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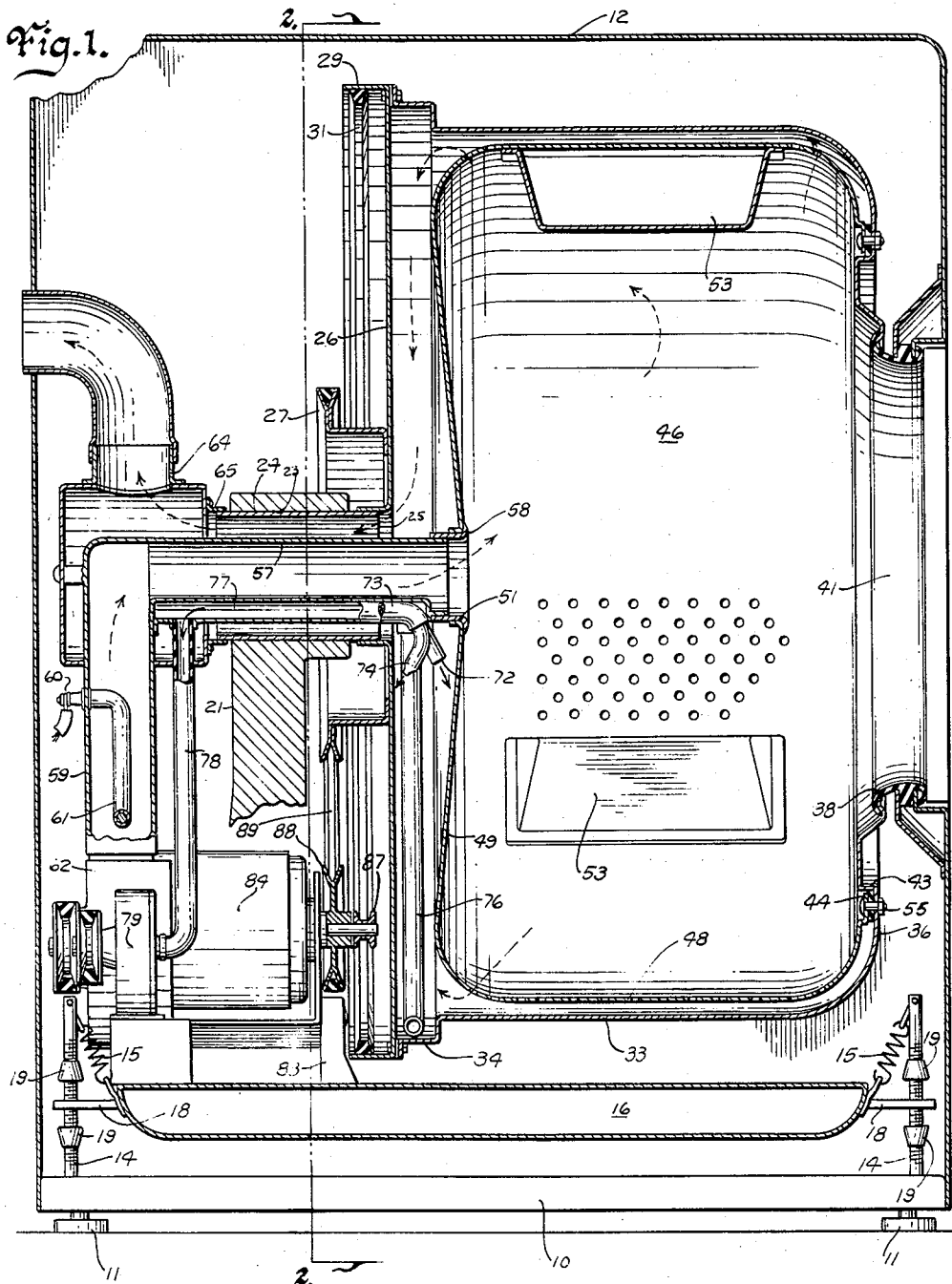
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2,925,663

