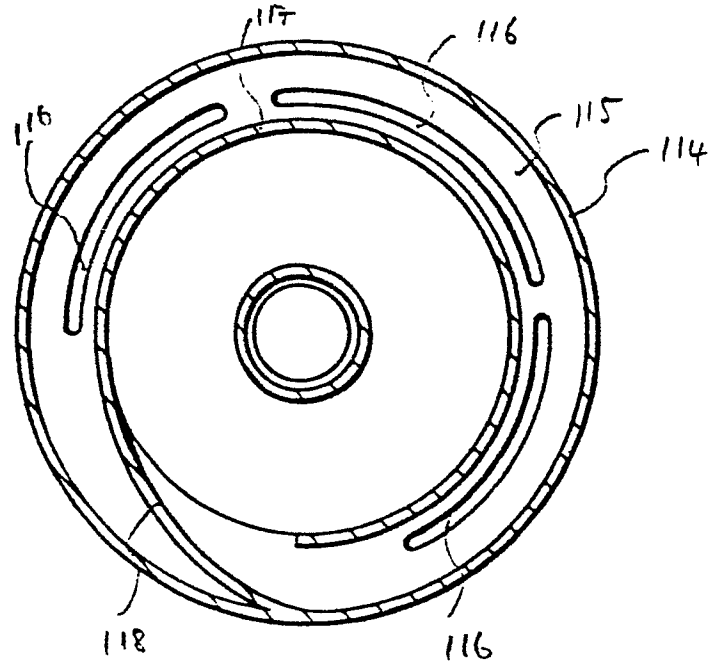


FIG. 9





European Patent
Office

EUROPEAN SEARCH REPORT

0134654
Application number

EP 84 30 4648

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	EP-A-0 037 674 (J. DYSON) * page 8, lines 6-22; pages 9-21; figures 1,2,4-8 *	1, 4	A 47 L 5/32 A 47 L 9/00 A 47 L 9/16
A		2, 5	
Y	DE-C- 626 014 (THE HOOVER CO.) * page 3, lines 81-103; figures 9-10 *	1, 4	
D, A	EP-A-0 042 723 (ROTORK APPLIANCES LTD.) * whole document *	1, 2, 4- 7	
A	GB-A-2 028 111 (MCDONALD/ELECTRIC GmbH)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	DE-C- 622 853 (THE HOOVER CO.) -----		A 47 L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16-10-1984	Examiner MUNZER E.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			