March 21, 1961 R. K. SHEWMON 2,975,528

PRIME MOVER FOR CLOTHES DRIER

Filed Nov. 29, 1957 2 Sheets-Sheet 1

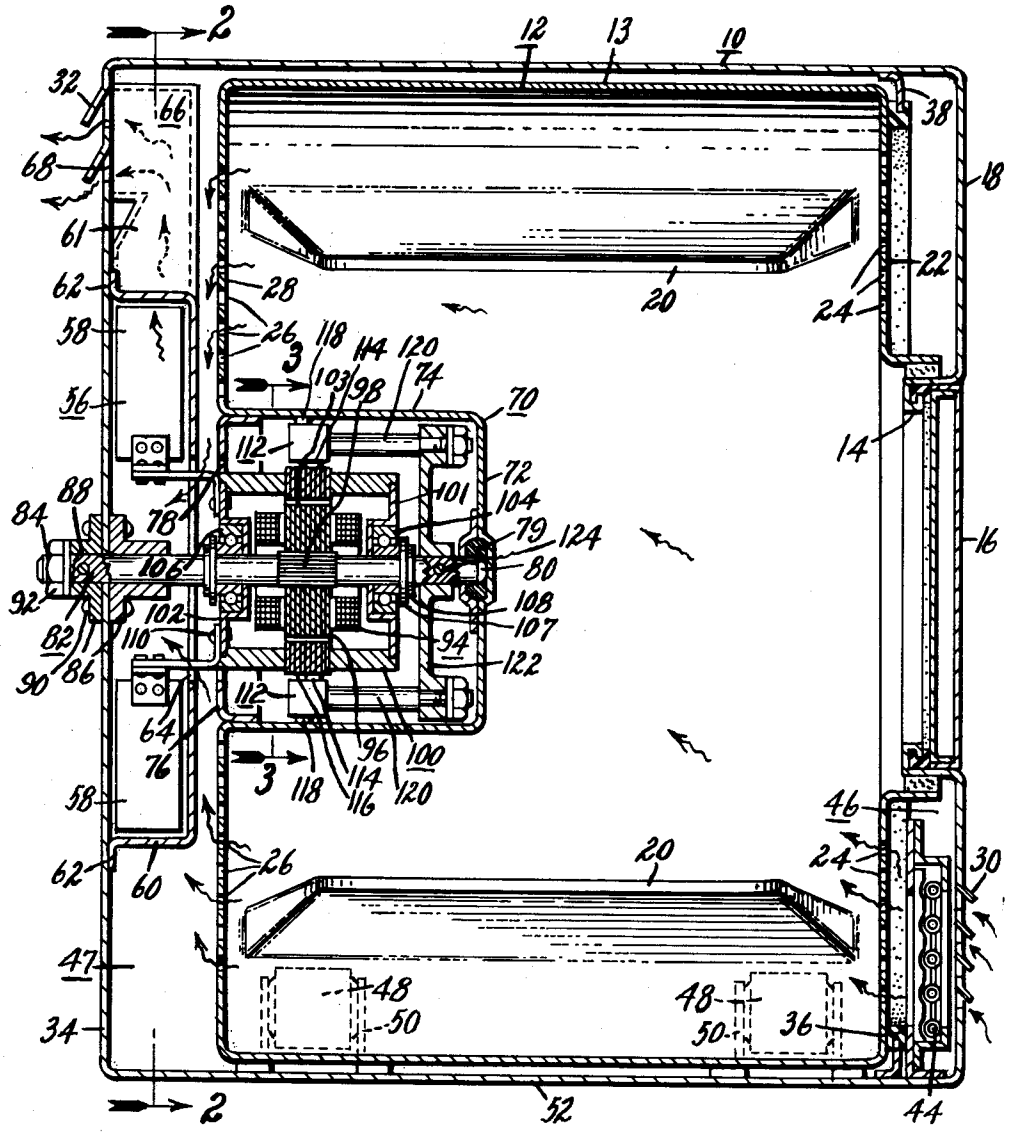


Fig. 1

INVENTOR.
RALPH K. SHEWMON
BY Edwin S. Dybwig
HIS ATTORNEY

March 21, 1961 R. K. SHEWMON 2,975,528

PRIME MOVER FOR CLOTHES DRIER

Filed Nov. 29, 1957 2 Sheets-Sheet 2

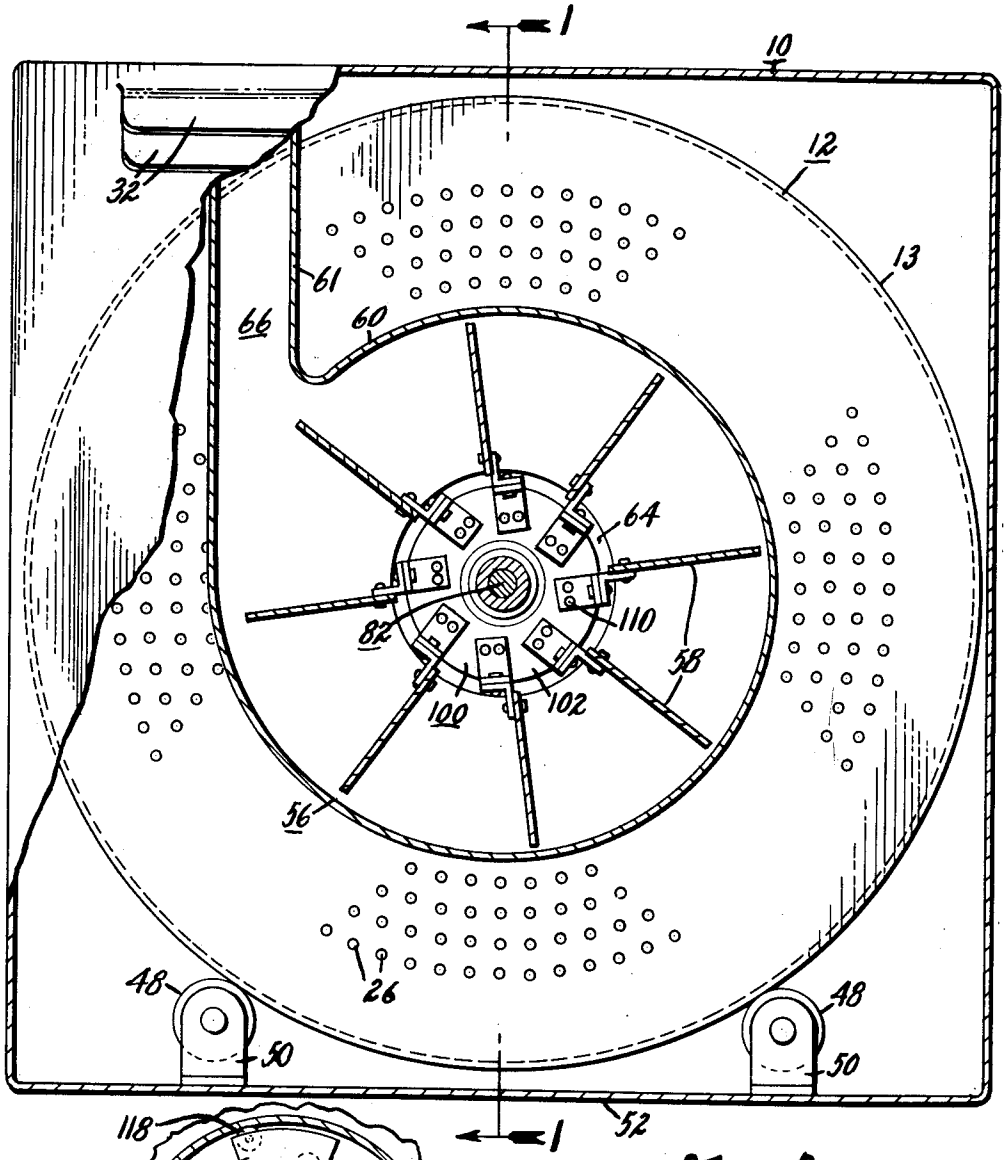


Fig. 2

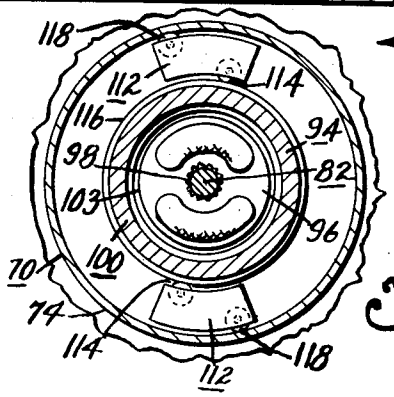


Fig. 3

INVENTOR.
RALPH K. SHEWMON
BY Edwin S. Dybwig
HIS ATTORNEY

United States Patent Office 2,975,528
Patented Mar. 21, 1961

2,975,528

PRIME MOVER FOR CLOTHES DRIER

Ralph K. Shewmon, Centerville, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Nov. 29, 1957, Ser. No. 699,538

4 Claims. (Cl. 34—133)

This invention relates to a domestic appliance and particularly to a clothes drier. More particularly, this invention relates to the prime mover utilized to drive a clothes drier.

