

Jan. 20, 1959

D. M. STRATHEARN ET AL
COMBINATION WASHER AND DRYER

2,869,345

Filed Jan. 18, 1955

6 Sheets-Sheet 1

Fig 1

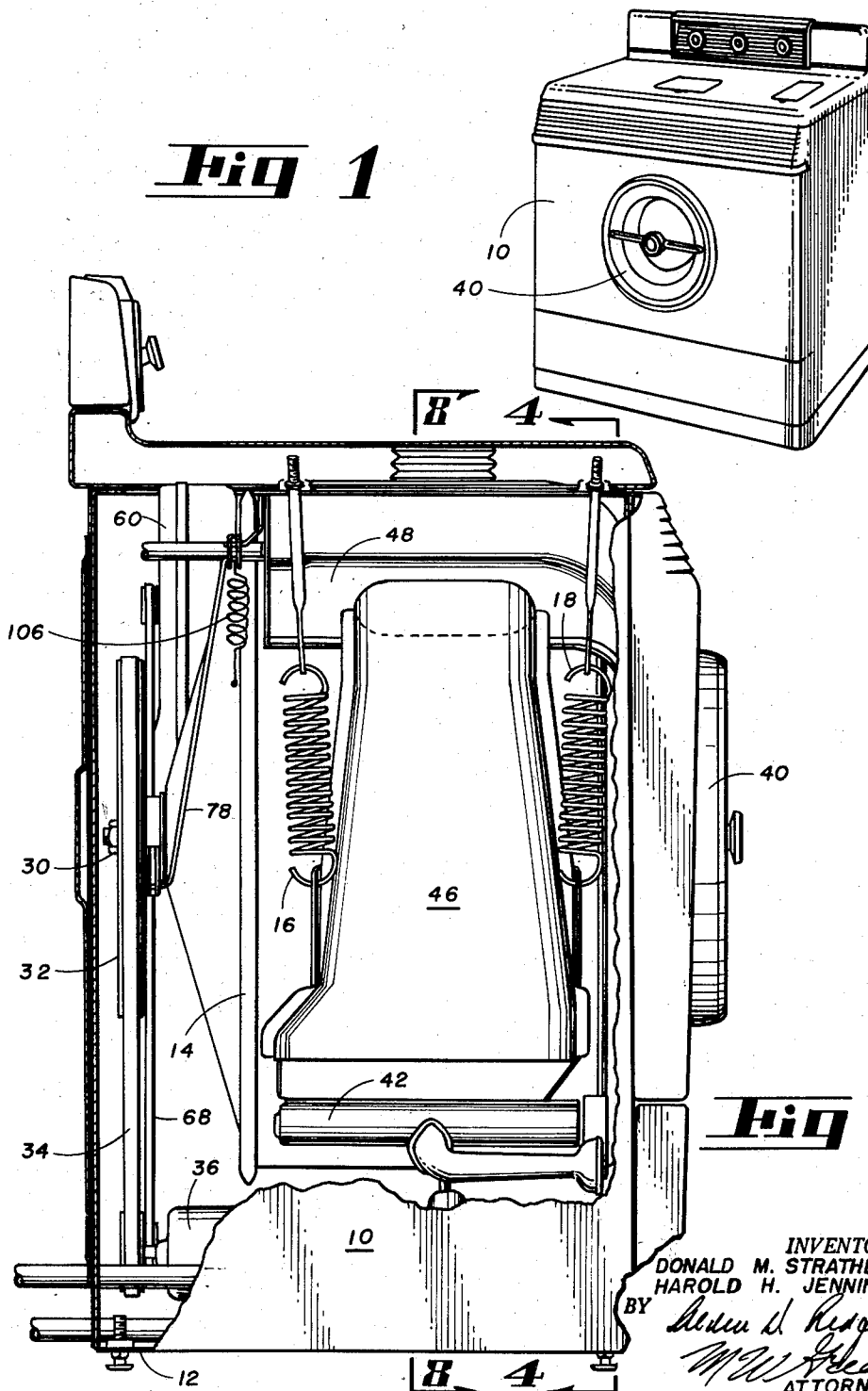


Fig 2

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6 Sheets-Sheet 3

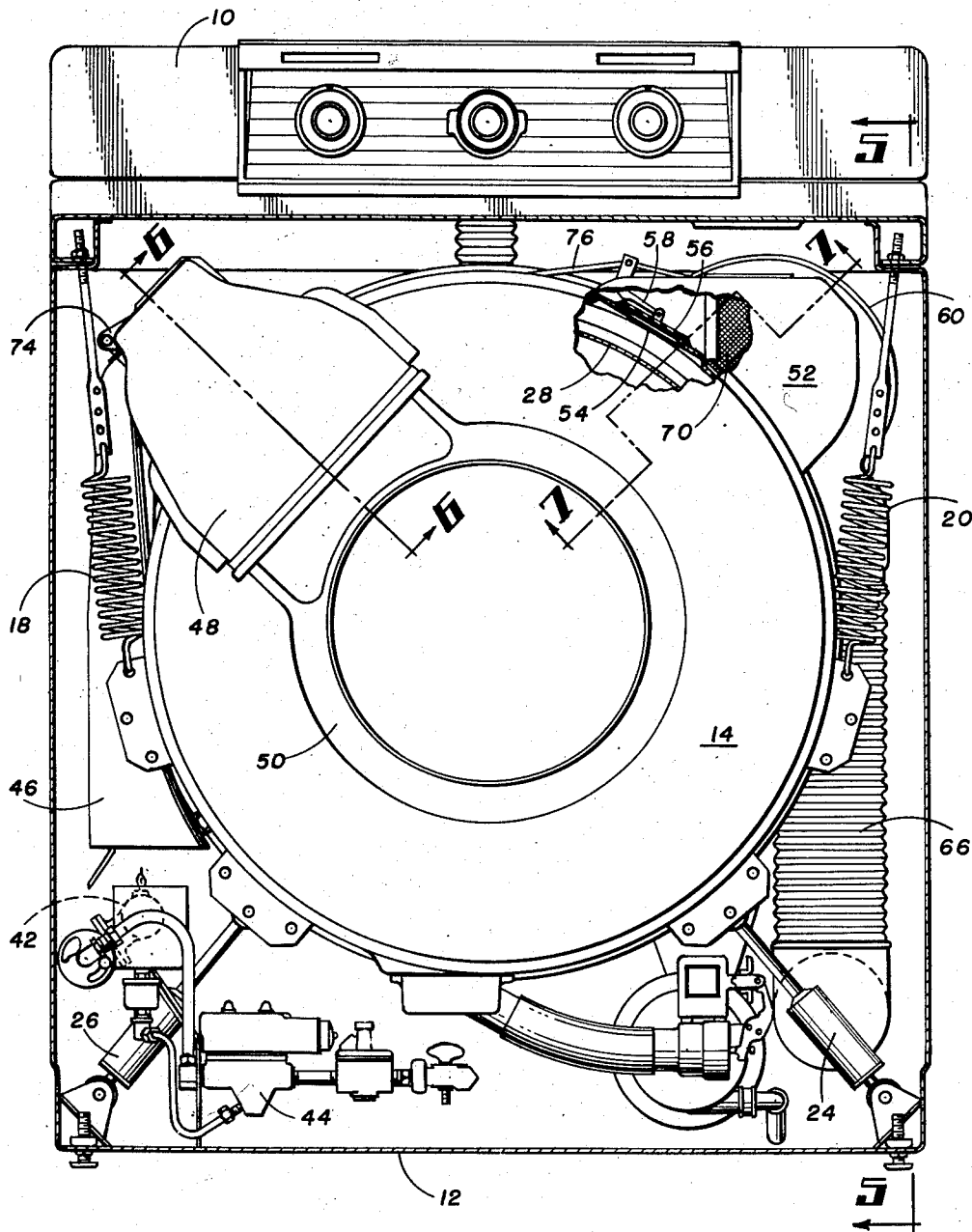


Fig 4

