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CLOTHES TREATING MACHINE WITH AUTOMATIC UNLOADING MEANS

Filed Sept. 16, 1966

2 Sheets-Sheet 1

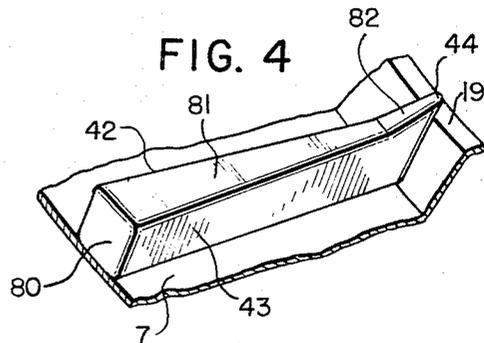
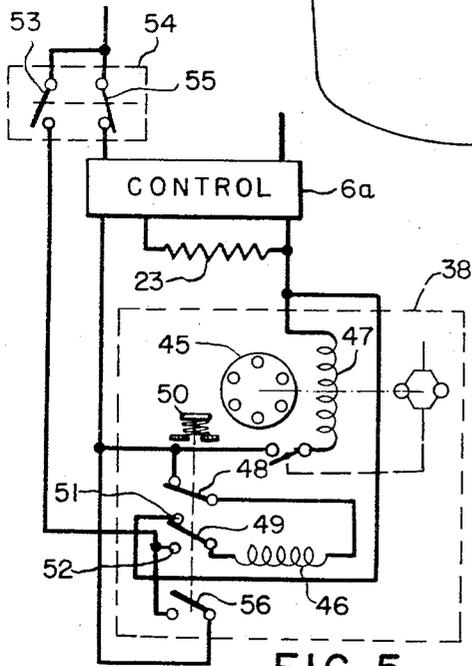
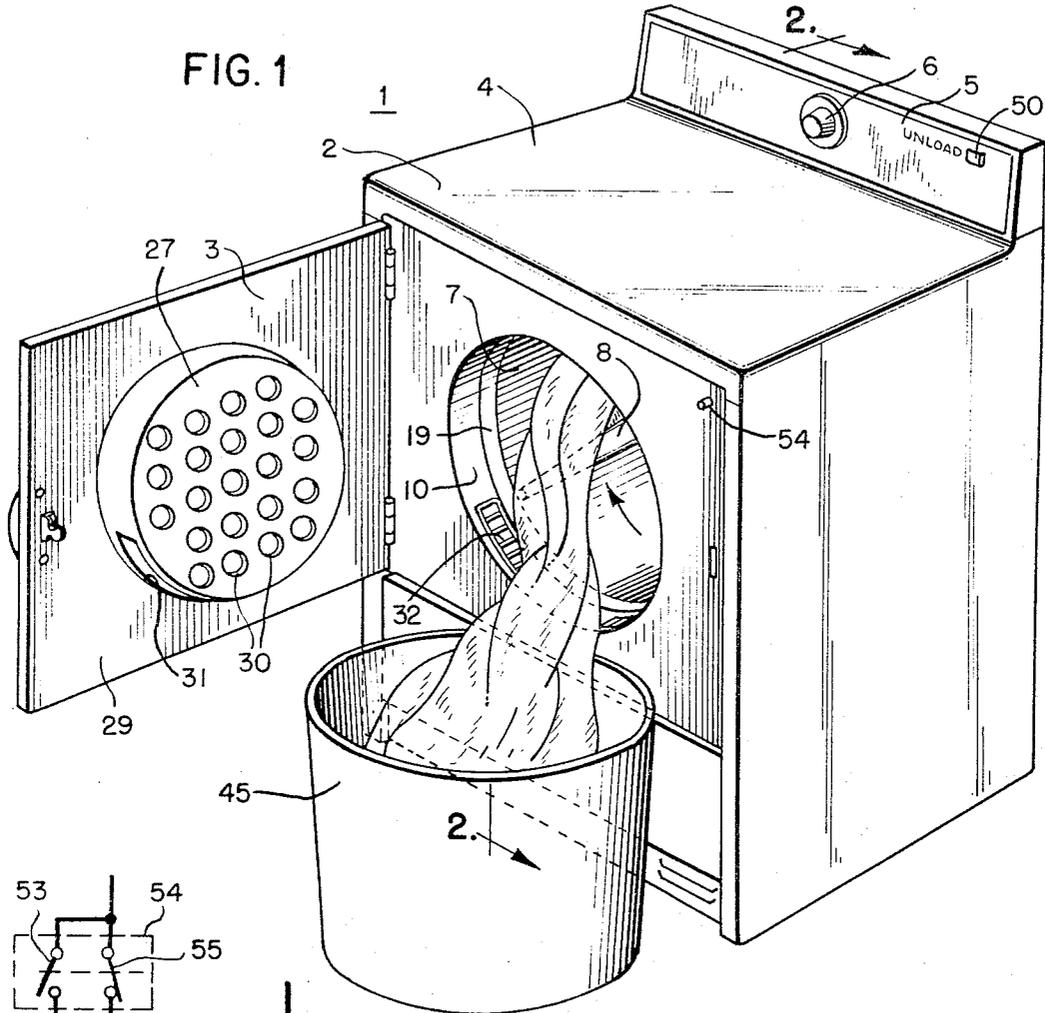