Locating all the many necessary elements of the device within the cabinet of a dryer presents a problem which must be solved in order to keep the size of the machine within permissible limits. Dryers in the past have utilized a conventional motor as a source of power and transmitted this power by means of a belt-driven pulley arrangement. In addition to the space occupied by the pulleys, additional areas must be found for the blower, the heater and the various dryer controls. Recent developments have established a trend toward an increasing amount of auxiliary equipment being built in to the dryer cabinet. This invention, therefore, seeks to solve these space problems in clothes dryers by providing a compact prime mover arrangement for motivating the various operating parts of the dryer.

Accordingly, it is an object of this invention to provide in a clothes dryer a prime mover which may be disposed for operation within the tumbling drum of a dryer.

Another object is to provide a prime mover in a dryer which may be mounted on the same axis as the tumbling drum of the dryer, thereby to alleviate congestion around the periphery of the drum.

It is also an object to provide a power source which will drive the tumbling drum and the blower of a dryer without resorting to a belt-and-pulley arrangement.

It is a further and more specific object that a clothes dryer be equipped with a tumbling drum, a blower and a prime mover, all arranged axially of each other.

It is a further object to provide speed reducing means between a prime mover and a tumbling drum arranged concentrically.

More specifically, this invention sets forth an arrangement whereby an inside-out motor is used to drive the rotating elements of a clothes dryer.

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 form of the present invention is clearly shown.

In the drawings:

Figure 1 is a side sectional view of a clothes dryer embodying this invention taken substantially along line 1—1 of Figure 2;

Figure 2 is a rear sectional view taken along line 2—2 in Figure 1 and showing the novel drum and blower mounting arrangement disclosed herein; and

Figure 3 is a sectional view taken along line 3—3 of Figure 1 showing a speed reducing means between the prime mover and the tumbling drum of a clothes dryer.

In accordance with this invention, a clothes dryer having a cabinet **10** enclosing a tumbling drum **12** is provided with an access opening **14** through which clothes are placed within the drum **12**. A door **16** is hingedly mounted on a front wall **18** of cabinet **10** and

adapted to close the opening **14**. The imperforate peripheral wall **13** of tumbling drum **12** has a series of raised baffles **20** for agitating and separating the clothes during rotation of the drum. The front wall **22** of drum **12** is ported as at **24** to allow the ingress of air from a front duct **46** to the tumbling drum during the drying process. The rear wall **28** of the drum is similarly ported at **26** to accommodate the egress of air from the drum to a rear duct **47**. Air flow accommodations are provided also in cabinet **10** wherein louvers **30** in cabinet front wall **18**, and louvers **32** in rear wall **34**, respectively, facilitate the flow of air to and from the dryer.

An annular seal **36** is disposed between the front wall **22** of tumbling drum **12** and an imperforate bulkhead **38** which extends from the cabinet **10** into overlapping spaced relationship with the drum wall **22**. The bulkhead **38** in the drum wall **22** and the seal **36**, effectively prevents the passage of air between the peripheral wall **13** of the drum and cabinet **10** from the front duct **46** to the rear duct **47**. In this design all air entering the cabinet **10** through inlet louvers **30** must pass through the tumbling drum **12** before exhausting from the cabinet from louvers **32**.

A means for heating the air flowing to the clothes drying chamber or drum **12** is embodied in a heater **44** disposed in the duct **46** between the wall **22** of the drum and front wall **18** of the cabinet. The heater is so arranged that air entering the dryer cabinet through louvers **30** is drawn over the heater coils and warmed before entering the tumbling drum **12** through ports **24**.

The drum **12**, in accordance with the concepts of this invention, is supported for rotation on rollers **48** which are journalled in brackets **50** attached to a base portion **52** of dryer cabinet **10**. Although the tumbling drum is shown supported on four such rollers in the embodiment disclosed herein, it is to be understood that the matter of support will depend on the size of the drum being rotated and the stability desired in the operation of the drum.

