April 13, 1965 A. MEYER 3,177,592

APPARATUS FOR TREATING TEXTILE GOODS

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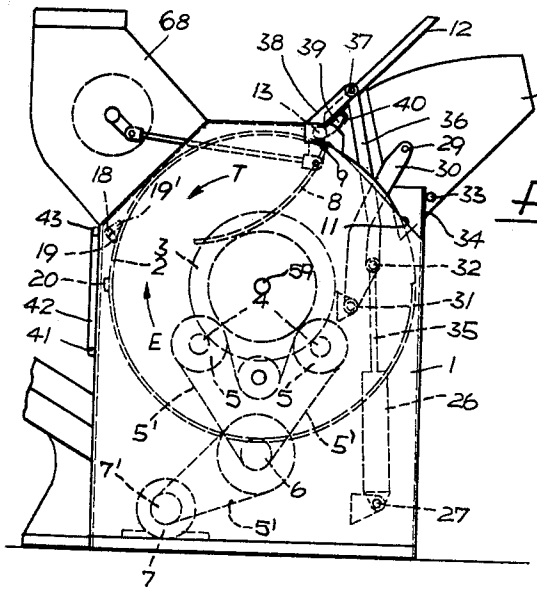

Fig. 1.

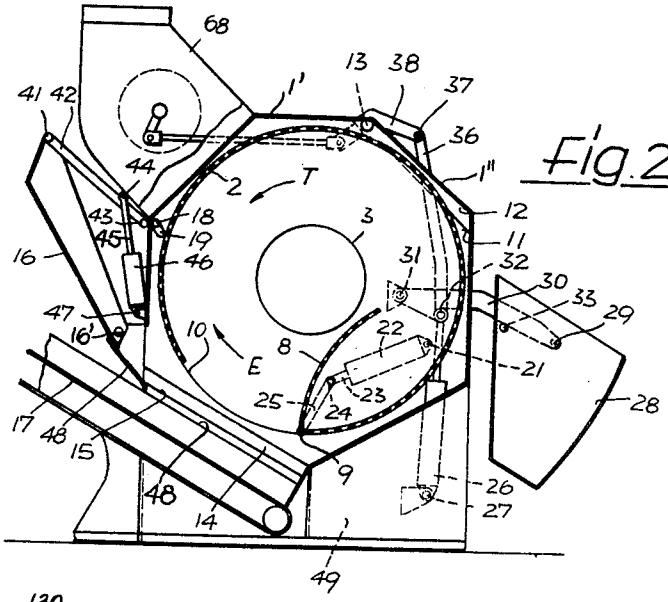

Fig. 2.

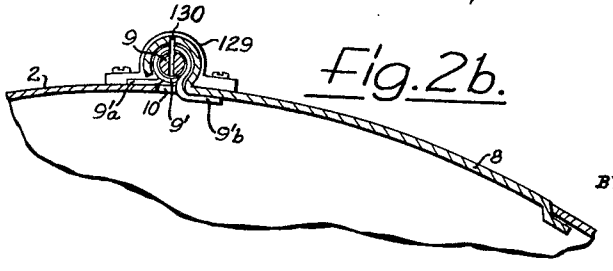

Fig. 2b.

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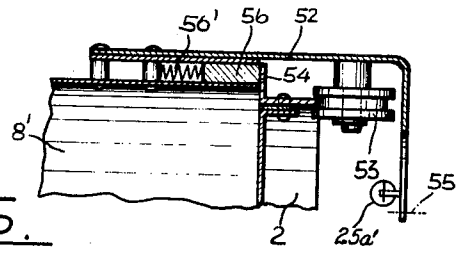


Fig. 5.

Fig. 2a.

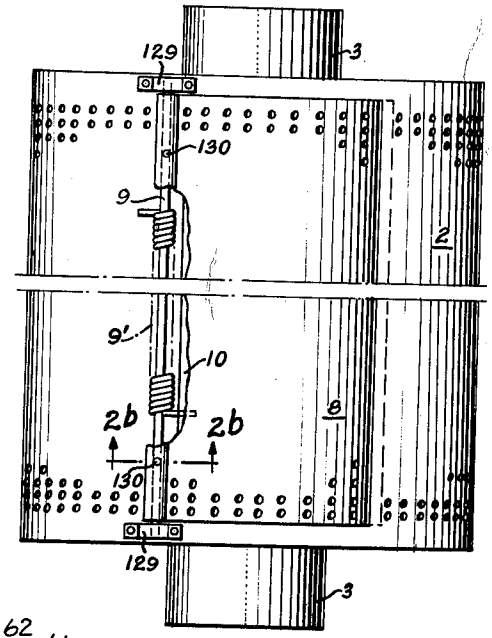
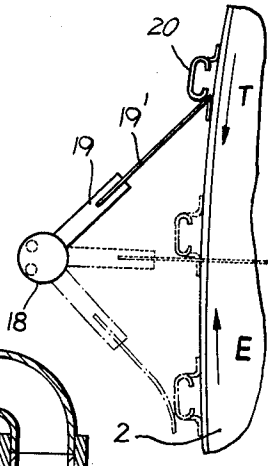


Fig. 6.



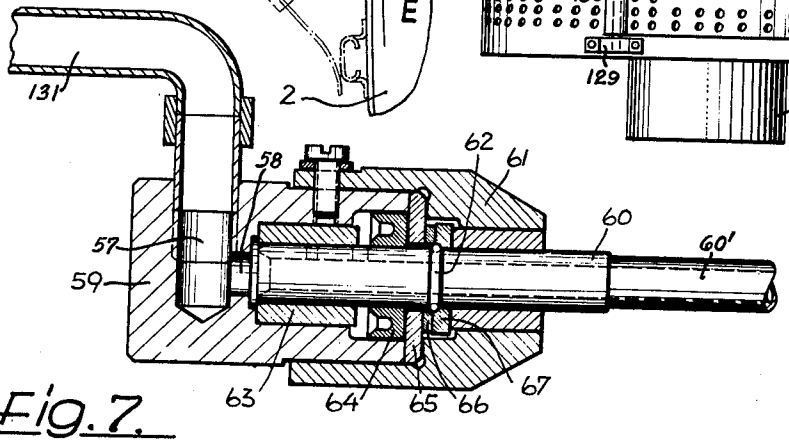


Fig. 7.

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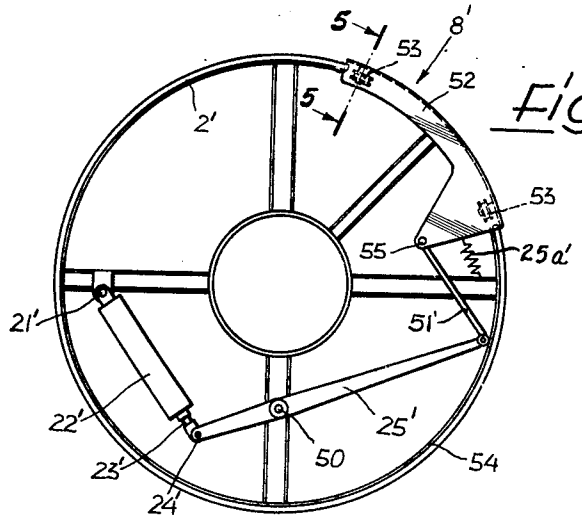

Fig. 3.

