

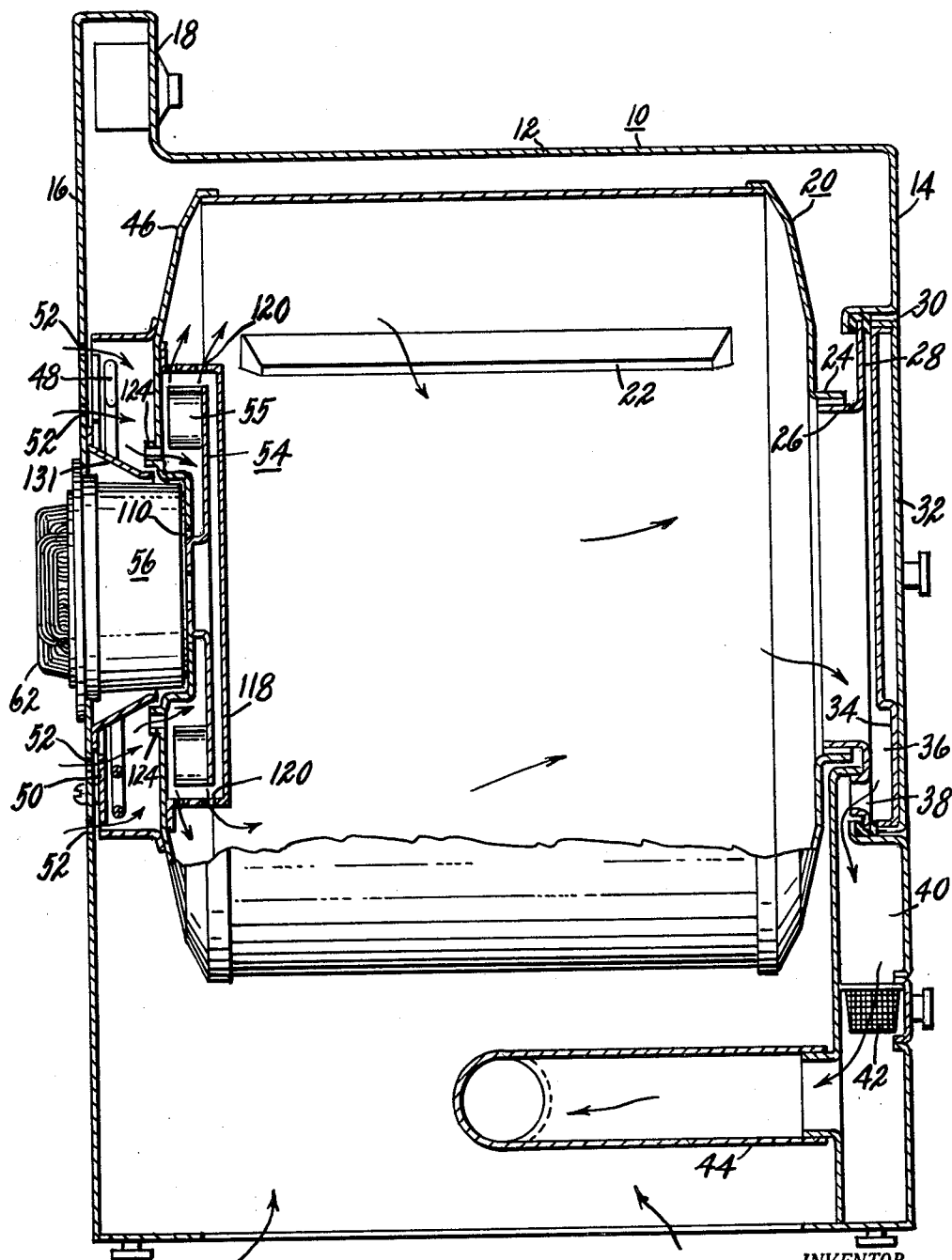
Jan. 26, 1965

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ROTARY CLOTHES DRYER WITH DIRECT DRIVE
MOTOR AND SPEED REDUCER ASSEMBLY

