March 9, 1971 E. L. SEYLER 3,568,476

CLOTHES WASHING AND DRYING MACHINE

Filed May 19, 1969 4 Sheets-Sheet 1

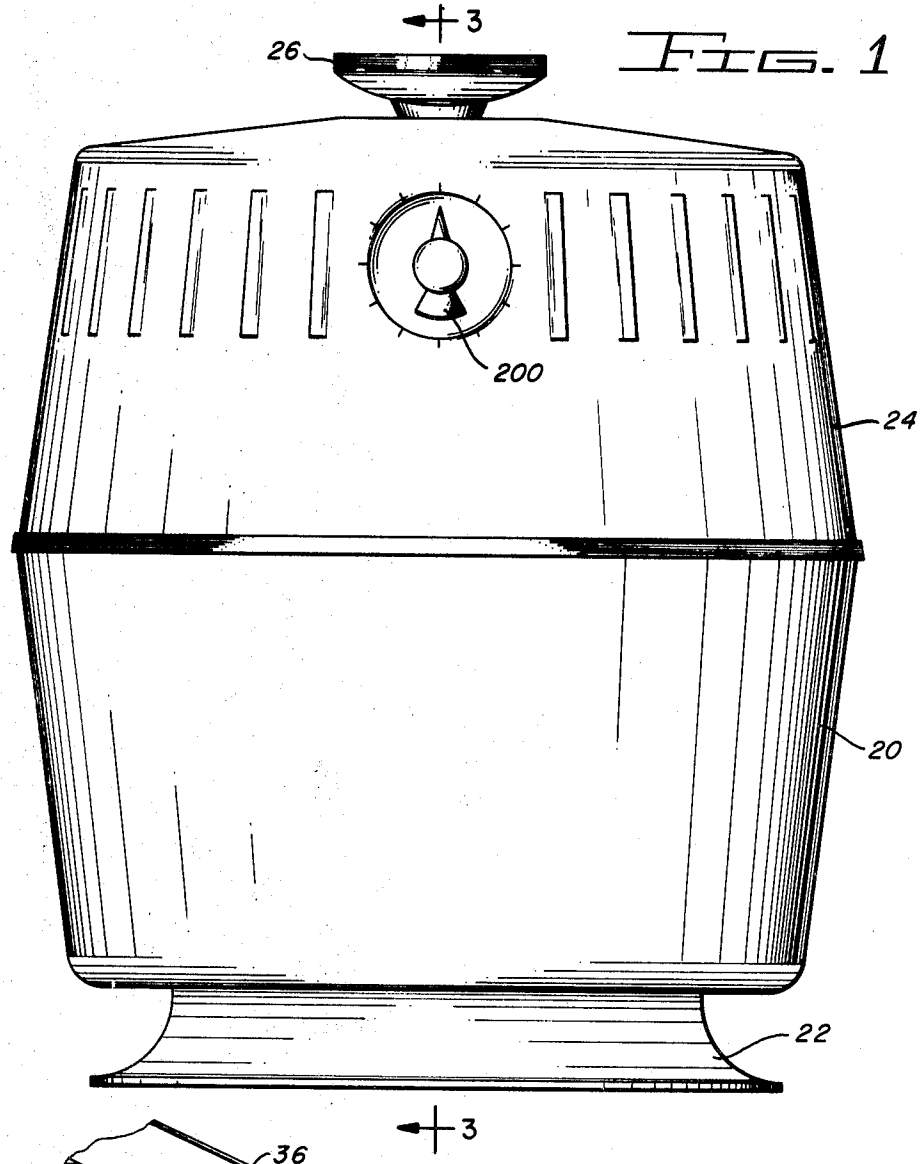


FIG. 1

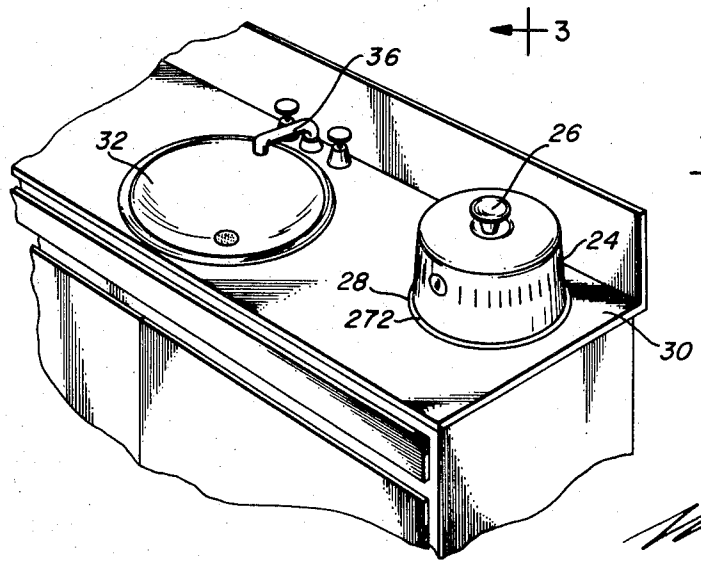


FIG. 2

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CLOTHES WASHING AND DRYING MACHINE

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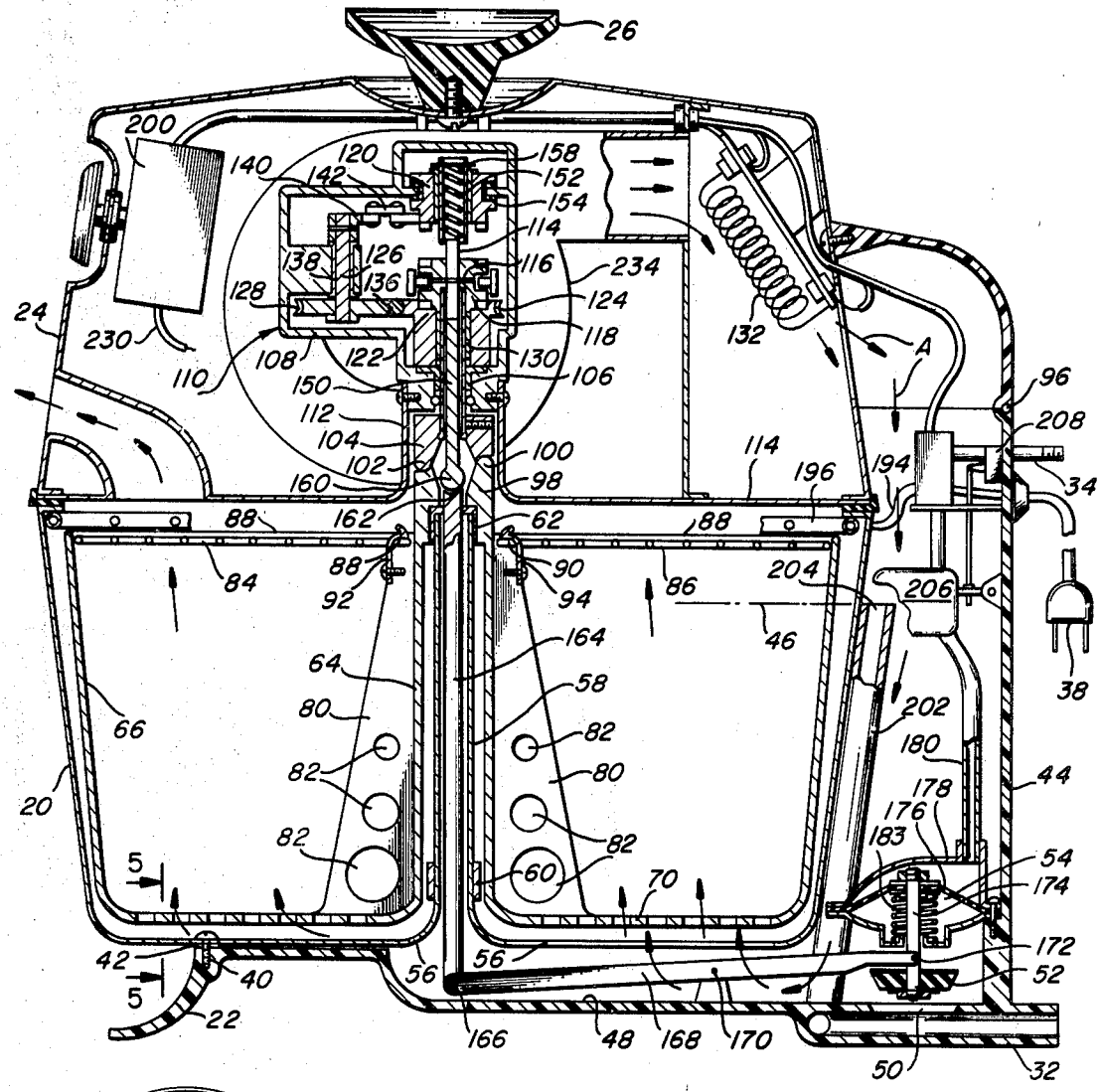