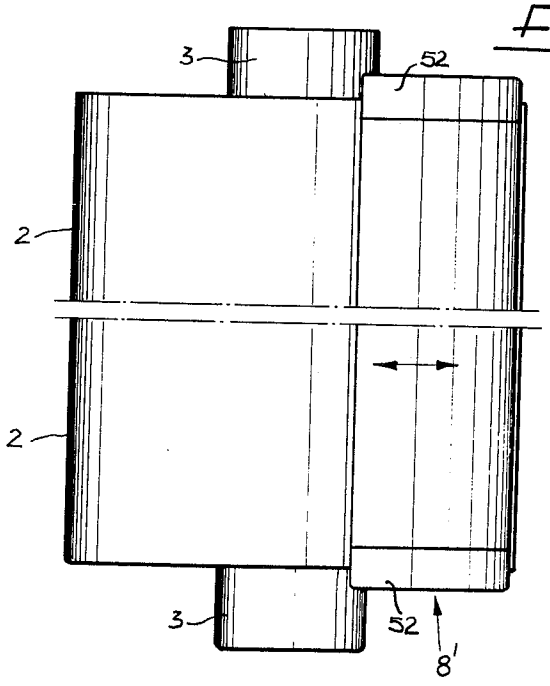

Fig. 4.

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Fig. 8

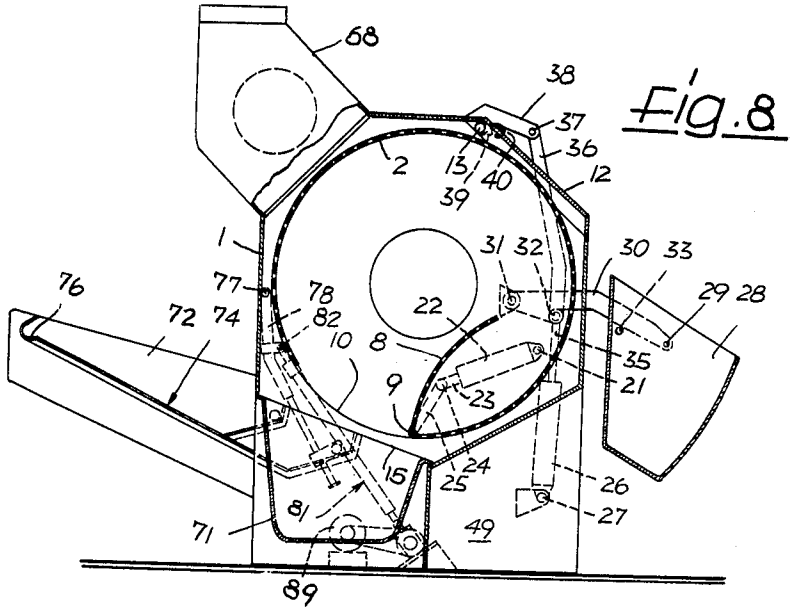

Fig. 9.

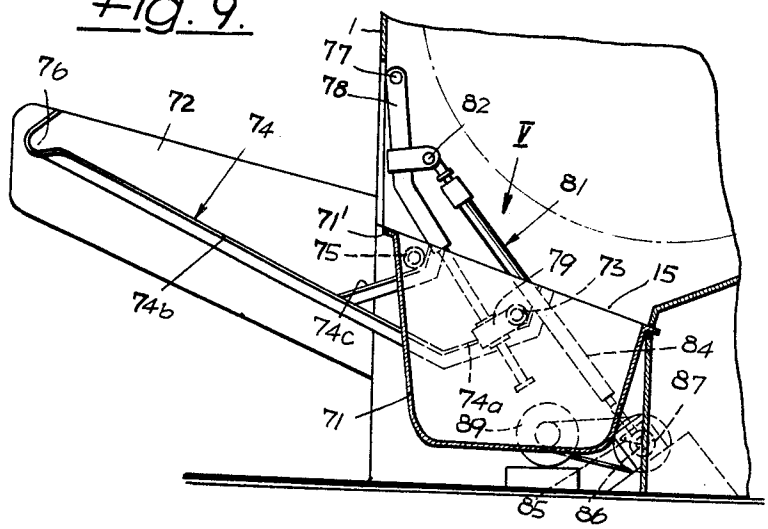

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Fig. 10.

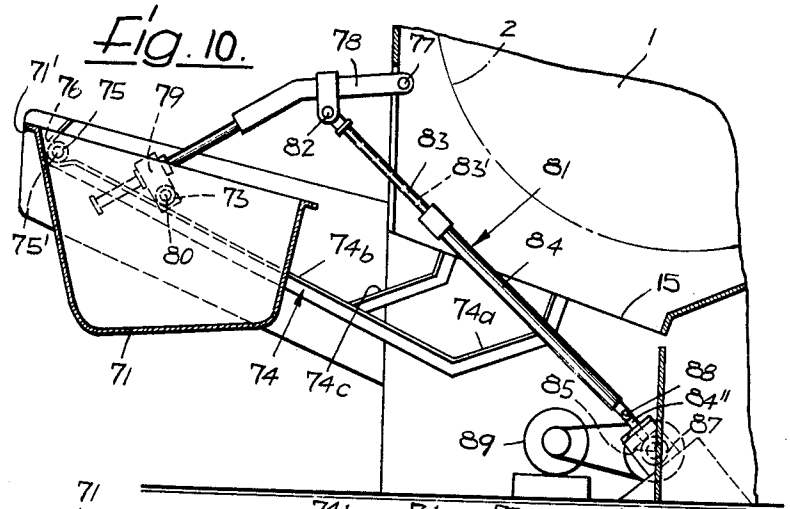


Fig. 12.

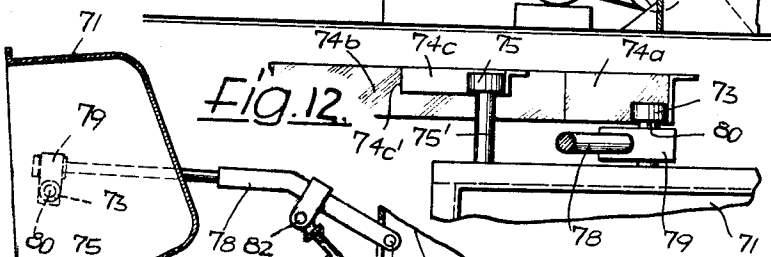
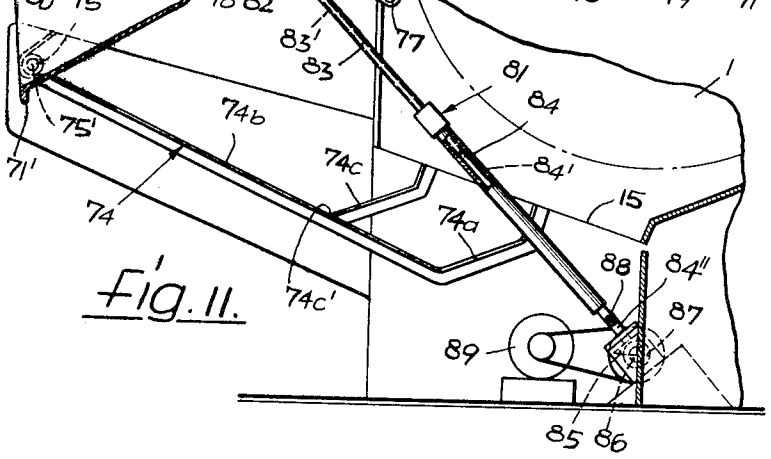


Fig. 11.



