United States Patent

[11] 3,604,029

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[21] Appl. No. **851,693**
[22] Filed **Aug. 20, 1969**
[45] Patented **Sept. 14, 1971**

[54] **METHOD AND APPARATUS FOR SEALING AND LUBRICATING A WASHING MACHINE TRANSMISSION**
3 Claims, 3 Drawing Figs.

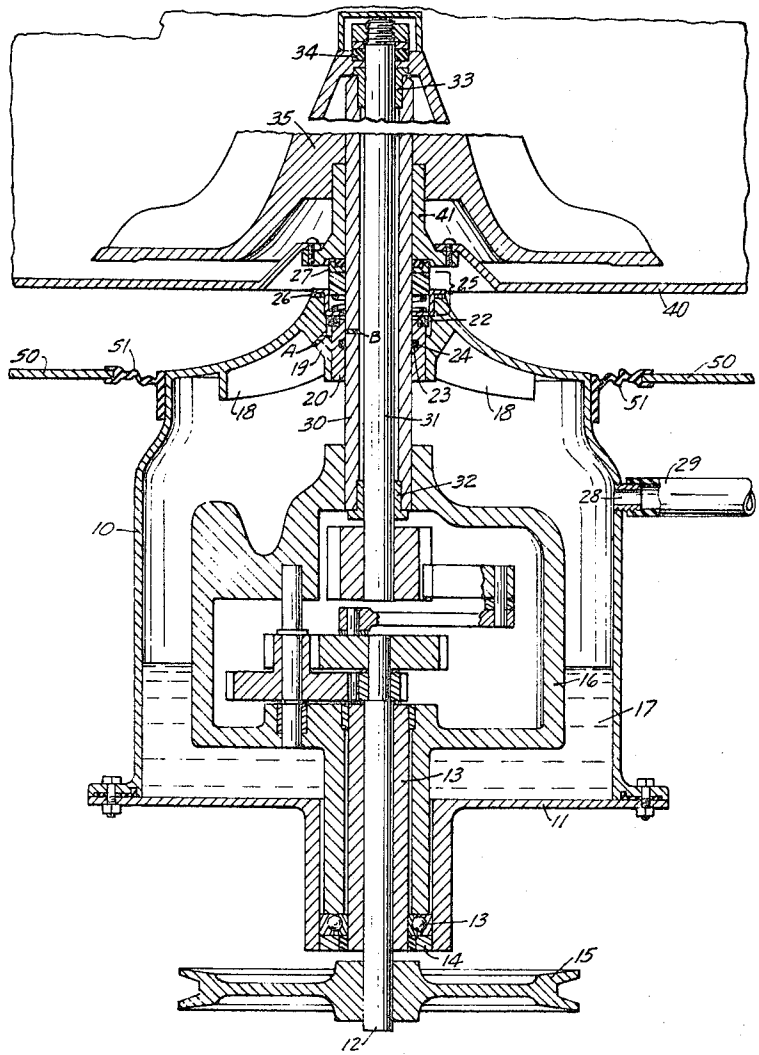
[52] **U.S. Cl.** ..... **8/159,** 68/13, 68/133, 184/6 W
[51] **Int. Cl.** **D06f 35/00,** F16j 15/54, F16n 1/00
[50] **Field of Search** ..... 68/133, 23, 23.3, 23.6, 23.7; 277/1, 187, 188; 184/1 E, 6 W; 8/159

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ABSTRACT: The normally frequent tendency of certain automatic washers to soil clothes by oil leaking from the transmission is dramatically reduced by placing a snug seal around the transmission drive tube and venting the gear case oil bath to the atmosphere.