Fig. 3

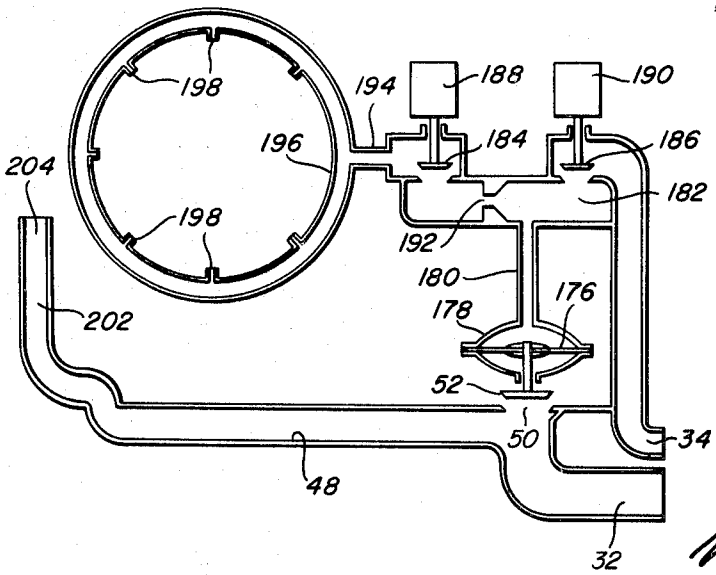


Fig. 4

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CLOTHES WASHING AND DRYING MACHINE

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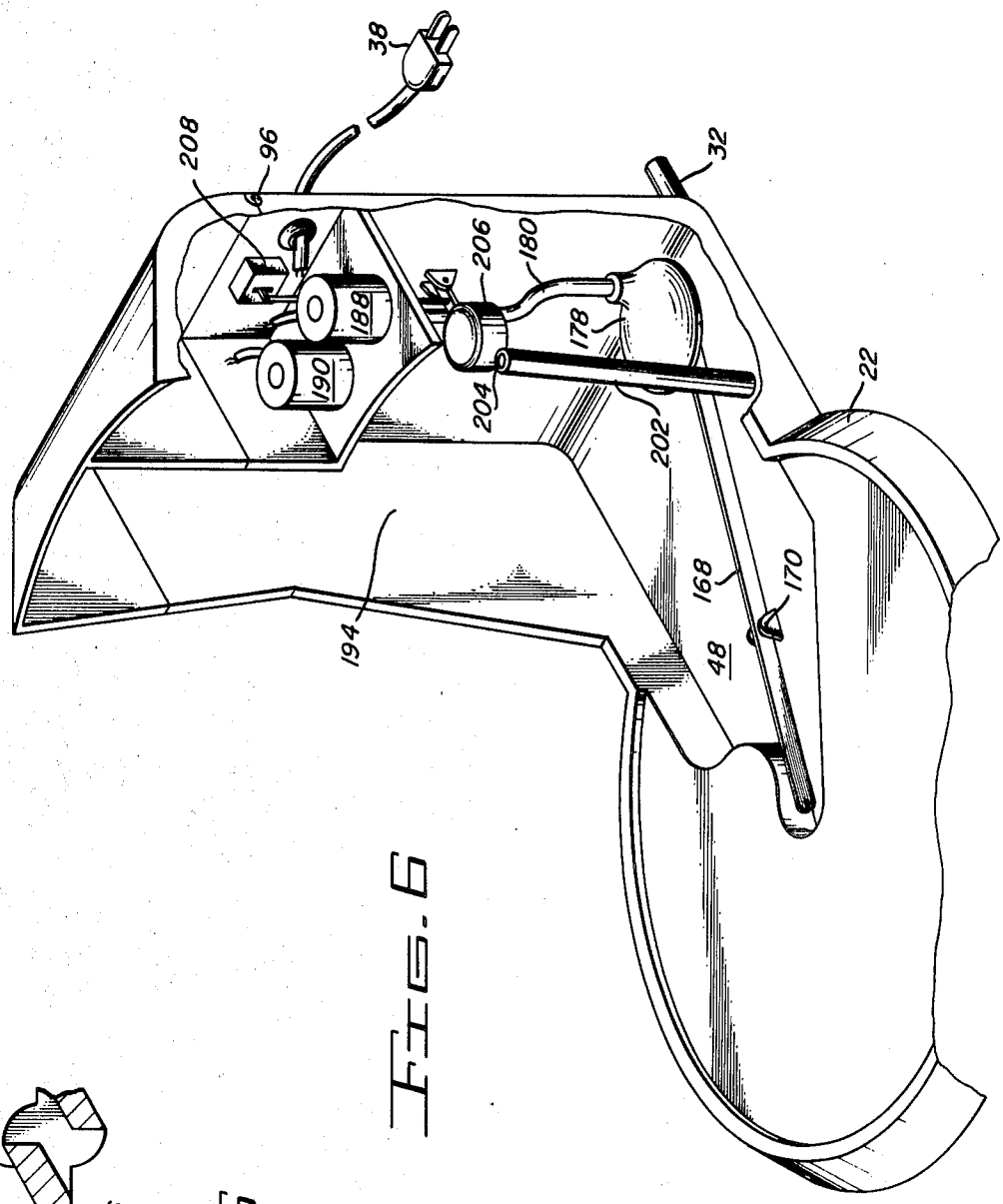


FIG. 6

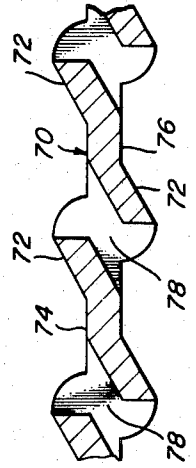


FIG. 5

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CLOTHES WASHING AND DRYING MACHINE

