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J. W. JENSEN

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WASHING MACHINE

Filed Feb. 17, 1937

2 Sheets-Sheet 1

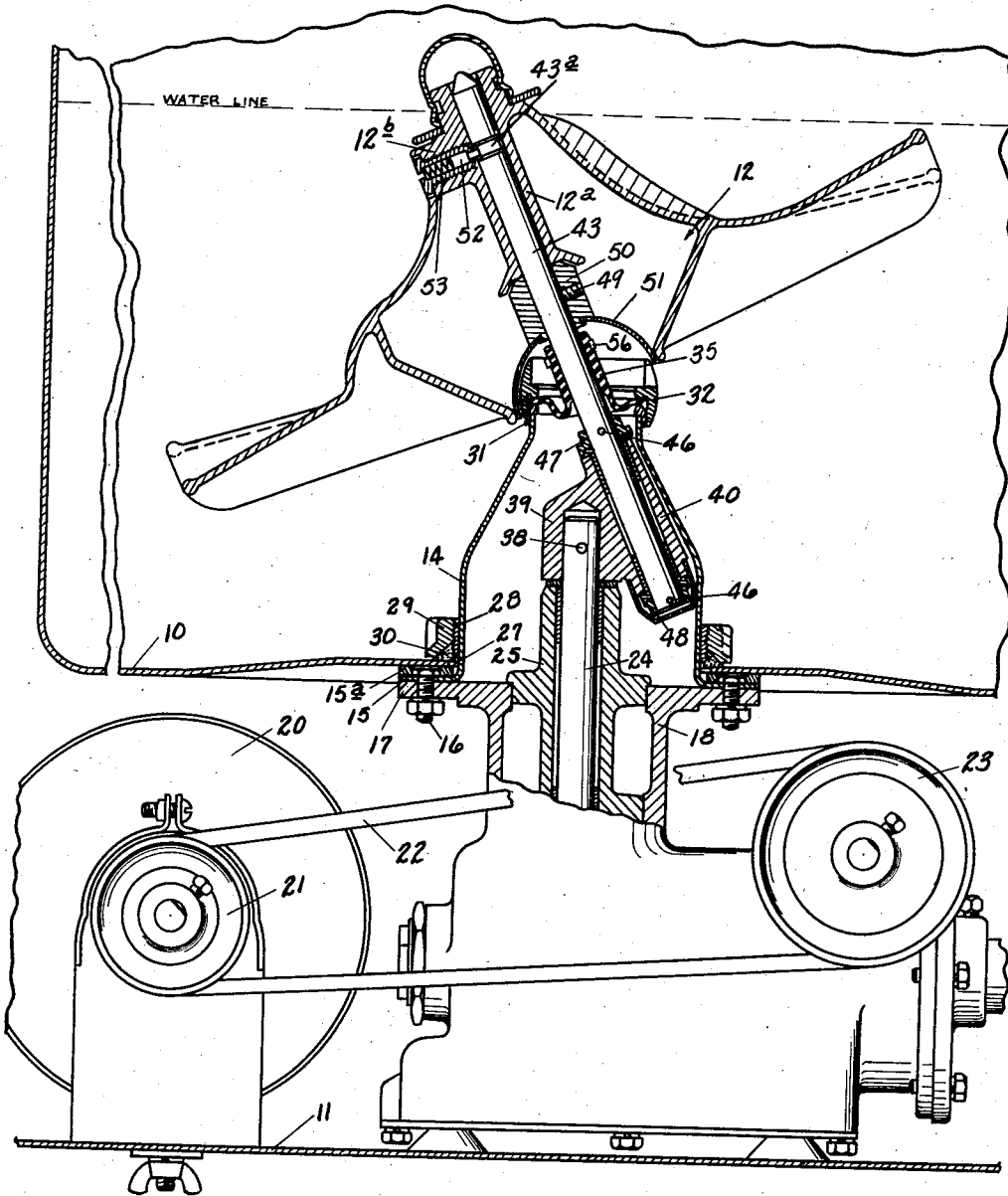


FIG. 1.