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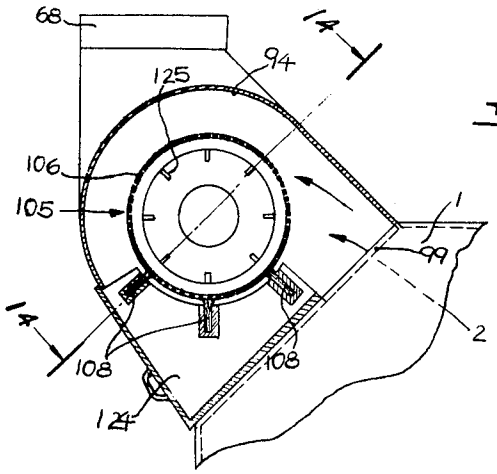
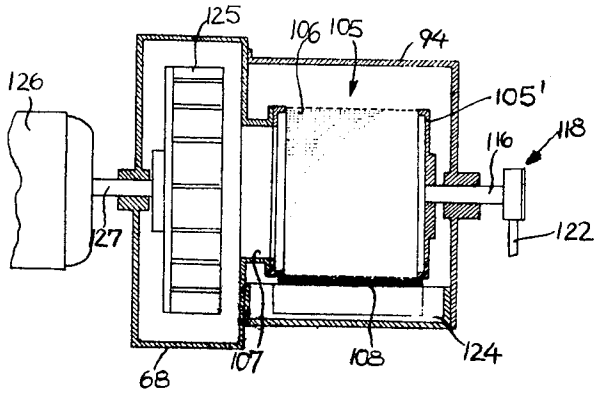


Fig. 13

Fig. 14



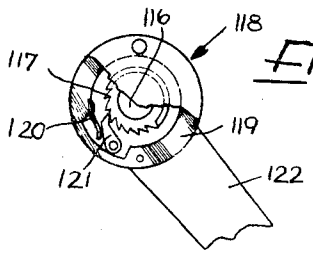


Fig. 15

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Fig. 16

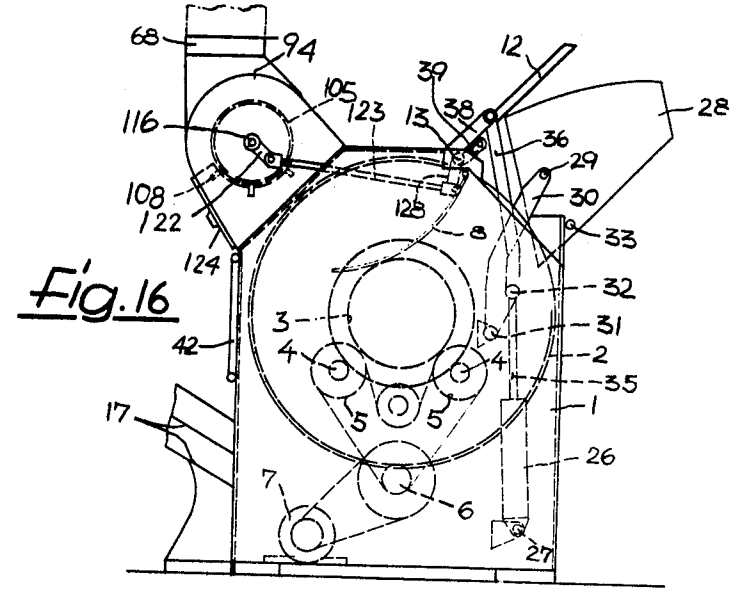

Fig. 17

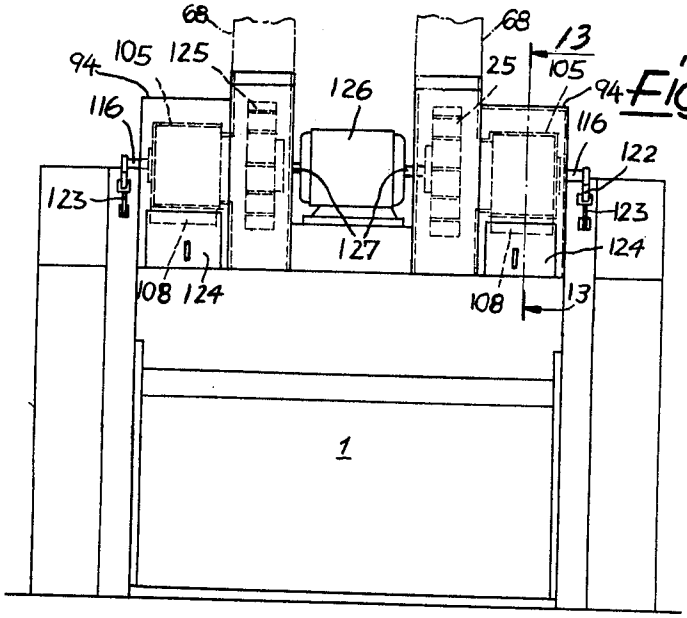

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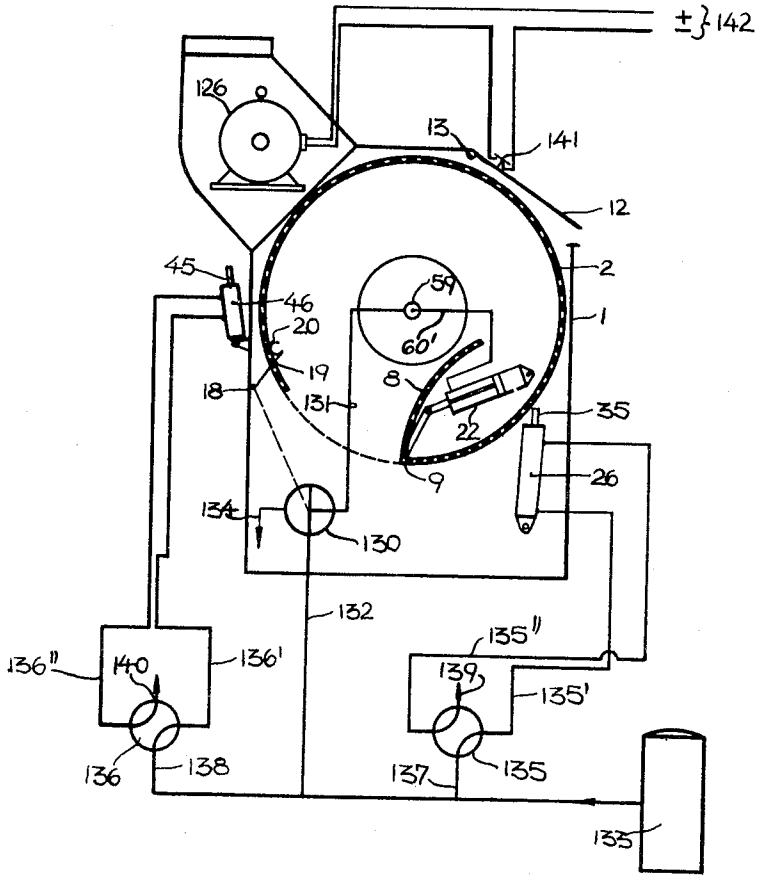
Fig. 18.



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United States Patent Office 3,177,592
Patented Apr. 13, 1965

3,177,592

APPARATUS FOR TREATING TEXTILE GOODS

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Filed July 29, 1960, Ser. No. 46,217
Claims priority, application Germany, Aug. 7, 1959, M 42,378; Apr. 23, 1960, M 45,090; July 1, 1960, M 45,788

19 Claims. (Cl. 34—82)

The present invention relates to an apparatus for treating textile goods in a revolving perforated drum which is enclosed within a stationary housing and the peripheral wall of which is provided with a filling and discharge opening which is adapted to be closed by a door or cover. More particularly, the apparatus according to the present invention is intended for drying and loosening washed, moist laundry, especially after the same has been spun and pressed to remove the greatest amount of moisture from the washing operation.