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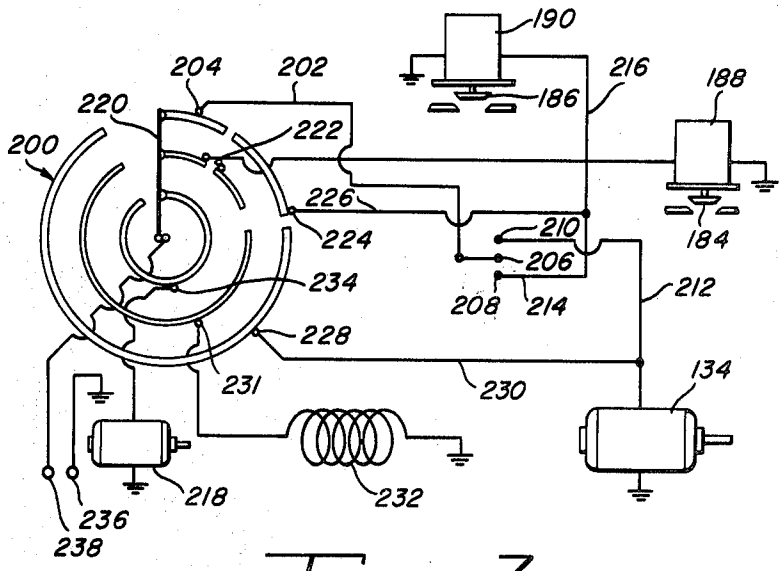


FIG. 7

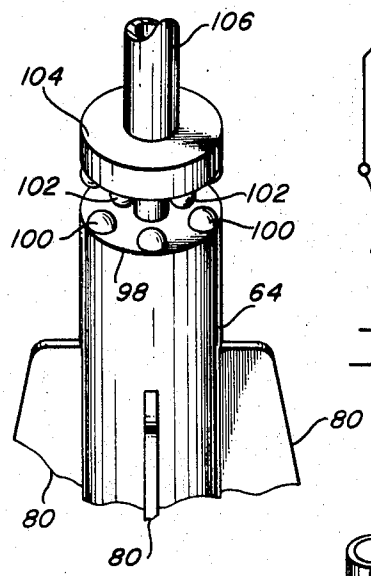


FIG. 8

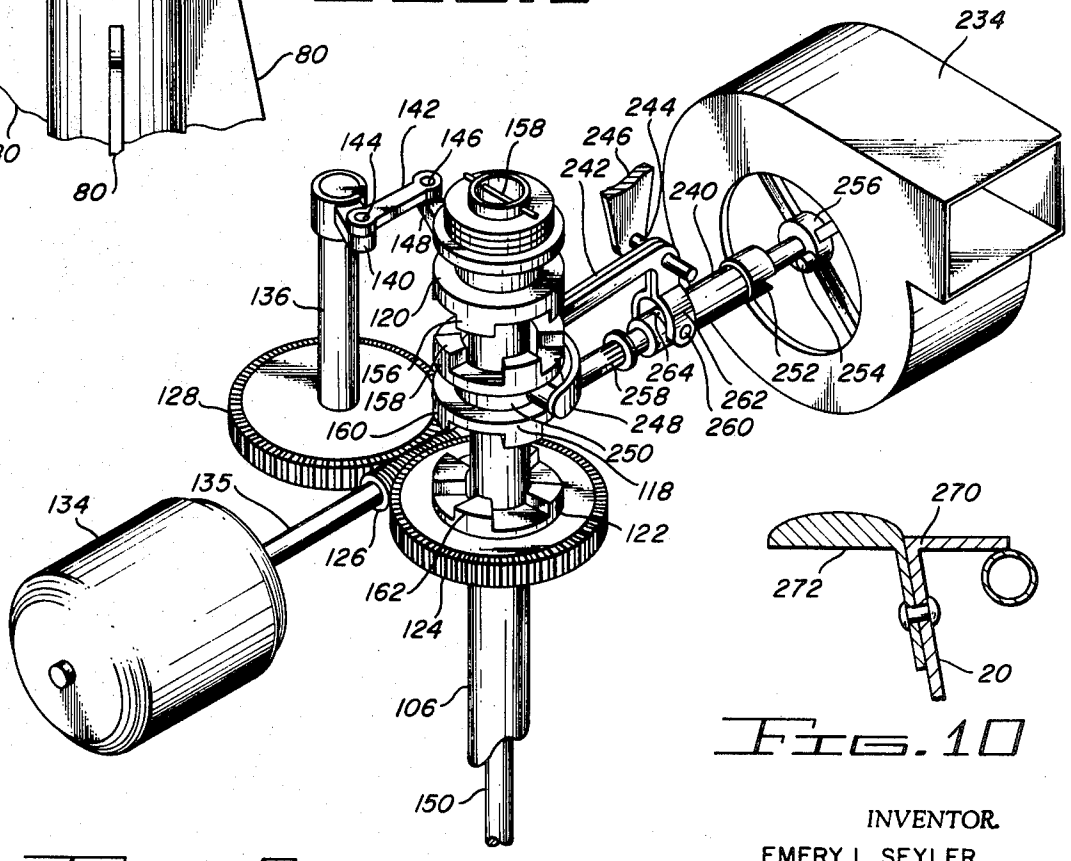


FIG. 9

FIG. 10

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3,568,476

CLOTHES WASHING AND DRYING MACHINE

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Filed May 19, 1969, Ser. No. 825,773
Int. Cl. D06f 25/00, 33/02
U.S. Cl. 68—12 17 Claims

ABSTRACT OF THE DISCLOSURE

A clothes washing and drying machine particularly adapted for use in washing delicate fabric items, such as ladies' under clothes; said washing machine being small and capable of use or installation in a bathroom area, and comprising novel features including a cover hingedly connected to a tub, wherein an agitator basket is located; said cover housing having drive mechnism for the basket and all located above the water level of the tub, and hydraulic pressure responsive actuating mechanism extending upwardly through a central hollow cylindrical bearing support of the tub and adapted to shift the drive mechanism of the machine which is carried in the cover housing thereof.

BACKGROUND OF THE INVENTION

Heretofore many ladies' delicate under garments have been laundered in large washing machines, and a large percentage of the laundry of such delicate items has been accomplished by hand in the privacy of the bathroom or other area, and the drying of such items has been a problem due to the exposure thereof to various persons when such items are hung in the bathroom or on a conventional clothes line in the open.

The laundry of ladies' lingerie has heretofore posed many inconveniences and some embarrassment due to the need for laundry facility in the bathroom where lingerie may normally be changed.

SUMMARY OF THE INVENTION

The present invention comprises a novel clothes washing machine particularly adapted for use in washing ladies' lingerie and which may be located either in a portable manner or permanently installed in a bathroom area. The machine of the invention comprises novel means for washing and drying very delicate lingerie and the machine is sufficiently compact so that it may be located in the bathroom on a conventional counter or other suitable means. The machine of the invention may be installed in a partly recessed position in the counter with the cover housing of the machine projecting thereabove, if desired.

Novel mechanical features of the machine comprises a tub having a moveable agitator basket therein and driven by mechanism carried in the cover housing above the tub, said mechanism comprising shifting means operable in response to hydraulic fluid pressure and having actuating means extending upwardly through a hollow cylindrical bearing support of the tub and engageable with the drive mechanism for the basket for shifting clutch means therein to a plurality of positions either to oscillate the basket or to rotate it, and concurrently to control the operation of a blower for use in drying operations. The machine of the invention also comprises novel axially releasable clutch mechanism engageable substantially on a plane at which the cover housing meets the top portion of the machine tub. This clutch mechanism being automatically axially releasable in case of overload, such as might be caused by jamming of the agitator basket of the machine, the clutch means comprising a plurality of interengaging substantially hemispheroid clutch assemblies which tend to cam each other apart axially to disengage automatically when an overload thereon occurs.

