SHAFT SEAL FOR USE IN WASHING MACHINES

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ABSTRACT

A shaft seal for use in washing machines which includes a rigid body having an expansible skirt responsive to centrifugal force to minimize friction when the washing machine does not contain water.

5 Claims, 4 Drawing Figures
SHAFT SEAL FOR USE IN WASHING MACHINES

This invention relates to shaft seals and more particularly to an improved seal for use in a clothes washing machine.

Clothes washing machines of the type having an outer tub, an agitator and a perforated spin tub, include a drive shaft which connects the usual motor and transmission to the agitator. This drive shaft extends axially through a spin tube which carries the perforated spin tub and which is also connected to the motor through the transmission to rotate the spin tube and its tub at a high speed. The spin tube extends axially through a stationary tube that is rigidly connected to, or is otherwise integral with, the outer tub and the transmission housing.

This construction functions in such a manner that to initiate a washing cycle, clothes are placed in the perforated spin tub and the outer tub is partially filled with water. The agitator then functions to agitate, vibrate or oscillate the clothes in some irregular manner. Upon completion of the washing cycle the water is drained from the tubs in a customary manner and the spin tube and its perforated spin tub are rotated at high speed to extract water from the clothes.

The assembly is such that when water is contained in the outer tub, seal means provided between the spin tube and the stationary tube is effective to prevent the escape of water into the spin tube bearing assembly. However, in known instances, when conventional lip type or face type seal is provided at this juncture, the seal is subjected to excessive wear by reason of rubber friction after the water is drained out of the outer tub and the perforated inner or spin tub and its spin tube are rotated at high speed. This results in a premature breakdown of the seal and frequently generates unwanted high driving torque squeals and like noises.

The present invention is concerned with the provision, in a clothes washer, of a seal which will prevent water from contaminating the spin tube bearing assembly when no relative motion exists between the spin tube and the stationary tube during the washing cycle, but which functions to prevent sealing engagement between the seal and the stationary tube during the spin dry operation.

It is therefore an object of the invention to provide a suitable stationary sealing surface and a novel seal assembly in a clothes washer.

Another object is to provide a seal which minimizes friction during the spin extraction cycle by centrifrically lifting it away from the stationary tube or other sealing surface around which it is normally seated.

Another object is to provide a seal for the stationary tube or other stationary sealing surface of a clothes washer assembly which utilizes hydros-static fluid pressure to aid its sealing in static condition.

Another object is to provide in a spin extractor type of clothes washer, a seal of such character as to be less expensive to manufacture and install than prior known assemblies.

Other object and advantages of the invention will become apparent with reference to the following description and accompanying drawings.

In the drawings:
FIG. 1 is a transverse sectional view of a spin-dry washing machine, embodying the invention.
FIG. 2 is an enlarged detail sectional view of the seal and associated parts.

FIGS. 3 and 4 are fragmentary sectional views of modified forms of washing machines, showing modified forms of seals therein.

Referring to the disclosure of an exemplary type of spin-dry washing machine shown in Figs. 1 and 2, said machine includes an outer tub 11 which is firmly secured, as at 12, to a stationary tube or sleeve 13 that projects upwardly into the tub from the housing of a transmission 14 to which is connected a drive motor 15.

A spin tube 16, drivingly connected with the transmission to be rotatably driven at a high speed, extends upwardly through the stationary tube 13 and mounts firmly at its upwardly projecting end the hub 17 of a perforated spin tube 18. An agitator shaft 19 is extended upwardly from the transmission through the spin tube 16 and mounts on its upper projecting end an agitator 20.

Insofar as described, when clothes are placed in the perforated spin tube 18 and water is admitted into the outer tub 11 to the approximate level indicated, the agitator 20 is oscillatably rotated to agitate, vibrate, oscillate or otherwise disturb the clothes in an irregular motion to effect the washing of same. After washing is completed, operation of the agitator is stopped and the water is allowed to drain out of the tubs 11-18 as through a drain outlet 21. The spin tube 16 and spin tub 18 are then rotated at a high speed to extract water from the clothes, which water also drains out through the drain outlet 21.