The known apparatus of this type are each provided with a drum which is open at both ends and rotatable about an inclined axis. The textiles to be treated are inserted into this drum at the upper end and removed therefrom at the lower end. During the treatment, hot air is passed into the drum through the perforated wall thereof. These prior apparatus are rather inefficient, especially because of the insufficient utilization of the hot air, and they have also the disadvantage that, because of the rotation of the drum, longer textile pieces will be twisted together while emerging from the drum, and that the textiles will not be completely dried. Another known apparatus of this type which is designed according to the principles of a concrete mixer and is used for loosening laundry has the disadvantage that it can only be filled and emptied by hand. Also, the cover of this drum is pivotable to the outside.

It is an object of the present invention to provide an apparatus of the above-mentioned type which overcomes the disadvantages of similar apparatus according to prior designs.

Another object of the present invention is to provide such an apparatus which permits the various operating steps thereof to be carried out partly automatically and partly by hand by a few very simple control movements, or entirely automatically according to a preset program.

For attaining these objects, the present invention provides a perforated drum which is rotatable about a horizontal axis and the peripheral wall of which is provided with an opening which is adapted to be closed or opened by a curved door which is automatically moved by the cooperation of control elements which are rotatable with the drum with other control elements which are stationary, and wherein these control elements, in turn, are controlled by a reversal of the direction of rotation of the drum so that the door will be closed when the drum rotates in one direction and opened when it rotates in the opposite direction. The mentioned door may extend over the entire length of the drum and it may also be designed so as to be either slidable in the peripheral direction of the drum or to be pivotable into the drum about an axis extending longitudinally along the peripheral wall of the drum.

The opening and closing movements of the curved door may be effected by at least one driving mechanism which is mounted on one end wall of the drum and is controlled by a camlike member which is mounted on and rotatable with the drum. When the drum rotates in one direction a resilient control lever which is mounted on the stationary housing of the drum and extends into the path of movement of the cam will then be pivoted by the cam from one end position to the other end position whereby the driving mechanism will be controlled to operate in one or the other direction.

This driving mechanism may be designed in the form of a pneumatic or hydraulic cylinder and piston unit. The operating medium for this unit may be supplied to the drum by operatively associated elements which are disposed coaxially with the drum and one of which is rotatable with the drum, while the other element is mounted on the stationary housing.

The driving mechanism of the curved door may, however, also consist of an electric motor or by one or two solenoids which are supplied with current in the usual manner through the shaft of the drum by means of slip rings.

The housing of the apparatus is provided with a discharge opening adjacent to the lower side of the drum. According to one preferred embodiment of the present invention this discharge opening may be closed or opened by a slide cover which may be controlled by a second driving mechanism. Underneath the discharge opening of the housing a conveying mechanism is preferably provided in the form of an endless conveyor belt which is adapted to receive the treated textiles when they are discharged from the drum and to convey them out of the housing to a suitable point away from the apparatus. In place of such a slide cover and a conveyor belt it is also possible according to the present invention to provide a discharge trough which covers the discharge opening of the housing when is is in its normal position and is adapted to be moved by swivel arms and roller tracks to a position outside of the housing in which it will then be tilted over to discharge the treated textiles, for example, upon a table.

According to another feature of the present invention, the upper part of the housing is provided with a filling opening which may be brought into alignment with the opening of the drum which may be closed by the curved door, and this filling opening of the housing may also be closed by a cover.

The present invention further provides a trough for filling the textiles to be treated into the drum. This filling trough may be pivoted from an inoperative position in a recess in the lower part of the housing to a position laterally adjacent to the housing, in which the opening of this trough is disposed at its upper side so as to permit the trough to be filled. Thereafter, the trough may be pivoted further upwardly to a position above the filling opening of the housing and during this part of the pivoting movement the trough will be automatically tilted so as to fill the textiles into the drum through the aligned filling openings in the housing and drum. According to a further feature of the present invention, the cover of the filling opening of the housing and the filling trough are both controlled by one driving mechanism in such a manner that the cover will be automatically opened when the trough approaches the filling opening and closed when the trough moves away from the filling opening.

In most apparatus of this type in which textile materials are treated by means of air, and especially hot air, the air current which is discharged therefrom during its operation usually contains foreign substances such as threads, fibers, fuzz, and the like which are severed from the materials during the treatment. If the air is sucked through the apparatus and no special provision is made to prevent this, these foreign substances will pass into the suction mechanism and if an air strainer is provided in front of it, they will clog up this strainer very quickly and thereby reduce the efficiency of the suction mechanism or even render it entirely ineffective.

In order to avoid this disadvantage, the present invention provides a special air filter which consists of a cylindrical sieve which is rotatably mounted and provided

with one or more stationary brushes which are adapted to wipe the cylindrical surface and interstices of the sieve. This cylindrical sieve is preferably combined with the suction fan to form a structural unit. After being used in the apparatus for the treatment of the textiles, the air is drawn by the suction fan through the cylindrical sieve to the inside thereof and then to the suction fan which then expels the air through an outlet. The cylinder is intermittently rotated about its axis, for example, at an angle of 60°, and during this rotation the suction fan is preferably stopped. By this rotation, the foreign substances which have accumulated on the outer surface of the cylindrical sieve will be wiped off by the brush or brushes.

More specifically, this air filter may be designed so that the shaft of the cylindrical sieve will be driven intermittently by a motor or by the driven part of an overriding clutch, the driving part of which is connected to the control mechanism for operating the cover of the housing which closes the filling opening thereof. Whenever this cover is lifted from the housing, the cylindrical sieve will be turned for a part of one revolution, while at the same time the suction fan will be stopped so that the foreign substances on the outer surface of the sieve will not be drawn tightly against the sieve but only adhere loosely thereto. The brush or brushes will then be able to exert a good cleaning action on the outer surface and the interstices of the sieve when the latter is turned about its axis.

These air filters are preferably mounted at both ends of the drum housing and in such a manner that two separate housings each having a cylindrical sieve therein are mounted on the drum housing, and that centrally between the coaxial sieve cylinders an electric motor is mounted which has a shaft extending at both sides therefrom and carries on each shaft portion a suction fan wheel which cooperates with one of the air filters and the housing of which is preferably combined with the respective filter housing to form a unit.

These and other objects, features, and advantages of the present invention will become further apparent from the following detailed description thereof, particularly when the same is read with reference to the accompanying drawings, in which:

FIGURE 1 shows an end view of the apparatus during the filling operation;

FIGURE 2 shows a cross section of the apparatus according to FIGURE 1 in the discharging position;

FIGURE 2*a* is a top plan view of the drum of the apparatus;

FIGURE 2*b* is a section along the lines 2*b*—2*b* of FIG. 2*a*;

FIGURE 3 shows an end view of a modification of the drum;

FIGURE 4 shows a top plan view of the drum according to FIGURE 3;

FIGURE 5 shows a cross section taken along line 5—5 of FIGURE 3;

FIGURE 6 shows a diagrammatic illustration of a part of the control mechanism for operating the door of the drum;

FIGURE 7 shows an axial section of a connecting element for supplying the pressure medium to the drum;

FIGURE 8 shows a cross section of a modification of the apparatus according to the present invention in the discharging position;

FIGURE 9 shows a part of FIGURE 8 on a larger scale;

FIGURE 10 shows the discharging trough of the apparatus according to FIGURES 8 and 9 in the outwardly extended position before being tilted;

FIGURE 11 shows the discharging trough according to FIGURE 10 in the tilted position;

FIGURE 12 shows an enlarged top view of a part of the roller track as seen in the direction of arrow V in FIGURE 9;

FIGURE 13 shows a cross section of the air filter taken along line 13—13 of FIGURE 17;

FIGURE 14 shows an axial section of the air filter taken along line 14—14 of FIGURE 13;

FIGURE 15 shows an overriding clutch;

FIGURE 16 shows an end view of the apparatus according to FIGURE 1 with an air filter;

FIGURE 17 shows a front view of the apparatus according to FIGURE 16 with two air filters; while

FIGURE 18 shows a circuit diagram of the apparatus.