Air circulation through the dryer during operation is provided by a blower **56** having rotatable impeller blades **58** therein. The blower **56** is shown formed in a novel manner wherein a housing section **60** having a neck portion **61** is secured in any suitable manner at **62** to the rear wall or panel **34** of the dryer cabinet to complete the blower assembly. Thus, a desirable savings in space and material is effected in this blower arrangement. The housing section **60** has an opening **64** through which air is drawn and an exhaust passage **66** which terminates in an outlet **68** adjacent the louvers **32** in the rear of the cabinet.

Pursuant to the novel concepts of this invention, the rear wall **28** of tumbling drum **12** is formed with a cavity or pocket **70** which provides the driving surface upon which a prime mover acts to rotate the drum. An end portion **72** and a cylindrical side wall or peripheral portion **74** set forth the bounds of pocket **70** which thus appears as a cylinder closed at one end only. Although the cavity **70** is shown within the drum **12** to take advantage of the waste space therein, it is within the purview of these teachings to form the pocket **70** outside the confines of the drum **12**. An annular bracket or partition **76** may be provided to partially close the opening **78** to said pocket. This partition **76** will serve to withhold dust and lint from the pocket. At the center of the end **72** of pocket **70** is a thrust bearing **79** adapted to receive one end **80** of a shaft **82**. The other end of shaft **82** is threaded at **84** and rigidly secured in a horizontal position to the rear wall **34** of the dryer cabinet by any suitable means. One adaptation of means whereby shaft **82** is held rigidly horizontal is embodied in juxtaposed collars **86** having an opening **88** which will snugly accommodate

shaft 82. The collars 86 may then be fastened together at 90 with the rear wall of the cabinet 34 disposed therebetween. Completion of the rigid disposition for the shaft 82 is effected by applying a nut 92 on the end of the shaft 82 to bond the collar, shaft and rear wall into a unitary fixed shaft assembly. In this relationship shaft 82 projects into the cavity 70 of drum 12 and rotatably supports the drum in the bearing 79. Thus it may be seen that the tumbling drum 12 is supported vertically by the rollers 48 and is prevented from moving axially toward either the front 18 or the rear 34 of the dryer by the disposition of the shaft 82 in thrust bearing 79, and the annular seal 36 in abutting relation to the drum.

The novel concepts and space saving arrangements advanced by this invention are effected through an adaptation of an "inside-out" motor 94 having an inner stator 96 rigidly secured to shaft 82 as by a spline arrangement 98. The rotor 100 in this type of motor is disposed to rotate about the outer periphery 103 of stator 96 on support discs 101, 102 which are journalled on bearings 104, 106, respectively. The bearings 104 and 106 are located on the shaft 82 and retained thereon by a suitable locking arrangement, such as a washer 107 and a snap ring 108.

In the embodiment shown, the impellers 58 are attached to the support disc 102 of the rotor 100 and rotated thereby at the same speed as the rotor. Although the impellers 58 are shown secured to the disc 102 by rivets 110, it is to be understood that any suitable means of attachment is satisfactory. It may also be recognized that further savings in manufacturing costs may be attained through casting the impeller blades integrally with the rotor 100.

Clothes drying is most efficient when the speed at which the clothes are tumbled in drum 12 remains low and the blower 56 draws sufficient air through the drum. Speeds of approximately 45 r.p.m. for the tumbling drum 12 and 1700 r.p.m. for the blower impellers 58 have been found desirable. It is therefore necessary to provide a speed reducing means between the rotating member or rotor 100 of inside-out motor 94 and the pocket side wall 74 upon which the rotor acts to drive the drum. For this purpose a speed reducer 112 includes an input roller 114 rotatably connected to a driving surface 116 on the rotor 100 and adapted to be driven thereby. Conventional speed reduction gearing is arranged within the reducer 112 to effect the desired output speed. This reduced speed is imparted to pocket side wall 74 through a driver roller 118. While the speed reducer elements 114 and 118 have been described as friction rollers, they could as well be formed as gears. However, where the rotation of drum 12 is accidentally and suddenly halted, slippage between the drum and motor is desirable to minimize the possibility of breakage in the driving system for the drum. The use of friction rollers for elements 114 and 118 is preferable to provide this slippage. The speed reducing means 112 may be held in operative relationship to the rotor 100 by a shaft 120 carried on a support plate 122 rigidly attached by a set screw 124 to the fixed shaft 82. Identical speed reducing means 112 have been shown disposed on opposite sides of the motor 94. However, any number of speed reducers 112 may be disposed about the motor for operating the tumbling drum, space requirements being the only limitation.