COMBINATION WASHER-DRIER WITH UNITARY TUB ASSEMBLY

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3 Sheets-Sheet 1



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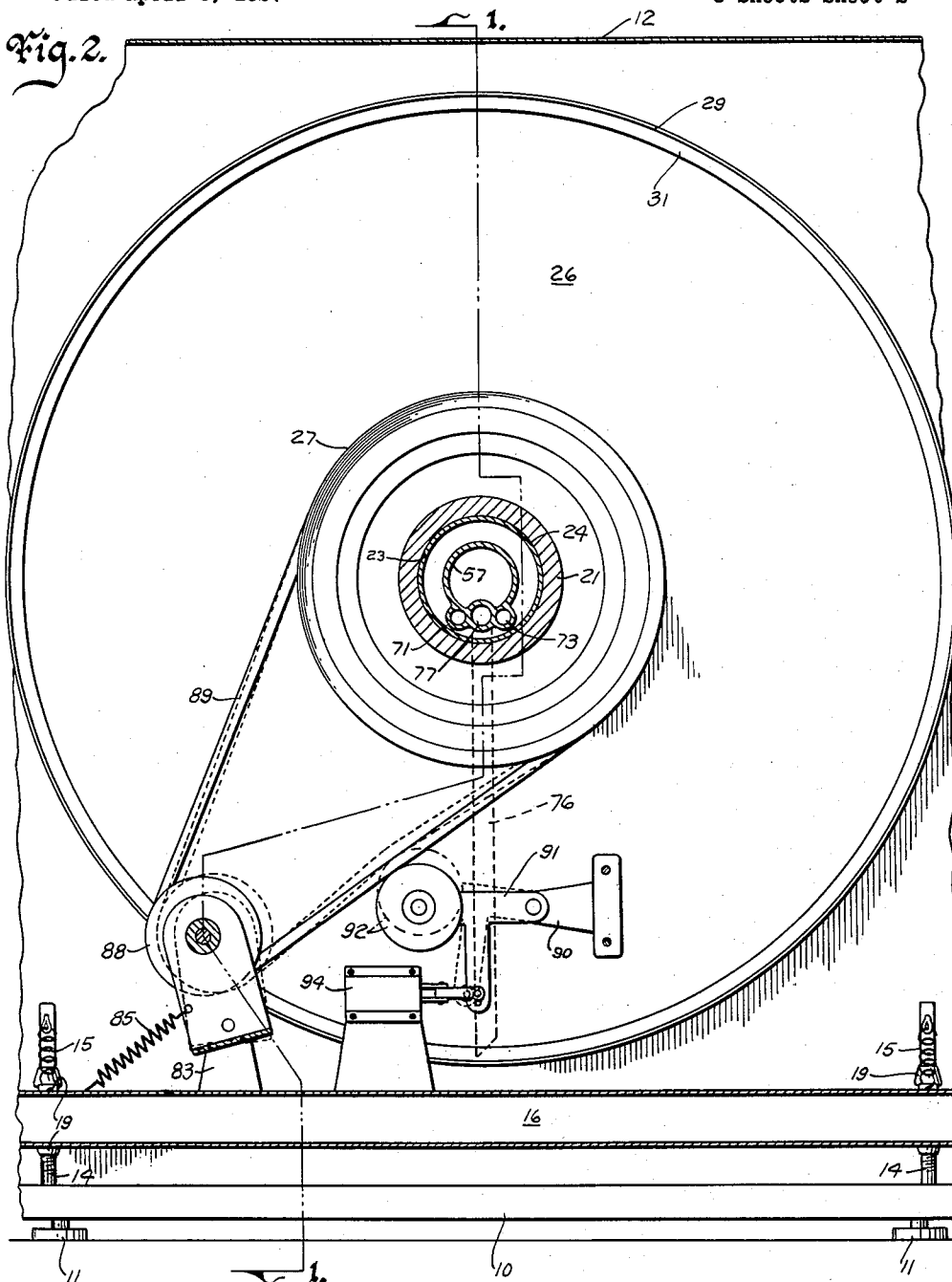
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COMBINATION WASHER-DRIER WITH UNITARY TUB ASSEMBLY

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Fig. 2.