FIG. 5

FIG. 4

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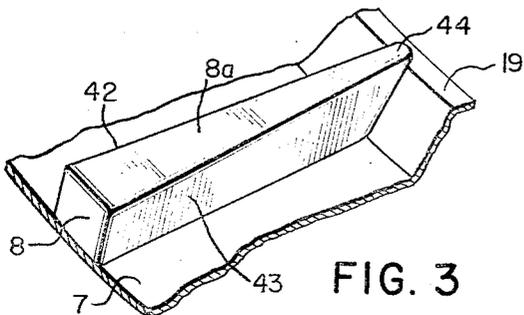
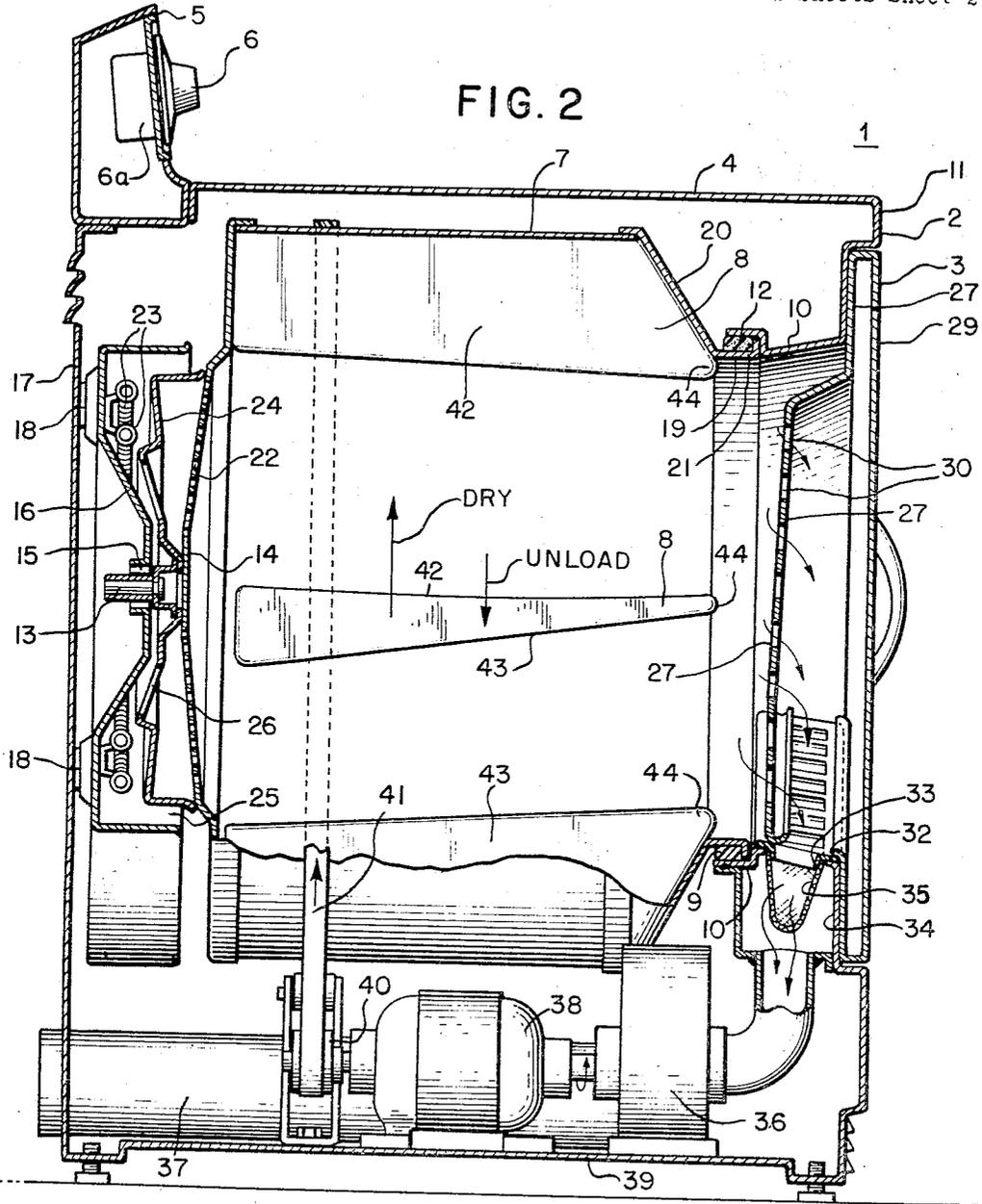
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2 Sheets-Sheet 2



