Dec. 20, 1938. A. W. MOLINARE 2,140,846

WASHING MACHINE

Filed Oct. 9, 1937 2 Sheets-Sheet 1

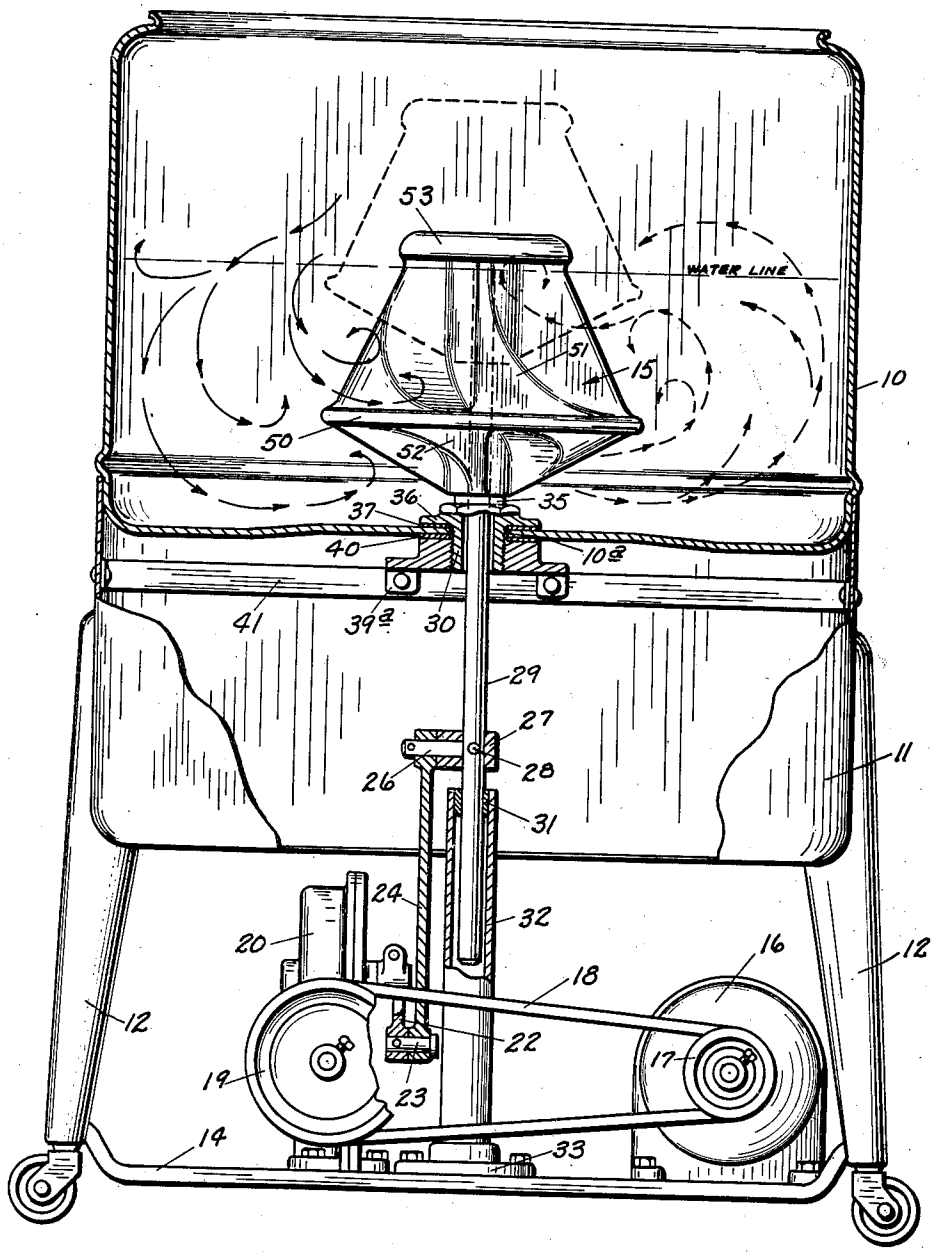


FIG. 1.