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SHEET 1 OF 2

FIG. 1

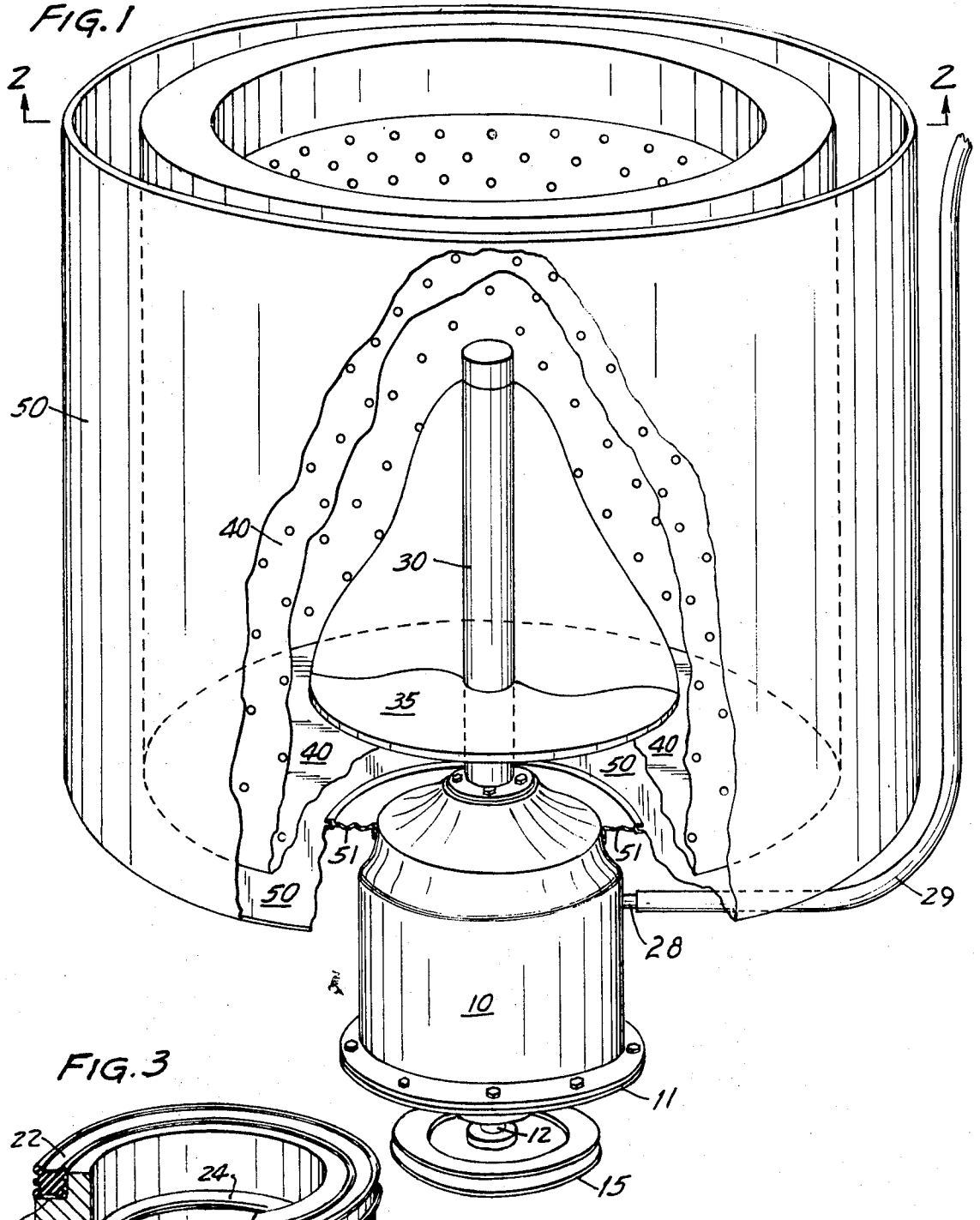
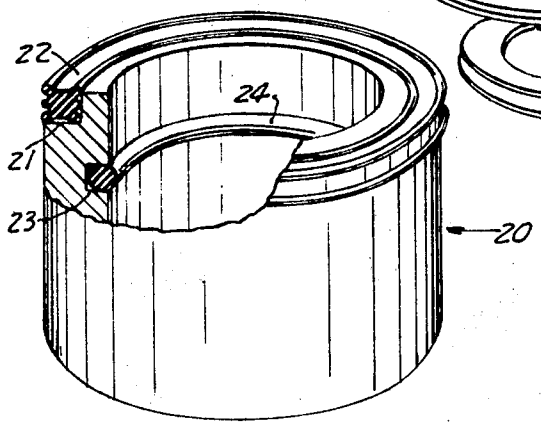