Referring first particularly to FIGURES 2, 2*a*, and 2*b* of the drawings, the apparatus according to the present invention comprises a housing **1** in which a perforated cylindrical drum **2** is rotatably mounted in a horizontal position by means of a pair of hollow shaft stubs **3** through which a drying medium, for example, a current of hot air which may be produced in a conventional manner, may be passed into the drum **2**. This drying medium may again be discharged from the housing **1** to the outside through an outlet **68**. The shaft stubs **3** are mounted on rollers **4** which, in turn, are mounted in the end walls of the housing **1**. At one end of the drum **2**, the rollers **4** are driven, for example, by a motor **7** through V-belts **5'** connecting the drive pulley **7'** of the motor with V-belt pulleys **5** on the rollers **4** through intermediate pulleys **6**. For filling and emptying the drum **2**, its peripheral wall is provided with an opening **10**, as shown in FIGURE 2 which preferably extends along the entire length of the drum and may be opened or closed by a door **8** which is curved in accordance with the periphery of the drum and is pivotable toward the inside thereof with a shaft **9** which is rotatably mounted in bearings **129** connected to the outside of the drum **2** along one longitudinal edge of the opening **10** and rigidly secured to the door **8**. The shaft **9** is acted upon by a torsion spring **9'**, as shown in FIGS. 2*a* and 2*b*. This spring **9'** has two bent ends **9'***a* and **9'***b*. The end **9'***a* lies upon the outside of the drum **2**, whereas the end **9'***b* is lying against the inside of the door **8**. Thus, the spring **9'** tends to maintain the door in the closed position. For opening the door **8**, a special opening mechanism is provided which, when operated, overcomes the action of the torsion spring **9'**.

The upper side of the housing **1** forms, for example, three sides of a regular heptagon, the central side **1'** of which extends horizontally. One inclined upper side **1''** of the housing **1** is provided with a filling opening **11** which has a size substantially in accordance with the size of the opening **10** in the drum **2** and may, in one position, during the rotation of the drum **2** be brought in alignment with the opening **10**. This filling opening **11** of the housing **1** may be opened and closed by a cover **12** which is pivotable with a shaft **13** pivotally mounted on the housing **1**. At a point approximately diametrically opposite to the opening **11**, the housing **1** is provided in a part **14** of an inclined inner wall with an opening **15**, which may be closed by a slide cover **16**. Underneath this opening **15** an endless conveyor belt **17** or the like is provided.

Thus, when the door **8** is opened and the opening **10** of the drum is in alignment with the opening **11** in the housing, and cover **12** is also opened, the textile goods to be treated in the apparatus may be filled into the drum. After the treatment, which may consist, for example, of drying and loosening the textiles, the door **8** and the slide cover **16** may be opened so that the textiles may drop out of drum **2** and upon the conveyor belt **17** which is driven by a suitable motor (not shown).

The direction of rotation of the drum **2** may be reversed either by hand by providing a reversible motor **7** and by operating a reversing switch or by automatic control means. Thus, during the treatment, for example during the drying of the textile goods, the drum is driven in a counterclockwise direction, as shown by the arrow T,

while during the unloading period it is driven in the opposite direction, as shown by the arrow E. The shaft 9, with which the door 8 is pivotable, is mounted on the forward side of the opening 10, as seen in the direction of the arrow T, that is, in the normal operating direction of the drum.

The housing 1 further supports a shaft 18 on which, as shown more particularly in FIGURE 6, a control arm 19 is mounted which carries a spring member 19'. The control arm 19 may be pivoted from one to another of two end positions which are disposed symmetrically to a radius of the drum 2 extending through the shaft 18, and it may be held resiliently arrested in these end positions. In one of these end positions of the control arm 19, the door 8 and the cover 12 will be opened, while in the other end position they will be closed. For this purpose, a suitable camlike projection 20 is provided on the peripheral wall of the drum 2 in a position so as to engage with the resilient end 19' of the control arm 19. Thus, depending upon the direction T or E of the rotation of the drum 2, the projection 20 may pivot the control arm 19 to one or the other of the end positions. Since the end 19' of the control arm 19 is resilient, the projection 20 may slide over the free end thereof when the arm is already pointing in the same direction in which the drum is rotating at the particular time. Thus, in the position illustrated in FIG. 6, the control lever 19 will be pivoted by the projection 20 to the position indicated in dot-and-dash lines, if the drum 2 rotates in the direction of the arrow T, while when the drum rotates in the direction of the arrow E, the projection 20 will bend the resilient end 19' of the control arm and ride over the same.

On one or both ends of the drum 2, an operating mechanism for the door 8 is provided. As shown in FIGS. 2, 8 and 18, this mechanism is controlled by the control arm 19 (FIG. 6) and consists of a cylinder and piston unit 22 which is pivotally mounted at 21 on the end wall of the drum and the piston rod 23 of which is pivotably connected at 24 to an arm 25 which, in the embodiment according to FIGS. 1 and 2, is rigidly secured to the shaft 9 of the door 8.

According to the modification shown in FIGS. 3 to 5, however, this arm 25' forms a two-armed lever which is pivotably mounted at 50 on the end wall of the drum 2' and connected at its one end by an arm 51' to the door 8' which is pulled to its closing position by suitable springs 25a'. The other end of the arm 25' is pivotally connected at 24' with the piston rod 23' of a cylinder and piston unit 22' which is pivotally mounted at the pivot 21' on the end wall of the drum 2'.

The door 8' has secured to each end a guiding cap 52 which carries rollers 53 for guiding the cap 52 and the entire door 8' along the outer edge of the projecting web of a circularly bent angle iron 54 which surrounds the respective end wall of the drum 2'. The arm 51' is pivotally connected at 55 to the guiding cap 52 which is sealed relative to the door 8' by a strip 56 of felt or the like which is pressed by a spring 56' against the angle iron 54. On the other hand, the two-armed lever 25' is pivotally connected at 24' with the piston rod 23' of a cylinder and piston unit 22' which is pivotally mounted at 21' on the end wall of the drum 2'.

As shown in FIGS. 1 and 2, the apparatus according to the present invention further comprises a trough 28 which extends over the entire length of the drum 2 and may be pivoted from an inoperative position in which it may be swung into a recess 49 in the lower side of the housing 1, to a filling position, as shown in FIG. 2, and then to an emptying position, as shown in FIG. 1, in which the textiles to be treated may be dropped from the trough 28 through the openings 11 and 10 into the drum 2. The end walls of the trough 28 are provided with coaxial shaft stubs 29 on which a pair of levers 30 are pivotally mounted, the other ends of which are pivotally connected on fixed pivots 31 on the inner sides of the end walls of

the housing 1 in front of the end walls of the drum 2. Also in front of each of the two end walls of the drum 2 and within the housing 1, a second cylinder-piston unit 26 is pivotally mounted on a fixed pivot 27 on the housing 1. These two units 26 serve for operating the cover 12 and the trough 28. The piston rod 35 of each unit 26 is pivotally connected at 32 to the lever 30. The trough 28 is further provided on its end walls with coaxial studs 33 which carry rollers and are adapted to limit the pivotal movement of the trough 28 about their pivots 29 in one direction by engaging with the lower side of the lever 30. When the trough 28 is being pivoted by means of the levers 30 to the emptying position above the opening 11, as shown in FIG. 1, studs 33 will abut against stop surfaces 34 on the housing, 1 so that, by being pivoted about the studs 33, the trough 28 will then be tilted to the emptying position as soon as the levers 30 approach their upper end position. The pivots 32 also carry levers 36 which serve for opening the cover 12 and are connected by pivots 37 to the levers 38 which are rigidly secured to the shaft 13 of the cover 12. Likewise rigidly secured to the shaft 13 in front of the two end edges of the cover 12 are a pair of curved members 39 which carry a pair of rollers 40 (FIGS. 1, 8 and 16) which are adapted to act upon the cover 12 in such a manner that, when these curved pieces 39 are pivoted, the cover 12 will be opened or closed.