The hydraulic pressure responsive mechanism of the invention which shifts the drive mechanism for the basket of the machine also actuates a drain valve, thereby greatly simplifies the cycling operations of the machine.

The machine also comprises novel clutch mechanism employing a sliding clutch operable between an oscillating member and a rotary member, said sliding clutch also controlling a blower engaging mechanism further to simplify the control operation of the machine.

The invention additionally comprises novel blower, heater and duct means formed by portions of the cover housing which is pivotally connected to the top portion of the washing machine tub of the invention.

Further, the invention comprises a novel agitator basket having novel spoiler vanes for efficient washing action, together with novel angularly disposed openings in the bottom of the basket all of which provide for efficient washing action and permit efficient aeration of the clothing during drying operations thereon. An additional advantage of the invention is the disposition of all of the electrical components thereof above the normal water level in the tub of the machine when in operation.

Accordingly, it is an object of the present invention to provide a novel clothes washing machine particularly adapted for use in washing lingerie in a convenient location and in a timely manner so that such lingerie need not be stored, while soiled, and subject to the usual damage thus caused.

Another object of the invention is to provide a clothes washing machine particularly adapted for use in washing lingerie in cold water to efficiently remove blood stains or other materials readily and quickly and efficiently.

Another object of the invention is to provide a washing machine particularly adapted for use in washing lingerie or other similar items in the area of a bathroom to save time and effort of the housekeeper and to alleviate the usual embarrassment with relation to the washing or hanging of such garments in the bathroom or other areas.

Another object of the invention is to provide a very compact washing machine adapted for complete washing and drying of delicate fabrics and particularly designed for use in the bathroom or other private area most convenient for changing and washing of lingerie or other delicate items.

Another object of the invention is to provide a clothes washing machine having novel water pressure actuated clutch shifting mechanism adapted to perform the required shifting operations to either rotate the clothes washing basket of the machine or to oscillate it, and concurrently to cause operation of a blower when the basket is rotated during the drying cycle operation of the machine.

Another object of the invention is to provide a novel water control system employing solenoid valves in series assuring protection from valve failures.

Another object of the invention is to provide a washing machine having novel spoiler and agitator structures in the clothes washing and drying basket of the machine which affords efficient washing and drying action relative to the mechanical energy applied particularly suited for delicte fabric articles, such as lingerie and other similar garments.

Another object of the invention is to provide a novel clothes washing basket having screen covers to positively confine garments to basket thus to prevent damage to the garments when being washed or dried, and thereby also

prevent abrasion of the garments during various washing and drying operations so that the most delicate garments, such as lingerie may be efficiently washed and dried without damage thereto.

Another object of the invention is to provide an novel ball-type clutch mechanism adapted to provide for driving the clothes handling basket of the machine, the ball drive clutch mechanism being located at a juncture of the cover housing and tub so that should the machine be opened, the drive is automatically disconnected or when the basket or other mechanism of the machine becomes stalled, the ball-type clutch automatically disengages upon overload.

Another object of the invention is to provide a washing machine in accordance with the foregoing objects, wherein all of the electrical components are above the water line to thereby alleviate the possibility of electrical shorts caused by water which may leak, splash or otherwise wet any of the lower areas of the machine, wherein the electrical components are normally located.

Another object of the invention is to provide a clothes washing and drying machine having a high volume, low temperature air flow through the basket of the machine so as to insure efficient drying of delicate fabrics without overheating or otherwise damaging the delicate garments, and further, to insure low temperature of portions of the machine which may be touched by the operator thereof, when opened, all of which provides safety for the fabrics, as well as the operator of the machine.

Another object of the invention is to provide a very compact clothes washer and dryer which may be readily portable from one room to another or which may be installed in a recessed counter top, if desired.

Further objects and advantages of the invention may be apparent from the following specification, appended claims, and accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a clothes washing and drying machine in accordance with the present invention;

FIG. 2 is a perspective view of the clothes washing and drying machine of the invention recessed in a bathroom counter top;

FIG. 3 is a vertical sectional view taken from the line **3—3** of FIG. 1, showing parts and portions of the invention in elevation and showing portions broken away and further in section to amplify the illustration, and further illustrating by arrows the path of the drying air through the machine when operating on the drying cycle;

FIG. 4 is a diagrammatic view disclosing the hydraulic means of the invention;

FIG. 5 is an enlarged fragmentary sectional view taken from the line **5—5** of FIG. 3, showing angularly disposed openings in the bottom of the clothes handling basket of the invention to insure efficient agitating and aerating action during washing and drying of garments in the machine of the invention;

FIG. 6 is a fragmentary perspective view showing the tub and cover housing structure broken away to expose various components of the machine of the invention;

FIG. 7 is a diagrammatic view of the electrical equipment of the washing and drying machine of the invention;

FIG. 8 is a fragmentary perspective view of the hub of the clothes handling basket of the machine of the invention, and illustrating a ball-type drive clutch mechanism in connection therewith;

FIG. 9 is a perspective view of the drive and clutch mechanism of the invention, including an air handling blower of the machine of the invention; and

FIG. 10 is an enlarged fragmentary sectional view of the rim of the tub of the invention showing structural details thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The clothes washing and drying machine of the invention comprises a tub **20** having a base **22** which may serve as a support for the machine of the invention, when in operation, as will be hereinafter described.

Hingedly connected to the tub **20**, as will be hereinafter described, is a cover housing **24** adapted to provide an enclosure for the open top of the tub **20**. This cover housing is provided with a handling knob **26** on the top thereof for use in manually pivoting the cover housing **24** upwardly to open position, as will be hereinafter described in detail.

As shown in FIG. 2 of the drawings, the clothes washing and drying machine of the invention may be located or supported in a recess **28** of a counter top **30** adjacent to a wash bowl **32** in a bathroom area, or the like, wherein lingerie is generally or quite often changed.

The machine of the invention, as shown in FIG. 1, is generally portable and may be hand carried to various locations, and as shown in FIG. 3 of the drawings, the tub is provided with a drain **32** which may be connected to a suitable flexible hose so that the hose may be disposed in the wash bowl **32**, as shown in FIG. 2, to drain thereinto. A water supply pipe **34**, as shown in FIG. 3, may be connected to a flexible hose to receive a supply of water from any suitable supply, as for example, a faucet nozzle **36**, if desired. Many of the flexible plastic fittings are adapted for use in connection with quick disconnect couplings or other convenient devices for quickly connecting a supply of cold water to the water supply pipe **34**, as shown in FIG. 3.

Also projecting from the machine of the invention is a conventional 110 volt power supply plug **38** which may be plugged into a conventional female socket for supplying the machine of the invention with suitable electrical energy for the motorized mechanism thereof, and also the electrical resistance heater used to heat air for drying purposes. Accordingly, it will be appreciated that the portable use of the machine of the invention may be very readily accomplished by suitable foregoing disconnect couplings for water supply and drain and electrical energy.