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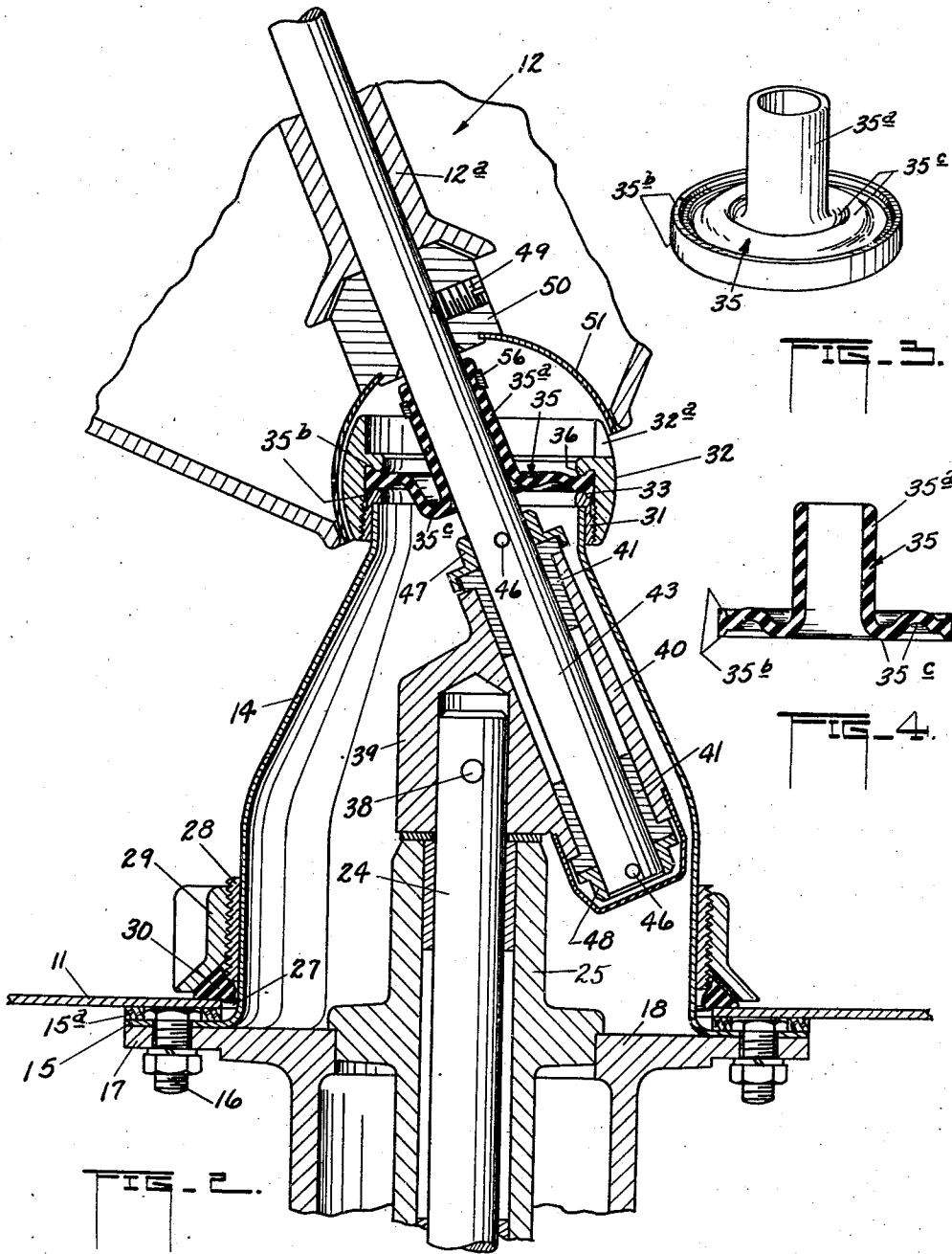
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2 Sheets-Sheet 2



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2,186,786

WASHING MACHINE

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5 Claims. (Cl. 286—29)

The present invention relates to improvements in washing machines for household use, and more particularly to machines of the type provided with an impeller or agitator member mounted in a tub for rotational movement in a direction transverse to the vertical axis of the tub, and disposed a substantial distance from the sides and bottom thereof so as to permit free circulation of the washing fluid and the clothes around and beneath the impeller member. More specifically, the present invention is directed to washing machines of the above class wherein the seal for the driving means for imparting motion to the impeller member is located below the normal level of the washing fluid contained in the tub. This invention is particularly suitable for use in constructions wherein the impeller shaft, which supports and imparts motion to the impeller member, is normally non-rotatable about its own axis and is disposed at an angle to the vertical axis of the tub and adapted to be moved in an orbit about said vertical axis.