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3 Sheets-Sheet 1



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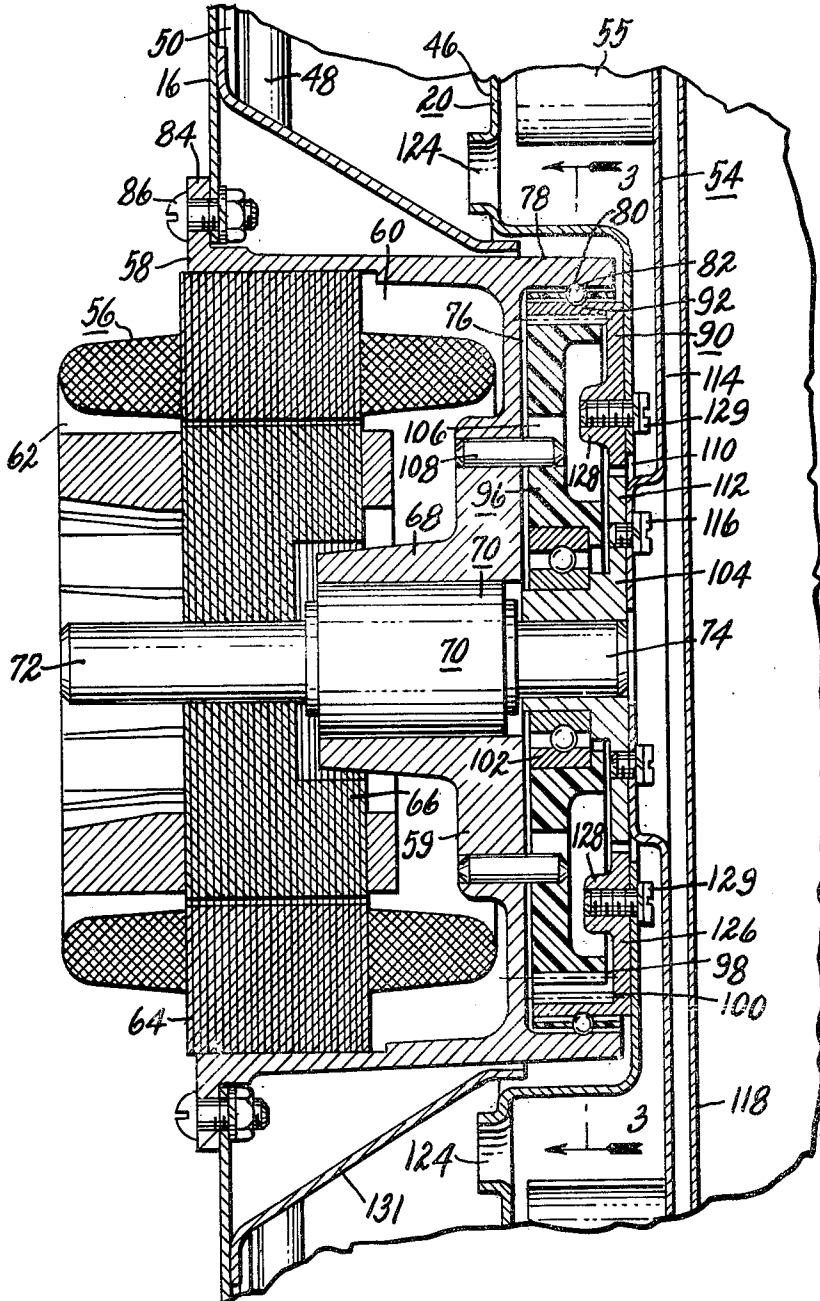


