Dec. 14, 1948. C. DAVIES 2,456,391

VENTILATOR

Filed Dec. 12, 1944 2 Sheets-Sheet 1

FIG. 1.

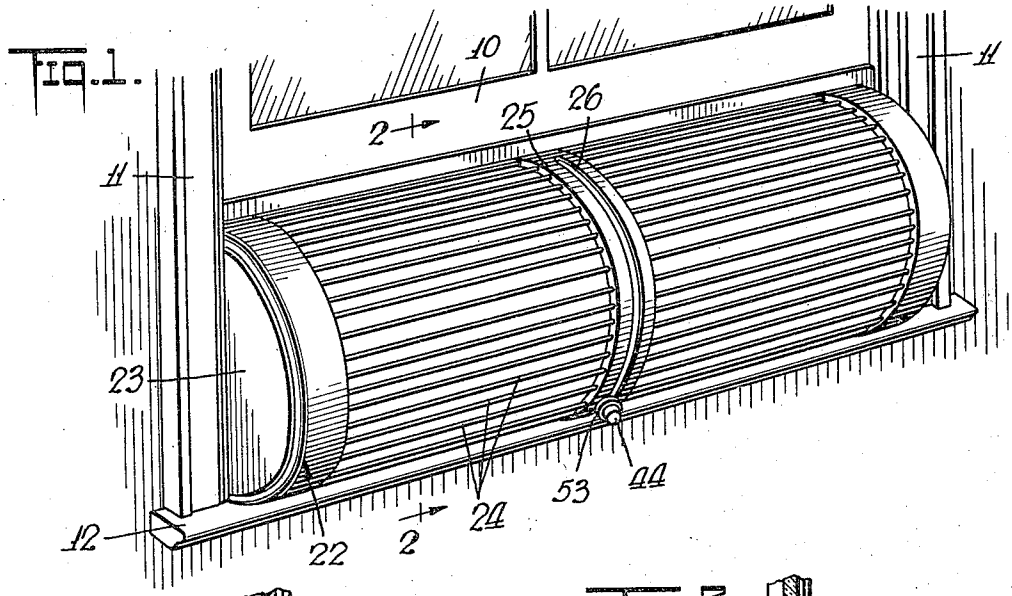



FIG. 2.

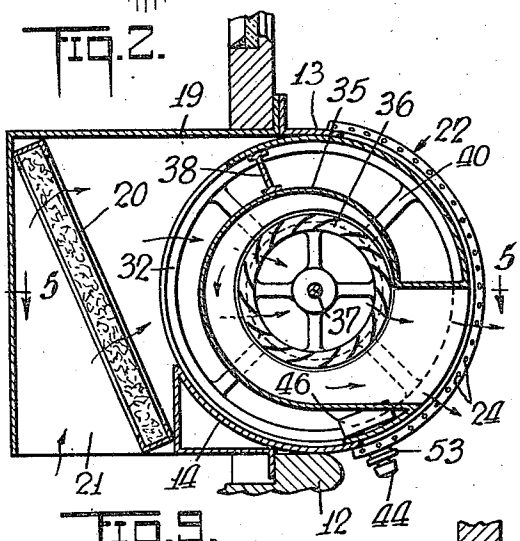



FIG. 3.

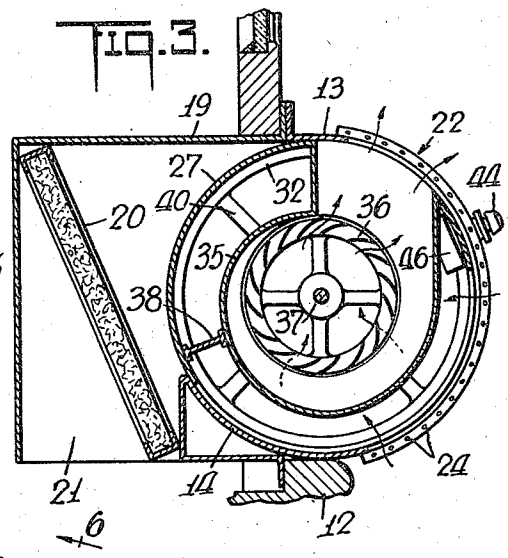
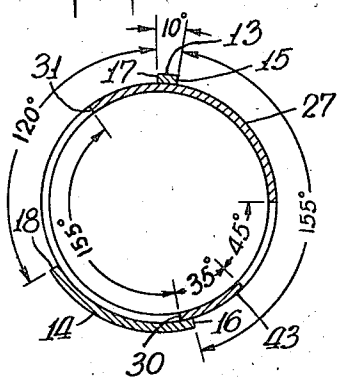



FIG. 5.



