

United States Patent

Triplett et al.

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[54] **ANNULAR SEALING RING**
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 [73] Assignee: **Fedders Corporation**, Edison, N.J.
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 [21] Appl. No.: **802,847**

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[52] **U.S. Cl.**.....277/229, 34/242
 [51] **Int. Cl.**.....**F26b 25/08**
 [58] **Field of Search**.....277/229, 34, 343, 233, 226, 277/227, 228; 161/176, 178; 34/242

[57] ABSTRACT

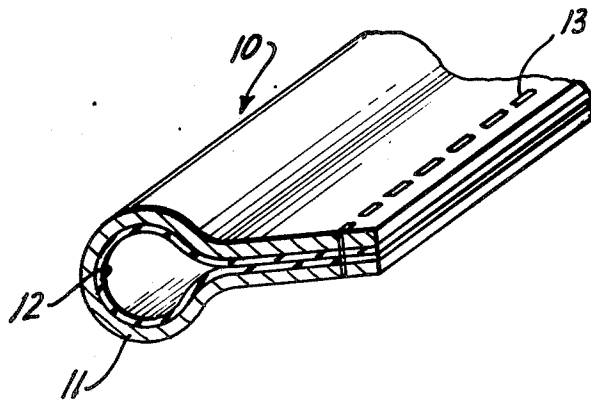
An annular sealing ring which is adapted to provide an airtight seal between relatively rotatable opposed concentric surfaces. The ring comprises a strip of laminated material which is folded longitudinally upon itself to provide a substantially "teardrop" cross-sectional configuration. The tubular portion of the ring at the forward end of the "teardrop" is adapted to resiliently engage one of the concentric surfaces, while the rear portion of the "teardrop" is adapted to be permanently secured to the other concentric surface. The laminated material from which the ring is constructed comprises a substrate of felt forming the outer bearing surface of the ring, and a coating of an elastomeric material bonded to the inner surface of the felt substrate.

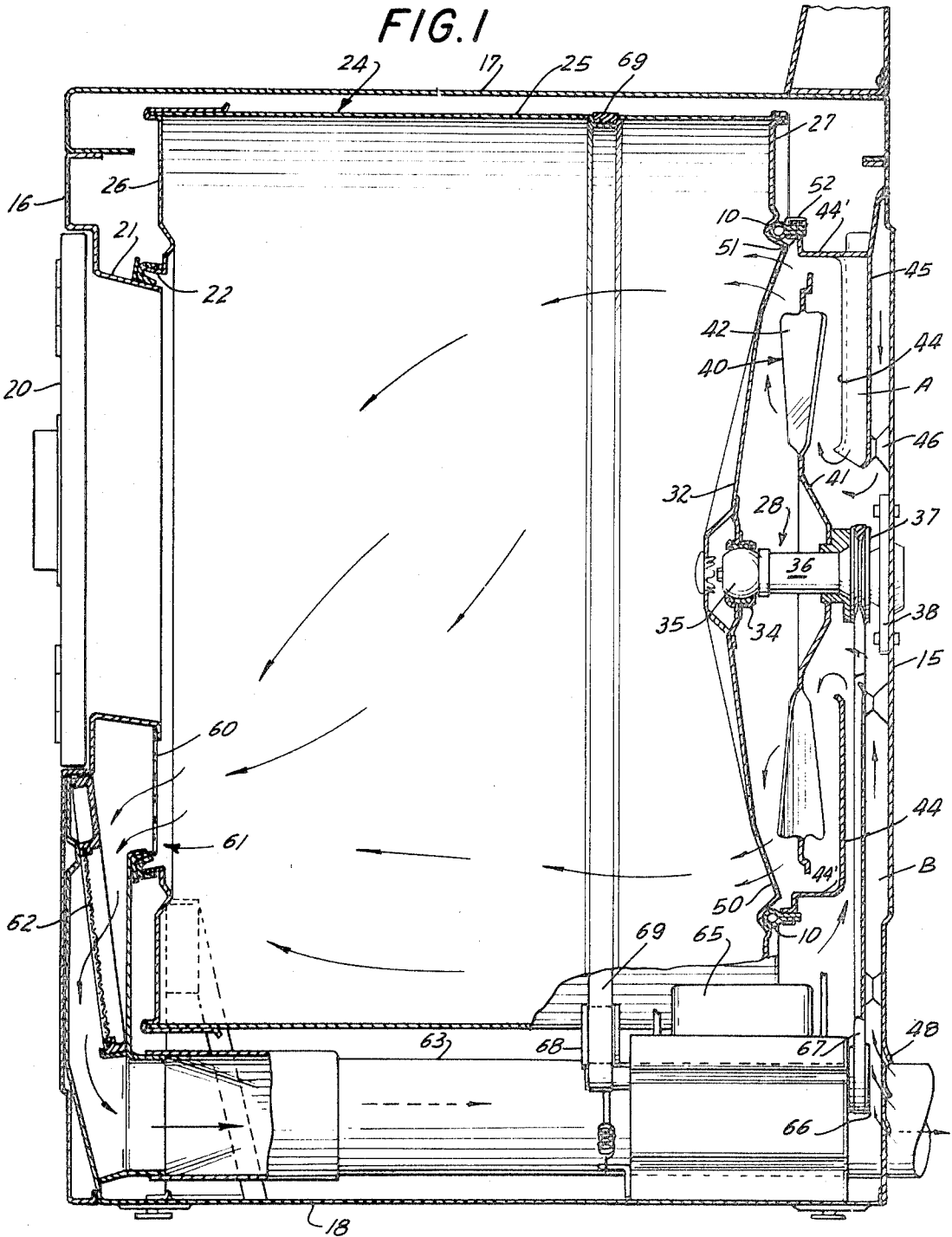
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6 Claims, 5 Drawing Figures





