Jan. 12, 1960 R. BARROS 2,920,471

VACUUM-COMPRESSOR WASHER-DRYER

Filed Oct. 24, 1957 2 Sheets-Sheet 1

Fig. 1.

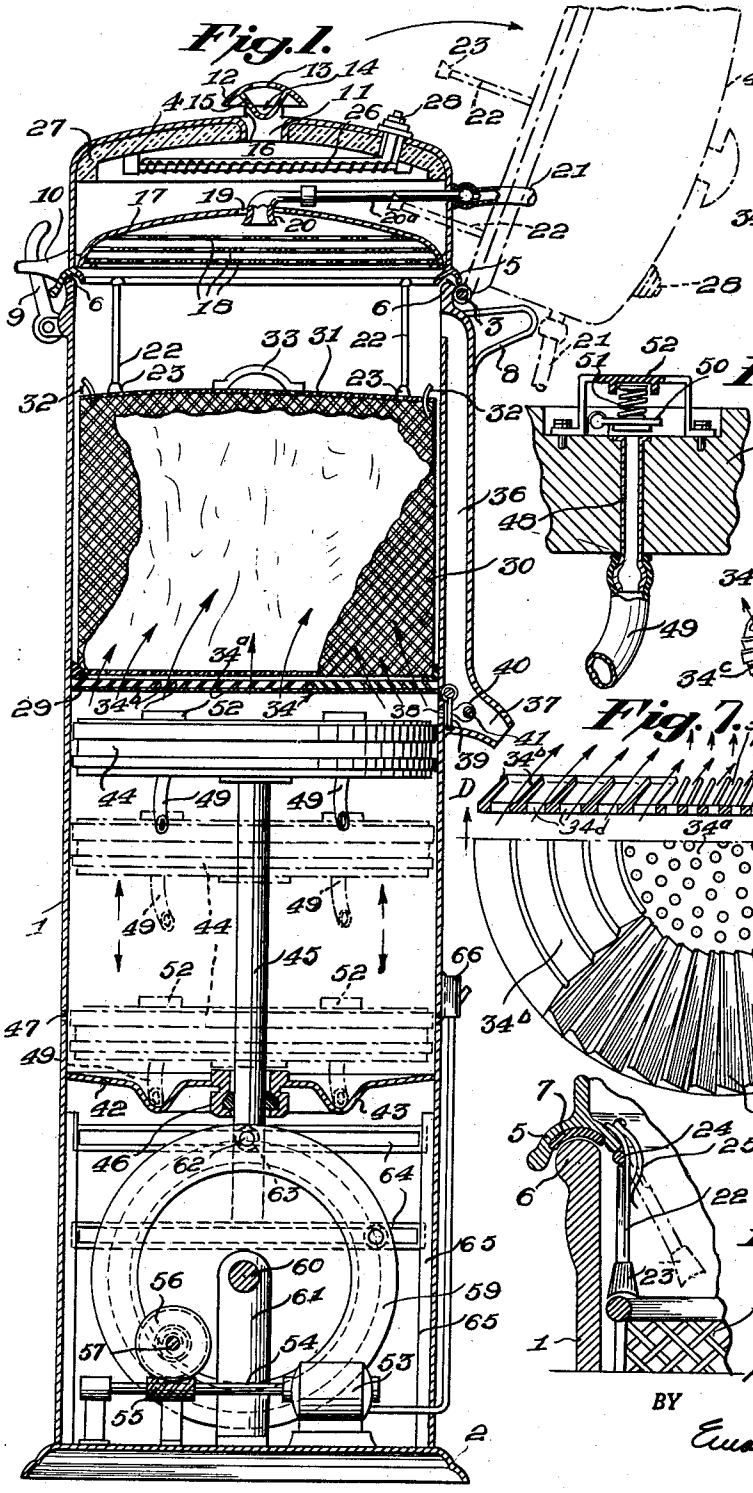


Fig. 5.