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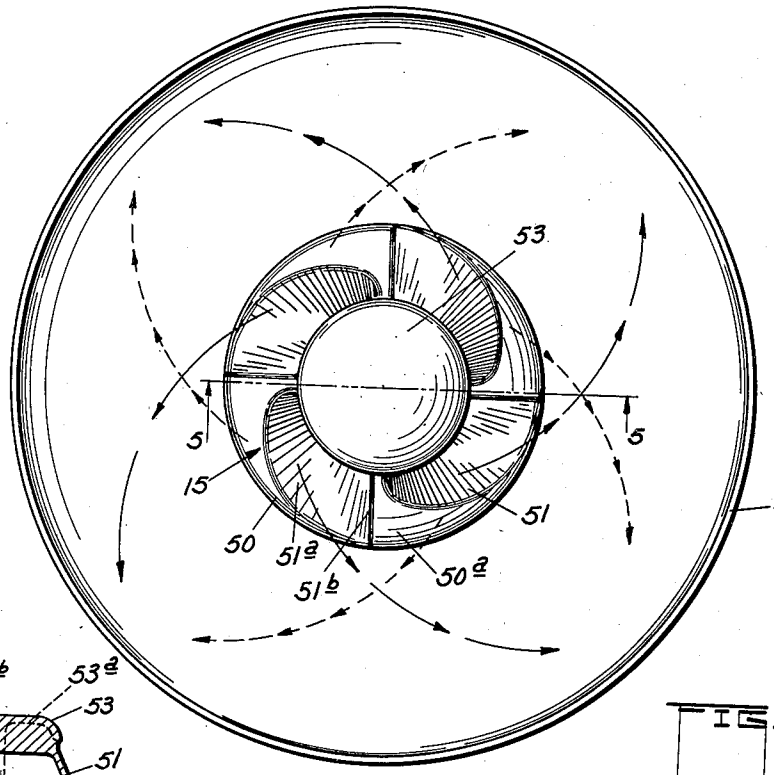


FIG. 2.

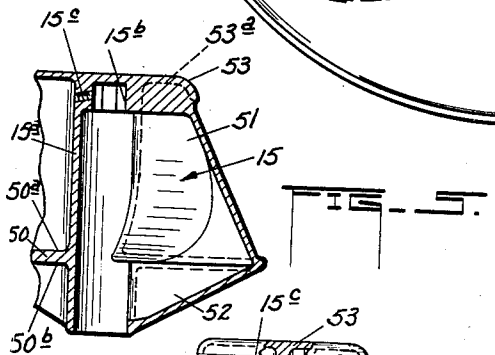


FIG. 5.

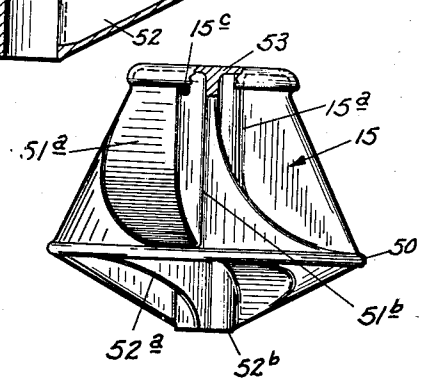


FIG. 4.

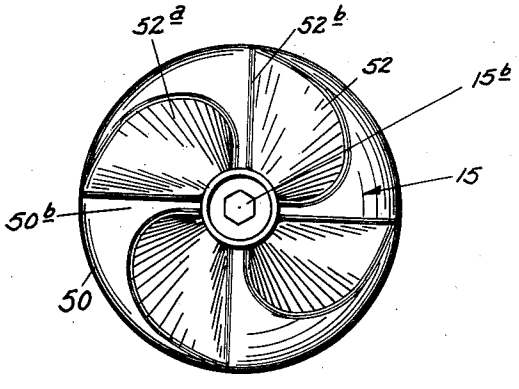


FIG. 3.