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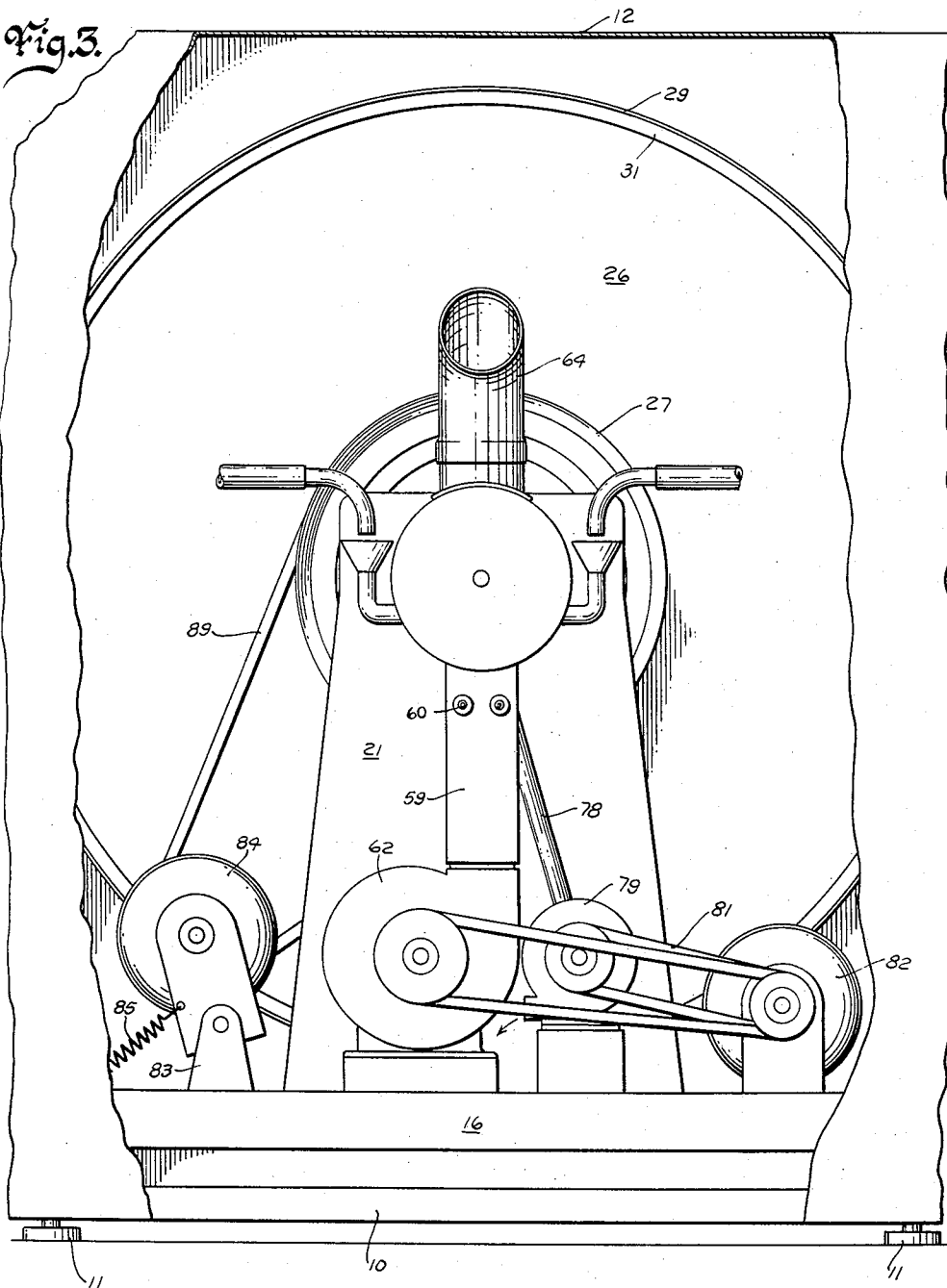
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COMBINATION WASHER-DRIER WITH UNITARY TUB ASSEMBLY

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3 Sheets-Sheet 3

Fig. 3.



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COMBINATION WASHER-DRIER WITH UNITARY TUB ASSEMBLY

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11 Claims. (Cl. 34—75)

This invention relates to a combination washer-drier capable of washing and completely drying fabrics without requiring the usage of a stationary imperforate casing often utilized in combination units incorporating a horizontally mounted clothes tumbler.

My invention also includes a unique two-speed tumbler drive system for rotating this novel unitary tub assembly. In addition, it also incorporates a water condenser unit capable of reducing the quantity of moisture, lint and heat discharged from an effluent duct communicating with the interior of the unitary tube assembly.

My invention further includes a stationary pickup tube which cooperates with a self-priming pump to empty the revoluble tub assembly of washing and rinsing fluids, lint, condensing fluids and condensate during the operation of the combination washer-drier.

Briefly, this combination washer-drier unit is formed by mounting an upstanding pedestal member on a resiliently suspended base support and journalling a hollow drum drive and support shaft within a bearing carried in the upper end of that pedestal. An imperforate shell or casing is rigidly connected to that hollow drum drive shaft and is spaced at its rear and side walls from a clothes tumbler rigidly connected to and carried within that encompassing shell.