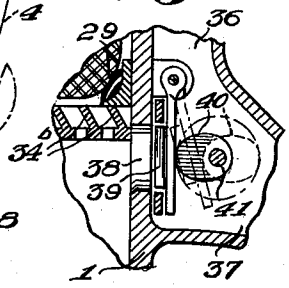


Fig. 9.

Fig. 8.

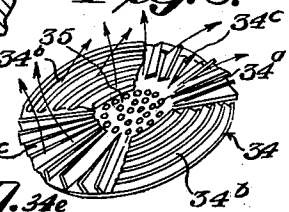


Fig. 7.

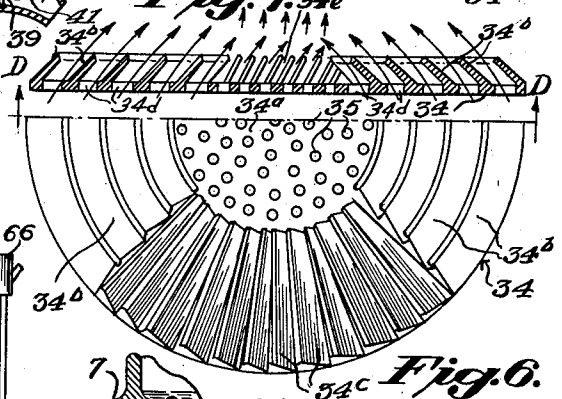


Fig. 6.

Fig. 10.

INVENTOR.
Ramon Barros.
BY
Emery L. Groff
Atty.

Jan. 12, 1960 R. BARROS 2,920,471

VACUUM-COMPRESSOR WASHER-DRYER

Filed Oct. 24, 1957 2 Sheets-Sheet 2

Fig. 2.

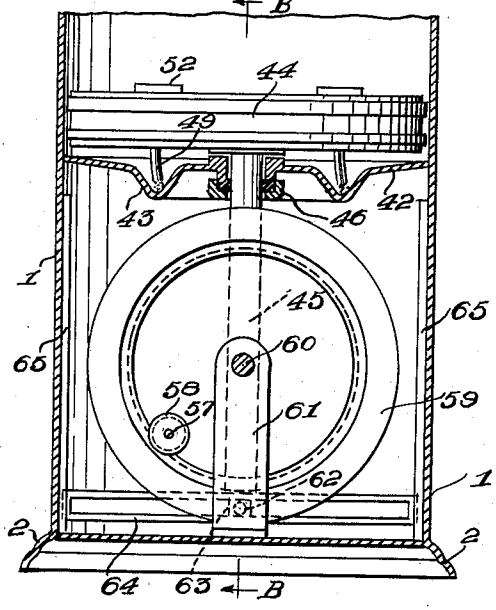


Fig. 3.

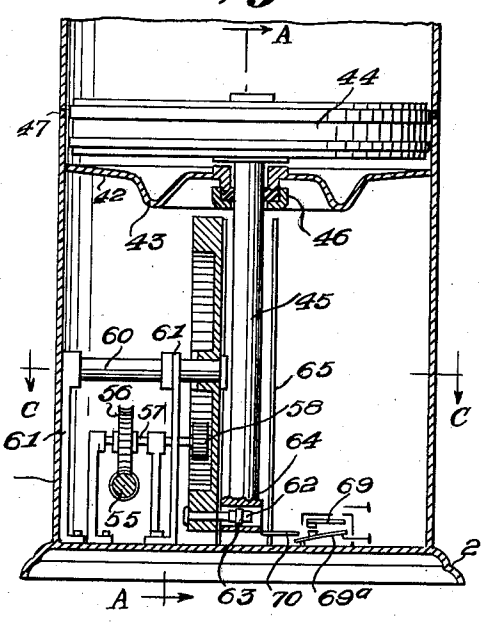
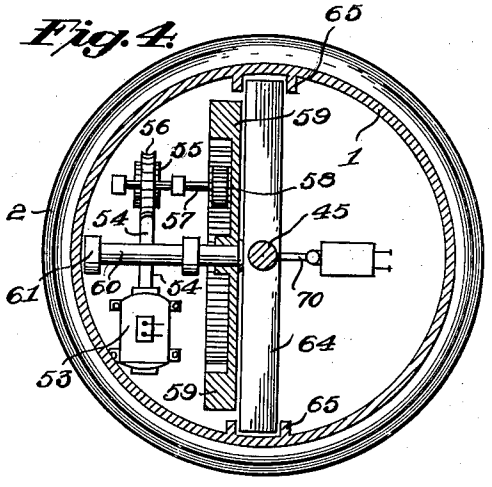