FIG. 3

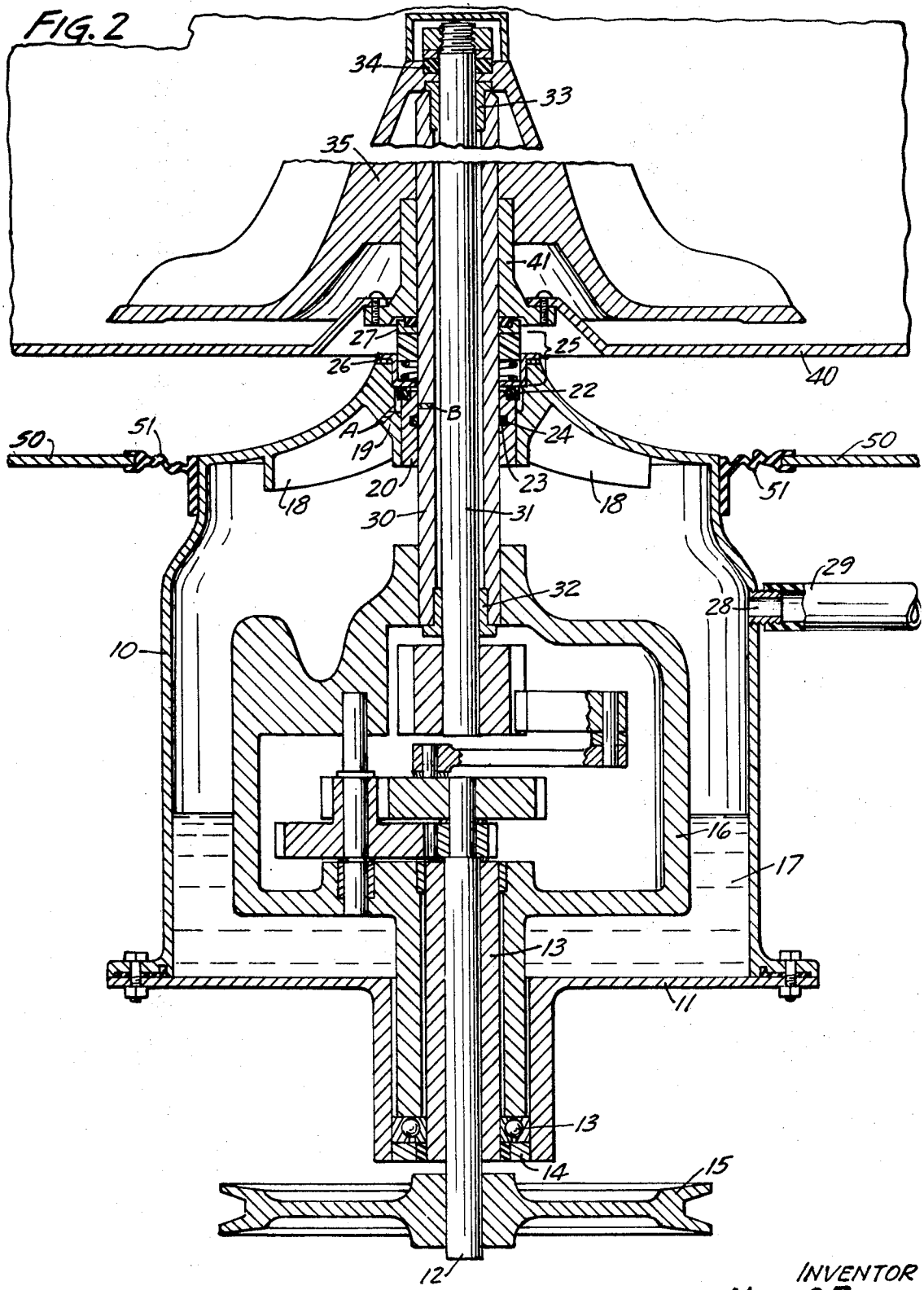


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FIG. 2



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METHOD AND APPARATUS FOR SEALING AND LUBRICATING A WASHING MACHINE TRANSMISSION

BACKGROUND OF THE INVENTION

This invention relates to washing machines and is primarily concerned with reducing the soiling of clothes by grease from the mechanism.