Fig. 2

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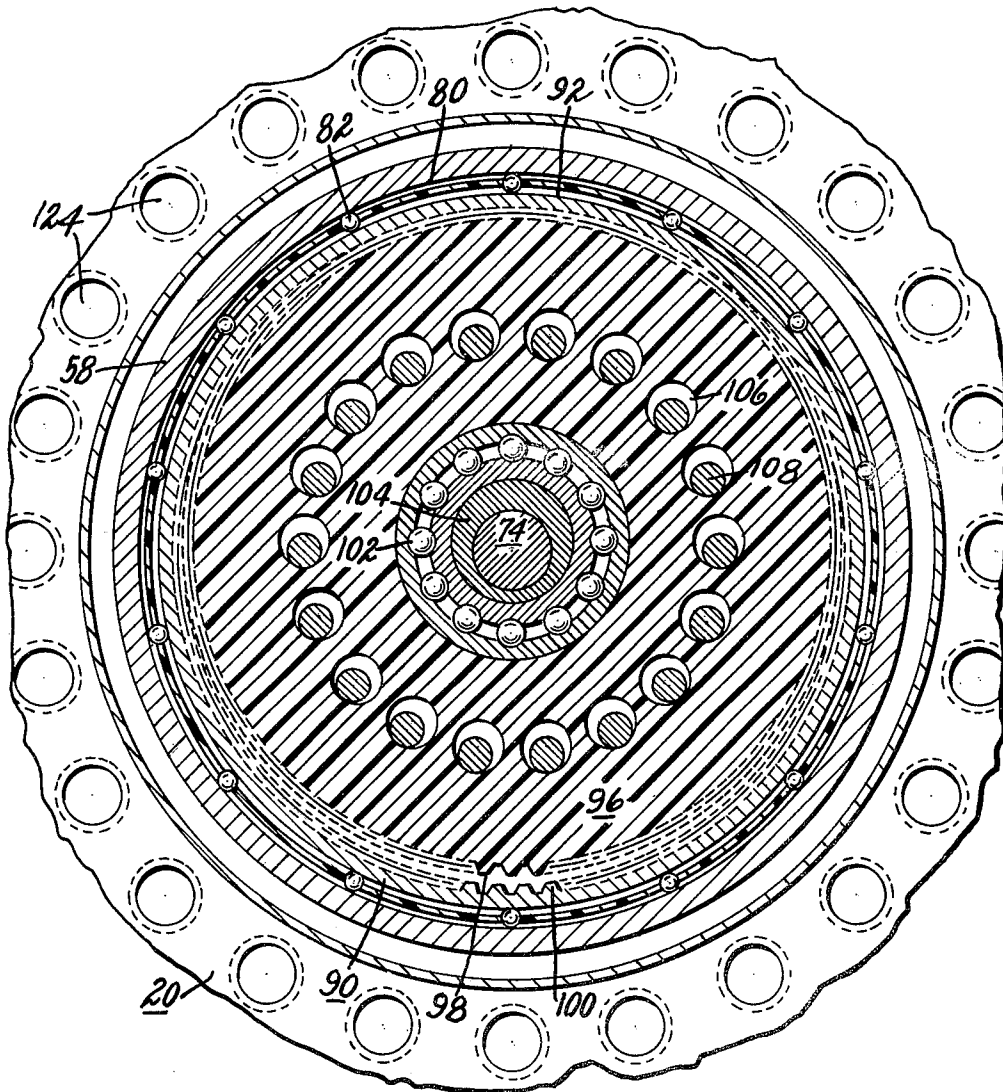


Fig. 3

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3,167,409

ROTARY CLOTHES DRYER WITH DIRECT DRIVE MOTOR AND SPEED REDUCER ASSEMBLY

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3 Claims. (Cl. 34-133)

This invention relates to a domestic appliance and more particularly to an improved prime moving and air distribution system for a clothes dryer.

Development in the laundry appliance art has been faced with the problem of locating the many necessary and auxiliary elements of the appliance within a cabinet having acceptable dimensions. In clothes dryers, for instance, there are such elements as a motor, a tumbling drum, a belt and pulley arrangement, a blower, ductwork, the heater, a sprinkler and the various dryer controls. In addition, recent developments have established a trend toward an increasing amount of auxiliary equipment within the dryer cabinet. This invention seeks to solve the space problems fostered by these developments in clothes dryers by providing a compact arrangement for rotating the tumbling drum and initiating the flow of air through the drum.