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6 Sheets-Sheet 4

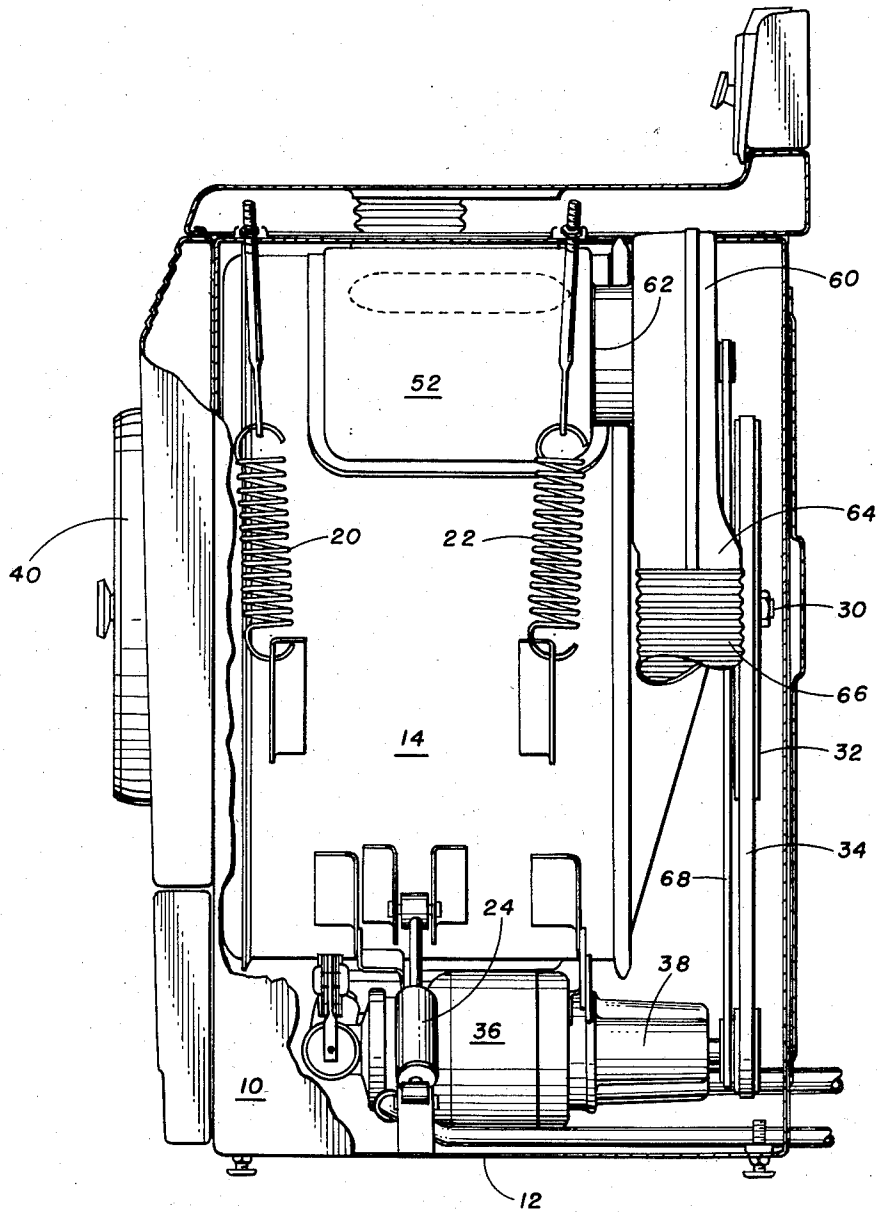


Fig 5

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6 Sheets-Sheet 5

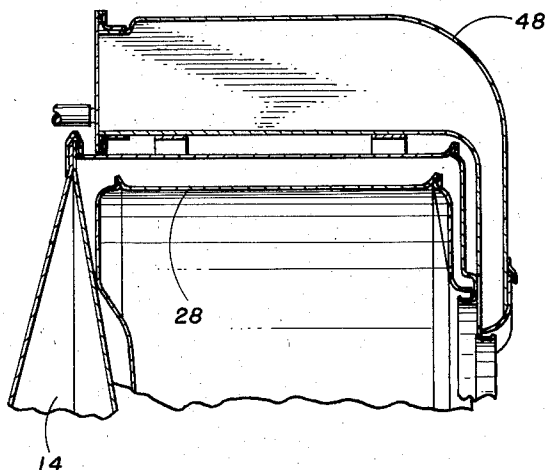


Fig 6

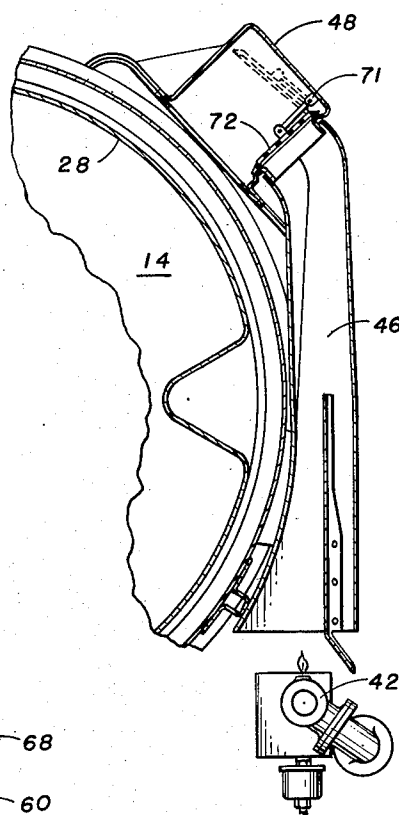


Fig 8