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**CLOTHES TREATING MACHINE WITH
AUTOMATIC UNLOADING MEANS**

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ABSTRACT OF THE DISCLOSURE

A clothes treating machine has a clothes receiving drum rotatable on a horizontal axis and with an access opening at one end. Vanes are provided on the peripheral wall of the drum and at least one vane includes a first side parallel to the axis of rotation and a second side skewed with respect to the axis of rotation. When the drum is rotated in one direction the first side will cause tumbling of the clothes with no appreciable axial movement. When the drum is rotated in the other direction the second side will cause the clothes to move axially toward the access opening.

It is an object of my invention to provide a clothes treating machine with a horizontally rotatable drum wherein the clothes may be automatically unloaded from the drum at a desired time.

A further more specific object of my invention is to form at least one of the clothes tumbling vanes conventionally provided within such drums with a special configuration in order to effect the desired unloading.

In carrying out my invention in one form thereof, it is intended to be used in the type of clothes treating machine wherein a generally cylindrical drum, rotatably mounted on a substantially horizontal axis, is provided for containing clothes to be treated. At one end of the drum, there is an access opening so that clothes may be loaded into the drum and unloaded therefrom at appropriate times. To insure that clothes tumble properly within the drum so as to expose all surfaces thereof to the treating medium, there is at least one vane mounted on the inner surface of the cylindrical wall of the drum. The tumbling is effected by causing one side of the vane to extend parallel to the axis so that, when the drum is rotated with that side as the leading side of the vane, clothes will be tumbled with substantially no axial motion thereof.

I propose to form the opposite side of the vane so that, relative to the axis of rotation, it is skewed in such a manner that drum rotation in the opposite direction, that is, with the opposite side of the vane as the leading side thereof, causes axial motion of the clothes toward the access opening. To phrase it differently, when the drum rotates in the direction intended to cause unloading, the top side of the vane, when the vane is moving upwardly, should slope down from the back of the drum towards the front access opening.

Together with this structure, I provide means for selecting the direction of rotation of the drum so that, alternatively and selectively, the clothes may be tumbled during their treatment or may be unloaded from the drum.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. My invention, however, both as to organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings, FIGURE 1 is a view in perspective of a clothes treating machine, specifically a clothes dryer, which incorporates my improved unloading system;

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FIGURE 2 is a cross sectional view along line 2—2 in FIGURE 1;

FIGURE 3 is a fragmentary view in perspective illustrating one form of vane which may be provided;

FIGURE 4 is a similar view showing a second form of vane which may be used with my invention; and

FIGURE 5 is a schematic illustration of an electrical control circuit suitable for use in connection with the clothes dryer of FIGURES 1 and 2.