Fig. 4.



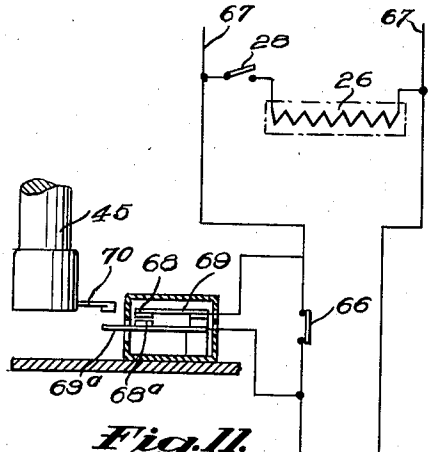


Fig. 11.

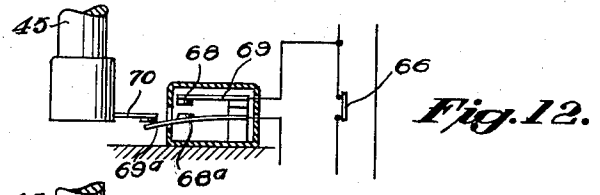


Fig. 12.

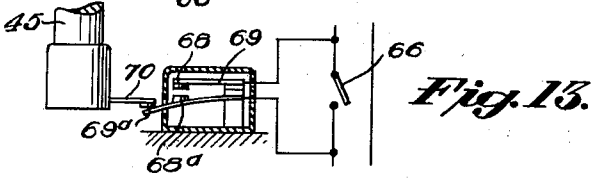


Fig. 13.

INVENTOR.
Ramon Barros.
BY
Emery L. Groff
Atty

United States Patent Office 2,920,471
Patented Jan. 12, 1960

2,920,471

VACUUM-COMPRESSOR WASHER-DRYER

Ramón Barros, Buenos Aires, Argentina

Application October 24, 1957, Serial No. 692,204

6 Claims. (Cl. 68—20)

The present invention refers to a clothes washing and drying machine, operating by vertical alternating movement, its essential object being to provide a new type of machine which, due to its excellent constructional and functional characteristics is particularly advantageous for washing purposes and, subsidiarily, for thorough drying of the clothes and garments in general, including hand-knitted wool or cotton and other relatively thick fabrics. The operative process is based essentially on action exerted by the forced passage, through the fabrics of said garments, of a liquid-gas mixture, preferably consisting of soapy water and air, and alternatively circulating in opposite directions.

It is a well-known fact that clothes submerged in a liquid have, practically, the same specific weight as the liquid. For this reason, the clothes-washing machines in use, the operation of which is based on the effects caused by agitation or turbulent movement of the washing liquid on the clothes immersed therein, suffer from the disadvantage that, as consequence of the similar specific weights, the clothes and the liquid are displaced together, at substantially the same speed and following practically the same course. Real agitation of one component regarding the other, therefore, does not actually take place, and the same may be said regarding action to force the washing liquid repeatedly through the mass of clothes.

In these conditions, washing action takes place most slowly and, generally speaking, inefficiently, particularly in the case of bulky articles or relatively thick pieces, such as woollen hand-knitted garments, etc.

In other types of machines, based on the same or similar processes, the garments are exposed to intensive friction or rubbing against an agitator member, or against the walls of the washer tub or drum, thus causing premature damage and wear of the garments, particularly if they are of silk or other delicate and flimsy fabrics.