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UNITED STATES PATENT OFFICE

2,140,846

WASHING MACHINE

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Application October 9, 1937, Serial No. 168,110

8 Claims. (Cl. 68—131)

The present invention is directed to certain novel improvements in washing machines, such as used in the household, and more particularly, to machines of the type wherein the impeller member is mounted substantially centrally in the tub, and in spaced apart relation to the walls and bottom thereof, to permit free circulation of the washing fluid and clothes around and beneath the impeller member. More especially, the present invention is directed to an improved form of impeller member for use in washing machines of the type wherein the impeller member is vertically reciprocated within the tub.

One of the primary objects of this invention is to provide a novel form of impeller member which is capable of producing an improved action of the washing fluid and clothes immersed therein for performing an efficient cleansing operation upon the clothes.

Another object is to provide a novel form of impeller member of the type adapted to be vertically reciprocated in the tub of the washing machine, and which is constructed and arranged to cause the washing fluid and clothes immersed therein to move outwardly from the impeller member at an angle oblique to a radial plane, and causing the clothes to be turned over and flexed at frequent intervals by the reciprocation of the impeller member.

A further object of this invention resides in the provisoin of a novel and improved form of impeller member of the character indicated, by virtue of which the fluid and clothes during one direction of reciprocation of the impeller member are caused to move outwardly at an angle oblique to a radial plane, and during the opposite direction of reciprocation of the impeller member, the fluid and clothes are caused to move outwardly at an angle oblique to a radial plane, in a generally opposite direction to the above mentioned movement caused by the other direction of reciprocation of the impeller member.

It is also an object of the present invention to provide a novel and improved form of impeller member of the character indicated, which causes frequent turning, rolling and flexing of the clothes for performing an efficient cleansing operation thereon, and which does not cause excessive beating or wear and tear upon the clothes.

Still another object resides in the provision of an improved form of vertically reciprocating impeller member, by virtue of which the fluid and clothes are, during alternate directions of reciprocatory movement of the impeller, imparted reversible circulatory movement around the impeller member; said circulatory movement being greater in one direction than in the other.

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

Fig. 1 is a view, part in elevation, part in section, of a washing machine provided with the novel form of impeller member, embodying the present invention.

Fig. 2 is a top plan view of the tub of the washing machine, showing my novel form of impeller member.

Fig. 3 is a bottom plan view of the impeller member.

Fig. 4 is a view of the impeller member in side elevation, part in section.

Fig. 5 is a fragmentary vertical sectional view through the impeller member, taken as indicated at line 5—5 on Fig. 2.

In the illustrated embodiment of my invention, the washing machine comprises an upwardly open tub 10, herein shown as of circular form, provided with a depending skirt 11, to which is rigidly secured a plurality of depending legs 12 for supporting the tub in proper spaced relation to the floor. The lower ends of the legs are connected together and braced by a frame 14, which serves as a reinforcing structure, and in addition, provides support for suitable driving mechanism for my novel form of impeller member which is hereinafter designated generally at 15, and which is disposed centrally within the tub 10.

The driving mechanism for the impeller member 15 comprises an electric motor 16, provided with a driving pulley 17, which through the medium of a belt 18 drives a pulley 19. It is to be understood that the pulley 19 is connected in a conventional manner to a worm gear speed reducer mechanism of conventional design, enclosed within the housing 20. The worm gear (not shown) may be understood to be mounted on a horizontal shaft, and mounted on the outer end of said shaft is a crank arm 22. Pivotally connected by a pin 23 to the outer end of the crank arm, is a pitman 24, which extends in an upwardly direction, having its upper end journaled on a pin 26, carried in a block 27, rigidly secured by a pin 28 to a vertically reciprocating impeller shaft 29, the upper end of which protrudes upwardly through the bottom of the tub 10, and on which is mounted the impeller member 15. It will now be apparent that by virtue of the drive mechanism described, the impeller shaft is imparted continuous vertically reciprocating move-

ment, while the motor 16 is in operation, and it will also be manifest that the drive mechanism herein disclosed may be arranged as desired for obtaining any suitable number of reciprocations of said shaft 29 and impeller member 15 in a predetermined interval of time.