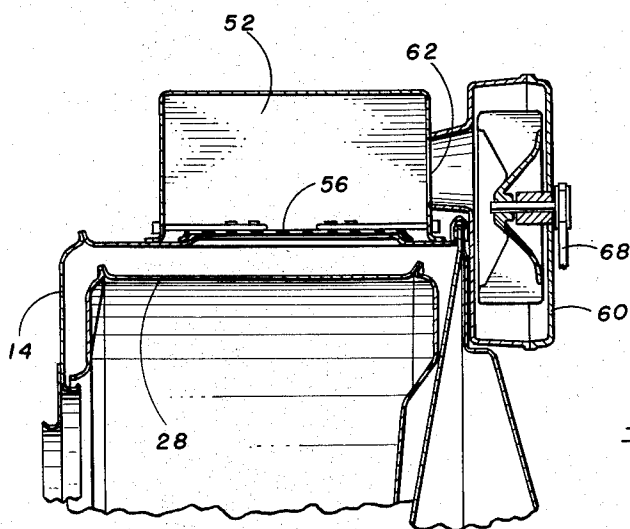


Fig 7

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6 Sheets-Sheet 6

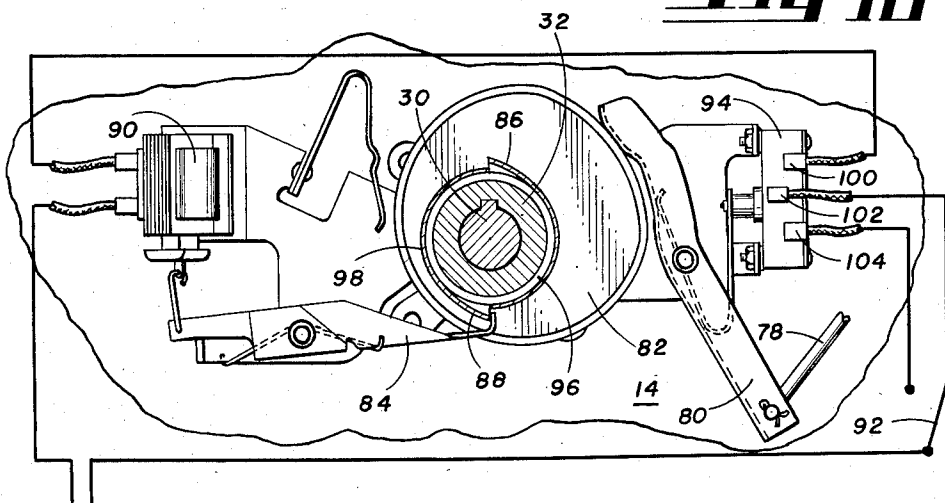
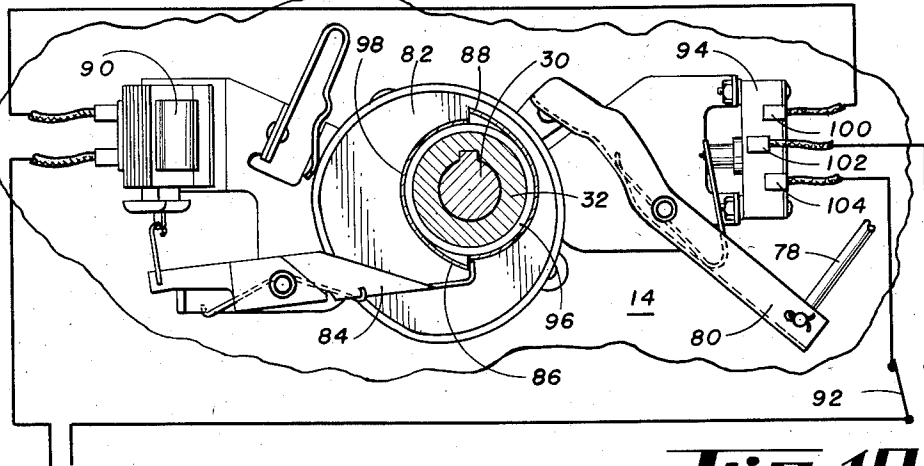
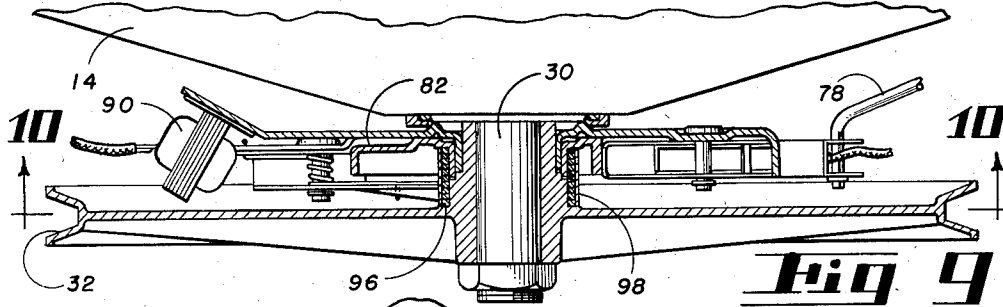


Fig 11

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2,869,345

COMBINATION WASHER AND DRYER

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Application January 18, 1955, Serial No. 482,541

8 Claims. (Cl. 68—19)

This invention relates to a combination washer and dryer for accomplishing the drying of clothes in the same machine in which they are washed.