Referring now to FIGURES 1 and 2, the machine illustrated is a clothes treating machine, more specifically a domestic clothes dryer, generally indicated by the numeral 1. Dryer 1 is provided in the usual way with a cabinet 2 having a front door 3 to provide access to the interior of the cabinet for loading and unloading clothes. Mounted on the top wall 4 of cabinet 2 is a control panel 5 which may include a suitable manual control member 6 connected to a conventional sequence control assembly generally shown at 6a. By manual setting of member 6, the machine is caused to start and automatically proceed through a cycle of operation.

Within cabinet 2, there is provided a clothes tumbling receptacle, or drum, 7 which constitutes the chamber for receiving fabrics to be dried, and which is mounted for rotation on a substantially horizontal axis. Drum 7 is substantially cylindrical in shape and has its cylindrical wall substantially imperforate as shown. On the interior surface of the cylindrical wall, there is provided a plurality of clothes tumbling ribs or vanes 8. In a manner which will be more fully described in connection with the specific aspects of my invention, clothes are lifted up by vanes 8 when the drum rotates during a drying operation and are then tumbled back down to the bottom so as to be flexed and so as to present different surfaces to the heated air effecting the drying.

The front of drum 7 may be supported for rotation within outer casing 2 by suitable nylon support pads, one of which is shown at 9. These pads are secured to the outer surface of a flange 10 which extends inwardly from the front surface 11 of cabinet 2 so as to provide a circular frame for door 3. Two pads such as 9 may be provided, one on each side of drum 7, so as to provide a stable support for the front thereof. The circumferential space between pads may be filled with felt material, such as that shown at 12, so that there will not be openings permitting the undesired passage of air.

The rear end of drum 7 receives its support by means of a stub shaft 13 extending from the center of rear wall 14 of the drum. Shaft 13 is secured within a bearing 15 formed in a baffle 16 which in turn is rigidly secured to the back wall 17 of cabinet 2 by any suitable means, such as, for instance, welding at a number of points 18. With the arrangement shown, the basket may rotate on its horizontal axis with pads 9 providing the front support and stub shaft 13 within bearing 15 providing the rear support.

In order to permit the flow of a stream of drying air through the clothes drum, the drum has a circular central aperture 19 formed in its front wall 20. The flange 21, which defines opening 19, is supported by the pads 9 in sliding relationship. The stream of drying air is permitted to enter through the rear wall 14 of drum 7 through a plurality of perforations 22, the perforations in the present case being formed to extend around the rear wall in an annulus.

As has been stated, baffle member 16 is rigidly secured to rear wall 17 of cabinet 2. Baffle member 16 also serves to support heating means 23. Elements 23 may be annular in shape so as to be generally coextensive with the perforations 22 in drum wall 14. A second baffle member 24 is rigidly secured to the back wall 14 of drum 7 outside the ring of perforations 22, and within the stationary baffle

16, so that an annular air inlet 25 is formed by baffles 16 and 24. In this manner, air may enter annular inlet 25 between the baffles, pass over the heaters 23, and then pass through openings 26 formed in baffle 24 to the interior of drum 7.

The front opening 19 of the drum is substantially closed by means of the cooperative relationship of inner surface 27 of door 3 and the inturned flange 10 forming the door frame. Front opening 19, in addition to serving as part of the air flow path through the drum, also serves as a means whereby clothes may be loaded into and unloaded from the drum. Door 3 is mounted on cabinet 2 so that, when the door is opened, clothes may be loaded and unloaded through the door frame 10. It will be observed that the door includes an outer flat imperforate section 28 and an inwardly extending hollow section 29 mounted on the flat outer section. Hollow section 29 extends into the circular door frame 10 when the door is closed, and the door surface 27 then comprises, as described, the major part of the closure means for the opening 19. The air outlet from the drum is provided by openings 30 formed in the inner wall 27 of hollow door section 29. The bottom of section 29 has an opening 32 formed therein so that, when the door is closed, opening 32 is aligned with an inlet opening 33 leading to an exhaust duct 34. As shown, a lint trap 35 of conventional design may be positioned to seat in the opening 33 so as to be readily removable for cleaning when the door 3 is open, and so as to trap lint which is carried off from the clothes by the drying air.