It is accordingly a primary object of this invention to provide a novel form of clothes washing machine whose operation is not only different but is more effective than has been realized in prior washing machines and which operation consists essentially in bringing about forced circulation of a mixture of air and washing liquid through the fabrics, alternately in opposite directions caused by a pressure effect followed by a latter combined suction and gravity effect. The garments are thus submitted to a repeated alternating washing and draining process, ensuring thorough cleansing action in a very short time.

Apart from its simple and rational construction and efficient operation, the new-style clothes-washing machine in accordance with another object of the present invention, offers other outstanding constructive and functional features resulting in evident advantages in application and use, among which may be mentioned the following:

During the operative process, the washing liquid flows to the basket containing the clothes in five different directions and in two alternately contrary courses, thus

forcing the garments to move constantly, producing light friction between them and contributing, not only to a better and more thorough washing of the clothes, but also keeping the clothes away from the walls of the basket, thus avoiding the damage caused by the ordinary machines in which the garments are subjected to intensive rubbing action.

Another of the advantages of this new type of machine, lies in the fact that, as will be made clear further on, it is possible to use the same washing liquid for successive operations, with the ensuing economic advantages.

This washing machine makes it possible to effect a series of repeated rinsings and a final thorough rinsing after the washing process is terminated. These rinsing steps are accomplished by means of a stream of clear water, circulating in a single direction through the clothes.

Additionally, and by means of the heating device with which the washer is equipped, sufficient hot water is available for the washing and rinsing processes.

As a complementary step to the rinsing, gradual drying of the clothes is feasible by means of a hot or cold air current forced through the clothes.

A further advantage lies in the fact that the washer is provided with a novel device for projecting into the machine a fragrant substance intended to perfume the garments during their drying, without incurring any risk of producing perfume stains.

The machine is furthermore characterized by a device which, while functioning as an air injector for the washing liquid, can at the same time serve for the automatic recovery of small filtration losses of said liquid.

On the other hand, the mixture thus formed, consisting of soapy water and air, operates as an efficient lubricating agent as well as a cooling agent for some of the operative parts of the machine.

Another very practical advantage of this new-style washing machine is that it may be drained through any common wash basin or sink, without the use of pumping equipment or floor drains, which are not always available.

Furthermore, depending, of course, upon the rational construction and balanced arrangement of the operative members, the present machine is free from vibrations or shaking. It can therefore be mounted on wheels and easily transported from one place to another or kept in any reduced space until required for use.

Also a consequence of its simple construction is its light weight, low cost, small consumption of electricity and high efficiency.

The invention likewise encompasses other accessory objectives which will be explained during the course of the present description.

In order that the present invention may be more clearly understood and readily put into practice, a non-restrictive structural embodiment of same has been illustrated in the attached two sheets of drawings:

Figure 1 is a diametrical vertical section of the new type of clothes washing and drying machine showing the piston in sundry operative positions.

Figure 2 is a partial vertical section through the same clothes washer, as observed in the plane of line A—A of Figure 3, illustrating the same piston in its lowermost position.

Figure 3 illustrates a further partial section, as observed in the plane of line B—B of aforesaid Figure 2.

Figure 4 is a cross-sectional and plan view as observed in the plane of line C—C of Figure 3.

Figure 5 illustrates a detail of the liquid draining valve control device.

Figure 6 is a partial top plan view showing the ar-

rangement of the baffles provided to guide the liquid in several directions.

Figure 7 is a diametrical section of said plate, as observed in the plane of the D—D of Figure 6.

Figure 8 shows a perspective view of the arrangement illustrated in Figures 6 and 7.

Figure 9 illustrates a detail, in diametrical section, of one of the liquid recovery and air injection valve means forming an integral part of the piston.

Figure 10 is a partial detail of the top cover retaining device for the machine and, finally

Figures 11 through 13 illustrate the connection circuit for the control members of the machine, in their several operative positions.