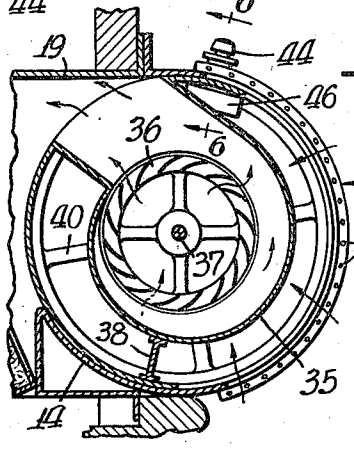




FIG. 4.

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Dec. 14, 1948. C. DAVIES 2,456,391

VENTILATOR

Filed Dec. 12, 1944 2 Sheets-Sheet 2

FIG. 5.

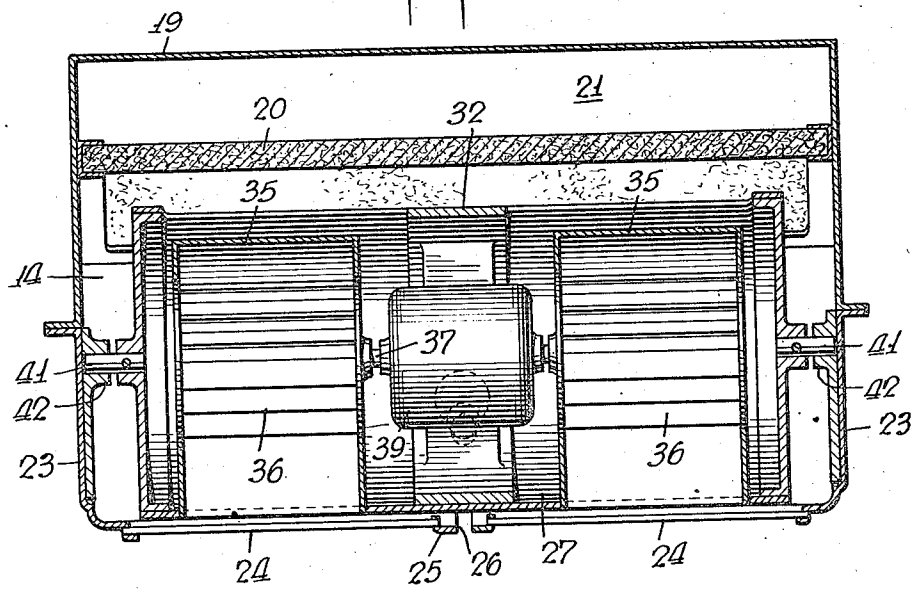



FIG. 7.

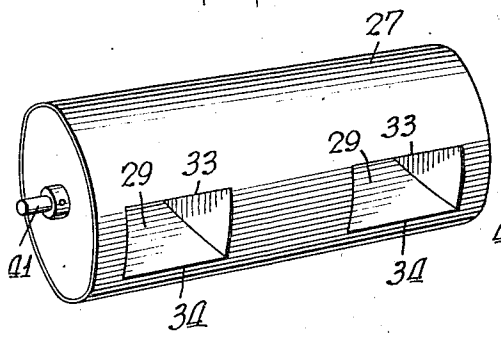



FIG. 8.