In machines for washing and drying clothes in which clothes are first washed by so-called tumble action methods of washing and subsequently providing for the removal of the major portion of the water from the clothes by relatively higher speed of rotation of the tumbling drum or basket thereby to remove the surplus water by centrifugal force, there is the problem of suspending the unit to minimize the effect of the vibrations set up by non-uniform distribution of the clothes during the centrifugal drying process. It is necessary to provide means for supplying heat for drying of the clothes and if gas heated unit is contemplated it is not considered advisable to put the gas burner on the portion of the unit which is suspended, but it is more practical and safe to locate the gas burner in a fixed position. It is also important in connection with mechanisms of this type, both gas and electric, that soapsuds and water be excluded from the portion of the unit which would allow such material to leak onto the heating element and it is, therefore, a problem to provide arrangements of conduits and closures which will seal the same during the time the machine is being used as a washer. Aside from the advantages of sealing there is additional advantage in the possibility of continuous operation of the blower which eliminates necessity for a substantial amount of control mechanism.

Therefore, the primary object of the invention is to provide a combination washer and dryer employing centrifugal extraction after washing wherein the rotating mechanism is suspended on resilient means with the opening for the heated air being arranged on the suspended unit above a fixed gas burner with sufficient clearance and sufficient opening to allow for normal movement of the suspended unit relative to the fixed position of the burner to allow for the collection of the major portion of the heat in the air circulating system.

It is another object to provide mechanism actuated from the rotating unit for opening and closing suitable valve mechanism in the air circulating system to allow free circulation of air during the drying portion of cycle, and close the valves during the washing portion of cycle.

The above and other objects of the invention will appear more fully by reference to the accompanying drawings forming a part hereof and wherein:

Fig. 1 is a perspective view of the complete unit housing the combination washer-dryer.

Fig. 2 is a side view of the unit with a portion of the cabinet broken away showing particularly a portion of the suspension mechanism, together with certain features of the belt drive for rotating the tumbler washer.

Fig. 3 is a rear view with back panel of machine removed showing the drive mechanism and general arrangement of suspended tub in relation to the fixed position gas burner, together with other features of the valve control and air circulating mechanism.

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Fig. 4 is a front view showing the general arrangement of the unit from the front, the front of the cabinet having been broken away to show various features of the air circulating system, the gas heating element, the suspension system and the drain from the tub.

Fig. 5 is a side view taken substantially along the line 5—5 of Fig. 4.

Fig. 6 is a section taken substantially along the line 6—6 of Fig. 4 and shows the general arrangement of the air circulating conduit communicating with the front clothes door opening.

Fig. 7 is a section taken substantially along the line 7—7 of Fig. 4 and shows the air circulating conduit and its connection to the fan, together with valve closure therefor.

Fig. 8 is a section taken substantially along the line 8—8 of Fig. 2 and shows the arrangement of the air conduit located above the gas heating element with air inlet adjacent the gas heater.

Fig. 9 is a side view taken along the line 9—9 of Fig. 3 and shows the mechanism for actuating the valves in the air circulating system.

Fig. 10 is another view of the shutter or valve control mechanism shown in Fig. 9, the position of the mechanism shown is that corresponding to the position assumed when the shutters in the air circulating system are closed.

Fig. 11 is a view similar to Fig. 10 but herein the mechanism is shown in a position which is assumed when the shutters aforementioned are "open."

Referring to the drawings, an outer cabinet 10 is so formed as to provide a substantial support frame built integral therewith and providing a bottom base support 12, this outer support member being connected resiliently to support a tub 14 through four spring support units 16, 18, 20, and 22, each connected to an inner corner of outer cabinet 10 and to the outside of tub 14 thereby to resiliently support the tub inside the cabinet for relative movement, the particular arrangement of such suspension together with shock absorbers 24, 26, being of the general type of structure more completely described in U. S. Patent No. 2,642,996 entitled Washing Machine—Centrifugal Extractor Support and Damping Mechanism.

The tub 14 is the outer cylinder tub of a horizontal axis type washing machine of the general arrangement shown in U. S. Patent No. Re. 22,375. The major parts of this so-called tumble action washer unit are the tub 14, an inner rotatable clothes containing cylinder 28 which is supported for rotation at one end of the tub and on shaft 30, the shaft 30 being driven in rotation from the back of the tub through pulley 32, belt 34, motor 36 with suitable transmission 38. The clothes to be washed are put into the front of the tub through a central door 40 substantially symmetrically positioned in front of open end of cylinder 28, washing liquid being made available in the tub 14 as set forth in aforesaid U. S. Patent No. Re. 22,375.

The washing operation generally designated as a tumble action method is well known in the art and is accomplished by rotation of cylinder 28 by the mechanism just described, the transmission being actuated to provide for rotation of cylinder to tumble the clothes therein in the presence of a washing liquid, the speed of rotation being that more fully described in U. S. Patent No. Re. 22,375. In that disclosure there is described a mechanism suitable to centrifugally extract water from the clothes, the resulting centrifugal extraction of liquid from the clothes leaving them in a condition such that the liquid content thereof is somewhat less than 100% of the dry weight of the clothes.