In machines of the character above indicated, it has long been a problem to provide an efficient seal to prevent the washing fluid from entering the interior of the support or the actuating mechanism of the impeller member. Various constructions have heretofore been proposed for overcoming this difficulty, many of which are not wholly satisfactory or are prohibitive to manufacture due to increased cost of fabrication.

It is, therefore, one of the primary objects of this invention to provide a novel and improved fluid seal for the purpose above indicated which is efficient and capable of being economically embodied in a washing machine construction.

Another object is to provide an improved seal for the purpose above indicated which is composed of flexible material for accommodating orbital movement of the impeller shaft.

A further object is to provide an improved seal for the purpose above indicated, formed of flexible material, and which is of generally disc form, having its central portion snugly fitted around the impeller shaft and its outer marginal edge is firmly secured to a support, while its intermediate portion is provided with one or more annularly extending corrugations to provide an excess of material for accommodating orbital movement of the impeller shaft.

Other objects and advantages of this invention will appear in the following description taken in connection with the accompanying drawings, in which—

Fig. 1 is an enlarged vertical section through

a washing machine of the character above indicated, provided with my novel and improved form of sealing member, constituting the present invention.

Fig. 2 is an enlarged fragmentary view of the support and drive connections for the impeller member and embodying my novel form of sealing member.

Fig. 3 is a perspective view of my novel and improved form of sealing member.

Fig. 4 is an axial section through the sealing member.

In the construction shown in the drawings the reference character 10 designates a conventional form of tub having associated therewith a supporting frame 11 which, together with the tub may be understood to be rigidly connected to supporting legs, not shown, for supporting the tub in proper spaced relation to the floor. The impeller member designated at 12 is mounted above a hollow support 14, the upper portion of which is of frusto-conical form extending upwardly from the bottom of the tub. The lower portion of the support is provided with a marginal annular flange 15 disposed beneath the tub and rigidly secured by a bolt 16 to a flange 17 of the housing 18 carried on the frame 11 beneath the tub. Interposed between said flange 15 of the support and the under surface of the tub bottom is a gasket 15^a.

Carried on the frame 11 is a prime mover, herein shown in the form of an electric motor 20, provided with a driving pulley 21 which through the medium of the V-belt 22 drives a pulley 23 which may be understood to be operatively connected to suitable reversible driving mechanism enclosed within the housing 18 for transmitting rotational movement to a vertically disposed drive shaft 24 journaled in a bearing 25 associated with said housing 18. The upper portion of said drive shaft 24 protrudes upwardly above the bottom of the tub interiorly of the support 14, as seen in the drawings. It is to be understood that the mechanism enclosed within the housing 18 is of such construction as to alternately cause a definite amount of angular rotation of the shaft 24 in opposite directions, and since said mechanism does not constitute any part of the present invention it is believed that a detailed description and illustration thereof is unnecessary.

The bottom wall of the tub 10, is provided with a relatively large aperture or opening 27 for permitting the support 14 to be projected upwardly therethrough into the interior of the tub. To provide a seal for said aperture around the sup-

port 14 an annular threaded ring 28 is sweated onto the external, lower portion of the housing 14, to be disposed immediately above the bottom of the tub, and threaded on said ring is a nut 29 which engages a resilient sealing gasket 30 for tightly compressing the latter between the nut and the bottom of the tub to form a fluid-tight seal around the opening 27.

Secured to the exterior surface of the neck at the upper end of the support 14, is an annular collar 31 which is exteriorly threaded for cooperative engagement with a threaded clamping member 32. The upper end of said collar 31 is formed with an upwardly facing annular bead 33, to constitute a shoulder for supporting and embracing a flexible sealing member 35. The clamping member 32 is provided interiorly with an annular bead or shoulder 36, preferably disposed in alignment with the shoulder 33 of the collar 31 when said member is threaded onto the collar. When said clamping member 32 is tightly threaded on the collar 31 the annular shoulders 33 and 36 firmly grip therebetween the outer marginal portions of the disc-like body of the flexible sealing member 35 to form a seal for precluding the passage of washing fluid around the marginal edge of said seal member into the interior of the hollow support 14. Desirably the upper end of the clamping member 32 is formed with a plurality of openings or slots 32^a for engagement by a suitable spanner wrench for applying or removing the clamping element.