Virtually all automatic washing machines employ a concentric drive tube and agitator shaft, a rotatable perforate basket being fastened to the former and an agitator mounted on the latter. The basket is surrounded by a permanently mounted solid tub, to which a pump is connected. During the wash and rinse cycles, the drive tube and basket are stationary, while the agitator shaft is driven by the gears in the transmission so as to oscillate and swish the water through the clothes. In the spin cycle, the drive tube and agitator shaft function as a unit, the gears in the transmission remaining locked and the entire transmission revolving to rotate the basket at relatively high speed and centrifugally spin the water through the holes in the basket into the surrounding tub, whence it is pumped away and discarded.

It is desirable to construct an automatic washer so that it can be serviced with a minimum of difficulty; this is particularly important where several machines are placed side by side, as in large apartment houses or commercial coin-operated laundries. The most satisfactory construction for servicing is one where all important parts of the machine can be reached from the top, and machines of this type are widely used in commercial establishments. For compactness, such machines have a transmission completely enclosed in an oil-filled case comprising an inverted cup cover which extends into the central portion of the tub; the drive tube and agitator shaft pass from the transmission through a bearing and seal in the top of the cover, the seal being intended to keep the transmission oil out of the wash or rinse water and vice versa. Unfortunately, however, in a regrettably high percentage of cases, the seal fails, allowing soapy water to get into the transmission where it not only corrodes the gears but also increases pressure, emulsifies some of the oil and grease, and spews it back through the defective seal into subsequent loads of wash. A load of clothes soiled in this manner is not only annoying to a housewife but expensive to the owner of a commercial laundry.

The problem of preventing intermingling of transmission oil and wash water has long been recognized, and many complicated devices have been investigated in an attempt to solve it. Prior to the present invention, however, no satisfactory way of accomplishing this objective had been found.

SUMMARY

The present invention provides a simple but extraordinarily effective modification of automatic washing machines of the type wherein the upper portion of the transmission case extends into the tub. Machines made, or modified, in accordance with the invention can be used for extended periods of time under very adverse conditions without leaking any transmission oil into the clothes being laundered. Frequency of repair is greatly decreased, thereby making the machines more attractive to both the housewife and the owner of a commercial coin-operated laundry.

In accordance with the invention, oil pressure is minimized and leakage drastically reduced by providing the transmission case with a vent to the atmosphere, connected to an expansion tube which extends considerably higher than the top of the case and terminates inconspicuously near the top rear of the machine. To further obviate difficulty in leakage, the drive tube is provided, where it emerges from the top of the transmission case, with a positive double seal. At the same time, to further relieve any pressure which might build up, the oil level in the transmission case is maintained at about one-third the height of the case, will below the customary level.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood by referring to the accompanying drawings, in which like numbers refer to like parts in the several views and in which:

FIG. 1 is a perspective view of a portion of a washing machine incorporating the invention, with certain parts cut away and other parts shown in dashed lines for convenience in understanding;

FIG. 2 is a vertical cross-sectional view of the central part of the machine shown in FIG. 1; and

FIG. 3 is an enlarged perspective view of a bearing seal assembly made in accordance with the invention.

DESCRIPTION OF PREFERRED EMBODIMENT

The presently preferred embodiment of the invention will now be described with particular reference to the drawing.