Like numerals represent like or similar parts throughout the several figures of the drawings.

In the embodiment shown in the drawings, the new type of washing machine according to the invention consists substantially of: a vertical tank 1, preferably of sheet metal, fixed below to a pedestal or base 2 and provided at its upper end with hinges 3 for a cover 4 having a channel shaped rim 5 capable of tightly closing over rim 6 of said tank for sealed closure by means of resilient gasket 7.

In Figure 1, tank 1 is provided with an outer projection 8 forming a bracket to support said cover 4 in its open position. Diametrically opposite thereto a locking means of any known kind is provided consisting, for example, of a lever 9 rotatably connected to said tank 1 and capable of engaging a lug 10 furnished in the corresponding cover to hold the latter in a closed position.

The central part of cover 4 is provided with an orifice 11; outside and facing in, is a fixed, spherical cap-shaped member 12, curving downwards and provided with a central orifice 13. The inside of said member is in turn provided with a small receptacle 14 having lateral inlets 15. The entire assembly is fixed to the cover by means of support 16 and its purpose is to act as outside air intake and, eventually, as perfume-holding receptacle, as well as a handle for opening and closing the said cover.

Cover 4, at its base, is provided with a substantially concave bottom 17, integrally joined thereto and in turn having below a plurality of horizontally disposed perforated plates 18 or plates of metal mesh, vertically spaced from one another.

In turn, the middle portion of aforesaid bottom 17 is provided with an orifice 19 axially receiving a nozzle 20 terminating above said plates 18 and continuing in the shape of a tube 20*a* which passes through cover 4 and is connected by means of a flexible hose 21 to the corresponding feedwater tap.

Cover 4, furthermore, is provided underneath with stems 22 serving as legs and furnished at their lower ends with small supporting feet 23, of rubber or some other compressible material, connecting with the lower edge 5 of said cover 4 by means of articulations 24 as shown in detail in Figure 10. Normally, stems 22 tend to be held in a position which is perpendicular to the lower plane of said cover, by means of small leaf springs 25 or other adequate members permitting stems 22 to swing inwardly.

Figure 1, furthermore, illustrates the provision, between cover 4 and bottom 17 of same, of an electrical heating resistance unit 26 suitably separated from said cover by means of an insulating lining 27. Control is obtained by means of switch 28 connected to the feed circuit.

Inside of tank 1, substantially below the top thereof, a fixed ring with a rubber or similar gasket 29 is provided to serve as support for a metal-mesh garment basket 30. This basket of metal mesh, perforated sheet metal or similar material, is closed above by a cover 31, of the same or similar material, fixed by means of catches or hooks 32 to lock the cover in closed position, and is provided with a handle 33 to facilitate handling.

The lower part of ring 29 is fixed to a plate 34 consisting, as is shown by Figures 6 through 8, of a circular-shaped central area 34*a* having a number of conveniently distributed openings 35, two diametrically opposite sectors each provided with a plurality of inclined baffles 34*b* arranged in concentric circles, and two further sectors, also diametrically opposite to one another, likewise being provided with a plurality of baffles 34*c* which are radially arranged and disposed in inclined relation to the plate 34. Said figures furthermore show that the baffles 34*b* are separated by openings 34*d* and are directed to converge towards the center and upwards, whereas radial baffles 34*c* are separated by openings 34*e* and are placed in an inclined position in order to guide the liquid upwards in a spiral movement.

An overflow tube 36 is provided at a level close to the upper edge of tank 1. Said overflow tube, in substantially vertical position, connects with a drain 37 arranged in close proximity to and underneath plate 34 and communicating with the inside of said tank 1 through an orifice 38 capable of being closed from the outside by a valve 39, preferably a rotary flap valve closed by thrust exerted by an eccentric disc 40 forming an integral part of rotary shaft 41.