At each end of the slide cover 16, as shown in FIG. 2, a lever 42 is pivotally mounted at one end at 41, while its other end is pivotally mounted on a fixed pivot 43 on the housing 1. Each lever 42 has a piston rod 45 of a third cylinder and piston unit 46 pivotally connected thereto at 44, and this unit 46 is, in turn, pivotally connected to the housing 1 at 47. The slide cover 16 is thus capable of sliding on rollers 16' along a rail 48, so as to open or close the opening 15. The pressure medium for operating the cylinder and the piston units 26 and 46 may be controlled from the outside of the housing 1, either by hand or by automatic program control means.

The medium for operating the flap door 8, which may consist of compressed air, a hydraulic fluid, electric current, or the like, may be transmitted to the operating mechanism thereof in a conventional manner through a part which revolves with the drum 2 and a stationary part on the housing 1, for example, in the case of compressed air or a hydraulic fluid by means of a mechanism, as shown in FIG. 7, which is mounted coaxially to one of the hollow shaft stubs 3 (FIGS. 1 and 2) on the drum 2. The pressure medium is then conducted through the bores 57 and 58 in a connecting member 59 into a pipe 60 which rotates with the drum 2, extends coaxially with the bore 58 and the axis of the drum 2 through the hollow shaft stub 3, and is secured to the latter and then leads to the respective end walls of the drum, on which the cylinder-piston unit 22 is mounted. The connecting member 59 is provided with a cap 61 which connects the pipe 60, which carries a spring ring 62, to the end of the bore 58 and seals the pipe thereto by means of sealing elements 63 to 67.

If in place of the slide cover 16 and the continuous conveyor belt 17, as shown in FIG. 2, a receiving trough 71 is provided, as shown in FIGS. 8 to 12, this trough may be pivoted by means of swivel arms and roller guides from its normal position, as shown in FIGS. 8 and 9, in which it covers the opening 15 in the housing 1, to a position outside of the housing 1, as shown in FIG. 10, and to a tilted position, as shown in FIG. 11, in which it is emptied of the textiles which it has received from the drum. At both sides of the path of movement of the discharge trough 71, a pair of guide plates 72 are mounted parallel to each other on the housing 1. Each of these guide plates 72 carries a roller guide rail 74 which consists of several parts which extend to different points underneath the housing 1. Guide rails 74 are arranged symmetrically at both sides of the path of movement of

the trough 71, and the associated rollers 73 and 75 are likewise provided at both sides of the trough. For the sake of simplicity, only the parts which are located at one side will be subsequently described.

A first roller 73, the shaft of which is secured to and supports the trough 71, is first movable from the closing position of the trough underneath the opening 15 of the housing 1 along a slightly downwardly inclined rail portion 74*a* and then toward the outside of the housing 1 along an upwardly inclined rail portion 74*b*. A second roller 75 which is mounted on the same side of the trough 71 adjacent to the "pouring" edge 71' thereof and which, as shown in FIG. 12, is spaced from the side wall of the trough 71' at a different distance than the first roller 73, is first guided slightly downwardly from the closing position of the trough 71 along a rail portion 74*c* parallel to the rail portion 74*a* which then merges at 74*c*' into the rail portion 74*b* which, at least from this point 74*c*' to the end of the rail track of the first roller 73, has a width equal to the combined width of the rail portions 74*a* and 74*c* to accommodate both rollers 73 and 75. This rail portion 74*b* has on its outer end a stop 76 for limiting the movement of the second roller 75.

The housing 1 further carries a pair of parallel arms 78 which are pivotable about a common axis 77 at the inner side of the guide plates 72. Each of these arms 78 carries on its free end a bearing 79 which is slidable along the arm, and in these two bearings 79 the discharge trough 71 is pivotally mounted by means of shaft stubs 80 which carry the rollers 73, as shown particularly in FIG. 12. Each of the pivotable arms 78 has pivotally connected thereto at 82 a connecting rod 81 which consists of a spindle 83 which is at least partly provided with screw threads 83' and is screwed into corresponding tapped threads 84' in at least a part of a pipe 84 to an extent depending upon the desired position of the trough 71.

Both pipes 84 are rotatable about their axes and each of them is connected by a universal joint 88 to a non-pivotable member 84''. Both of these members 84'' are driven at the same speed by a common drive shaft.

If the driven end of each pipe 84 carries a bevel gear 85 which is in mesh with another bevel gear 87 on a common drive shaft 86, the universal joint 88 may be omitted and the pipe 84 may be mounted so as to be pivotable about shaft 86 which extends parallel to the axis 77 of swivel arms 78 and is driven by a motor 89. Each pipe 84 may then be mounted, for example, by a bearing which surrounds the pipe approximately at the point where otherwise the universal joint would be mounted, and which is pivotable about the axis of the shaft 86 on which the two bevel gears 87 are mounted so that, when the pipe 84 is pivoted about this axis, the bevel gear 85 will roll along bevel gear 87.

The air discharge element 68, as shown in FIGS. 13 to 17, contains an air filter and is for this purpose provided with a chamber 94 which communicates, on the one hand, through an inlet opening 99, as shown in FIG. 13, with the housing 1 and, on the other hand, through an air outlet conduit 107, as shown in FIG. 14, with the outlet socket 68. Chamber 94 has a cylinder 105 rotatably mounted therein, the peripheral wall of which forms a sieve 106, one end 105' of which is closed, while the other end is open and slidably connected to the air outlet conduit 107. One or more cleaning brushes 108 are mounted in a fixed position in the chamber 94 and wipe along the sieve 106 when the latter rotates.

The cylinder 105 is mounted on a shaft 116 which also carries on its end the driven part of an overrunning clutch, that is, in the particular embodiment as illustrated, a ratchet wheel 117 of a ratchet drive unit 118, while the driving part 119 thereof is rotatably mounted on the shaft 116. This driving part 119, which is provided in a conventional manner with a pawl 121 which is acted upon by a spring 120, is rigidly secured to a lever 122 which is connected by a connecting rod 123 (FIG. 16) to one end of a lever 128 rigidly secured to the shaft 13 of the cover 12.

Whenever the cover 12 is closed, the ratchet unit 118 is actuated so as to turn the shaft 116 of the cylinder 105 by a part of one revolution. The threads, fibers, fuzz, and the like which have become deposited on the outside of the sieve 106 will then be wiped off by the brushes 108 and drop into a removable box 124 underneath the cylinder 105 which may be partly formed by wall portions of the chamber 94 and may also carry the brushes 108, as indicated in FIGS. 13 and 14, which may be mounted so as to be easily exchangeable.

If the apparatus according to the present invention is made of large dimensions for the industrial treatment of textiles, both ends of the housing 1, which in this case is provided on each end with a control mechanism for operating the cover 12, may be provided with an outlet socket 68 including a chamber 94 and a sieve cylinder 105, as illustrated in FIG. 17. At the center between the two sieve cylinders 105 an electric motor 126 is mounted, the two shaft ends 127 of which are coaxial with the cylinders 105. Each of these shaft ends 127 carries a suction fan 125. The motor 126 is to be switched off as soon as the cover 12 is opened, and it is again to be switched on when the cover 12 is closed.