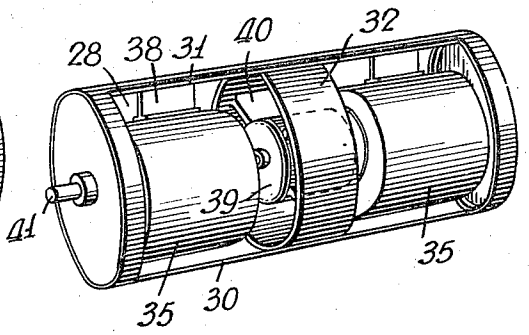
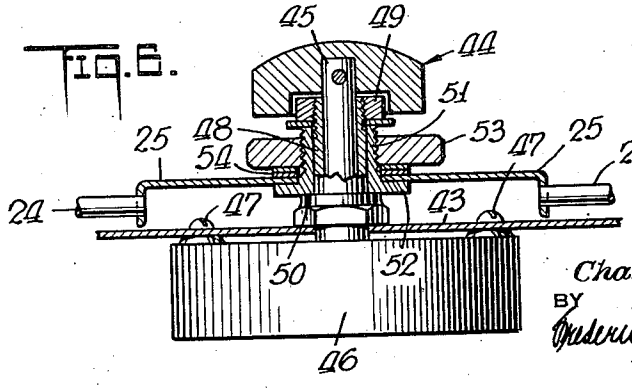



FIG. 6.




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# UNITED STATES PATENT OFFICE

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## VENTILATOR

Charles Davies, New Rochelle, N. Y.

Application December 12, 1944, Serial No. 567,831

9 Claims. (Cl. 98—94)

1

My present invention relates generally to ventilators, and has particular reference to the type of ventilator that is mounted in a wall opening, for example, an opening produced by partly elevating a window.

A general object of the invention is to provide a device which is inexpensive to manufacture, easy to install, easily adjustable to effect different ventilating functions, simple to control, compact and workmanlike in structure, and attractive in appearance.

A more particular object of the invention is to provide a device of the kind in which the ventilation of a room may be selectively controlled by either introducing fresh air into the room, recirculating the air in the room, or exhausting the air from the room. These objectives are not new per se, but ventilators heretofore designed for this purpose are relatively cumbersome and complicated, and usually require a multiplicity of independent adjustments and manipulations to bring the parts into the proper functioning relationships. By means of my improved ventilator, the rotative adjustment of only a single element, and the manipulation of only a single control handle or the like, are sufficient to bring the parts successively into the various relationships necessary to accomplish the different types of ventilation.

Briefly stated, the present construction consists essentially of a fixed cylindrical housing mounted in the wall opening, and a cylindrical drum mounted for concentric rotation within the housing. The housing is provided with a pair of apertures arranged respectively on the inner and outer sides of the wall within which the ventilator is mounted. The drum is provided with circumferentially-spaced inlet and outlet ports, and is of hollow construction, a blower being mounted within the drum to draw air through the inlet port and expel it through the outlet port.

The successful achievement of the advantages of the present construction resides in a predetermined unique proportioning of the drum ports and the housing apertures whereby a mere rotative adjustment of the drum automatically and successively establishes communication (*a*) from the outer aperture to the inner aperture (for pure ingress of air), (*b*) from the outer aperture and a part of the inner aperture to another part of the latter (for partial ingress and partial recirculation of air), (*c*) from a part of the inner aperture to another part thereof (for pure recirculation of air), and (*d*) from the inner aperture to the outer aperture (for egress of air). In the preferred construction, the housing includes

2

a shell-like portion of semi-cylindrical shape and of open-work construction which fits over the inner aperture, this shell being provided with a medial band having a groove therein, whereby the rotative adjustments of the drum may be conveniently achieved by securing a control handle to the drum and causing it to project outwardly through the slot. I prefer to associate a means with this handle for permitting it to be releasably secured in engagement with the shell so as to retain the drum in any selected position. I prefer also to associate the control handle with a means for controlling the operation of the blower. In this way, the manual grasping and manipulation of a single handle member is all that is required of the user of the device.