Duct 34 leads downwardly to a blower 36 which is then suitably connected to an exhaust 37 leading out of the dryer. Blower 36 is directly driven by an electric motor 38 supported on base 39 of dryer 1. In addition to driving blower 36, motor 38 constitutes the means for effecting rotation of drum 7, being provided on its shaft with a small pulley 40. A belt 41 extends around pulley 40 and around the cylindrical wall of drum 7. The relative circumferences of pulley 40 and drum 7 cause the drum to be driven by the motor at a speed suitable to effect tumbling of the clothes therein.

Thus, the air is pulled into the drum over the heating element, as previously described, and then is passed from the drum through the perforations 30 in door 3, into the lint trap 35, duct 34, and blower 36, to duct 37. At the same time, the fabrics in the drum are tumbled so that the heated air passing through the tumbling clothes causes vaporization of moisture from the clothes. The vapor is carried off with the air as it passes out of the machine.

During a clothes drying operation, the drum is rotated counter-clockwise, as viewed in FIGURE 1 and as shown by the arrow pointing upwardly in FIGURE 2. It is to be observed that the leading surface 42 of vane 8 (see also FIGURE 3), for this direction of rotation, extends generally parallel to the axis of rotation of drum 7. As a result, during the rotation on the horizontal axis, surface 42 is substantially level. Then, upon further rotation of the drum, the clothes tend to fall away from the outer wall of the drum and down to the bottom thereof.

This action causes flexing of the fabric of the clothes so that all parts of the fabric are exposed to the flow of drying air. This is a conventional operation in dryers of this type. The purpose of the vane structure is to effect movement of the clothes substantially in a plane, carrying the clothes against the inner surface of the drum for a period and then permitting them to fall through the drum down to the bottom thereof. No axial motion is provided by the vanes, nor is any desired or intended, since such axial motion would tend to cause a bunching action of the clothes at one end of the drum.

The opposite surface 43 of the vane, that is, the surface which forms the leading face of the vane during rotation in the opposite direction, is canted or skewed with respect to the horizontal axis of rotation. This skewing is provided such that, for the direction of rotation in which it is the leading edge, surface 43 slopes downwardly from the rear

of the drum to the front opening 19 thereof when the particular vane 8 is on the ascending side of the drum. This provides a substantial axial component of motion to the clothes so that, rather than merely being tumbled, they will be moved by the vane from the rear to the front of the drum when the reverse, or unloading, direction of rotation is provided as shown by the downward arrow in FIGURE 2 and by the arrow in FIGURE 1.

It will further be noted that, as shown, vane 8 may have a slanted inner edge 8a which extends radially inward to an increasing extent from the rear to the front thereof, with the front edge 44 of the vane extending radially inward at least to, and preferably slightly into, the opening 19. This configuration has the result, when door 3 is open, of causing the clothes to be moved toward the front of the drum and through the opened door, substantially as shown in FIGURE 1. Thus, with the door open, the unloading rotation of the drum causes the clothes to unload themselves into any suitable receptacle 45.

In order to cause the drying function and the unloading function to be selectively carried out, any appropriate control circuit may be provided. A highly simplified schematic of one such circuit is, for instance, shown in FIGURE 5 wherein it will be observed that heating elements 23 and motor 38 are controlled through the control mechanism 6a previously mentioned. This control mechanism may be of any suitable type, such as time controlled, moisture controlled, temperature controlled, etc.

As is well known in the art, motor 38 is conventionally an induction-type motor having a rotor 45, a run, or main, winding 46, and a start winding 47. Main winding 46 is normally connected to a pair of contacts 48 and 49 in a predetermined relationship to winding 47. When manual switch 50 is depressed, and for as long as it is depressed, contact 48 engages a contact 51, and contact 49 is moved out of engagement with contact 51 and into engagement with a contact 52. This reverses the relationship of the main winding with respect to start winding 47. When button 50 is not depressed, the motor 38 will start in a predetermined direction, specifically, the direction to cause rotation of the drum counter-clockwise as shown by the arrow marked "dry" in FIGURE 2. If the button 50 is depressed, then the rotation of the drum is in the opposite direction, that is, in the direction shown by the arrow marked "unload" in FIGURE 2.