As is shown generally in FIG. 1, transmission case cover **10** and baseplate **11** enclose a set of gears which is driven by a motor (not shown) belted to pulley **15** mounted on drive shaft **12**. Nipple **28** is fitted into the upper peripheral portion of cover **10**, with expansion tube **29** connected thereto. From the top of cover **10** emerges drive tube **30**, concentrically surrounding agitator shaft **31**, on which agitator **35** is mounted. Fixedly connected to drive tube **30** is hub **41**, to which perforate basket **40** is attached. Concentrically surrounding basket **40** is tub **50**, which is attached to the washer frame (not shown) and snugly fitted around the upper peripheral portion of case **10** through flexible rubber boot **51**. A pump assembly (not shown) pumps water into and out of tub **50** at appropriate times in the washer cycle.

As is shown more particularly in FIG. 2, drive shaft **12** passes through base plate **11** and is surrounded by spin tube bearing **13**, seal **14** preventing the escape of oil. On the upper end of drive shaft **12** is mounted one of the gears (most of which are not shown) making up the transmission and contained in gear case **16**. Oil **17** is present in the transmission case to perhaps one-third the height of cover **10** and is preferably of a "clinging" type similar to that used to lubricate hypoid gears. It should be noted that it is conventional to fill the transmission case about three-fourths full of oil.

Emerging from the top of cover **10** is drive tube **30**, concentrically surrounding agitator shaft **31** and spaced therefrom at opposite ends by lower bearing **32** and upper bearing **33**. Agitator shaft **31** extends somewhat beyond the upper end of drive tube **30**, seal **34** insuring that no oil leaks out at this point. Since this point is above the water line in the tub, however, this is ordinarily a rather minor problem.

The central top portion of transmission case cover **10** has an opening through which drive tube **30** passes, the area surrounding this opening being reinforced with fillet **19**. A multipart sealing means is positioned in and adjacent the opening to keep wash water and transmission oil out of contact with each other. Drive tube bearing seal assembly **20**, a feature of the invention, is mounted within this opening. Bearing seal assembly **20**, which is preferably made of oil-impregnated bronze, is a cylinder having a portion of the top peripheral exterior cut away to leave a right-angled shoulder **21**, in which is seated sealing ring **22**, characterized by having a plurality of continuous grooves on each face. The inner periphery of assembly **20** also is provided with channel **23**, in which rubber O-ring **24** is seated. At the top of assembly **20** is flanged spring-loaded drive tube seal assembly **25**, the flange of which is seated snugly against gasket **26**, which separates and seals the flange to the rim around the opening in case **10**. At the top of assembly **25** is sealing washer **27**, which has a carbon lower face and a rubber upper face. In use, washer **27** rotates with hub **41**, the carbon face reducing friction. Hub **41** is forced downward against washer **27**, compressing the spring in assembly **25**, seating the flange and lower face thereof and improving the seal. The grit removed from clothes, corrosive detergents, vibration and water combine to wear washer **27** and cause the intermingling of wash water and transmission oil in conventional machines. In the present invention, however,

such oil-water intermingling does not occur, even when washer 27 wears badly, or when it is deliberately damaged.

Assuming that a conventional transmission case cover 10 is being modified, there will typically be a set of curved vanes 18 at the top, one or more open conduits extending through fillet 19 to just below seal assembly 25, and one or more other open conduits extending through drive tube 30 to agitator shaft 31. In the spin cycle, rotating gear case 16 is thus intended to force oil through these conduits to insure lubrication of the drive tube bearing and agitator shaft bearing 32. For purposes of the present invention, the vanes are unnecessary and the conduits, if present, must be closed, e.g., with plugs A and B.

Bearing seal assembly 20 marks a distinct constructional change over the conventional equipment. In standard equipment, assembly 20 does not exist, a conventional bronze bushing being employed and so positioned as not to block access to the conduit extending through drive tube 30. In the conventional construction, no attempt is made to obtain a tight seal between the bushing and the lower surface of seal assembly 25.

It will be noted that in the present invention the passage of oil 17 around either the inner or outer surface of bearing seal assembly 20 is effectively blocked by, respectively, sealing ring 22 and O-ring 24. Blocking oil flow in this manner, however, tends further to increase the pressure in the transmission case during the spin cycle, especially since no open conduits remain. In order to minimize the effect of this pressure in causing failure of washer 27, the level of oil 17 in the transmission case is held to about one-third the height of transmission case cover 10. Further reducing this problem, nipple 28 is threaded into the side of cover 10 above the level of oil 17 and a tube, e.g., a flexible synthetic rubber hose 29 is connected thereto. The opposite end of the tube, which is open to the atmosphere is extended well above the transmission case, preferably terminating inconspicuously near the top rear of the washer.