Rotary motion is imparted to the tub assembly thus formed by a combination belt and drum drive while the washing and condensing fluids are removed from this tub assembly by means of a stationary pickup tube extending into a lower sump formed between the rear walls of the clothes tumbler and the imperforate outer shell and communicating with a self-priming pump.

Air flow drying is produced in this combination unit by forcing heated air through an air intake conduit which extends through the hollow drive shaft in spaced coaxial relationship to the cylindrical wall of that hollow shaft and which communicates with the interior of the clothes tumbler through a centrally located opening in the rear wall of that clothes receptacle. The hot moist air expelled from the perforate periphery of the clothes receptacle as a result of this forced air flow passes between the imperforate rear walls of the clothes tumbler and its surrounding shell in a generally radial convergent pattern and is exhausted through an external duct after passing through the space formed between the walls of the air intake conduit and the hollow drive shaft.

Additional constructional features and objects of this invention will be more apparent after reference is made to the accompanying specifications and drawings in which:

Figure 1 is a sectional view in elevation showing a combination washer-drier embodying my invention;

Figure 2 is a sectional view taken on line 2—2 of Figure 1; and

Figure 3 is a fragmentary rear elevation of the combination washer-drier shown in Figure 1.

Referring now to the accompanying drawings, Figure

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1 shows a stationary base frame member 10 mounted on legs 11 and supporting the enclosing cabinet structure 12.

Mounted on the corners of base frame 10 are upright rod members 14 which serve as the anchoring means for the four suspension springs 15 connected to the suspended and weighted base member 16. The suspended base member 16 is free to move in a vertical direction by means of the suspended system but is restricted from any lateral or torsional movement by means of the guide holes (not shown) in the guide members 18 attached to base 16 to receive the rod members 14. Vertical movement of guide members 18 on rod members 14 is limited by adjustable stop members 19 carried on each of the rod members 14.

The suspended base member 16 serves as the mounting for the upstanding pedestal member 21 which is provided at its upper end with a large bearing 23 for receiving the revoluble hollow drive and support shaft 24 which projects from the front and rear surfaces of pedestal 21. While not shown in detail, it will be appreciated that various types of bearings may be used between shaft 24 and pedestal 21 to accommodate rotary movement of that shaft.

A circular member 26, provided with a centrally located flange forming an opening 25 therein, is rigidly connected to that part of shaft 24 extending from the front face of pedestal 21. Base member 16 and pedestal 21 in effect form a supporting framework for revolubly mounting member 26 and the remaining clothes container structure supported thereby. The cylindrical and otherwise imperforate wall 26 is also rigidly connected to a drive pulley 27 which is capable of rotating member 26 during the centrifugal extraction operations. Rear wall 26 is also provided with a peripheral flange 29 which projects rearwardly from wall 26 to provide an anchoring surface for the V-belt 31 permanently cemented or fastened in some suitable fashion to flange 29 to form a part of the rim drive used to rotate wall 26 during the low speed tumbling operations.

Affixed to rear wall 26 in a watertight relationship is the generally cylindrical side wall 33 of an encompassing imperforate shell which is formed with a shouldered portion 34 which cooperates with wall 26 to provide an annular sump area for use within the lowest extremities of walls 26 and 33.

The front wall 36, which is a continuation of wall 33, is provided with a centrally located access opening 38 which is aligned with the access openings formed in cabinet 12. These latter openings receive the door gasket 41 which projects through opening 38 to form a watertight seal between cabinet 12 and wall 36. Other types of door boots or gaskets may also be used to accommodate both the rotary and vertical movements of the tub assembly relative to cabinet 21.

Front wall 36 is provided with a shouldered portion 43 which receives the front flange 44 of the clothes basket liner or tumbler 46 which is provided with a perforate cylindrical side wall 48 and a rear wall 49 which is imperforate except for a centrally located opening 51 which provides the air access opening into the drum or basket liner 46.

The clothes tumbler 46 is equipped with a plurality of clothes lifting vanes 53 which are attached to its side wall 48. Basket liner 46 is rigidly attached to and supported by the front wall 36 on flange 44 by means of the circular row of bolts 55 and spacers interconnecting those members. Basket liner 46 is also spaced from the walls of the outershell formed by walls 26, 33 and 36 to provide an air passageway between the side and rear walls of this encompassing shell and the clothes tumbler 46 which ele-

ments together form a unitary tub assembly for receiving fabrics to be washed and dried.