The flexible sealing member 35 desirably is formed of flexible material such as a synthetic composition commercially known as "Duprene," or other suitable materials, such as rubber. Said sealing member includes an annular body portion and a centrally disposed hub 35^a, while its marginal edge is provided with oppositely projecting annular flanges 35^b, adapted to be disposed laterally beyond the gripping shoulders 33 and 36 to insure and maintain proper positioning of the sealing member. The portion of the body intermediate the hub and the marginal edge of said member 35 is provided with one or more annularly extending corrugations 35^c, to provide an excess amount of material for permitting flexing and movement of the hub portion 35^a without placing said body under tension or strain. It has been found by extensive tests that a sealing member of the character indicated very satisfactorily serves the function intended therefor.

Mounted on the upper end of the drive shaft 24, inside of housing 14, and rigidly secured to said shaft by a pin 38, is a crank 39 formed with a laterally and angularly disposed bearing 40. Mounted in opposite ends of the bearing are bushings 41 to provide support for the lower end of an impeller shaft 43 which extends in an upwardly oblique direction with its axis at an angle to the axis of the drive shaft 24. Secured to said lower end of the impeller shaft by means of pins 46 are collars 47 and 48 disposed adjacent the outer ends of the respective bushings 41 and serve as thrust members and lock said impeller shaft against axial movement.

As may be seen in the drawings, the impeller shaft extends upwardly through the neck of the hollow cone support 14 and is snugly embraced by the centrally disposed hub 35^a of the flexible seal 35 to preclude the passage of fluid along said shaft into the interior of the support 14. And rigidly secured to said impeller shaft above said seal, by means of a set screw 49 is a block

50 which carries a semi-spherical depending skirt 51 which is dimensioned for a close fit, relatively to the lateral spherically formed external surface of the clamping member 32. Said skirt 51, serves mainly as a protective element for the sealing member 35, when the impeller 12, is removed, to preclude tampering with or injury to said flexible seal, intentionally or otherwise.

Mounted for free rotation on the upper end of the impeller shaft 43, is the impeller 12, with its central hub 12^a having journal support on the upper end of the block 50. The impeller, as shown, is of general disc-form and of substantially circular outline. Said impeller is detachably secured to said shaft by means of a spring pressed detent 52 carried by a bushing 53 threaded in a boss 12^b at the upper end of the impeller member, said detent extending into an annular groove 43^a in said impeller shaft so as to permit rotation of said impeller about said shaft. Said impeller member, as may be seen in the drawings, is spaced a substantial distance from the sides and bottom of the tub to permit free movement of the fluid and clothes around and beneath the impeller.

As above mentioned, the hub 35^a of the flexible seal is dimensioned for a relatively tight or snug fit on the impeller shaft 43 so as to provide a seal against the passage of washing fluid down along the impeller shaft interiorly of the hollow housing 14 and normally prevents rotation of said impeller shaft about its own axis. Since it is possible that the material constituting the sealing member, when immersed in relatively hot washing fluid for a substantial period of time, may tend to swell, there is a slight possibility of leakage occurring between the interior of the hub 35^a and the impeller shaft. To preclude this possibility I mount an annular ring or collar 56 around the upper end of said hub 35^a for maintaining said hub in firm and snug engagement with said shaft at all times. Because of the construction and arrangement of the driving mechanism for the impeller, said impeller shaft 43 together with the impeller move bodily in an orbit around the axis of the drive shaft 24. Such movement is thus imparted to the hub 35^a of the sealing member 35. Hence the plurality of annularly formed corrugations 35^c in the body of the flexible seal member 35 as above described, provides an excess of material for freely accommodating such orbital movement of the impeller shaft 43 without imposing tension or strain on the body of said member, while at the same time maintaining proper sealing around the impeller shaft 43.