The tub **20** may be made of tough plastic, metal or any other suitable material, as desired, and the base **22** may be fixed thereto by means of screws **40** with a seal gasket **42** located between the tub and the base.

The base is provided with an upstanding well section **44** projecting generally above the normal water line **46** when the tube **20** is at its full operating capacity.

The base **22** is provided with a water drain sump **48** communicating with a valve seat **50** controlled by a poppet-type drain valve **52** actuated by a power operated means **54** which is responsive to water pressure and operable thereby, as will be hereinafter described in detail.

The tub at its bottom portion is provided with openings **56** communicating with the sump **48** of the base to allow for water drain, and also upward flow of air for drying, as will be hereinafter described.

The tub **50** is provided with a central hollow cylindrical bearing support **58** carrying bearings **60** and **62** on which a hollow cylindrical central hub portion **64** of a clothes handling basket **66** is mounted.

The hub portion **64** is concentric with the upstanding hollow cylindrical bearing support of the tub and surrounds the same, as shown best in FIG. 3 of the drawings.

The basket **66** is a foraminous basket having a louvered bottom portion **70**, as shown best in FIG. 3 and in section detail in FIG. 5.

As shown in FIG. 5, the bottom portion **70** is provided with a plurality of louvers **72** which are disposed at an inclined angle to the bottom plane of the basket and extend above and below the normally upper and lower surfaces **74** and **76** of the bottom of the basket. This louver structure being angularly directed above and below the bottom of the basket provides for flow directing passages

78 which are generally inclined relative to the bottom of the basket, and thus provide for vortex or swirling action of water or air relative thereto during washing and/or drying operations, as will be hereinafter described in detail.

Secured to and carried by the hub 64 of the basket 66 are spoiler vanes 80 having a plurality of holes 82 therein. These holes are increasing in diameter toward the bottom of the tub, as shown best in FIG. 3, and serve to provide for the flow of water therethrough during oscillatory motion of the basket 66 and to thereby increase washing action due to improved turbulence of the water and increased flow of the water through clothing which is impelled in an oscillatory motion by the vanes 80, as the basket 66 is moved in an oscillatory motion during washing action of the machine.

A pair of generally semi-circular in cross-section cover screens 84 and 86 are disposed to enclose the upper open end 88 of the basket 66. These screens 84 and 86 are provided with hinge portions 88 and 90 retained by respective detent springs 92 and 94 either in the closed position, as shown in FIG. 3 of the drawings, or pivoted upwardly to a position at substantially 90 degrees relative to the position, as shown in FIG. 3, when the cover housing 24 of the machine is pivoted into open position about the axis of a pivot pin 96 which connects the cover housing 24 with the upstanding portion 44 of the base 48. It will be seen that when the cover housing is pivoted upwardly to an open position about the axis of the pin 96 that the screens 84 and 86 may be opened relative to the basket 66 to allow for loading or unloading of garments, such as lingerie, relative to the interior of the basket 66.

As shown best in FIGS. 3 and 8 of the drawings, the hub 64 of the basket 66 is provided with an upper end portion 98 carrying a plurality of generally hemispherical clutch dogs 100 which are spaced apart a distance equal substantially to the diameter of these spheroid clutch dogs and these spheroid clutch dogs 100 are adapted to be meshed with similar spheroid clutch dogs 102 of a clutch member 104. The upper portion 98 of the hub 64 and the member 104, together with the clutch dogs 100 and 102, constitute axially engageable and disengageable clutch means disposed near the juncture of the cover housing 24 and the tub 20 so that these clutch dogs may be engageable and disengageable with the closing and opening of the cover housing 24. Additionally, the spheroid form of these clutch dogs 100 causes them to act as disengaging cam surfaces when an overload occurs in the machine, as for example, whenever the basket 66 may become manned by some foreign part or item that may be caught in the machine. Thus, the axially engageable and disengageable clutch means 100 and 102 may respond to overload to avoid damage to the mechanism and to alert the operator that some difficulty has occurred. The clutch member 104 is fixed to and carried by a hollow operating shaft 106 which extends into a housing 108 of a basket drive mechanism 110. This housing 108 is mounted in the cover housing 24 by means of a hollow cylindrical upstanding portion 112 carried by a bottom plate 114 of the cover housing 24, which serves as an immediate cover to be disposed over the upper open end of the tub 20, as shown best in FIG. 3 of the drawings.

In the following description of the basket drive mechanism 110 attention is called to FIGS. 3 and 9, wherein the mechanism is shown. The disclosure of FIG. 3 includes the housing 108 which is omitted in FIG. 9 to expose the details of the drive mechanism.

The hollow operating shaft 106 is provided with slotted side wall portions 114 through which a pin 116 extends. This pin 116 also extends through a sliding clutch member 118 which is provided with a pore slidable over the periphery of the hollow operating shaft 106, and the sliding clutch 118 is alternatively engageable with an isolating clutch member 102 or a rotating clutch member 122, as will be hereinafter described in detail.

Fixed to the rotating clutch member 122 is a ring gear 124 which meshes with helical teeth at one side of a worm gear 126 while another worm wheel 218 meshes with the opposite side of the worm gear 126, all as shown best in FIGS. 3 and 9 of the drawings. The rotary clutch member 122 is freely rotatably mounted around the periphery of the hollow operating shaft 106 by means of a suitable bearing 130 and connected to the worm gear 126 is a drive motor 134, shown best in FIG. 9 of the drawings.

Fixed to the worm wheel 218 is a shaft 136 journalled in bearings 138 in the housing 108. The shaft 136 carries a crank arm 140 at its normally upper end which is pivoted to a link 142 which in turn is pivoted to the oscillating member 102, as shown in detail in FIG. 9 of the drawings. The crank arm 140, as shown in FIG. 9 of the drawings, is connected to the link 142 by means of a pivot pin 144 and another pivot pin 146 couples the link 142 with an extending arm portion 148 of the oscillating clutch member 120.

As the crank arm 140 is rotated about the axis of the shaft 136, the link 142 and arm 148 causes the oscillatory clutch member 120 to oscillate about the axis of the hollow operating shaft 106. Thus, when the motor 134 by means of its shaft 135 rotates the worm gear 126 both the gears 124 and 128 rotate constantly causing constant oscillatory motion of the oscillating clutch 120 about the axis of the shaft 106, and also constant rotation of the rotary clutch 122 about the axis of the hollow operating shaft 106. The sliding clutch 118 is therefore slidably engageable with either the oscillating clutch 120 or the rotating clutch 122 in accordance with the cycle operation of the machine, as will be hereinafter described in detail.

The pin 116 which extends through the slots 114 in the hollow operating shaft 106 also extends through a sliding clutch actuating rod 150 which is axially reciprocally mounted in the hollow operating shaft 106. This sliding clutch actuating rod 150 is engaged at its upper end by a compression spring 152 which tends to hold the sliding clutch 118 downwardly into engagement with the rotary clutch 122.

The rotary clutch 122 is axially and stationarily rotatably mounted in the housing 108 while the oscillating clutch 120 is also axially restrained to oscillate in the housing 108 by means of bearing mean 154 mounted in an external groove of the oscillating clutch 120, as shown best in FIG. 3 of the drawings.

As shown in detail in FIG. 9 of the drawings, the oscillating clutch 120 is provided with axially extended clutch teeth 156 adapted to mesh with mating teeth 158 on the normally upper end of the sliding clutch 118.