I achieve the foregoing general objects and advantages, and such other objects and advantages as may hereinafter appear to be pointed out, in the manner illustratively exemplified in the accompanying drawings in which:

Figure 1 is a perspective view of a ventilator construction in accordance with the present invention, shown for illustrative purposes in association with a partly opened window of a room;

Figure 2 is a cross-sectional view taken substantially along the line 2—2 of Figure 1, showing the parts in a relationship in which air from the outside is introduced into the room;

Figure 3 is a view similar to Figure 2 showing the parts adjusted into a relationship in which recirculation of the air within the room is accomplished;

Figure 4 is a view similar to Figures 2 and 3, showing the parts in an adjusted relationship in which air is withdrawn or exhausted from the room to the exterior;

Figure 5 is a cross-sectional view taken substantially along the line 5—5 of Figure 2;

Figure 6 is an enlarged fragmentary cross-sectional view taken substantially along the line 6—6 of Figure 4;

Figure 7 is a perspective view of the drum by itself;

Figure 8 is a view similar to Figure 7 depicting the drum from the opposite side; and

Figure 9 is a diagrammatice view showing the special proportioning of ports and apertures, constituting a characterizing feature of the present invention.

In Figures 1–4 I have illustratively shown a ventilator of the present character mounted in a wall opening defined by a partially elevated window 10, the side frames of the window being designated 11, and the window sill being desig-

nated 12. It will be understood that the invention is not restricted to a mounting of this particular character, and that the external parts of the ventilator construction may be designed in any suitable or convenient fashion for fitting the ventilator into association with the wall opening in which it is to be mounted.

As hereinbefore stated, the construction involves a fixed housing and a rotatable drum. The main part of the housing is cylindrical in shape and comprises the parts 13 and 14. These parts are circumferentially spaced from each other, so that the edge 15 (of the part 13) and the edge 16 (of the part 14) define between them a relatively wide aperture on the inner side of the wall. Referring to Figure 9, it will be noted that this aperture has a width of approximately 155°. Similarly, the space between the edge 17 (of the part 13) and the edge 18 (of the part 14) defines a somewhat narrower aperture (approximately 120° as best indicated in Figure 9) on the opposite or outer side of the wall.

As shown in Figures 2–5, the housing includes also a portion 19 which may be of any suitable shape and which is arranged over the outer aperture. This housing portion may be substantially rectangular in contour, as shown in the illustrated structure, and is preferably provided with an air filter 20 fixedly mounted in the angular relationship shown, so that air entering through the opening 21 will travel through the filter 20 before passing into the outer aperture between the edges 17 and 18 of the cylindrical housing portion.

On the other or inner side of the wall, the housing is provided with a shell-like portion 22 which is semi-cylindrical in shape and of open-work construction to permit free passage of air through it. This shell, as shown most clearly in Figure 1, is arranged over the inner housing aperture, i. e., the relatively wide aperture between the edges 15 and 16 of the cylindrical housing portion. The shell 22 is provided with opposed end walls 23 of substantially semi-circular shape, and the open-work construction may consist in the provision of spaced rods or slats 24 arranged in parallelism along the cylindrical surface of the shell. In a medial portion of the shell, a circumferential band 25 is provided, this band having a slot 26 therein.

The main movable element of the present assembly is the hollow cylindrical drum shown most clearly in Figures 7 and 8. This drum has a cylindrical wall portion 27 and is provided with an inlet port 28 (Figure 8) and at least one outlet port 29 (Figure 7). The width of the inlet port 28 is defined by the opposed parallel edges 30 and 31. Upon reference to Figure 9, it will be observed that the width of this port is approximately 155°. Its function and operation are not impaired by the provision of a medial bridging wall 32, as shown most clearly in Figure 8, this wall being desirable for reinforcing purposes. The width of the outlet port 29 is defined by the opposed edges 33 and 34. An inspection of Figure 9 will indicate that this width is approximately 45°.

In the illustrated embodiment, I have shown two outlet ports in the drum, but this represents a mere duplication of parts, and the description of the invention will therefore be confined to one port 29 and its associated elements.

Within the drum, I provide a centrifugal blower 35, as shown most clearly in Figures 2–4. This blower may be of any conventional construction, and consists essentially of a housing of volute shape, the outlet being in registry with, and thus



defining, the outlet port 29. Within this housing there is the usual impeller 36, provided with circumferentially-arranged blades, and mounted for rotation upon an axle or shaft 37. The opposite ends of the blower housing are open, and when the impeller rotates, it draws air through these axial openings and expels it centrifugally through the volute housing and out of the outlet port 29.