The centrally located air intake opening 51 is aligned with the tubular member 57 to define an air intake passageway into tumbler 46. A seal or gland 58 fastened around the front end of conduit 57 and projecting into tumbler 46 through opening 51 accommodates the rotary movement of clothes receptacle 46 relative to member 57 while providing an air seal between these parts. The tubular air intake member 57 is connected in turn to the vertical duct 59 which houses a heating element 61 having terminals 60. Vertical duct 59 joins the outlet of the blower fan generally indicated by the numeral 62. Air passing into blower fan 62 is taken from the ambient atmosphere in which the combination unit is located.

Air pumped into the unitary tub assembly through duct 59, intake conduit 57 and opening 51 by blower fan 62 is discharged through the perforate cylindrical side wall 48 and forced between the walls 26 and 49. The air is then discharged through the centrally located opening 25 which communicates with the space bounded by the hollow drum support shaft 24 and the tubular air intake member 57. Air exhausted from the interior of hollow drive shaft 24 is then expelled into the stationary exhaust ductwork 64 which carries the gland 65 contacting the revoluble shaft 24 to accommodate relative motion between shaft 24 and ductwork 64.

Wash water is supplied to the interior of the unitary tub assembly by means of a conduit 71 which is formed integrally with the stationary tubular air intake member 57 and which discharges into the unitary tub assembly against wall 49 through nozzle 72 located between the walls 26 and 49.

Water for condensing the moisture vapors produced during the drying operation is injected into the unitary tub assembly through the conduit 73 which is formed in member 57 similarly to conduit 71 and which is provided with a discharge nozzle 74 which discharges condensing fluid against the interior surface of the imperforate wall 26.

Water is removed from this unitary tub assembly during both the washing and drying operations by means of the stationary drain or pickup tube 76 which depends from its communicating drain conduit 77 into the annular sump formed by the shouldered portion 34 of the side wall 33 in cooperation with wall 26. Conduit 77 in turn communicates with the hose 78 connected to the intake of the self-priming water pump 79 having its discharge conduit leading to an external drain. Driving power for water pump 79 is, in this illustrative embodiment, supplied through the belt member 81 interconnecting the pulley of water pump 79 with that of the pump and blower drive motor 82.

The driving power for the unitary tub assembly described is supplied by means of the main drive motor 84 which is pivoted on the mounting bracket 83 carried by base member 16 toward which motor 84 is urged by the spring 85 connected between motor 84 and base member 16.

Motor 84 is shown in Figure 1 as being provided with a small driving pulley 87 and with a larger driving pulley 88 both of which are rigidly connected to the motor drive shaft. The small motor pulley 87 normally engages the V-belt member 31 on the unitary tub assembly by reason of the bias of spring 85 whereas the larger motor pulley 88 may be connected to the unitary tub assembly drive pulley 27 carried on the back wall 26 of that assembly. This latter connection is made possible by means of belt 89 which may interconnect pulleys 88 and 27 but which normally only loosely interconnects those latter pulleys.

When pulley 87 engages the V-belt 31 carried by flange 29, motor 84 turns the unitary tub assembly at a tumbling speed of approximately 50 r.p.m. but when pulley 87 is moved away from the V-belt 31 and pulley 88 permitted to rotate pulley 27 through the tightened belt 89, the

unitary tub assembly will be rotated at a spin speed exceeding 200 r.p.m. in the same direction. The controls for this speed changing mechanism include a bell crank lever member 91 pivoted on bracket 90 fixed to pedestal 21 and carrying an idler roller 92 adapted to engage the outer surface of belt 89. The movement of the belt tightener formed by members 91 and 92 is achieved by the energization of the shifter solenoid 94 supported by the base member 16.

When solenoid 94 is deenergized, member 91 and its idler roller 92 tend to swing away from belt 89 which assumes a slackened position even through spring 85 pivots motor 84 outwardly and moves motor pulley 87 against the V-belt 31 carried by flange 29. When solenoid 94 is energized, the idler roller 92 is forced against the outside surface of the belt 89 tightening the latter belt into grooves of pulleys 27 and 88 with the result that motor 84 is pivoted away from the V-belt 31 thereby separating the latter member from the small motor pulley 87 while simultaneously creating a belt drive from the larger motor pulley 88 to the tub assembly drive pulley 27.