The sliding clutch 118 is provided with normally downwardly extending teeth 160 adapted to mesh with generally upwardly extending teeth 162 of the rotary or rotating clutch 122, all as shown best in FIG. 9 of the drawings. Thus, the sliding clutch 118 actuated by the sliding clutch actuating rod 150 and pin 116 may be moved into locked or clutched engagement with either the oscillating clutch member 120 or the rotary clutch member 122, it being noted that the sliding clutch 118 is the only member locked onto the hollow operating shaft 106 against rotation relative thereto, and that the oscillating clutch 120 and rotary clutch 122 are freely movable relative to the hollow operating shaft 106 when the sliding clutch 118 is disengaged from both the clutch members 120 and 122, as shown in FIG. 9 of the drawings.

It will be understood, however, that the sliding clutch 118 is normally engaged with either the oscillating clutch member 120 or the rotary clutch member 122 during operating of the machine, as will be hereinafter described in detail.

As shown in FIG. 3 of the drawings, the assembly of the hollow operating shaft 106 and the components in connection with the housing 108 are retained by pin

158 which extends through the hollow operating shaft 106 at the normally upper end of the oscillating clutch 120, and this pin 158 also acts as an abutment for the spring 152, hereinbefore described.

The normally lower end of the sliding clutch actuating shaft 150 is provided with a spherical portion 160 which is engageable with a conforming upper portion 162 of a shifting rod 164 which extends downwardly and concentrically through the interior of the hollow upstanding bearing support 58 of the tub 20.

A normally lower end of the shifting rod 164 is connected by means of a pin 166 to a shifting lever 168, as shown in FIG. 3 of the drawings.

The shifting lever 168 is pivotally mounted on a trunnion pin 170 carried in the sump 48 of the base 22 and an end of the shifting lever 168 opposite from the pin 166 is provided with a pivot pin 172 pivotally connected with a plunger of the poppet valve 52, hereinbefore described. The plunger 174 of the poppet valve 52 is connected with a flexible diaphragm 176 in a diaphragm housing 178. This diaphragm 176 is responsive to water pressure conducted therethrough a control pressure conduit 180, as will be hereinafter described. A spring 183 at one side of the diaphragm 176 tends to hold it in a position to retract the poppet valve 52 from the seat 50 and to maintain the drain opening inwardly of the seat 50 open.

As shown diagrammatically in FIG. 4 of the drawings, the control pressure conduit 180 communicates with a liquid passage 182 disposed between poppet valves 184 and 186 of respective solenoid valves 188 and 190. These poppet valves 184 and 186 are arranged in series flow relationship to each other, as shown in FIG. 4, and as will be hereinafter described in detail.

Disposed between the poppet valves 184 and 186 is a pressure control orifice 192 which communicates at one side with the chamber 182 and the poppet valve 186 and at an opposite side with the poppet valve 184 having an outlet 194 communicating with a water supply means outlet conduit 196. This water supply means outlet conduit 196 is generally ring-shaped, as shown in FIGS. 3 and 4, and is provided with a plurality of inwardly radially directed water spray nozzles 198 adapted to spray water inwardly and over the basket cover screens 84 and 86 and onto clothing or garments internally of the basket during an initial cycle operation of the clothes washing and drying machine of the invention.

The water supply pipe 34 may be connected to a suitable supply of cold water, as hereinbefore described, and is adapted to deliver water to the inlet of the valve 186 controlled by the solenoid 190 so that the water may pass from the supply pipe 34 through the valve 186 and into the passage 182 upstream of the restricted orifice 192 so as to impose fluid pressure through the control pressure conduit 180 and to the diaphragm 176 to force the poppet valve or drain valve 52 closed against its seat 50 when initial washing cycle of the machine of the invention, is initiated by operation of the electrical timer 200 of the machine, as will be hereinafter described in detail.

Water passing through the restricted orifice 192 may pass through the valve 184 when opened by the solenoid 188 and through the passage 194 to the ring-shaped water supply outlet conduit 196, hereinbefore described.

Communicating with the outlet 32 of the base 22 is an upstanding water overflow conduit 202 having an upper open end 204, shown best in FIGS. 3 and 4 of the drawings, to insure overflow of water into the drain 32 in the event the water level reaches substantially above the level 46 as controlled by a float 206 which actuates a float switch 208, as will be hereinafter described.

The float switch 208, as shown in FIG. 7 of the drawings, is illustrated diagrammatically in circuit with the motor 134 and the solenoid 190, as well as the timer 200.

A conductor 202 connects a contact 204 of the timer with a movable contact 206 of the float switch 208 which alternatively may contact a contact 210 in connection with the motor 134 through the conductor 212 or the movable contact 206 of the float switch 208 may engage a contact 214 in connection with a conductor 216 coupled to the solenoid 190 which actuates the valve 186, hereinbefore described.

The timer 200 is rotatably operated by a conventional timer operating motor 218 which has moveable contact arm means 220 adapted to engage contacts 204 and 222 connected to the solenoid 188. The contact arm 220 is also engageable with a contact 224 in connection with a conductor 226 coupled to the conductor 216, hereinbefore described. The contact arm 220 is also adapted to engage the contact 228 coupled to a conductor 230 which is connected to the conductor 212, hereinbefore described. The arm 220 is disposed also to engage a contact 231 in connection with an electrical resistance heater coil 232 shown at the outlet of a blower 234 which will be hereinafter described in connection with the basket drive mechanism 110.

An arcuate contact 234 is disposed to be contacted by the arm 220 for energizing the timer motor and the arm 220 is adapted to pass the end of the contact 234 for shutting off operation of the timer operating motor at the end of each cycle of operation.

Power supply conductors 236 and 238 are equivalent to the conductors in connection with the prongs on the male plug 38, shown in FIG. 3 of the drawings.

It will be understood that the timer 220 causes the various structures of the washing and drying machine of the invention to operate in a cycle sequence fashion and that the blower 234 shown in FIGS. 3 and 9 is provided with a conventional centrifugal impeller rotatable about the axis of the shaft 135 in connection with the motor 134. Slidably mounted on this shaft 135 is a clutch sleeve 240 actuated by a bell crank lever 242 carried by trunnions 244 pivotally mounted in brackets 246 secured to the upper portion of the cover housing 24. The bell crank lever 242 is provided with a yoke 248 of substantially conventional form having opposed bearing trunnions engaged in a peripheral annular slot 250 of the sliding clutch 118 so that when the sliding clutch 118 is engaged with the rotary clutch 122, as hereinbefore described, the bell crank arm 242 forces the clutch member 240 at notched portions 252 to engage clutch pins 254 carried by a hub portion 256 of the blower impeller. The sliding clutch member 240 is preferably longitudinally slidably mounted on a spline portion 258 of the shaft 135 so that the member 240 rotates with respect to trunnion pins 260 on a clutch yoke portion 262 of the bell crank arm 242, said yoke portion 262 being similar to the yoke portion 248 and having its trunnions 260 operating in a peripheral groove portion 264 of the sliding clutch member 240. Thus, when the sliding clutch member 250 moves into engagement with the rotary clutch 122, the bell crank arm 242 is pivoted so as to engage the sliding clutch member 240 with the trunnions 254 to cause engagement of the impeller 256 to cause operation of the blower 234 to force air in the direction of the arrows A, as shown in FIG. 3 of the drawings, from the outlet of the blower through the heating coil 232 and downwardly through the upstanding housing portion of the base 22 and through the sump 48 thereof, and upwardly through the bottom of the tub 20 and through the foraminous clothes handling basket 66 at the area of the louvers 70 in the bottom thereof.