The housing of the blower may be secured to the interior of the drum in any suitable or desired manner, and I have illustratively shown a strut 38 for accomplishing this purpose.

Where two outlet ports are provided, as is preferable, a second blower of identical construction is associated with the other port.

Also mounted within the drum is an electric motor 39 (see Figure 8), supported in a similar manner by means of struts 40 or the like, and axially aligned with the blower or blowers. The shaft of the motor is connected to the blower shaft or shafts. Where two blowers are employed, an efficient construction results from mounting the blowers on opposite sides of the motor, respectively.

From the description given, it will be obvious that the blower operates to draw air into the drum through the inlet port 28 and to expel it out of the drum through the outlet port 29.

The drum is mounted for concentric rotation within the cylindrical housing, and a convenient method of mounting the parts lies in providing stub shafts 41 at opposite ends of the drum, and journaling these shafts in suitable bearings 42 carried by the end walls 23 of the shell portion of the housing.

The operation of the device depends upon the proportioning of parts as indicated in Figure 9. The inner and outer apertures in the housing, and the inlet and outlet ports of the drum, have the approximate relative widths shown. Additionally, it should be observed that the shorter housing wall portion 13 covers an arc of approximately 10°, and the shorter wall portion 43 of the drum (lying between the inlet and outlet ports) covers an arc of approximately 35°.

As a result of this predetermined proportioning of the elements, the mere rotation of the drum is sufficient to adjust the device into the different relationships necessary to achieve different ventilating effects. Thus, with the parts in the relationships shown in Figure 2, it will be observed that the inlet port of the drum is in registry with the outer aperture of the housing, while the outlet port of the drum is in registry with the lower end region of the inner housing aperture. As a result, when the blower operates, air will be drawn through the filter 20 and expelled into the room on the other or inner side of the wall. When the drum is rotated in a counterclockwise direction (as viewed in the present drawings) the inlet port of the drum will ultimately reach a position in which it is in communication partly with the outer housing aperture and partly with the inner housing aperture. This relationship of parts is not shown in the drawings, being an intermediate position with respect to the positions shown in Figures 2 and 3. In such intermediate position, the parts are so arranged that some air will be drawn into the room from the outside, while some air will simultaneously be recirculated within the room itself. A further rotative adjustment of the drum will bring the parts into the relationships shown in Figure 3. It will be observed that the outer housing aperture is now

sealed by the drum, and that the inlet port of the drum is in registry only with the inner housing aperture. The outlet port of the drum is still in registry with the inner housing aperture, and as a result the operation of the blower will serve to draw air from the room into the lower region of the housing aperture and will expel the air back into the room through the upper region of the housing aperture. Thus, a pure recirculation of air is achieved.

A still further rotative adjustment of the drum will bring the parts into the relationships shown in Figure 4. The outlet port of the drum is now in registry with the outer housing aperture, as a result of which air will be exhausted from the room to the exterior.

It will be observed that these various results are achieved by rotating the drum through approximately 155°. This rotation may be manually effected by means of the control handle designated generally by the reference numeral **44**, this handle being secured to the drum (preferably in the region **43**) and projecting through the slot **26**. A preferred handle construction and mounting are shown in Figure 6. The handle **44** has been shown in the form of a knob secured to the end of a shaft **45** which projects into association with an electric switch **46** secured to the drum portion **43** by means of studs or equivalent fastening elements **47**. The switch **46** may be of any known or conventional character, and for this reason its detailed construction has not been illustrated. Suffice it to point out that the switch is of such a character that the rotation of the shaft **45** by means of the knob **44** will turn the switch on and off; and if desired, the switch may include a rheostat whereby continued rotation of the knob will bring more or less of the rheostat into action to control the amount of current.

The shaft **45** is mounted within a sleeve **48** which is preferably threaded at its end to receive a nut **49**. By means of this nut, and a cooperating shoulder **50**, a tubular element **51** is secured to the sleeve **48**. At its inner end, the element **51** is provided with a flange **52** which bears against the rear face of the medial band **25**. The element **51** is also exteriorly threaded to receive an adjustment wheel **53** which may be turned to increase or relieve pressure upon a washer **54** which bears against the outer surface of the band **25**.