FIG. 18 shows a circuit diagram of the apparatus. Depending upon the direction of rotation of the drum 2 which is determined by the direction of the rotation of the motor 7, the camlike projection 20 will pivot the control lever 19 and thereby turn the shaft 18 which actuates a compressed-air valve 130 which may be, for example, a three-way valve. This valve 130 communicates through a conduit 131 with bore 57 of the connecting member 59, as shown in FIG. 7, and the pipe 60 is connected by a conduit 60' to the pressure chamber of the cylinder and piston unit 22, the other chamber of which cylinder communicates with the outer atmosphere. The second outlet of the valve 130 is connected through a conduit 132 with a source of compressed air 133, while the third outlet 134 of the valve 130 leads to the outer atmosphere.

Each of the two cylinder-piston units 26 and 46 is controlled by a four-way valve 135 or 136, respectively. Two diametrically opposite outlets of each of these valves are connected through the conduits 135', 135'' or 136', 136'' to the cylinder chambers of the units 26 and 46, respectively. The third outlet of each valve 135 and 136 is connected through the conduits 137 or 138 to the source of compressed air 133, while the fourth outlet of each valve is connected through the conduits 139 or 140 with the outer atmosphere.

The electric line 142 for operating the motor 126 is connected to a switch 141 which is adapted to interrupt the line 142 when the cover 12 is being opened and again to close the line when the cover 12 is being closed.

The operation of the apparatus is as follows:

For starting the apparatus, the four-way valve 135, as shown in FIG. 18, is turned so as to operate the cylinder-piston unit 26 to draw the trough 28 out of the recess 49 and to the position shown in FIG. 2 adjacent to the housing 1 where it may be filled with the textiles to be treated. At the same time or prior thereto, the motor 7 is started so as to turn the drum 2 in the direction of the arrow E. The projection 20 then engages with the control lever 19 which is thereby pivoted to the position as shown in FIGS. 6 and 18. By this movement, valve 130 will be turned to the position according to FIG. 18 so that the cylinder-piston unit 22 will be actuated by compressed air so as to open the door 8 against the action of the torsional spring 9' (FIGS. 2*a* and 2*b*) which acts upon the shaft 9. The drum 2 is then turned to the position as shown in FIG. 1, where it is stopped by switching off the motor 7. In this position of the drum 2 the opening 10 of the drum coincides with the opening 11 of the housing 1. Next, the cylinder-piston unit 26 is further

actuated by means of the valve **135** to lift the filled trough **28** (FIG. 2) while at the same time the cover **12** is opened to permit the textiles to be filled from the trough **28** into the drum **2**.

The opening movement of the cover **12** also results in a turning of the sieve cylinder **105** (FIGS. 13 and 14) so that any fibers, threads, and the like are brushed off the sieve **106** by the brushes **108** and fall into the box **124**. Furthermore, as indicated in FIG. 18, the motor **126**—if running—will be switched off by the opening movement of the cover **12** and the resulting opening of the switch **141**.

If the four-way valve **135** is then turned in the opposite direction, the cover **12** will be closed (FIG. 2), the motor **126** will be started, and the trough **28** will be lowered and returned to the recess **49**. The motor **7** is then started to rotate the drum **2** in the direction of the arrow T, whereby the valve **130** will be turned to release the pressure from the cylinder-piston unit **22**. The door **8** will then be closed under the action of the torsion spring **9'** on the shaft **9** (FIGS. 2*a* and 2*b*). The drum **2** will now rotate and hot air may be supplied into the drum through the hollow shaft stubs **3** (FIGS. 1 and 2) thereof and may then be drawn off by the suction fan or fans **125** through the sieve cylinder **105** (FIGS. 13 and 14).

When the treatment is completed, the direction of rotation of the drum **2** is reversed, so that the door **8** will be opened. The opening **10** of the drum is then brought into alignment with the discharge opening **15**. In the embodiment of the apparatus according to FIGS. 1 and 2, the four-way valve **136** is then actuated to pull the slide cover **16** to its open position so that the opening **15** will be opened permitting the textiles to fall upon the conveyor belt **17** which will carry them out of the apparatus.

If the apparatus is designed according to FIGS. 8 to 12, the treated textiles will drop into the discharge trough **71** which is moved to the discharging position according to FIG. 11, when the motor **89** is switched on, whereby pipes **84** are rotated about their axes so that the spindles **83** will be screwed outwardly to pivot the swivel arms **78** outwardly and then upwardly. The rollers **73** and **75** will then at first run slightly downwardly along the rail portions **74***a* and **74***c*, whereby the trough **71** will be moved away from the opening **15**, and they will thereafter run upwardly along the wide rail portion **74***b* until the rollers **75** are arrested by abutting against the stops **76**, as shown in FIG. 10. Since the rollers **75** are thus arrested, the continued pivoting movement of the swivel arms **78** in the upward direction will result in a pivoting of the trough **71** about the axis of the shafts **75'** of the rollers **75**. The rollers **73** will thereby be lifted from the rail portion **74***b* and will move along an arc about the coaxial roller shafts **75'** so that the trough **71** will be tilted to the position, as shown in FIG. 11, and emptied of the textiles. For returning the through **71** thereafter to its original position in which it closes the opening **15**, the direction of rotation of the motor **89** is reversed whereby the trough **71** will be moved in the opposite manner as above described.

Although the present invention has been illustrated and described with reference to the preferred embodiments thereof, it is to be understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

I claim:

1. An apparatus for treating textiles, comprising a stationary housing, a drum enclosed within said housing and having a perforated substantially cylindrical wall and end walls, coaxial hollow shaft stubs projecting from said end walls and rotatably mounted within said housing, means for rotating said drum in opposite directions, said cylindrical wall of said drum having an opening therein, a curved door connected to said drum and movable relative to said opening for opening and closing, respectively, said opening, resilient means automatically tending to urge said door into its closing position, means for moving said door to the open position comprising at least one unit mounted on said drum and movable therewith, said one unit comprising a cylinder and a piston reciprocating in said cylinder, means for pivotally connecting said one unit to one of said end walls of said drum, means for supplying a pressure medium to said one unit, said means for rotating said drum in opposite directions including means for controlling the operation of said unit comprising a resilient crank pivotally mounted on said housing, a member secured to said drum for pivoting said resilient crank during the rotation of said drum, a control valve operatively connected to and actuated by said crank and mounted in a fixed position for controlling the flow of said pressure medium to said unit, and means for transmitting said pressure medium from said fixed control valve to said movable unit, so that said flow of said pressure medium occasioned by movement of said crank in one direction opens said control valve to operate said cylinder to open said door and movement of said crank in the opposite direction vents said cylinder and allows said door to close.

2. The apparatus, as set forth in claim 1, wherein said housing has an upper opening and a lower opening, each of said openings is brought substantially in alignment with said drum opening when said drum is stopped in the respective positions, means for covering and uncovering said upper opening of said housing, means for covering and uncovering said lower opening of said housing, a shaft rotatably mounted in said housing and extending adjacent to one edge of said upper opening and parallel to the axis of said drum, said upper covering means being pivotally connected to said shaft, means for additionally pivoting said upper covering means about said shaft and comprising at least one second unit, similar to said first unit, means for pivotally connecting said second unit to said housing at the inside thereof, means for supplying a pressure medium to said second unit, means for controlling the operation of said second unit, and a source of pressure medium connected to said pressure medium supplying means for said first and second units.

3. The apparatus, as set forth in claim 2, wherein said opening in said drum and said curved door extends substantially along the entire length of said drum.

4. The apparatus, as set forth in claim 2, which includes means for guiding said door so as to be slidable in the peripheral direction along said cylindrical wall of said drum for opening and closing, respectively, said opening therein.

5. The apparatus, as set forth in claim 2, which includes means for pivotably connecting said door to said drum, so as to be pivotable toward the inside of said drum about an axis disposed substantially on said cylindrical wall and parallel to the axis of said drum.