In order to prevent water contained in the tubs from entering into the space between the stationary tube 13 and the spin tube 16, the novel seal 22 of the present invention is provided. This seal may be fabricated from rubber or other heat resistant resilient material. As best shown in Fig. 2, this seal is substantially cup-shaped and it comprises a thick body portion 23 having depending from its bottom face a resilient skirt 24. When mounted in recess 17a in hub 17, the body portion 23 is press fitted on the spin tube 16 to provide a water seal at this location. Firmness to resist unwanted expansion of the body is assured by fitting a support collar 25 therearound. This collar may or may not be bonded to the body. The skirt portion 24 of said seal is relatively thin so as to have maximum flexibility consistent with its sealing function. The inside surface of said skirt, adjacent to its lower end, is formed with a plurality of lips 24a that normally have a seating engagement with a wear ring 26 press-fitted onto the upper end of the stationary tube 13.

This seal 22 functions in the following manner. When water is present in the tubs the hydro-static fluid pressure exerts force on the outer surface of the skirt 24 to insure its seating firmly on the wear ring 26 thus preventing water from entering between the spin tube 16 and the stationary tube 13. Now, after the water has been drained from the tubs and the spin tube is rotated at a high rate of speed to extract water from the clothes, the centrifugal force exerted on the flexible skirt 24 causes same to expand thus lifting the lips 24a clear of the wear ring 26. This prevents frictional wear on the seal skirt 24 and as a consequence the useful life of the seal is greatly prolonged and no noises are generated.

In the FIG. 3 and 4 modifications like, numerals identify corresponding parts.
3

Referring now to the FIG. 3 disclosure, the spin tube 16 carries a flange 16a to which the spin tub 18a is secured. An annular seat 16b in flange 16a affords a mounting for the body 31 of a seal 32. As shown, the body 31 is press-fitted into its seat and it has a stiffening ring 33 on its inner periphery, preferably bonded thereto. The seal 32 includes a depending skirt 34 that has seating engagement normally with an upturned flange 35 on the stationary tube 11a. This flange 35 constitutes a stationary tube responding to the tube 13 of the previously described structure. Preferably, the flange or tube 35 is fabricated from stainless steel and is as by bolts 37 to the outer tub 11a. The function of this assembly is, like before, such that the pressure of water in the tubs urges the skirt 34 into tight sealing engagement with the stationary tube 35 and, when the water is drained and the spin tub 18a rotated at high speed, the skirt 34 will expand sufficiently to ride clear of the tube 35.

In the FIG. 4 disclosure, the flange or tube 35a is integral with the outer tub 11b.

In both disclosures the outer stationary tubs 11a and 11b may be mounted on or suspended from the frame of the washing machine or mounted on the transmission housing in any suitable manner.

Although I have described preferred embodiments of my invention, in considerable detail, it will be understood that the description thereof is intended to be illustrative rather than restrictive, as details of the structure may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact construction described.

I claim:

1. In an automatic clothes washing machine including an outer tub, an inner perforated spin tub including an integral spin tube, an annular flange integral with the outer tub spaced from and surrounding the spin tube, means to rotate the spin tube and spin tub connected therewith, and an annular water seal between the spin tube and said annular flange, said water seal comprising a resilient annular member including a firm body in sealing contact with the spin tube and rotatable therewith, a resilient expansible skirt integral at one end with said body and having sealing contact with the annular flange when the spin tube is idle, said skirt being expansible out of sealing fit with the annular flange by action of centrifugal force when the spin tube is rotated.

2. The structure recited in claim 1 in which the body of the water seal is reinforced to resist distortion.

3. The structure recited in claim 2 in which the reinforcement comprises a metallic ring bonded to the body.

4. The structure recited in claim 1 in which the resilient expansible skirt has a internal rib at its free end.

5. The structure recited in claim 1 in which the spin tub has an annular recess to receive the body of the resilient annular member.

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