In operation, the combination washer-drier illustrated in the accompanying drawings functions in the following manner. Clothes placed within the unitary tub assembly are received through the access openings formed in the cabinet 12 and the front wall 36 of tumbler 46. Water is supplied into the unitary tub assembly through the wash water conduit 71 which discharges its stream of water through the nozzle 72 against rear wall 49 to fill the unitary tub assembly to a predetermined desired level as controlled by external controls forming no part of this invention. The fabrics contained within the unitary tub assembly are tumbled during the agitation portion of the washing cycle at approximately 50 r.p.m. by the clothes lifting vanes 53 as motor 84 rotates the entire assembly through the small pulley 87 and the V-belt 31 fastened to flange 29.

The washing fluids are discharged from the unitary tub assembly following the agitation operation by means of the stationary drain tube 76 which extends into the sump area formed by the lower part of the shouldered portion 34 and empties that sump area of retained fluids, lint, etc. whenever the water pump 79 is rotated by the pump drive motor 82. The major portion of the washing fluid retained within the fabrics and not readily drained into this sump within the unitary tub assembly is centrifugally separated from these fabrics upon the energization of the shifted solenoid 94 which tightens belt 89 and connects pulley 27 with pulley 88 while simultaneously disconnecting the low speed drive connection between pulley 87 and belt 31. This produces a high speed centrifugal operation which centrifugally extracts most of the remaining wash water from the clothes. This remaining wash water is automatically removed through pickup tube 76 as fluids are extracted from the clothing within tumbler 46.

Following these first agitation and centrifuging operations, rinse water is supplied to the unitary tub assembly through conduit 71 in a manner similar to that utilized for filling the tub assembly with washing fluid. During this rinsing operation solenoid 94 is deenergized to allow the unitary tub assembly to be rotated at its slower speed to tumble these fabrics within the rinsing fluid contained within the unitary tub assembly. Following this rinsing operation, solenoid 94 is again energized together with water pump motor 82 to effect a removal of these rinsing fluids from the tub assembly.

At the end of the final rinse period solenoid 94 is again energized allowing the tub assembly to be rotated at its tumbling speed for tumbling the clothes during the drying operation. The blower fan 62, which in this embodiment, is powered by the water pump drive motor 82, operates throughout the drying cycle during which time the heating element 61 is energized through an external circuit (not shown). This causes hot air to flow upwardly

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through duct 59 and into the tubular air intake duct 57 which discharges into the center of the clothes basket liner 46 through the centrally located opening 51.

The passage of this warm air into the unitary tub assembly causes an evaporation of the entrained moisture within the tumbling fabrics to take place. The resulting hot moisture vapors created by this evaporation are moved by this forced air flow through the perforate cylindrical basket side wall 48 toward the space between the rear walls 26 and 49. This space communicates with the passageway formed by the cooperation of the tubular air intake conduit 57 and the hollow drum support shaft 24. Air entering this latter passageway is vented to the stationary exhaust duct work 64 for discharge to a remote atmosphere.

If it should be desired to reduce the amount of heat discharged through the stationary exhaust ductwork 64 as well as reducing the amount of lint discharged there-through, water pressure may be supplied to the condenser water conduit 73 during the drying operation allowing cooling fluid to be discharged through nozzle 74 in a spray against the interior of the rear wall 26 to form a water film on that latter wall member. This will cause the hot moisture vapors discharged from the perforate periphery of the clothes basket 46 to condense out the entrained moisture as well as serving as a means for removing lint from the air passing over that water film. The condensing fluid, condensate and lint scrubbed from the air passing through the space between the rear walls of basket liner 46 and the outer tub casing and accumulating in the sump formed by the cooperation between wall 26 and the shoulder 34 are removed through the pickup tube 76 by water pump 79 in a manner similar to that utilized for moving the washing fluids from the unitary tub assembly.

While the preferred embodiment of the combination unit described and illustrated herein shows an air flow drier capable of discharging air from the interior of the tub assembly to some remote atmosphere, this invention also includes the provision of a closed circuit drier which can be functionally produced by interconnecting the air exhaust ductwork 64 with the intake of blower fan 62.