Inside of tank 1, and at a certain height of same, a disc 42, slightly conical in shape and preferably of sheet metal, is provided as a fixed and integral part of said tank. Said disc 42 is furnished with an annular, channel-shaped depression 43. Thus, between said bottom disc 42 and plate 34 a chamber is formed for tight displacement of a piston 44, the stem 45 of which is guided in sealed relation through aforesaid disc 42 by means of a stuffing box 46. In a position slightly below the level determined by the upper face of aforementioned piston 44 at the lowermost end of its stroke, one or more narrow orifices 47 have been provided through the wall of tank 1, in free communication with the outside.

The details of Figure 9 furthermore show that said piston 44 is furnished with two vertical and, preferably, diametrically opposite tubular members 48, the lower ends of which extend beneath the bottom face of the piston and are there connected to respective short length tubes 49 of rubber or other flexible and elastic material, the upper ends of which are provided with air injection and liquid recuperation valves preferably consisting of a rotary flap 50 normally held in closing position by an expansion spring 51 placed between the upper face thereof and a stirrup-like support 52 forming an integral part of the piston.

The alternating stroke of piston 44 is accomplished by means of an electric motor 53 mounted on a pedestal or base 2. The drive shaft 54 of this motor forms an integral part of a worm 55 which, as shown in detail in Figures 1 and 4 meshes permanently with a crown gear 56 which, together with worm 55, constitutes the speed-reducing gear. The outlet shaft 57 of this speed reducer is in turn an integral part of a pinion 58 permanently meshing with an inside crown gear 59 fixed to a shaft 60 mounted on a pair of fixed supports 61. Aforementioned crown gear 59 is an integral part of an offset pin 62 inserted in a ball bearing 63 running on the bed provided by a guide member 64 forming an integral part of the lower end of the piston stem. Both ends of the guide member 64 in turn slide in vertical rising and falling movements, along vertical and diametrically opposite rails 65 forming an integral part of tank 1.

The washing machine is furthermore provided with a hand-operated switch 66, series connected with one of the feed line conductors 67 and with an automatic control switch consisting substantially of a pair of contacts 68 and 68*a* forming part of a rigid finger 69 and a resilient finger 69*a* respectively and independently connected to the same feed circuit. Said contacts 68 and 68*a* are normally held closed by pressure exerted by finger 69*a* which, as shown in detail in Figures 11 through 13 is suitably extended at its free end into facing rela-

tion with a small thrust arm **70** forming an integral part of the lower end of piston stem **45**.

The procedure for operating the new-style washer according to the present invention, is as follows:

Piston **44** being in its lowermost position, namely the position illustrated in Figures 1 through 3, soap is provided and water fed to the tank by means of the flexible hose **21**, until reaching drain orifice level **38**. Once this level has been reached, the water supply is closed off and eccentric disc **40** adjusted to hold valve **39** in closed position. In these circumstances, after loading the clothes in basket **30**, the latter is placed in the machine, held down by ring **29** on plate **34** and kept in position by stems **22** when closing the cover **4**. The motor is now started by closing the hand-operated switch **66**, thus producing alternating vertical displacement of piston **44** within the corresponding part of tank **1**.

The piston in its rising motion drives the soapy water upwards through plate **34**. The liquid, guided by the openings and concentric and radial baffles, is impelled in five different directions, as shown by the arrows of Figures 7 and 8, entering, as shown, basket **30** which contains the clothes to be washed, and passing through them with perfect washing effect.

Consequently because of the different directions followed by the liquid current, the garments will change in position and arrangement until finally, through compression, they settle against the cover of basket **30**, which retains them while the soapy water is forced through the fabric.

Afterwards, as soon as piston **44** commences its downward stroke, the clothes with the liquid are transported downwards and are forced against the bottom of basket **30**, suction and gravity both combining to force the soapy liquid again through the fabrics. Practically the entire liquid charge is drawn downwards and the clothes are thus drained of liquid within the basket **30**.