The mechanism disclosed herein provides for drying clothes in the same rotating container in which they are washed, the mechanism and controls being of the general type disclosed in Miller Patent No. 2,656,695. That

patent sets forth certain control mechanisms for providing automatic operation of a tumble type washer together with air circulating mechanism with electric heating devices in combination therewith to circulate heated air through the tumbler drum. The present invention is related, however, to novel features of a unit in which gas heat is used to heat the air in the circulating system for the purpose of drying clothes. The general arrangement of this unit and the construction of the circulating system is as follows:

A gas burner 42 with suitable automatic controls 44 is located and supported on the base 12 with the portion of the burner providing the gas flame being positioned under the open flared end of a flue 46. The lower open end of this flue serves as the air inlet opening for the air circulating system, the gas flame heated air flowing upwardly into an enclosure 48 which is in the form of a box-like member extending along the top side wall of tub 14, the enclosure 48 extending downwardly over the front of the tub to connect with an annular inlet 50 surrounding the door 40. By the aforesaid flue 46 and the enclosure 48 and the inlet 50 there is provided a conduit for heated air from the bottom inlet of flue 46 above the burner to the interior of the tub 14 and cylinder 28.

Also on the outside of the tub but on the opposite side of the cabinet there is provided a second enclosure 52 which covers an opening 54 from the outside of the tub, which opening is provided with a valve or shutter 56 opened and closed by a lever mechanism 58 later to be more fully described. At one end of enclosure 52 there is a blower 60 having its inner inlet 62 secured to the end of enclosure 52 and its outlet 64 connected to a downwardly extending flexible conduit 66. This conduit is secured to suitable outlet from the dryer such as a piping connection to the outside of the building in which the machine is used. The blower is driven by a belt 68 from the motor 36. The rotation of the blower 60 causes air to be drawn from the enclosure 52 and from the interior of the tub and cylinder, which induces circulation through the entire system into the flue 46 and over the gas burner 42 thereby providing a circulation of heated air into the clothes cylinder and outwardly therefrom in a so-called one pass circulation of air through the tumbling drum. The valve 56 is opened or closed to either allow such circulation or to terminate it, depending upon the position of the valve. The enclosure 52 is also provided with a lint screen 70 for the purpose of collecting lint from the circulated air.

In order to assure that there will not be a circulation of suds or water from the enclosure 48 down into the flue 46 and onto the gas burner 42 a valve or shutter 72 is provided at the point where the flue 46 enters the enclosure 48. This valve 72 is provided with a lever actuating mechanism 74 and the two valves or shutters, one 72 in enclosure 48 and the other valve 56 in the enclosure 52, are both connected together by the link 76 and both operated simultaneously by an actuating rod 78. This rod 78 is positioned in either valve "open" or valve "closed" position by a cam operated lever 80, this lever being positioned by a cam 82 positioned in either maximum "up" or maximum "down" position. A latch 84 contacts either a lug 86 or a lug 88 carried in rotation with the cam. The two positions of the mechanism are shown in Fig. 10 and 11, the position in Fig. 10 being the valve "closed" position and the position in Fig. 11 being the valve "open" position.

The change in position of the cam 82 from the position shown in Fig. 10 to the position shown in Fig. 11 is effected by a half revolution clutch mechanism carried on the cylinder shaft 30 which is shown in Figs. 9, 10 and 11 and is located at the rear of the machine between the back of the tub 14 and the drive pulley 32. The clutch itself as shown in Fig. 9 is mounted around the hub of pulley 32 and is in the form of a so-called spring clutch 96 positioned to connect the cam 82 with the hub of the con-