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FIG. 2

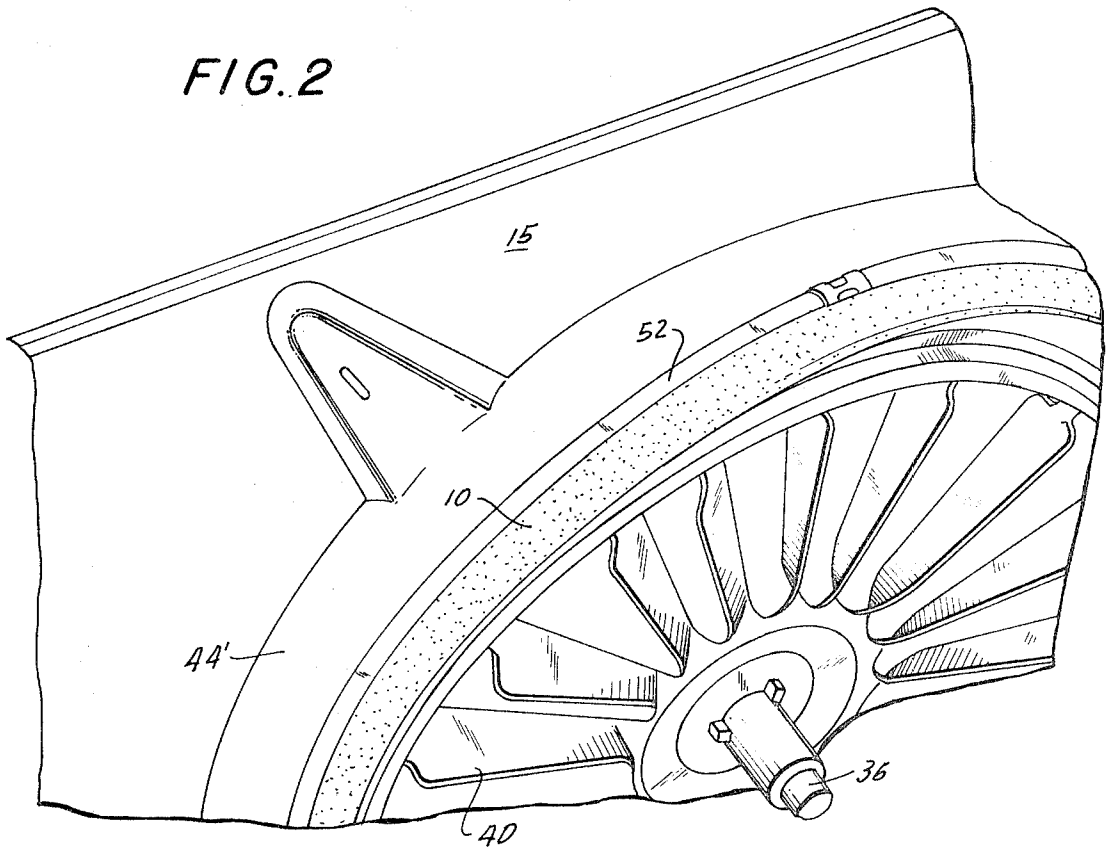


FIG. 4

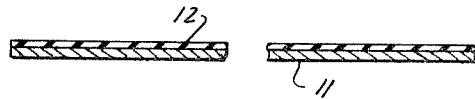


FIG. 3

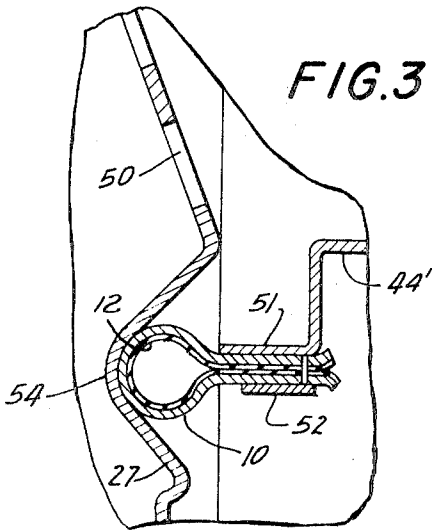
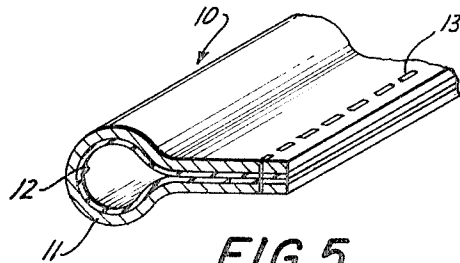


FIG. 5



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ANNULAR SEALING RING

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to an annular sealing ring suitable for preventing leakage of air between a rotating member and an adjacent stationary member. In a preferred embodiment, the invention is adapted to be used as a rear seal positioned between the rotating clothes basket and the stationary cabinet of a household clothes drying machine.

In modern high-capacity clothes dryers, it is common for the rear wall of the clothes basket to also form the forward face of the blower housing. This being the case, it is necessary to position an annular seal between the rotating basket and the stationary cabinet to insure that the air directed from the fan passes through the openings provided in the basket rear wall.

To provide a suitable seal for this purpose, it has been proposed to extend a close fitting steel cylindrical band across from the basket to the stationary blower housing to minimize the clearance and thereby reduce air leakage. This construction is normally unsatisfactory, however, since the distance between the blower housing and basket is subject to wide variation, particularly during rotation of the basket.