As may be seen in the drawings, the impeller shaft 29 extends through the bottom of the tub through an opening 10a, while its lower end is reciprocally guided in a bearing 31, disposed in the upper end of an upstanding tubular standard 32, which is secured by means of a fitting 33 at its lower end to the frame 14.

Surrounding the upper portion of the impeller shaft 29, which protrudes into the tub, is an upstanding tubular standard 35, the lower of which is formed with a flange 36, forming a transverse shoulder adapted to be seated tightly against the bottom of the tub, surrounding the opening 10a, with a gasket 37 interposed between said flange and the bottom of the tub. Said flange portion 36 includes a depending externally threaded portion 38, projecting downwardly through the opening 10a, below the tub, and threaded into a block 39, the upper end of which forms a transverse shoulder for tightly seating against the under surface of the bottom of the tub, surrounding the aperture 10a, with a gasket 40, interposed therebetween. The bottom of the block 39 is formed with depending ears 39a, rigidly secured to a cross member 41, which in turn is secured to the inner wall of the skirt 11. It will now be apparent that when the lower end of the tubular standard 35 is tightly threaded into the block 39, with the gasket members 37 and 40 interposed therebetween, a fluid-tight seal is formed around the opening 10a in the bottom of the tub.

It is to be understood that the tubular standard 35 projects upwardly into the interior of the tubular body portion 15a of the impeller member a substantial distance, preferably above the normal level of water in the tub, so as to avoid the necessity of a water seal. It is also to be understood that the upper end of the impeller shaft 29 is provided with a suitable head or block (not shown) for engaging in a socket 15b formed in the upper end of the tubular body portion 15a of the impeller member, and the impeller member is rigidly secured to said block by means of a set screw 15c.

The impeller member, designated generally at 15, preferably is formed as a casting and includes a main transversely extending circular body portion 50 of substantially circular outline. Said body portion, as may be seen in the drawings, is formed with upper and lower surfaces 50a and 50b, on each of which are integrally formed a set of vanes 51 and 52, respectively, extending above and below the body portion 50 and connected to the tubular body portion 15a. These respective sets of vanes are circumferentially spaced apart, preferably equal distances, and as herein shown in each instance are four in number, with the vanes of one set vertically aligned with the vanes of the other set, but manifestly, this arrangement may be varied if desired. As may be seen in the drawings, the upper set of vanes 51 are of considerably greater vertical extent than the lower set of vanes 52. A corresponding set of faces of the upper set of vanes, as indicated, at 51a, are sloped or curved at an angle to vertical, while their opposite faces 51b lie substantially in vertical planes, and are substantially flat surfaces. The bottom set of vanes 52 are disposed in opposed relation to the upper set of vanes 51, and have a set of corresponding faces, designated at 52a, sloped or curved at an angle to vertical, in a direction opposite to the faces 51a of the upper vanes. The faces 52b of said lower vanes are substantially flat, and lie substantially in vertical planes.

It will now be apparent that the sloping or inclined faces of the respective sets of vanes, being disposed in opposite relation, will during opposite reciprocations of the impeller member, cause opposite actions upon the washing fluid and clothes immersed therein. In other words, during one direction of movement of the impeller member, the washing fluid and clothes will be projected in an outwardly direction at an angle oblique to a radial plane, and causing circulatory movement of the body of washing fluid and clothes, and during the opposite reciprocation of the impeller member, the washing fluid and clothes are caused to move in an opposite general circulatory direction. However, due to the fact that the lower set of vanes, designated at 52, are of substantially less vertical extent than the upper set of vanes 51, the amount of action on the washing fluid and clothes by said lower set of vanes will be materially less than the action caused by the upper set of vanes 51. By virtue of this differential, it will be apparent that during continuous reciprocatory movement of the impeller member, the body of clothes will move first in a circulatory path in one direction, and will then be returned in the opposite direction a lesser amount so that there will be a gradual advance of the clothes in a circulatory path around the tub in a direction corresponding to the direction of movement caused by the action of the upper set of vanes 51.