I claim:

1. An appliance comprising, a clothes receiving receptacle having a back wall provided with an opening for passage of air therethrough, said receptacle being further provided with a perforate side wall for movement of air therethrough and with a front wall defining an access opening, a casing encompassing and unitarily fastened to said receptacle in spaced relationship to said back wall and said perforate side wall, support means including a bearing, a hollow shaft fastened to said casing and journaled in said bearing for revolubly mounting said receptacle and said casing, a conduit positioned within said hollow shaft adjacent said opening to define a first air passageway communicating with said receptacle through said opening, said conduit having at least some portions of its periphery spaced from said hollow shaft to define therewith a second air passageway communicating with said perforate side wall through the space between the walls of said receptacle and said casing, means for moving air through said receptacle through said passageways, and drive means for rotating said receptacle and said casing in unison.

2. An appliance comprising, a clothes receiving receptacle having a back wall provided with a centrally located opening therein for admittance of air into said receptacle, said receptacle being further provided with a perforate side wall for exhausting air from said receptacle and a front wall defining an access opening, a casing encompassing and unitarily fastened to said receptacle in spaced relationship to said back wall and said perforate side wall, support means including a bearing, a hollow shaft fastened to said casing and journaled in said bearing for revolubly mounting said receptacle and

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said casing, a conduit positioned within said hollow shaft and communicating with said centrally located opening to define an air intake passageway into the interior of said receptacle, said conduit having at least some portions of its periphery spaced from said hollow shaft to define therewith an air exhaust passageway communicating with said perforate side wall through the space between said walls of said receptacle and said casing, means for moving air into said air intake passageway and out of said receptacle through said air exhaust passageway, and drive means for rotating said receptacle and said casing in unison.

3. An appliance comprising, a clothes receiving receptacle having a back wall provided with a centrally located opening therein for admittance of air into said receptacle and a front wall defining an access opening, said receptacle being further provided with a perforate side wall for exhausting air from said receptacle, an imperforate casing encompassing and unitarily fastened to said receptacle in spaced relationship to said back wall and said perforate side wall, support means including a bearing, a hollow shaft fastened to said casing and journaled in said bearing for revolubly mounting said receptacle and said casing, a conduit positioned within said hollow shaft and communicating with said centrally located opening to define an air intake passageway into said receptacle through said opening, said conduit having at least some portions of its periphery spaced from said hollow shaft to define therewith an air exhaust passageway communicating with said perforate side wall through the space between said walls of said receptacle and said casing, means for heating said air prior to its passage through said central opening, means for moving air into said air intake passageway and out of said receptacle through said air exhaust passageway, and drive means for rotating said receptacle and said casing in unison.

4. An appliance comprising, a clothes receiving receptacle having a back wall provided with a centrally located opening therein for admittance of air into said receptacle and a front wall provided with an access opening, said receptacle being further provided with a perforate cylindrical side wall for exhausting air from said receptacle, an imperforate casing encompassing and unitarily fastened to said receptacle in spaced relationship to said back wall and to said perforate side wall, said casing cooperating with said receptacle to form a unitary tub assembly for retaining fluid therein, support means including a bearing, a hollow shaft fastened to said casing and journaled in said bearing for revolubly mounting said unitary tub assembly, a conduit positioned within said hollow shaft and communicating with said centrally located opening to define an air intake passageway into said receptacle, said conduit means having at least some portions of its periphery spaced from said hollow shaft to define therewith an air exhaust passageway communicating with said perforate side wall through the space between said walls of said receptacle and said casing, means for injecting fluid into said casing, a drain tube positioned within said hollow shaft and extending downwardly therefrom between said receptacle and said casing, means for supplying a suction to said drain tube to remove fluid from said tub assembly through said drain tube, means for moving air into said air intake passageway and out of said receptacle through said air exhaust passageway, and drive means for rotating said tub assembly.

5. An appliance comprising, a clothes receiving receptacle having a back wall provided with a centrally located opening therein for admittance of air into said receptacle and a front wall provided with an access opening, said receptacle being further provided with a perforate cylindrical side wall for exhausting air from said receptacle, an imperforate casing encompassing and unitarily fastened to said receptacle in spaced relationship to said back wall and to said perforate cylindrical side

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wall, said casing cooperating with said receptacle to form a unitary tub assembly for retaining fluid therein, support means including a bearing, a hollow shaft fastened to said casing and journaled in said bearing for revolubly mounting said tub assembly, a conduit positioned within said hollow shaft and communicating with said centrally located opening to define an air intake passageway into said receptacle, said conduit means being spaced from said hollow shaft to define therewith an air exhaust passageway communicating with said perforate cylindrical side wall through the space between said side walls of said receptacle and said casing, heating means for heating air passing through said air intake passageway to evaporate moisture from fabrics placed within said receptacle, means for moving air into said air intake passageway and out of said receptacle through said air exhaust passageway, means for injecting cooling fluid into said casing to condense therein moisture evaporated from said fabrics retained within said receptacle, means positioned within said hollow shaft and depending downwardly into said receptacle for removing fluids from said tub assembly, and drive means for rotating said tub assembly.