Prior attempts to provide an interengaging seal between the two surfaces have not met with success since no material has been found which possesses all of the required physical properties. In particular, the seal should possess sufficient resilience or deformability to readily conform to the variations in the distance between the housing and basket during rotation. In addition, it must also possess high temperature resistance, have a low coefficient of friction, and be impervious to reasonable air pressure.

It is an object of the present invention to provide a seal which is adapted for use in a dryer of the described type and which possesses all of the above noted properties. It is also an object to provide a seal which has long life, is of simple construction, and relatively inexpensive to manufacture.

These and other objects are obtained in the illustrated embodiment of the present invention by the provision of an annular sealing ring comprising a hollow tubular body member of generally circular cross section, the body consisting of an outer bearing surface of a polyester felt material, and an inner coating of an elastomeric material, such as silicone rubber, bonded to the underside of the bearing surface. The body is formed by first coating one side of a flat strip of the felt with the elastomeric material, and then folding the coated side of the strip longitudinally upon itself to provide a cross section of substantially "teardrop" shape. The contiguous side edges of the strip are normally secured together along the length of the strip, and the two ends thereof may also be joined to form the ring. The resulting ring has a cross-sectional configuration which includes a forward circular portion which serves as the seal, and a flat overlapping rear portion which serves as a means to secure the seal to the mounting member.