Contact 52 bypasses control 6a and is connected through a contact arm 53 to one side of the line. The same is true for a contact 56 which is also closed by depressing button 50. Contact arm 53 is part of a switch mechanism 54 which also includes a contact 55. When contact arm 53 is opened, arm 55 is closed, and vice versa. Switch 54 is a door switch as shown in FIGURE 1; when door 3 is closed, it is in the position shown in FIGURE 5, and when the door is opened contact arm 55 is opened also and contact arm 53 is closed. The energization of the motor in a regular drying operation is controlled through contact arm 55 and the control 6a; the operation of the motor in the reverse, or unloading, direction is controlled through contact arm 53. As a result, only the regular direction of motor rotation, that is, that suitable for providing tumbling of the clothes may be effected with the door closed. On the other hand, with the door opened, regular tumbling of the clothes may not be provided, and operation of the motor in the unloading direction can be provided only as long as button 50 is depressed.

In order to obtain the advantage of my inventive concept, it is merely necessary after the completion of the drying operation to open the door 3 and place a receptacle 45 in front of the opening 19. Button 50 is then depressed, and as previously described, the skewed relationship of surface 43 of vane 8 to the horizontal axis of rotation of the drum causes the vane to guide the clothes into the opening so that they will be tumbled out through opening 19 into receptacle 45. Of course, while it is preferred that all vanes 8 be formed as described in order to mini-

mize the length of time required for an unloading operation, the unloading may be effected even though fewer than all of the vanes have the special configuration described.

Referring now to FIGURE 4, there is shown a second embodiment of my invention in which a vane 80 is provided having, as before, a surface 42, parallel to the horizontal axis of rotation for effecting normal tumbling, and a surface 43 skewed relative to the horizontal axis of rotation for effecting unloading. Vane 80, however, has a relatively flat inner edge formed by a surface 31 which is the same height over almost the full length of drum 7. Near the front of the drum, a short distance from opening 19, the inner edge is formed by a radially inwardly slanted portion 32 having its front edge 44 slightly inwardly of the opening 19, as before.

There may be a slight tendency for the slant of vane 8 to move clothes axially during a regular drying operation; in such event, a vane of the type shown at 80 in FIGURE 4 may be provided. Vane 80 eliminates any possibility of the slope providing any substantial degree of axial motion of the clothes during a regular drying operation, but still retains the guidance feature of the end thereof which is adjacent opening 19, guiding the clothes out of the drum as they are moved axially by the skewed surface 43.

While in accordance with the patent statutes I have described what at present is considered to be the preferred embodiments of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and I therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A clothes treating machine comprising:

- (a) a generally cylindrical drum for containing clothes to be treated, said drum being rotatably mounted on a substantially horizontal axis and having an access opening at one end thereof;
- (b) means for rotating said drum on its horizontal axis in either direction;
- (c) at least one clothes tumbling vane mounted on the inner surface of the cylindrical wall of said drum, said vane having

- (i) one side extending parallel to said axis so that drum rotation with said one side as the leading side of said vane causes tumbling of clothes with substantially no axial motion thereof and
- (ii) its opposite side skewed relative to said axis so that drum rotation with said opposite side as the leading side of said vane causes axial motion of clothes toward said access opening; and
- (d) means for selecting the direction of rotation of said drum.

2. The machine defined in claim 1 wherein a door is provided for closing said access opening during rotation of said drum with said one vane side as the leading side.

3. The machine defined in claim 1 wherein a cabinet with a door is provided, said drum being rotatably mounted within said cabinet and said door being aligned with said access opening.

4. The machine defined in claim 1 wherein said access opening is substantially circular.

5. The machine defined in claim 1 wherein said one vane has one end thereof adjacent said access opening extending radially inwardly at least to the edge of said opening.

6. The machine defined in claim 5 wherein said one vane has its inner edge sloping radially outward from said access opening to the other end of said drum.

7. The machine defined in claim 5 wherein said vane has its radially inner edge at a substantially constant distance over the major part of the length of said drum, and having a small portion at the end of said drum adjacent said opening sloping radially inwardly into said opening.

8. The machine defined in claim 1 wherein said means for rotating said drum in either direction comprises a reversible motor, means biased to cause said motor to rotate in the direction wherein said one vane side is the leading side, and manual means for causing operation of said motor in the opposite direction when said door is open and said manual means is being manually operated.

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