6. An appliance comprising, a supporting frame including an upstanding pedestal, a hollow shaft journaled in said pedestal for rotation on a horizontal axis, a casing connected to said hollow shaft for rotation therewith, said casing including a rear wall provided with a first opening communicating with said hollow shaft, said casing further including a side wall and a front wall defining an access opening therein, a basket liner positioned within said casing and connected to said front wall, an air conduit positioned within and cooperating with said hollow shaft to define an air passageway between said air conduit and said hollow shaft, said basket liner having a perforate side wall and a rear wall provided with a second opening communicating with said air conduit, said side and rear walls of said casing and said basket liner being spaced respectively from each other to provide a means of communication between said perforate side wall and said air passageway, and air translating means for moving air through said basket liner through said air conduit and said air passageway.

7. An appliance comprising, a supporting frame including an upstanding pedestal, a hollow shaft journaled in said pedestal for rotation on a horizontal axis, a casing connected to said hollow shaft for rotation therewith, said casing including a rear wall having a first opening communicating with said hollow shaft, said casing further including a side wall and a front wall defining an access opening, a basket liner positioned within and connected to said casing, an air conduit positioned within and cooperating with said hollow shaft to define an air passageway between said air conduit and said hollow shaft, said basket liner having a perforate side wall and a rear wall provided with a second opening communicating with said air conduit, said side and rear walls of said casing and said basket liner being spaced respectively from each other to provide a means of communication between said perforate side wall and said air passageway, and air translating means for moving air through said basket liner through said air passageway and said air conduit.

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8. An appliance comprising, a revoluble cylindrical casing rotatably mounted on a horizontal axis, said casing including a rear wall provided with an air exhaust conduit and a front wall defining a central access opening therein, a basket liner positioned within and connected to said casing, said basket liner having a perforated side wall and a rear wall spaced from said casing and provided with a central opening therein, an air conduit communicating with said central opening, means for injecting fluid into said casing, drain means including a pump to remove fluid from said casing, means for moving air through said air conduit into said basket liner through said central opening and out of said basket liner through said exhaust conduit in said casing, heat means for heating air entering said basket liner, and drive means for rotating said casing assembly about said horizontal axis.

9. The invention in accordance with claim 8 including means for injecting cooling fluid into said casing outside of said basket liner to condense therein moisture evaporated from fabrics retained within said basket liner.

10. An appliance comprising, a hollow shaft journaled in a supporting member for rotation on a horizontal axis, a casing connected to said hollow shaft for rotation therewith, said casing including a rear wall provided with a first opening communicating with said hollow shaft, said casing further including a side wall and a front wall defining an access opening therein, a basket liner positioned within said casing and connected thereto, an air conduit positioned within and cooperating with said hollow shaft to define an air passageway between said air conduit and said hollow shaft, said basket liner being perforate and having a rear wall provided with a second opening communicating with said air conduit, said side and rear walls of said casing and said basket liner being in spaced relationship to provide a means of communication between said perforate portion of said basket liner and said air passageway, an air translating means for moving air into said basket through said air conduit and said air passageway, and means for heating said air before entry into said basket liner.

11. An appliance in accordance with claim 1 and further including means for injecting cooling fluid into said casing outside of said basket liner to condense therein moisture evaporated from fabrics retained within said basket liner.

References Cited in the file of this patent

UNITED STATES PATENTS

50	2,262,186	Lindberg	Nov. 11, 1941
	2,498,181	Reiter	Feb. 21, 1950
	2,503,329	Geldhof et al.	Apr. 11, 1950
	2,506,516	Moore	May 2, 1950
	2,608,769	O'Neil	Sept. 2, 1952
55	2,645,033	Kling et al.	July 14, 1953
	2,706,346	Smith	Apr. 19, 1955
	2,717,457	Smith	Sept. 13, 1955
	2,722,057	Pugh	Nov. 1, 1955
60	2,792,640	Patterson	May 21, 1957

FOREIGN PATENTS

280,805	Switzerland	May 16, 1952
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