Additional objects and advantages of the present invention will become readily apparent to one skilled in the art from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view of a clothes dryer which incorporates the present invention,

FIG. 2 is a fragmentary perspective view of the fan housing of the dryer illustrated in FIG. 1, the clothes basket having been removed,

FIG. 3 is a fragmentary enlarged sectional view of the seal illustrated in FIG. 1,

FIG. 4 is an end view of the laminated material from which the seal of the present invention is fabricated, and

FIG. 5 is a fragmentary sectional view of the finished sealing ring and illustrating its "teardrop" cross-sectional configuration.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a seal incorporating the teachings of the present invention is illustrated generally at 10. As best seen in FIGS. 4 and 5, the seal 10 is formed from a flat strip of felt material 11 which has been coated with an elastomeric backing material 12. The strip is folded longitudinally upon itself, with the elastomeric material facing inwardly, to form the "teardrop" configuration illustrated in FIG. 5. The contiguous side edges of the strip are usually secured together by suitable means, such as by the illustrated stitching 13. Obviously, other means of securement, such as stapling, gluing, or self-bonding could also be employed. The two ends of the strip may then be joined by any of the above methods to form an annular ring. The resulting cross-sectional configuration of the seal includes a forward tubular portion which serves as a resilient bearing surface, and a rear flat portion which provides a convenient surface to secure the seal to its mounting structure.

In the illustrated embodiment, the outer material 11 of the seal comprises a nonwoven fabric consisting of a web or mat of randomly oriented fibers. Such a material, commonly referred to as felt, has been found to be particularly suitable for the above purposes since its inherent fluffiness provides a low friction bearing surface and also since it is capable of forming a secure bond with the elastomeric backing material 12. Obviously, a woven fabric possessing similar characteristics would also be acceptable for this purpose.

It is also obvious that the substrate of outer material 11 may be made from a variety of suitable fibers which have the ability to withstand high temperatures, have a low coefficient of friction, and which are economically practical. In this regard, the polyester fibers such as "Dacron" sold by du Pont or "Kodel" sold by Eastman Kodak have been found to be eminently suitable. These polyester fibers are capable of withstanding heat up to approximately 450° F., they possess high strength and abrasion resistance, and they have a low coefficient of friction.

The backing 12 comprises a layer of an elastomeric material bonded to the felt substrate 11. The backing material functions to give added resilience and strength to the felt, and also to make the material more impervious to the passage of air. The particular thickness of the elastomeric coating, as well as the thickness and dimensions of the felt strip, obviously depend upon the use to which the seal will be put. When employed in a clothes dryer as hereinafter further described, it has been found that a 0.06-inch-thick felt strip and a coating of approximately 0.0075 inch is very satisfactory.

There are several conventional methods by which the elastomeric backing material 12 may be applied to the felt substrate 11. Selection of a particular method is influenced by the physical and mechanical properties of the coating and substrate, together with the associated processing economics. As typical examples, the coating may be applied to the flat felt substrate by a normal calendering operation, or by a knife or spread coating operation. Once coated, the laminated material is normally passed through an oven where the excess solvent, if present, is evaporated and the coating resin is cured.

The particular elastomeric material employed must have the properties of being impervious to reasonable air pressure and capable of withstanding high operating temperatures. For example, the air pressure in a modern high capacity clothes dryer is approximately 0.05 pound per square inch (i.e., 1.5 inch/H₂O) and the operating temperature approximately 400°-425° F. As a particular example of a suitable backing material, it has been found that dimethylpolysiloxane, generally termed silicone rubber, and sold under the trademark "SILASTIC" by the Dow-Corning Corporation of Midland, Michigan, is very satisfactory for this purpose. Other silicone rubbers can be employed wherein some of the methyl groups are replaced by phenyl groups. Silicone rubbers of these types are stable at high temperature up to approximately 550° F., have an excellent ability to adhere to felt and other fabric materials, and possess sufficient durability, strength and flexibility.

A domestic clothes dryer which incorporates a seal embodying the teachings of the present invention is illustrated generally in FIG. 1. The dryer is provided with a cabinet having a rear wall 15 and front wall 16, and top and bottom walls 17 and 18 respectively. The front wall 16 has a door 20 hinged thereto enclosing an opening defined by a cylindrical flange 21 in the front wall 16. This arrangement provides an access to the front opening 22 of a rotatable clothes container or basket 24 for loading and unloading clothes in the basket.

The basket is mounted for rotation about a substantially nonvertical axis which, in the present case, is preferably horizontal. More particularly, the basket is substantially cylindrical in shape, and includes a cylindrical wall 25, a front wall 26 having the opening 22, and a rear wall 27 having a shaft and bearing assembly 28 for the basket 24 and the fan or blower 40. The rear wall 27 of the basket has a conically shaped depressed portion 32 providing a mounting means in the form of a sheet metal hub 34 secured thereto as by welding. The hub is designed to receive a ball-like bearing 35 secured to the bearing shaft 36. The shaft 36 extends rearwardly through a hollow cylindrical portion of a pulley 37 and into a supporting bracket 38 fixed to the rear wall 15 of the cabinet.