It is to be understood that although the hub 35^a of the flexible sealing member is snugly fitted on the impeller shaft, the frictional engagement of said hub may be overcome under abnormal conditions, such as when there is a direct force acting on the impeller shaft to cause rotation thereof about its own axis. This condition may come about in the event that the impeller member becomes frictionally locked to the impeller shaft so that it is not freely rotatable thereon, and when said impeller in its normal movement in an orbital path by the rotation of the impeller member about the axis of the drive shaft 24 contacts articles in the tub which exert a reactionary force on the impeller member and thus tend to cause rotation of the impeller shaft about its own axis. Under such conditions the impeller shaft may slip and rotate a slight amount within the hub 35^a of the flexible seal

35. The impeller shaft 43 may also be rotated a slight amount in the hub 35^a during the removal of the impeller 12 from said shaft 43, without impairing the sealing effect of the hub around said impeller shaft.

For purpose of illustration I have herein shown and described a preferred embodiment of my invention, wherein the outer marginal edge of the sealing member is firmly gripped between cooperating shoulders. It will be manifest, however, that various other suitable arrangements may be employed. I do not, therefore, wish to be understood as limiting this invention to the precise form and construction herein disclosed except as it may be so limited in the appended claims.

The term "clothes" as used herein and in the claims is intended to be accorded the customary meaning in the art, namely, as including all washable fabric or sheet material, as well as wearing apparels.

I claim:

1. The combination of an upwardly extending hollow casing having its upper end terminating in a neck providing a transverse shoulder, a shaft extending in the casing and having a portion protruding through said neck, a flexible sealing member snugly fitted around the shaft and having its marginal portions extending over said shoulder, and means cooperatively engaging the neck of said casing and having an oppositely facing shoulder whereby the marginal portions of the flexible member are firmly gripped between said shoulders to seal the interior of the casing against passage of fluid through the neck thereof, said flexible member having a marginal flange disposed outwardly beyond one of said shoulders for assisting in maintaining it in position.

2. The combination of an upwardly extending hollow casing having its upper end terminating in a neck providing a transverse shoulder, a shaft extending in the casing and having a portion protruding through said neck, a flexible sealing member snugly fitted around the shaft and having its marginal portions extending over said shoulder, and means cooperatively engaging the neck of said casing and having an oppositely facing shoulder whereby the marginal portions of the flexible member are firmly gripped between said shoulders to seal the interior of the casing against passage of fluid through the neck thereof, said flexible member having oppositely extending flanges at the marginal edge thereof disposed outwardly beyond the respective shoulders,

3. The combination of an upwardly extending hollow casing having its upper end terminating in an annular neck providing a transverse annular shoulder, a shaft inclined at an angle to vertical and having its lower end mounted in the casing and its upper end extending through said neck and adapted to be revolved in an orbit about a vertical axis, a flexible seal of annular form having a centrally disposed hub snugly fitted around said shaft and having its marginal portions extending over said shoulder, the body of said seal surrounding the hub being formed with one or more annular corrugations to provide an excess of material for accommodating said orbital movement of the shaft, and means cooperatively engaging the neck of said casing and having an oppositely facing shoulder whereby the marginal portions of said flexible member are firmly gripped between said shoulders to seal the interior of the casing against passage of fluid through the neck thereof, said flexible member having a marginal flange disposed outwardly beyond said shoulder for assisting in maintaining said member in position.

4. As an article of manufacture, a seal of flexible material comprising a generally disc-shaped body having the marginal edge thereof provided with oppositely projecting annular flanges, and an up-standing hub in the center thereof.

5. The combination of an upwardly extending hollow casing having its upper end terminating in an annular neck, a shaft inclined at an angle to vertical and having its lower end mounted in the casing and its upper end extending through said neck and adapted to be revolved in an orbit about a vertical axis, said mounting and angular relation of said shaft being co-related so that the stationary point on the axis of the shaft lies in a plane adjacent the plane of the upper end of the hollow casing, a flexible sealing member having sealing engagement with said shaft and extending over the opening of the neck of the casing, the body of said sealing member surrounding said shaft being disposed in substantially the same plane as said stationary point, said body being formed with one or more annular corrugations to provide an excess of material for accommodating said orbital movement of the shaft, the outer marginal edge of said sealing member having sealing engagement with said neck of the casing, whereby to accommodate said orbital movement of the shaft and providing a seal against passage of fluid through said neck of the casing.

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