In the meantime, piston **44** on arriving at a point close to the limit of its downward stroke, closes orifice **47** and compresses the air between said piston **44** and the bottom disc **42**, while flexible tubes **49** insert their lower ends in channel **43**, as shown in Figure 2. In this manner, the liquid which may have accumulated in said channel, mixed with the compressed air, lifts valves **50** and rises above the piston. Thus the small quantity of liquid which possibly may have filtered through is recovered, and new foam-forming air is incorporated wtih the liquid-gas washing mixture, with the consequent great advantages for the washing process. The operative cycle continues during the new rising stroke and repeated descent of the piston, and so on, for as long as the user wishes.

Once washing has been finished and if it be desired to again employ the same liquid for washing other clothes, the motor is stopped by means of switch **66**. Actual stopping of the motor will take place only when the piston has reached the lowermost point of its stroke and the small thrust arm **70** has acted on resilient finger **69***a* which was still holding the circuit closed. In this manner, when the piston has stopped in its lowermost position, the soapy water will be at a level below that of orifice **38** and the garments will have been drained of liquid through suction exerted by the piston descent. It is now merely a question of placing another basket of clothes or the same basket with other clothes in the machine and to start up the motor anew.

In case it is desired to use hot water for the washing and rinsing operations, this is possible by connecting the electric heater resistance **26** while water is allowed to enter the machine.

Once the washing has been finished and it is desired to change the water for rinsing without stopping the motor, the eccentric disc **40** is actuated by means of its rotary shaft **41**, thus freeing valve **39**. Each time, then, that piston **44** is on its upward stroke, it expels the water through orifice **38** and drain **37**. On its downward stroke the piston, through suction, closes valve **39** and extracts the water still remaining in the clothes.

Valve **39** is again left in its closed position and water is made to enter the machine. The cycle is repeated, but without soapy water and the ensuing rinsing step with clear water may be repeated as often as desired.

Finally, and for a last thorough rinsing with a stream of clear water in one direction only, water inlet and valve **39** are opened simultaneously; thus, each time that piston **44** rises it expels the water through orifice **38** and drain **37** while on its downward stroke, through suction effect, it closes valve **39** and extracts the clear water—still entering the machine—from the clothes. If this suction effect were excessive, automatic compensation is provided by the aperture of valves **50** of piston **44**. When the piston is again on its upward stroke valve **39** will again open, thus continuing the rinsing cycle.

In order to drain the clothes, it is merely necessary to close the water inlet through nozzle **20**. The liquid contents of the clothes will be removed by suction produced during each descent of piston **44**.

By merely extending this phase of the operation, the draining step may be continued at will until final drying of the clothes due to the forced passage of air aspirated by the piston is completed. This air can also be heated, if preferred, by connecting electric heater resistance unit **26**.

On the other hand, by introducing a suitable quantity of essence or perfume in receptacle **14** provided in the top cover **4**, it is possible to perfume the current of air entering through orifice **11** and to transmit said perfume to the clothes during the drying process, with no danger of staining the garments.

Also, and by means of adequate throttling of the water supply through nozzle **20** while heater resistance **26** is connected, the clothes may be treated with steam.

Due to its special features, this system, as has been said, is most advantageous for washing and drying garments of whatever fabric. In the case of very small and delicate pieces, they may be placed first in a bag of gauze to avoid damage.

It is worthy of note that said piston **44** is actuated by cam action of pin **62** fitted to crown gear **59**, for which reason the piston is slower at the ends of its strokes. Consequently, the compression and suction effects produced alternately by said piston are smooth and piston action is in a certain manner elastic, avoiding all sudden effects on the garments.

It is also to be noticed that as a consequence of the high position of drain **37**, the present machine may be placed directly alongside any current sink or lavatory basin, in order to use the drain of such domestic conveniences, a not inconsiderable advantage.

Another of the characteristic advantages of the machine lies in the fact that as a consequence of its very reduced piston speed and the consequent slow operation of its corresponding drive members, operation is very smooth and silent, there being no vibration or shaking whatsoever. It is thus possible to mount the machine on wheels for easy conveyance.