tinuously rotating pulley 32. A shell 98 surrounds the spring clutch 96 and is provided with lugs 86 and 88 positioned 180 degrees apart on the periphery of the shell 98. The spring clutch is so connected with the shell 98 that when the shell is held against rotation by contact of the latch 84 with either of the lugs 86 or 88, the spring clutch 96 is contracted and will not be effective to clutch the cam 82 in rotation with the pulley 32 and will, therefore, leave such cam stationary. However, when the latch 84 is released the spring clutch will be allowed to retract and cause the cam 82 to rotate with the pulley 32. The latch member 84 is spring-urged to contact lugs 86 or 88 and the actuation of solenoid 90 will move the latch 84 out of contact against the actuation of the spring. A two-way switch 94 actuated by the cam lever 80 as shown in Figs. 10 and 11 has three terminals, 100, 102 and 104, and when the lever 80 is in the position as shown in Fig. 10 the internal switch mechanism is such that terminals 104 and 102 are connected together so that as in Fig. 10 when the mechanism is in the "shutter closed" position for the wash cycle the solenoid 90 will not be energized as long as the cam 82 is in the position shown in Fig. 10 and timer switch 92 is in "wash" position. However, if for instance the timer switch shown diagrammatically at 92 in Fig. 10 is moved to the "dry" position, there will be an actuation of the solenoid 90 which will disconnect the latch 84 from the lug 86 and result in the rotation of the cam 82. This rotation will only continue for a half revolution inasmuch as the contact of the cam 82 with the lever 80 will disconnect terminals 102 and 104 and connect terminals 100 and 104 together and cause the solenoid to stop its pull on the end of latch 84 and allow the latch to again drop into position to contact the lug 88 as the cam and lug rotate. The cam will therefore stop its rotation when the latch 84 hooks onto the lug 88 as at such time the spring clutch 96 will not be actuated and the parts will then be in the position shown in Fig. 11 and it will be apparent with such movement above-described the lever 80 in addition to having disconnected the solenoid from actuation will have moved the actuating rod 78 to the "shutter open" position of Fig. 11 and will have opened both shutters 72 and 56. It is apparent that the switch 94 provides a two-contact arrangement which is afforded by the cam lever 80 and with the cam lever 80 in the position shown in Fig. 10 solenoid 90 will be actuated only prior to the connection of latch 84 on the lug 86 while, when the switch 92 is in the "dry" position, solenoid 90 will be actuated to allow half revolution to effect connection of the latch 84 on the lug 88 thereby positioning the cam 82 in the "shutter open" position as shown in Fig. 11 to open the shutter valves 72 and 56. The arrangement thus provides a half revolution movement of cam 82 stopping always at the position selected by the "wash" or "dry" position of switch 92, the "wash" position effecting a closed position of shutters 72 and 56 and the "dry" position effecting an opening of both shutters.

In operation it is understood that the mechanism operates first as a washer and subsequently as a dryer. The controls for causing such change in operation being shown generally in Miller Patent No. 2,656,695. This mechanism, however, is in the present instance connected to suitable controls for the gas burner 42 so that the gas burner is put into operation during the drying cycle.

First considering the operation of the machine during the wash cycle, the shutters are closed during this portion of the cycle so that there is no circulation of air through the flue 46 inasmuch as the shutter 72, as well as the shutter 56 is in the closed position; therefore, there is no hazard to the operation of the gas flame if there be an excessive suds condition in the tub 14 as the opening into the tub 14 in each of the enclosures 48 and 52 is closed during the wash cycle inasmuch as the cam 82

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is in the position shown in Fig. 10 and the springs actuating the shutter mechanism cause the closure of shutters 56 and 72. However, when the timing mechanism causes a change in the switch contacts 92 shown at Fig. 10 from the "wash" to the "dry" position, it is evident that solenoid 90 will immediately be actuated as previously discussed so that the latch 84 will release from the lug 86 and the spring clutch 96 will be thereby actuated to rotate the cam 82 which lifts the lever 80 until switch 94 releases the solenoid 90 and spring rotated latch 84 will thereby catch the lug 88 on 180 degree rotation and cause the cam 82 to assume the position shown in Fig. 11, thereby actuating the rod 78 which causes the two shutters 56 and 72 to be opened against the spring tension of 106, thereby making it possible for the air to circulate through the system for drying. It is noted that the shutters are normally closed by spring tension and are opened by actuation of cam 82 and a pull on rod 78. The path of air enters the flue 46 over the gas flame and is heated thereby and moved upwardly through the flue 46 into the enclosure 48, then into the tub 14 through the annular inlet 50 around the clothes door. The heated air inside the tub 14 is pulled out of the tub into the enclosure 52 by the blower 60 the inlet for which is at 62 and connects with the enclosure 52. The blower pulls air from the interior of the tub 14 and thereby causes the entire circulation above outlined, the air being carried into the tub 14 and outwardly therefrom is finally discharged from the blower outlet 64 and the conduit 66 to suitable piping outside the machine.

The provision of shutters to allow or prevent circulation of air makes it possible to continuously operate the blower 60 whether or not the shutters are open to allow air flow. In this manner controls, special transmission, or separate motor drive which would otherwise be necessary to put the blower in operation at the proper time in the cycle, are eliminated.

It has previously been mentioned that the entire tub assembly 14 is suspended on springs and also is provided with shock absorber units 24 and 26. The suspension, of course, allows movement of tub 14 and flue 46, but the flared flue opening is of sufficient size to allow some movement and still provide inlet of air into the bottom of flue 46 within the range of normal movement of the suspended unit.

The mechanism has been described by reference to specific structure found practical in actual operation. It is evident that certain of the features would be useful in other slightly varied constructions, as for instance the shutter arrangement might be useful in an electrically heated unit and still afford the advantages of a continuously rotating blower without necessity for special mechanism to put the blower in operation at the proper time in the cycle. It is therefore not intended to limit the scope of the invention other than by the scope of the following claims.