Extending upwardly and outwardly from the cover housing plate 114 is an air outlet duct 115 which permits air to exhaust from the tub and basket to outside atmosphere through the side wall of the cover housing 24.

In the structure, as shown in FIG. 10 of the drawings, an upper peripheral portion 270 of the tub 20 may be fitted with an outwardly directed flange 272 of annular form for the purpose of providing a support for the washing and drying machine of the invention when recessed in a counter top, as shown in FIG. 2 of the drawings. In

this position, the bottom portion of the cover housing **24** is substantially flush with the counter top and the top of the tub **20** is also substantially flush with the counter top, thus providing a substantially permanent or stationary mounting of the machine of the invention as an option to the completely portable version thereof, as shown in FIG. 1 of the drawings.

In a general mode of operation, the clothes washing and drying machine of the invention may be used, as follows:

Initially the operator places lingerie or other delicate items in the basket **66** with the cover housing **24** in open position and with the rubber covered screens **84** and **86** pivoted upwardly, as hereinbefore described. The cover housing **24** may then be pivoted about the axis of the pin **96** to a closed position, as shown in FIG. 3 of the drawings, after soap has been added to the interior of the tub, then the operator turns the timer to an on position substantially as shown in FIG. 7 of the drawings, whereupon the arm **220** is driven by the motor **218** in a substantially clockwise direction, as shown in FIG. 7 of the drawings.

The timer first causes energization of the primary solenoid **188** in connection with the valve **184** and energizes the solenoid **190** in connection with the valve **186**. This subjects the passage **182** and the interior of the control pressure conduit **180** to water pressure imposing water pressure on the diaphragm **176** and closing the drain valve **52**. At the same time, the lever **186** pivots the shifting rod **164** upwardly and thereby forcing the sliding clutch actuating rod **150** to move the sliding clutch **118** into engagement with the oscillating clutch **120** to thereby cause oscillating action of the basket **66** through the axially engageable and disengageable clutch means **100** and **102**. At this time, water also sprays through the nozzles **198** onto the clothes in the basket **66**.

As the water level increases in the tub **20**, it causes the float **206** to actuate the switch **208** to de-energize the solenoid **190** and to close the valve **186**. In this position, the basket is agitated through oscillatory motion for approximately 3 and one-half minutes by means of the crank arm **140** and link **142** in connection with the oscillating clutch member **120**, as hereinbefore described.

The timer then turns off the solenoid **190** allowing the valve **186** to close so that a pressure drop in the control pressure conduit **180** communicating with the diaphragm **176** permits the spring **182** to open the valve **52** and allow the tub **20** to drain through the drain **32**. At the same time, the diaphragm **176** is moved upward by the spring **182**, the shifting lever **168** drops the shifting rod **164** allowing the spring **152** to force the sliding clutch **118** into the position, shown in FIG. 3, wherein it engages the rotary clutch **122**. The basket **66** is then rotated for approximately one minute while the water drains from the tub **20**. The timer then opens the valves **184** and **186** by means of the solenoids **188** and **190** to again fill the tub **20** for rinsing action, whereupon the foregoing oscillatory action of the basket **66** ensues while the drain valve **52** is closed.

The garments in the basket are then agitated by oscillatory action for approximately three minutes, and the timer then operates the valves **184** and **186** in a manner, as hereinbefore described, to return the sliding clutch **118** into engagement with the rotary clutch **122** and to cause rotary motion of the basket **66**. At this time, the lever **242** is actuated so as to engage the blower rotor hub **256** and to cause air to move through the blower outlet and over the heating coil **232** which is then energized by the timer so that warm air travels downwardly through the duct portion **194** of the base **22** through the sump **48** and upwardly through the angularly disposed louvers **72**, hereinbefore described, to provide a rotary entrance of the air for suspending the clothing or garments in such a manner as to provide for the most efficient and gentle drying action. It will be understood that this drying action includes high volume and substantially nominal heat so that the garments are not damaged, but are efficiently dried as they are floated by the air passing upwardly through them. This drying action takes place for about thirty minutes at which time the timer turns off the timer motor **218** and the entire washing and drying cycle is complete. The operator then opens the cover housing **24** with respect to the tub **20** and the screens **84** and **86** are moved to open position, whereupon the operator may remove the lingerie from the machine which is then ready for use or storage.

It will be obvious to those skilled in the art that various modifications may be resorted to without departing from the spirit of the invention.

I claim:

1. A clothes washing and drying machine comprising; a tub adapted to contain water; a cover housing pivoted relative thereto and adapted to cover the upper open end of said tub and to be opened to expose the upper open end of said tub; a clothes handling basket movably mounted in said tub; said tub having a bottom portion providing with a hollow cylindrical upstanding bearing support provided with bearings mounting said basket concentrically around said bearing support; basket drive mechanism including oscillatory drive and rotary drive mechanism carried in said cover housing above said tub; a basket drive shifting rod means extending upwardly through said hollow bearing support of said tub; said basket having a hollow hub portion provided with an upwardly extending end; axially engageable and releasable clutch means disposed to interconnect said basket drive mechanism and said upper end of said basket hub; and power operated means for actuating said basket drive shifting rod for shifting said mechanism for selectively utilizing said oscillating drive or said rotary drive means for moving said basket in said tub.

2. The invention, as defined in claim **1**, wherein: said power operated means includes a water pressure responsive means disposed to move said shifting rod.

3. The invention, as defined in claim **1**, wherein: said axially engageable and releasable clutch means comprises a plurality of substantially spheroid-shaped members in connection with said drive mechanism and a mating group of spheroid members in connection with said hub of said basket; said axially engageable and releasable clutch mechanism disposed substantially near the plane at which said cover housing meets the upper open end of said tub.

4. The invention, as defined in claim **1**, wherein: said basket drive mechanism comprises a motor having an output shaft carrying a worm gear; a pair of opposed worm wheels constantly meshed with said worm gear; said rotary drive means connected with one of said worm wheels; said oscillatory drive mechanism comprising a shaft connected to the other of said worm wheels; a bell crank and link oscillating mechanism connected to said last mentioned shaft; said bell crank and link oscillating mechanism coupled to said rotary drive means; a hollow operating shaft extending axially through said rotary drive means and said oscillatory drive means; said rotary drive means and oscillatory drive means freely movable about the axis of said hollow operating shaft; a lower end of said hollow operating shaft carrying one portion of said axially engageable and releasable clutch mechanism; a sliding clutch slidably mounted on said hollow operating shaft and axially movable into clutching engagement with said oscillatory drive means or said rotary drive means alternatively; said hollow operating shaft having slotted side walls; pin means extending through said sliding clutch means; a sliding clutch actuating rod mounted in said hollow operating shaft and having a lower end engageable with said shifting rod means in said bearing support; an upper portion of said sliding clutch operating rod engaging said pin; a return spring adapted to force said sliding clutch member in an opposite direction; yoke means engageable with said sliding clutch mechanism; a blower engaging clutch operable

by said yoke means; a blower having an impeller therein adapted to be engagingly operated by said last mentioned sliding clutch mechanism, whereupon movement of said sliding clutch into engagement with said rotary drive means causes the rotor of said blower to be engaged and rotated.