The blower or fan assembly 40 includes a circular sheet metal plate 41 which is secured at its center to the pulley 37. The outer circumference of the blower includes a plurality of radially extending blades 42 twisted from the plane of the plate. The fan is confined between and enclosed by the rear basket wall 27 (particularly the conical portion 32 thereof) and a duct assembly comprising a front plate 44 and rear plate 45 forming a passage A. The rear plate 45 is connected across the bosses 46 to the cabinet rear wall to provide a passage B for the inflow of ambient air from the vents 48 in the cabinet rear wall.

A conventional heating assembly (not shown) is positioned in a suitable housing connected to the passage A such that the fan is effective to draw heated air into the passage A for mixture with the exterior ambient air drawn through the vents 48 and passage B. The air mixture is then forced into the basket through the openings 50 in the basket rear wall 27.

The outer circumference of the front duct plate 44 is provided with a transverse flange 44' which is bent in the manner illustrated to form a cylindrical flange 51 for mounting the annular seal 10 of the present invention. The seal 10 may be fixed to the flange 51 by a steel band 52, or by some other conventional method such as tape, adhesive, wire stitching, and the like. The seal engages a mating annular depression 54 (note FIG. 3) in the basket rear wall to block the passage of air between the basket and the flange 51 and thereby insure that the air directed from the fan 40 will flow through the openings 50 and into the basket 24. The air next flows through the basket 24 in the manner indicated by the arrows in FIG. 1 and enters the openings 60 in the upper collector duct assembly 61 which is secured to the front wall 16 of the cabinet. The air then passes through a removable lint screen or trap 62 to the exit duct 63.

The dryer incorporates a basket and fan drive assembly which includes a conventional motor 65 having a first pulley 66 connected to the pulley 37 of the fan through the belt 67, and a second pulley 68 operable to rotate the basket by the

connecting belt 69 which surrounds and engages substantially the entire outer diameter of the basket 24. The motor may, if desired, be reversible and incorporate an automatically operable one-way clutch arrangement whereby rotation of the motor shaft in one direction rotates both the fan and the clothes basket for normal clothes drying, while rotation in the opposite direction disengages the clutch to cause the drive to the basket to be disconnected while the drive to the blower remains operative. Further details of this drive arrangement, as well as other details of the dryer structure may be obtained by reference to copending application Ser. No. 697,453 filed Jan. 12, 1968, now U.S. Pat. No. 3,447,248 issued on June 6, 1969.

While the present invention has been described for purposes of illustration with particular reference to a domestic clothes dryer, it will be apparent from the above disclosure that the annular seal 10 could be used in other equipment where a seal is required between a rotating or reciprocating member and a stationary member. The seal 10 is sufficiently resilient and deformable to readily conform to the variations in the distance between the two members and thereby is able to insure a continuous sealing engagement. The bearing surface of the seal also possesses a low coefficient of friction, and is abrasion resistant and thus long wearing. In addition, the unique "teardrop" configuration of the seal permits it to be easily mounted on a supporting member.

We claim:

1. A resilient and deformable sealing member comprising; a strip of laminated material folded longitudinally upon itself to form a forward portion of substantially tubular configuration and a rear portion formed by the contiguous side edges of the strip, said laminated material comprising a fabric substrate forming the outer bearing surface of said sealing member, and a coating of an elastomeric material bonded to the inner surface of said fabric substrate.
2. The sealing member as defined in claim 1 wherein said fabric substrate comprises nonwoven polyester fibers.
3. The sealing member as defined in claim 2 wherein said elastomeric material is silicone rubber.
4. A sealing ring for sealing between relatively rotatable opposed concentric surfaces, said ring comprising: a strip of laminated material folded longitudinally upon itself to form a forward portion of substantially tubular configuration and a rear portion formed by the contiguous side edges of the strip, the ends of said strip being joined to provide an annular configuration, said forward tubular portion of said ring being adapted to resiliently engage one of said concentric surfaces, and said rear portion being adapted to be permanently secured to the other of said concentric surfaces, said laminated material comprising a substrate of low friction material forming the outer bearing surface of said sealing ring, and a coating of an elastomeric material bonded to the inner surface of said substrate.
5. The sealing ring as defined in claim 4 wherein said low friction material comprises nonwoven polyester fibers.
6. The sealing ring as defined in claim 5 wherein said elastomeric material is silicone rubber.

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