We claim:

1. A shutter mechanism and control of the character described comprising linkage mechanism and a shutter device opened and closed by said linkage mechanism, a cam for actuating said linkage mechanism to open and to close said shutter device, means to actuate said cam including a rotating drive member and a spring clutch engageable with said drive member and cam to provide releasable connection therebetween, a shell surrounding said spring clutch adapted to hold said clutch out of engagement on restriction of rotation of said shell, and to actuate said clutch when said shell is allowed to rotate, opposite latch members on said shell operable to hold said shell in fixed position at substantially half revolution intervals, and a solenoid operable to release said shell for half revolution actuation thereof.

2. Mechanism of the character described for actuating shutter means for opening and closing air circulating con-

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duit means, said mechanism comprising a continuously rotating shaft, a spring clutch selectively operable with said continuously rotating shaft, means for transmitting motion from said clutch to said shutter means to open and close said shutter means, a latch mechanism affording half revolution positions of said spring clutch defined by latch connections at substantially half revolution positions of said clutch, a solenoid operable to unlatch said latch connections for half revolution movement of said clutch thereby to cause said clutch to position itself for opening and closing said shutter means.

3. A mechanism for opening and closing one or more shutters in an air-circulating system of a combination washer and dryer, characterized by a cam actuated linkage having one position for shutter opening and a second position for shutter closing, said two positions afforded by a cam mechanism having two positions corresponding to open and closed positions as aforesaid, a spring clutch operable to actuate said cam for half revolution movement and a solenoid to intermittently release said spring clutch for said half revolution movement corresponding to said two-position locations, a switch operable to actuate said solenoid for half revolution movement and connections from said cam to said switch assuring connection of said solenoid for actuation only when said switch is in position calling for movement of said cam.

4. A shutter mechanism and control of the character described having a linkage mechanism operable for shutter actuation in an air circulating system, a cam and a cam follower for effecting movement of said linkage mechanism from shutter opening position to shutter closing position, a rotating drive member, a coiled spring friction clutch normally in engagement with said cam and member and rotatable with the latter to move said cam for activation of said cam follower to displace said linkage mechanism from one to the other of said positions, a latch engageable with an element of said coiled spring friction clutch thereby to hold said clutch out of engagement, and a solenoid to momentarily release said latch thereby to allow rotation of said cam for movement of said cam follower and displacement of said linkage mechanism from either one of said positions.

5. In a combination washer and dryer, having a rotatable clothes containing cylinder mounted for rotation in a tub where a tumble action washing and centrifugal extraction of washing fluid occurs, a resilient support and damping mechanism for said tub and cylinder unit allowing limited movement of said tub and cylinder unit, an air circulating flue on said tub having a flared downwardly directed opening of width comparable to said limited movement, and a heating element fixedly positioned under said flared opening in said air circulating flue whereby a portion of said flared opening is always above said heating element at all positions afforded by said limited movement and air heated by said heating element is carried into said flue for circulation into said tub and cylinder for drying clothes carried therein.

6. In a combination washer and dryer in which washing is effected by tumble action rotation of a clothes containing member followed by an increased speed of rotation for centrifugal extraction to remove a major portion of water from the clothes and having a support member for said rotating member and a resilient suspension for said support member, characterized by an air-circulating conduit carried with and adjacent said support member, and a heating element fixedly positioned below an opening in said conduit, the opening in such conduit being flared to a width comparable to movement allowed by said resilient suspension and positioned in such relation to said heating element that the resilient movement allowed by the resilient suspension of said conduit relative to the heating element does not interfere with the inlet of air into said flared opening of said conduit and over said heating element.

7. In a combination washer and dryer having a cycle

of operation including washing and drying, a tub, a clothes cylinder mounted for rotation in said tub for tumble action washing therein, a spring support for said tub, an air circulating flue on said tub and communicating therewith, and said flue having a flared opening of size comparable to movement allowed by said spring support, a heating element fixedly positioned below said tub under said flared opening in said air circulating flue, a valve in said flue, and mechanism to close said valve during said tumble action washing in said tub and cylinder and to open said valve during a drying portion of said cycle of said combination washer and dryer.

8. A shutter control mechanism for closing an air circulating conduit from contact with washing liquid during the washing portion of the cycle of a combination washer-dryer and for opening said conduit for air circulation during drying portions of said cycle, comprising a shutter, a shaft continuously rotating during the drying and wash-

ing portions of the cycle, rotatable shutter actuating mechanism, a spring clutch positioned to intermittently connect said shaft with said shutter actuating mechanism, means to connect said clutch to rotate said shutter actuating mechanism toward shutter open position, and further means to disconnect said spring clutch when said shutter mechanism is actuated to desired shutter open position.

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