Accordingly, it is an object of this invention to provide a prime moving system for a dryer without belts and pulleys and wherein the motor is mounted in axial alignment with the tumbling drum.

More particularly, this invention is directed to a compact motor-speed reducer assembly for a dryer in axial alignment with and in direct drive relationship to the tumbling drum and blower impeller.

A further object of this invention is the provision of an improved motor and wobble roll speed reducer assembly adapted to drive at two speeds simultaneously.

Another object of this invention is the provision in a clothes drying tumbling drum of a blower housing carried by the rear wall of the tumbling drum and rotated thereby about a more rapidly rotating impeller.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a side sectional view, partly in elevation, of a clothes dryer suitable for use with this invention;

FIGURE 2 is a fragmentary side sectional view of the motor-speed reducer-impeller and drum assembly of this invention; and

FIGURE 3 is a fragmentary sectional view taken along line 3-3 of FIGURE 2.

In accordance with this invention and with reference to FIGURE 1, a clothes dryer 10 is illustrated. The dryer has an outer cabinet including a top wall 12, a front wall 14, a rear wall 16 and a control console 18 at the top thereof. The cabinet encloses a rotatable tumbling drum 20 having a plurality of internal baffles 22 for agitating the clothes whenever the tumbling drum is rotated. The front of the tumbling drum is formed with an out-turned cylindrical collar 24 to form an access opening which telescopically receives and is relatively rotatably supported on an in-turned collar 26 of a front port plate 28. The front port plate is supported in an opening 30 of the front wall 14 which is closed by a door 32. Note that the inside of the door 32 is recessed at 34 to form with the port plate 28 an air passage 36 and 38 leading to a front duct 40. A removable lint basket 42 may be disposed in the front duct to intercept air flow for lint re-

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moval before the air is discharged to the atmosphere through an exhaust duct 44.

A conventional drying cycle accomplished with the clothes dryer of this invention includes a period wherein the drum 20 is rotated to tumble clothes in the path of air moving axially from a back wall 46 of the tumbling drum to the access opening 26 at the front of the dryer. The drying cycle is expedited if heated drying air is circulated through the tumbling drum and for this purpose an annular heater 48 is included at the rear of the tumbling drum and attached to a reflector plate 50 which is in turn held in spaced relationship to the rear wall 16 of the dryer cabinet. Perforations in the form of two concentric circles of ports 52 are spaced on opposite sides of the reflector plate 50 and the annular heater 48 to receive air drawn into the cabinet by an impeller 54 having a plurality of generally radial vanes 55. The tumbling drum 20 and the impeller 54 are rotated at approximately 50 r.p.m. and 1750 r.p.m., respectively, by a prime mover and speed reducer assembly, shown generally at 56 and described more fully next following.

Turning now to FIGURE 2, the prime mover and speed reducer assembly 56 is partially enclosed in an aluminum die cast motor housing 58. The motor housing is essentially cylindrical and has an interior recess or compartment 60 for receiving a motor 62 having a stator 64 press fit into the recess 60 and a rotor 66. A central boss or collar 68 formed integrally with the housing 58 extends from a partition 59 into the recess 60 to receive in press fit relationship a water pump bearing 70 for journaling a motor shaft. The motor shaft has a first shaft portion 72 affixed to the motor rotor 66 and a second shaft portion 74 for driving the speed reducer 75. Opposite the motor recess 60 is a speed reducer recess or compartment 76 defined by an annular flange 78 on the motor housing which has a central groove 80 to define an outer race for a bearing 82. Completing the motor housing 58 is a radial flange 84 which extends on the back side of the cabinet rear wall 16 and is adapted through fastening means 86 to retain the motor and speed reducer assembly 56 to the cabinet.