Prior to operating the dryer a quantity of damp clothes is placed in the tumbling drum 12 through door opening 14. The dryer is energized to initiate the tumbling action of the drum 12 through motor 94 and to activate electric heater 44. In view of the interconnection between the impeller blades 58 and the rotor 100 of the motor 94, the blower 56 operates to draw air into duct 46 of cabinet 10 through inlet louvers 30. Prior to entering the tumbling drum 12 by way of ports 24 the air is heated by the heater 44. The agitation produced by the rotation of the drum 12 and the revolving baffles 20 causes the tumbling clothing to be exposed to the heated air being passed through the drum. As the clothes are dried, moisture-laden air is withdrawn from the tumbling drum through ports 26 into a rear duct 47 from which point it enters the blower inlet opening 64. The action of impellers 58 in blower housing 56 then expells the air from the dryer at exhaust louvers 32. During this operation the tumbling drum 12 is caused to rotate at a speed less than the speed of rotation of rotor 100, i.e. the r.p.m. at which gear or roller 114 rotates is reduced by means of a reducer mechanism 112 to a point where gear or roller 118 drives the tumbling drum at the desired speed. Thus, it may be seen that the nesting arrangement of blower, tumbling drum and prime mover has provided a clothes dryer wherein the tumbling drum may be sized to the uppermost limits of the dryer cabinet and additional room provided for other dryer features.

The disposition of the inside-out motor within the confines of a centrally located pocket in the drum represents the preferred embodiment of this invention. However, it is recognized that an inside-out motor 94 could be substituted for one of the rollers 48, thereby to drive the drum 12 from a support roller location.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a clothes dryer comprising a cabinet; a drum in said cabinet; a structure within said drum defining a cavity; a shaft connected to said cabinet and rotatably mounting said drum in said cavity; a motor including a stator secured to said shaft and a rotor disposed between said shaft and a portion of said cavity and adapted to rotate said drum; and a blower for drawing a stream of heated air through said drum including a housing arranged axially of said drum and an impeller in said housing secured to said rotor for rotation therewith.

2. In combination, a clothes dryer comprising a cabinet having support means; a drum in said cabinet on said support means; a structure within said drum defining a cavity; a shaft connected to said cabinet and rotatably mounting said drum in said cavity; a motor including a stator secured to said shaft and a rotor disposed between said shaft and a portion of said cavity and adapted to rotate said drum; speed reducing means between said rotor and said drum; and a blower for drawing a stream of heated air through said drum including a housing arranged axially of said drum and an impeller in said housing secured to said rotor for rotation therewith.

3. In combination, a clothes dryer comprising a cabinet; a rotatable support in said cabinet; a drum in said cabinet on said support; a structure within said drum defining a cavity; a shaft connected to said cabinet and rotatably mounting said drum in said cavity; a motor including a stator secured to said shaft and a rotor disposed between said shaft and a portion of said cavity and adapted to rotate said drum; and a blower for drawing a stream of heated air through said drum including a housing arranged axially of said drum and an impeller in said housing secured to said rotor for rotation therewith.

4. In combination, a clothes dryer comprising a cabinet; a rotatable support in said cabinet; a drum in said cabinet on said support; a structure within said drum defining a cavity; a shaft connected to said cabinet and rotatably mounting said drum in said cavity; a motor including a stator secured to said shaft and a rotor disposed between said shaft and a portion of said cavity and adapted to rotate said drum; speed reducing means between said rotor and said drum; and a blower for drawing a stream of heated air through said drum including a housing arranged axially of said drum and an impeller in said housing secured to said rotor for rotation therewith.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,770	Eynon	Dec. 8, 1925
1,936,737	Tingley	Nov. 28, 1933
2,393,380	Jorgenson et al.	Jan. 22, 1946
2,441,801	Dever	May 18, 1948
2,506,516	Moore	May 2, 1950
2,587,646	O'Neil	Mar. 4, 1952
2,764,820	Kauffman	Oct. 2, 1956
2,829,287	Soler Font	Apr. 1, 1958