The switch mechanism **46** is of course connected to the electric motor **39** by suitable wiring (not shown) whereby the manipulation of the knob **44** will serve to establish or disconnect an electric connection to the motor. By slightly loosening the control wheel **53**, the drum may be adjusted into any selected one of its various positions, and by re-tightening the wheel **53**, the washer **54** is caused to bear frictionally against the band **25** to hold the drum in the adjusted position.

It will thus be observed, that the manipulation of a single handle is all that is needed to control the operation of the blower (or blowers), and to shift the drum into the proper position to accomplish the type of ventilation which is desired. Because of the absence of movable baffles, louvers, valves, or other similar elements, the operation of the device is simplified to a highly desirable degree; as a result of which there is a reduced likelihood of any faulty adjustments and consequent faulty functioning of the apparatus. Moreover,



the single control handle makes it possible to design the structure in a more attractive manner, unmarred by the presence of extraneous levers, knobs, or control elements.

In general it will be understood that the details herein described and illustrated, except those which are specifically referred to in the claims, may obviously be modified in a number of respects by those skilled in the art, without departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that such details be interpreted as being purely illustrative.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In a ventilator for a wall opening, a fixed cylindrical housing mounted in said opening with its axis horizontal and provided with apertures on the inner and outer sides of said wall respectively, a hollow cylindrical drum mounted for concentric rotation within said housing in snugly contacting relation thereto, said drum having closed ends and being provided with circumferentially-spaced inlet and outlet ports lying respectively in diametrically opposite semicircular segments of the drum periphery, and a blower mounted within the drum to draw air through the inlet port and expel it through the outlet port, the drum interior being unobstructed except for said blower.

2. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum.

3. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum, said shell being provided with a circumferential band having a slot therein, and a control handle secured to the drum and projecting outwardly through said slot.

4. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum, said shell being provided with a circumferential band having a slot therein, a control handle secured to the drum and projecting outwardly through said slot, and means associated with said control handle for releasably locking it to said shell to retain the drum in a selected position.

5. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum, said shell being provided with a circumferential band having a slot therein, a control handle secured to the drum and projecting outwardly through said slot, and means associated with said control handle for releasably locking it to said shell to retain the drum in a selected position, said means comprising an adjustable member adapted to engage frictionally with said band.

6. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum, said shell being provided with a circumferential band having a slot therein, a control handle secured to the drum and project-

ing outwardly through said slot, and means associated with said handle for controlling the operation of said blower.

7. In a ventilator, the combination with the elements set forth in claim 1, of a housing portion comprising a semi-cylindrical open-work shell mounted over said inner aperture in concentric relation to the drum, said housing portion including opposed end walls within which the drum is journaled.

8. In a ventilator for a wall opening, a fixed cylindrical housing mounted in said opening with its axis horizontal and provided with apertures on the inner and outer sides of said wall respectively, a hollow cylindrical drum mounted for concentric rotation within said housing in snugly contacting relation thereto, said drum having closed ends and being provided with circumferentially-spaced inlet and outlet ports lying respectively in diametrically opposite semicircular segments of the drum periphery, and a blower mounted within the drum to draw air through the inlet port and expel it through the outlet port, the drum interior being unobstructed except for said blower, said inner housing aperture having a width of approximately 155°, said outer housing aperture having a width of approximately 120°, said housing having a part which lies between said apertures and adjacent to one edge of the wall opening, said housing part having a width of approximately 10°.



9. In a ventilator for a wall opening, the combination of elements set forth in claim 8, said inlet port being of such a width relative to said housing apertures that rotative movements of the drum will bring the inlet port successively (*a*) into registry only with said outer aperture, (*b*) into simultaneous partial registry with each of said apertures, and (*c*) into registry only with said inner aperture, said outlet port being so positioned that during said rotative movements of the drum it will register correspondingly (*a*) with one end region of the inner aperture, (*b*) with the other end region of the inner aperture, and (*c*) with the outer aperture.

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