The machine is of very durable and simple construction, high functional efficiency, and consumes little electric current.

It is also to be understood that the machine is equipped with an advantageous automatic switch. This device ensures the stopping of piston **44** at the lowermost position of the latter's stroke once the operative cycle is finished. To this end, while hand-operated switch **66** is closed, as illustrated in Figures 11 and 12, the action of thrust arm **70** of stem **45** on the automatic switch, produces no effect whatsoever on the circuit of motor **53**. However, when switch **66** is disconnected to stop said motor, the latter will continue receiving current until the moment when thrust arm **70**, forming integral part of stem **45** of piston **44**, reaches its lowermost position, as

illustrated in Figure 13. At this instant, by means of arm 70, downward pressure is exerted on resilient finger 69*a*, causing contacts 68 and 68*a* to separate, thus totally interrupting the motor circuit and immediately stopping said motor.

The invention as herein described and illustrated may be clearly understood and further explanations will not be required by those versed in the art.

It is evident that many changes pertaining to construction and details may be made without departing from the scope of the present invention as clearly defined in the following claims.

I claim:

1. A clothes washing and drying machine, comprising, a vertically elongated cylindrical tank having a supporting base and whose upper end is provided with a hinged cover, a horizontal ring disposed within the tank intermediate said base and said cover and being rigidly secured to the inner wall of the tank, a mesh garment supporting basket having a bottom wall removably engaged with said ring, a circular plate disposed beneath said ring and being rigidly secured thereto, said plate being provided in a central area thereof with perforations and being also provided with baffles outwardly of said central area which are separated by openings in the plate and which are disposed in acute angular relation to the plate and in different directions relative to the center thereof for directing washing liquid upwardly through said basket in different directions, a horizontal disc rigid with said tank and beng disposed between said plate and the tank base, said disc being provided with an upwardly opening annular liquid collecting channel, a piston disposed within the tank intermediate said plate and said disc and being provided with a depending stem, a stuffing box in said disc through which the lower end portion of said stem extends, motor operated means disposed within said tank intermediate said disc and said base and having operative connection with said stem for reciprocating said piston in said tank intermediate said plate and said disc, an orifice in the wall of said tank in a position to be closed by said piston when in its lowered position in engagement with said disc, said piston being provided with valve means operable upon air compression by the piston after having closed said orifice to force any liquid accumulated in said channel to a position above said piston to be forced upwardly with the mass of washing liquid through the basket, and said cover being provided with a liquid inlet.

2. A clothes washing and drying machine in accordance with claim 1, wherein said baffles on said plate comprise diametrical opposed groups thereof which extend circumferentially of the plate and diametrically opposed groups thereof which are disposed radially of the plate.

3. A clothes washing and drying machine in accordance with claim 1 wherein said cover is provided with a downwardly concave bottom through which said liquid inlet extends, and said bottom being provided with a plurality of vertically spaced and horizontally disposed perforated plates below said liquid inlet.

4. A clothes washing and drying machine in accordance with claim 3, wherein said cover is provided with a central opening in the top wall thereof, a receptacle supported by said cover externally thereof and in opposition to said opening and having provision for air inlet and as a perfume-holding means, and electric heating means supported by the cover below said receptacle.

5. A clothes washing and drying machine in accordance with claim 1, wherein said piston supported valve means each comprises a tubular member extending vertically through the piston with its lower end projecting below the bottom wall of the piston, a short length of rubber tubing engaged with said lower end, and a pivoted flap normally closing the open end of said tubular member through the action of a coil spring.

6. A clothes washing and drying machine in accordance with claim 1, wherein said cover is provided with a plurality of laterally swingable depending stems whose lower ends are provided with yieldable basket cover engaging means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,601,091	Wayland	Sept. 28, 1926
1,605,412	Williams	Nov. 2, 1926
1,825,651	Barrett	Oct. 6, 1931
1,981,456	Kuhn et al.	Nov. 20, 1934
2,300,214	Fleming	Oct. 27, 1942