The speed reducer portion of the assembly 56 will be described with reference to FIGURES 2 and 3 and includes an annular internal gear or driven member 90 having an inner race 92 which cooperates with the outer race 80 on the housing to receive the ball bearing 82. Received within the dish-out portion of the internal gear 90 is an external gear or motion transfer member 96 which has external teeth 98 for enmeshing with the internal teeth 100 of the internal gear. The external gear 96 is journaled by a bearing 102 on eccentric driving member 104 which is press fit on the motor shaft portion 74.

Whenever the eccentric driving member 104 is rotated by the powershaft from the motor, the motion transferring member 96 would normally tend to rotate freely with the eccentric and the bearing 102 and no speed reduction would be possible. However, in order to stabilize the member 96 and prevent its free rotation, a plurality of ports 106 are arranged circumferentially about the body of the member 96. In each of these ports 106 there is disposed a pin 108 which is affixed to the partition 59 of the motor housing 58. Although a large number of pins 108 are illustrated, it should be understood that two could be used 90° apart in order to improve the rigidity of the speed reducing mechanism. The eccentric 104 keeps but one portion of the gear teeth 98 in a rolling engagement with but one section of the gear teeth 100. Thus, whenever the eccentric 104 rotates, the motion transferring member 96 tends to wobble or roll within the annular flange of the internal gear 90, limited by the pins 108, and the gear 90 is thereby rotated at a reduced speed.

In short, we have a speed reducing planetary mechanism wherein an eccentric 104 carried by the driving shaft 74 imparts motion to a gear 96 which is prevented from rotating about its own axis by a plurality of fixed pins or rollers 108 that roll about the gear ports 106. The number of teeth 98 on the gear 96 as compared to the number of teeth 100 on the driven member 90 determines the speed reduction from the motor shaft 74 to the driven member 90 in accordance with conventional mathematical procedures.

More particularly, the prime mover system 56 may include an induction motor having a rotor shaft which rotates at 1750 r.p.m. If the driven member 90 is formed with one hundred and five gear teeth and the external gear 96 is formed with one hundred and two teeth in pitch diameters of 5.250 inches and 5.100 inches respectively, a reduction of thirty-five to one is achieved with a cam eccentricity of .075 p.d. Thus, the prime mover system is adapted to drive through the eccentric 104 at 1750 r.p.m. while the driven member 90 rotates at 50 r.p.m.

In order to mount the prime moving mechanism 56 on the dryer 10, the flange 84 is adapted to be fastened to the rear wall 16 of the dryer. This places the front face of the eccentric 104 in juxtaposition to an opening 110 in the rear wall 46 of the tumbling drum. The eccentric 104 has a radial flange 112 to which an impeller disc 114 is attached as at 116.

Referring now to FIGURE 1, a cup-shaped blower housing 118 is fastened as by welding to the rear wall 46 of the tumbling drum to form an enclosure about the impeller 54. A plurality of ports 120 are disposed circumferentially about the cylindrical side wall of the blower housing 118, such that the rotation of the impeller 54 throws air (as shown by the air flow arrows) from the housing radially into the tumbling drum. In order to admit air to the blower housing, a plurality of inlet ports 124 are formed in the rear wall of the tumbling drum.

Although the front end of the tumbling drum 20 is relatively rotatably supported on the in-turned collar 26 of the front port plate, its primary support is on the speed reducer mechanism at the prime moving system. For this purpose, the driven member 90 has a face portion 126 in which a boss 128 is formed to receive a fastening means 129 which holds the rear wall 46 of the tumbling drum. A generally conical motor shield 131 protects the motor from the radiant heat of the heater 48 and interfits with a dish-out portion of the drum wall 46.