5. The invention, as defined in claim 1, wherein: said basket is provided with a hub surrounding said bearing support and spoiler vanes extending radially outward from said hub, said spoiler vanes having openings extending therethrough; said basket having a bottom portion provided with angularly disposed louvers therein directed at an angle to the bottom plane of said basket to provide a swirling motion of air entering the basket when drying operations are performed and to provide for an upward swirling motion of water and a downward motion of water relative to said basket during an oscillatory action thereof.

6. The invention, as defined in claim 5, wherein: said basket drive mechanism comprises a blower drive means; a blower operable by said drive means concurrently with the utilization of said rotary drive means in connection with said basket; duct means extending from said blower to the bottom of said tub and basket; said basket being foraminous in the bottom portion thereof, whereby air may move upwardly through the bottom of said basket and upwardly through clothing therein tending to float the same during drying operations of the clothes in the basket.

7. The invention, as defined in claim 6, wherein: a heater is disposed at the outlet of said blower for heating said air which is forced through said duct and into the bottom of said basket.

8. The invention, as defined in claim 1, wherein: a generally ring-shaped spray manifold is disposed in said tub near the upper portion thereof having nozzles directed toward said basket; and screen means mounted in connection with said basket to cover the upper portion thereof; said screens movably mounted to permit loading and unloading of said basket and to permit said screens to be placed in substantially horizontal position over clothes in said basket to protect the clothing from abrasion with any portion of said machine above the basket.

9. The invention, as defined in claim 1, wherein: said tub is provided with a base having a sump sealingly connected to the bottom of said tub; said base having an upwardly extending duct portion integral with said sump and disposed laterally relative to said tub; hinge means on said upwardly extending duct portion; a duct portion on said cover housing hingedly connected to said hinge means and extending above said tub; a blower operable by said basket drive mechanism disposed to deliver air into said duct for conveying said air downwardly to the bottom interior of said tub and around said basket therein.

10. The invention, as defined in claim 1, wherein: said machine is provided with an electrical timer; a motor for operating said basket drive mechanism; a heater and blower, together with solenoid valves and a float switch all in circuit with said timer, and disposed above a normal water level in said tub.

11. The invention, as defined in claim 2, wherein: said water pressure actuated means of said power operated means comprises a pressure responsive member; a lever coupled to said pressure responsive member and pivoted relative to said tub and engageable with said shifting rod means; a pair of solenoid valves disposed in series; a water supply communicating with said solenoid valve; a water outlet means in said tub adapted to deliver water to clothing therein; a restricted orifice between said solenoid valves; a control pressure conduit communicating with said pressure responsive member of said power operated means and located on the inlet side of said restricted orifice so that when water is admitted to the interior of said tub, that said shifting rod means may be actuated; and a drain valve coupled to said pressure responsive member and adapted to close when water is being admitted to said tub through said water supply outlet means therein and held in said closed position until such time as one of said solenoid valves shall close the other of said solenoid valves.

12. The invention, as defined in claim 3, wherein: cam action of said axially engageable and releaseable clutch means is adapted automatically to release axially when an overload in connection with said basket occurs.

13. In a clothes washing and drying machine, the combination of: a tub having a bottom and an open top; a cover housing hinged thereto and covering said top of said tub; said tub having a generally central upstanding hollow cylindrical bearing support secured to said bottom thereof; a foraminous basket having a central hub portion rotatably mounted in surrounding relation to and on said bearing support; a first axially engageable and releasable clutch means carried by said hub portion of said basket and disposed at a normally upper end of said hub portion; a motorized basket drive mechanism disposed in said cover housing and having a second axially engageable and releasable clutch means engageable with said first axially releasable clutch means when said cover housing is in closed covering position relative to said open top of said tub; a blower mounted in said cover housing and disposed to be driven by said basket drive mechanism; duct means for conducting air from said blower to a lower portion of said tub and into a lower portion of said foraminous basket; said drive mechanism having a hollow operating shaft generally axially aligned with the rotary axis of said basket hub; a sliding clutch slidably mounted on said hollow operating shaft and coupled thereto to prevent relative rotation of said sliding clutch and said hollow operating shaft; blower drive engaging and disengaging means operable by said sliding clutch; said sliding clutch having first and second clutch ends; said drive mechanism having an oscillating drive member and a rotary drive member mounted concentrically about said hollow operating shaft and spaced apart; said oscillating drive member having oscillating clutch means cooperable with said sliding clutch; said rotary drive member having rotary clutch means cooperable with said sliding clutch; said oscillating clutch means and said rotary clutch means being spaced apart, a distance, whereby either said oscillating clutch means or said rotary clutch means, but only one of them may be engaged by said sliding clutch at any one time; said second axially engageable and releasable clutch means coupled to said hollow operating shaft; said blower drive engaging and disengaging means disposed to engage and drive said blower when operated by said sliding clutch to a position in which said sliding clutch engages said rotary clutch means of said rotary drive member; a sliding clutch actuating rod reciprocally mounted in said hollow operating shaft and disposed to actuate said sliding clutch, said actuating rod having a normally lower end disposed in the proximity of said first and second axially engageable and releasable clutch means; a shifting rod reciprocally mounted in said hollow upstanding bearing support of said tub; said shifting rod having a normally upper end engageable with said lower end of said sliding clutch actunating rod; and power operated means responsive to water pressure for actuating said shifting rod; a drain valve for said tub operable by said power operated means; water supply means having an outlet conduit communicating with the interior of said tub for supplying water thereinto; a pair of solenoid valves disposed in series with each other and with said water supply outlet conduit; a restricted orifice disposed between said valve; a water pressure supply pipe communicating directly with a first one of said valves; and a control pressure conduit communicating between an outlet of said first one of said valves and said restricted orifice; said control pressure conduit communicating with said pressure operated means; an electrical timer coupled to said motorized

basket drive mechanism and said solenoid valves; an electric heater coupled to said timer and disposed at the outlet of said blower to heat air being delivered to said tub and through said basket; a float communicating with the water level in said tub; a switch operable by said float; said switch disposed in circuit with said timer and said solenoid valves and operable to cause operation of one of said valves when said water reaches a predetermined level in said tub; an air outlet in said cover housing; said air outlet communicating through said cover housing from the interior of said tub to atmosphere externally of said cover housing.

14. The invention, as defined in claim **13**, wherein: said blower and drive for said blower is operated by said sliding clutch when moved into engagement with said rotary clutch means.

15. The invention, as defined in claim **14**, wherein: a plate is disposed in said cover housing below said basket drive mechanism, said blower and heater to thereby provide a closure for said housing above said tub and to provide a separate compartment for said drive mechanism, said blower and said heater.

16. The invention, as defined in claim **15**, wherein: said tub is provided with a base having a sump portion sealingly connected with the bottom of said tub; said base provided with an upstanding duct disposed outwardly beyond said tub; said cover housing being pivoted to said upstanding duct; said cover housing having a complemental duct portion aligned with said upstanding duct of said base at which said cover housing is pivoted to said upstanding duct portion; said duct portion of said cover housing and duct portion of said base providing a continuous duct extending to the bottom of said sump and communicating with the bottom of said tub and said basket therein.

17. The invention, as defined in claim **13**, wherein: said water outlet conduit of said water supply is generally ring-shaped and concentrically disposed in said tub near an upper portion thereof and provided with spray nozzle means adapted to spray water uniformly over the interior of said tub and in said basket for wetting clothes therein and for filling said tub to a predetermined level.

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