6. The apparatus, as set forth in claim 1, wherein said curved door is slidable in the peripheral direction along said cylindrical wall of said drum for opening and closing, respectively, said opening therein, means for slidably guiding said door including guide rails secured to each of said end walls, guiding caps secured to said door carrying rollers for guiding said caps and said door along said guide rails, spring means automatically tending to close said door, and said crank is pivotally mounted on said housing and pivoted in two end positions symmetrically to a radius of said drum.

7. The apparatus, as set forth in claim 2, wherein said housing has a recess in one longitudinal wall near the lower end thereof, and which includes a filling trough, and means for swinging said trough from an inoperative position within said recess to a filling position outside of said housing wall, and from said filling position upwardly to a discharging position above said upper opening of said housing, and means operatively connecting said swinging means of said trough to said additional pivoting means of said upper covering means so that, when said filling trough approaches said upper opening, said upper covering means is moved to uncover said upper opening, while

when said filling trough is moved from said discharging position toward said filling position, said upper covering means is moved to cover said upper opening.

8. The apparatus, as set forth in claim 7, which includes means for pivotally connecting said filling trough to said swinging means, stationary means on said housing and associated fixed means on said filling trough for engagement with each other when said trough has been swinging to a level at which the upper edge of said trough is disposed at a level higher than the outer edge of said upper opening, so that, when said swinging means are swinging further upwardly, said fixed means on said trough will engage with said stationary means on said housing and tilt said trough about said fixed means to empty the contents of said trough through the uncovered upper opening of said housing and the opening of said drum and into said drum by pivoting said door inwardly by the gravity of said contents against the action of said resilient door closing means.

9. The apparatus, as set forth in claim 2, wherein said means for covering and uncovering said upper and lower openings of said housing comprises a slide member, means for guiding said slide member, means for moving said slide member comprising at least one third unit, similar to said first and second units, means for supplying a pressure medium to said third unit, means for controlling the operation of said third unit including means for connecting said source of the pressure medium to said pressure supplying means of said third unit in order to open and close, respectively, said openings.

10. The apparatus, as set forth in claim 9, which includes a continuous conveyer belt partly disposed underneath said lower housing opening and extending to a point outside of said housing.

11. The apparatus, as set forth in claim 2, which includes a discharge trough for receiving the treated textiles from said drum through said drum opening and said lower housing opening, rail means extending from a point in said housing underneath said lower housing opening to a point outside of said housing, roller means on said discharge trough for moving said trough along said rail means, swivel arms pivotally connected to said housing and to said discharge trough for moving said trough along said rail means from a position in which it covers said lower housing opening to a position outside of said housing, stop means on the outer end of said rail means for limiting the outward travel of said trough to a certain position and arm means for tilting said trough in said position to discharge its contents, and means for moving said swivel arms.

12. The apparatus, as set forth in claim 11, wherein said rail means comprises a pair of parallel guide plates mounted on the opposite ends of said housing and projecting toward one side of said housing to a point spaced therefrom, said rail means comprising a pair of guide rails, each of said rails being mounted on one of said guide plates at the side facing toward the other of said guide plates and extending from a point in said housing underneath said lower housing opening to a point near the outer end of said guide plates, said swivel arms comprising a pair of arms pivotally mounted near one end on said housing about a common axis and swingable parallel to said guide plates, a bearing member mounted on and slidable along each of said arms near the other end thereof, said discharge trough having an open top for receiving the treated textiles from said drum through said drum opening and said lower housing opening, coaxial stub shafts secured to the opposite sides of said trough and rotatably mounted in said bearing members, said roller means comprising a pair of rollers on each side of said trough for moving said trough along said rails, one of said rollers of each pair rotatably mounted on each of said bearing members, and the other roller of each pair rotatably mounted on each side wall of said trough near one longitudinal edge of said open top, said rollers, on said bearing members being spaced at a different distance from each other than said rollers on said side walls so that the two rollers on each side of said trough will travel along two separate closely adjacent paths on each of said rails, each of said rails comprising a part extending at a slightly downwardly inclined angle from a point underneath the lateral edge of said lower housing opening for guiding said roller on said bearing member, a second part connected to the lower end of said first part and being upwardly inclined for guiding the last-mentioned roller out of said housing, and a third part connected to said second part at a point intermediate the ends of said second part for guiding said roller on said side wall of said trough toward and upon said second, upwardly inclined part, said second part having a width equal to at least the combined width of the paths of both rollers of one pair at least between said connecting point of said third part and the outer end of said second part carrying said stop means.

13. The apparatus, as set forth in claim 11, in which said means for swinging said swivel arms comprise a connecting rod having two telescoping parts, one of said parts forming a tubular member having inner screw threads and the other part forming a threaded spindle screwed into said tubular member, one of said parts being pivotally connected at its outer end to one of said swivel arms and driving means for rotating the other part about its axis so as to extend or contract the length of said connecting rod.

14. The apparatus, as set forth in claim 13, wherein said connecting rod further comprises a universal joint connected at one end to one of said parts of said connecting rod and at the other end to said driving means.

15. The apparatus, as set forth in claim 13, wherein said driving means comprise a bevel gear secured to the innermost end of the other part of each of said connecting rods, a second bevel gear rotatably mounted in a fixed position and in mesh with said first gear, a common drive shaft carrying said second gears and extending parallel to the pivotal axis of said swivel arms, means for pivoting each of said connecting rods about the axis of said common drive shaft, and means for driving said shaft.

16. The apparatus, as set forth in claim 2, which includes an air outlet member mounted on said housing and having a chamber therein and an air inlet opening connecting said chamber with the inside of said housing, and a suction outlet socket on said member, a cylinder rotatably mounted within said chamber and having a perforated peripheral wall forming an air filter and being closed at one end and being rotatably slidable at the other open side in sealing engagement with said outlet socket, means for intermittently rotating said cylinder comprising connecting means operatively connected to said pivoting means of said upper covering means so that said cylinder is rotated, while said upper covering means is being opened, at least one brush mounted in a fixed position in said chamber and engaging said perforated peripheral wall of said cylinder from the outside thereof and adapted to brush along said wall when said cylinder is rotated, means for producing a suction in said outlet socket for drawing an air current from the outside through said hollow shaft stubs into said drum and then through said housing and then through said cylinder to said suction producing means which then expel said air to the outer atmosphere, means for driving said suction producing means, and means for starting and stopping said last driving means responsive to the movement of said means for pivoting said upper covering means so that said driving means are stopped when said covering means is in open position and started when said covering means is in closed position.

17. The apparatus, as set forth in claim 16, which includes a removable container within said chamber underneath said cylinder for receiving the foreign substances

filtered by said cylinder from said air current and removed by said brush from said cylinder.

18. The apparatus, as set forth in claim 17, wherein said brush is mounted within said container and removably secured thereto.

19. The apparatus, as set forth in claim 16, which includes a motor having a drive shaft extending from each end thereof, and a pair of suction fans, each connected to and driven by one of said shaft ends, said outlet member is mounted on each end of said housing, said outlet member containing one of said chambers and cylinders, and each of said suction outlet sockets communicating its cylinder with the adjacent suction fan, said motor being centrally mounted on said housing in the longitudinal direction thereof, said suction fans and outlet members and the elements therein being disposed symmetrically at both ends of said motor.

References Cited by the Examiner

UNITED STATES PATENTS

918,114	4/09	Anderson	34—133
1,189,777	7/16	Bartholomew	34—82
1,212,859	1/17	Weiss	34—133
2,253,047	8/41	Purkett	34—131
2,522,448	9/50	Husk et al.	34—131
2,611,192	9/52	Huebsch	34—82
2,852,236	9/58	Jackson	34—133

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