In practicing this invention, it has been found desirable to fill the transmission case with an oil which does not foam and which has a viscosity corresponding to about SAE 90. It has been found that these oils containing an additive which promotes clinging to metal surfaces is extremely desirable, since this obviates any problem which might arise through draining of oil from parts which are temporarily out of contact therewith, as when the machine is started after a long period of inactivity. One oil which has been found to fulfill these criteria is Ford-Ferguson Hydraulic Oil, commercially available from Warden Oil Company, Minneapolis Minn. The conventional use of oil-impregnated bronze for constructing agitator shaft bearings 32 and 33 also minimizes the need for adding more oil to the transmission case.

What I claim is:

1. In a washing machine of the type comprising a set of transmission gears enclosed in an oil-containing case, the upper portion of said case being surrounded by the central portion of a generally cup-shaped tub, an assembly comprising an agitator shaft surrounded by a drive tube extending upward from said gears through sealing means adjacent the top of said case, a generally cup-shaped perforate basket positioned inside said tub and rigidly fastened to said drive tube, the improvement which comprises
   1. insuring that there is no open conduit leading from the top of the transmission case to the drive tube and agitator shaft,
   2. incorporating an air vent near the upper portion of said case, said vent being connected to an expansion tube which extends above the top of said case and which is open to the atmosphere, and
   3. providing, at the site where the assembly passes through the top of the case, a bearing seal assembly which is so constructed as to prevent passage of oil into the wash or rinse water and vice versa, said bearing seal assembly comprising
      a. a rigid tube having the peripheral portion adjacent one end cut away to provide a right-angled external shoulder, said tube also having a continuous circumferential channel in the interior of said tube.
      b. an elastomeric ring mounted snugly on said shoulder, said ring having a substantially rectangular cross section of dimensions such as to extend beyond both the end of said tube, the upper, lower and inner faces of said ring each having a plurality of continuous grooves to permit firm sealing on each of said four faces, and
      c. an O-ring seated in said channel to grip the drive tube snugly, whereby the normal tendency of said sealing means, upon becoming worn, to permit passage of oil along said drive assembly into said clothes basket and thus soil clothes during the washing process, is greatly reduced.

2. A method of modifying a washing machine to minimize any tendency to soil clothes by grease spotting during the washing cycle, said washing machine being of the type comprising a set of transmission gears enclosed in an oil-containing case, the upper portion of said case being surrounded by the central portion of a generally cup-shaped tub, an assembly comprising an agitator shaft surrounded by a drive tube extending upward from said gears through sealing means adjacent the top of said case, a generally cup-shaped perforate basket positioned inside said tub and rigidly fastened to said drive tube, and open conduits leading from the top of the transmission case to the drive tube and agitator shaft, said method comprising the steps of
   1. closing said conduit,
   2. incorporating an air vent near the upper portion of said case,
   3. connecting to said vent an expansion tube which extends above the top of said cover and which is open to the atmosphere, and
   4. providing, at the site where the assembly passes through the top of the case, a bearing seal assembly which is so constructed as to prevent passage of oil into the wash or rinse tube, and vice versa, said bearing seal assembly comprising
      a. a rigid tube having the peripheral portion adjacent one end cut away to provide a right-angled external shoulder, said tube also having a continuous circumferential channel in the interior of said tube.
      b. an elastomeric ring mounted snugly on said shoulder, said ring having a substantially rectangular cross section of dimensions such as to extend beyond both the end of said ring each having a plurality of continuous grooves to permit firm sealing on each of said four faces, and
      c. an O-ring seated in said channel to grip the drive tube snugly.

3. The method of claim 2 including the additional step of using a clinging oil in the transmission case, said case being only about one-third filled with said oil.