In operation, the motor 62 is energized to cause the power-shaft portion 74 to rotate at 1750 r.p.m. As the eccentric 104 rotates in response to the motor shaft, the impeller 54 is rotated at motor speed to induce an air flow through the tumbling drum. Simultaneously, the drum being attached as at 129 to the driven member 90 of the speed reducer rotates at approximately 50 r.p.m. Air is drawn by the impeller 54 through the inlet ports 52 in the back wall of the dryer, across the heater 48 and into the blower housing by way of the rotating drum inlet ports 124. This air is then thrown radially outwardly through the blower housing ports 120 into the tumbling drum from whence it moves axially from the drum to the front duct 40 and the exhaust duct 44.

It should now be seen that an improved prime moving system and air distribution system has been provided for a clothes dryer wherein the mechanism is contained in a compact manner in axial alignment with an end of a tumbling drum which also defines the blower housing. This invention frees the remainder of the dryer cabinet for auxiliary equipment or permits a comparable reduction in cabinet size to slightly more than the size of the tumbling drum itself. Further, an improved motor and speed reducer is taught wherein the motor casing forms one race of the speed reducer bearing. This improvement in conjunction with a pin-stabilized wobble member results in better mechanical rigidity in the speed reducer.

While the embodiment of the present invention, as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A prime moving system adapted to rotate a tumbling drum for tumbling clothes and an impeller for initiating a flow of air through said tumbling drum and comprising means forming a housing, partition means in said housing dividing said housing into first and second compartments, a speed reducer in said first compartment, said speed reducer including driven internal gear means having an attachment face adapted for rotating said tumbling drum, bearing means including a wall of said first compartment and a wall of said internal gear means, external gear means smaller than said internal gear means and drivably engaged at one point with said internal gear means, said external gear means having a plurality of ports, means affixed to said partition means and extending into loosely fitting relationship with each of said ports to prevent the rotation of said external gear means, and eccentric driving means relatively rotatably supporting said external gear means and having an attachment portion coplanar with said attachment face of said internal gear means adapted for rotating said impeller, and a motor in said second compartment having a powershaft journaled in said partition in axial alignment with said internal gear means and connected to said eccentric driving means for rotating said eccentric driving means at one speed, thereby to cause said external gear means to gyrate and change the point of engagement with said internal gear means for rotating said internal gear means at another speed.

2. In combination, means forming a rotatable drum having an inlet port and an exhaust opening, means in series fluid flow relationship with said inlet port for heating fluid moving to said drum through said inlet port, means forming an impeller housing on said drum enclosing said inlet port and having an outlet port communicating with said exhaust opening, impeller means in said impeller housing for effecting a heated fluid flow to said drum, and prime mover means in juxtaposition with said drum and having a first portion connected to said impeller means for rotating said impeller means at one speed and a second portion connected to said tumbling drum for rotating said tumbling drum and said impeller housing at another speed, said prime mover means comprising means forming a motor housing having a partition forming first and second compartments, a motor in said first compartment having a powershaft means including said first portion journaled in said partition and extending through said second compartment for attachment with said impeller means, and a speed reducing planetary mechanism having a radially inner driving member drivably connected to said powershaft means and a radially outer driven member including said second portion forming with said motor housing a bearing for relatively rotatably supporting said mechanism in said motor housing.

3. In combination, means forming a rotatable drum having an inlet port and an exhaust opening, means in series fluid flow relationship with said inlet port for heating fluid moving to said drum through said inlet port, means forming an impeller housing on said drum enclosing said inlet port and having an outlet port communicating with said exhaust opening, impeller means in said impeller housing for effecting a heated fluid flow to said drum, and prime mover means in juxtaposition with said drum and having a first portion connected to said impeller means for rotating said impeller means at one speed and a second portion connected to said tumbling drum for rotating said tumbling drum and said impeller housing at another speed, said prime mover means comprising means forming a motor housing having a partition forming first and second compartments, a motor in said first compartment having a powershaft means including said first portion journaled in said partition and ex-

tending through said second compartment for attachment with said impeller means, and a speed reducing planetary mechanism in said second compartment having a radially inner driving member divably connected to said power-shaft means and a radially outer driven member including said second portion bearingly carried in said second compartment for relatively rotatably supporting said mechanism in said motor housing.

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