The upper end of the impeller member is formed with a substantially transversely extending head 53 the under portion of which is formed with an annular recess, as indicated at 53a, for the purpose of deflecting currents of the washing fluid in a downward direction to eliminate the splash of the fluid during the reciprocation of the impeller member.

For purpose of illustration, I have herein diagrammatically shown in Figs. 1 and 2, by full line arrows, the theoretical path of travel of the washing fluid and clothes during the up-stroke of the impeller member, while the arrows indicated by dotted lines in these respective views indicate the theoretical path of travel of the washing fluid and clothes during the down stroke of the impeller member. By virtue of the construction embodying this invention, it will be apparent that during the up-stroke of the impeller member 15, the washing fluid and clothes are moved in a multiplicity of directions. The body of fluid and clothes at the upper portion of the tub are moved outwardly, and downwardly, and then inwardly and upwardly, which movements are combined with and modified by the non-radial, reversible circulatory movements imparted to the washing fluid and clothes by the sloping surfaces 51a of the upper set of vanes 51. Upon the down-stroke of the impeller member the washing fluid and clothes at the upper portion of the tub are caused to move inwardly toward the center of the tub, then in a downwardly direction, and thence outwardly over the bottom portion of the tub, and again in an upwardly direction to complete a circulatory path of movement in a theoretical vertical plane, which is modified by the circulatory movements as above

described, caused by the sloping surfaces 52ª of the lower set of vanes 52. Such action of the fluid and clothes results in frequent rolling, turning and flexing of the clothes to perform an efficient cleansing operation thereon. Moreover, the action, although vigorous, is gentle on the clothes and does not impose severe strains or abrading action on the fabric.

It is to be understood that the term "clothes" used herein and in the claims is to be accorded the general meaning in the art, namely, as including any washable fabric or sheet material in addition to wearing apparel.

Although I have herein shown and described a preferred embodiment of my invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise embodiment herein disclosed, except as it may be so limited by the appended claims.

I claim:

1. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

2. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, one set of vanes being of less vertical extent than the other set, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

3. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, the last mentioned set of vanes being of less vertical extent than the first mentioned set of vanes, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

4. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, the opposite faces of one set of vanes lying substantially in vertical planes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

5. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of said sets of vanes lying substantially in vertical planes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the

washing fluid and clothes to move outwardly in an opposite non-radial direction.

6. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, one set of vanes being of less vertical extent than the other set, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, the opposite faces of said sets of vanes lying substantially in vertical planes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

7. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, and a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, the last mentioned set of vanes being of less vertical extent than the other set, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, the opposite faces of said sets of vanes lying substantially in vertical planes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

8. In a washing machine, the combination with a tub adapted to contain washing fluid and clothes to be washed, and a vertically reciprocating impeller shaft extending upwardly through the bottom of the tub; of an impeller member mounted on said shaft, within the tub, said member comprising a body portion of substantial area extending transversely of the axis of the tub, a set of circumferentially spaced apart vertically disposed vanes extending upwardly from said body, a second set of circumferentially spaced apart vertically disposed vanes extending downwardly from said body, and a transversely extending head spaced axially above said body portion and said first mentioned set of vanes, corresponding faces of one set of vanes being disposed at an angle oblique to vertical, and corresponding faces of the other set of vanes being disposed at an angle oblique to vertical in opposite relation to the oblique faces of the first set of vanes, whereby reciprocation of said impeller in one direction causes the washing fluid and clothes to move outwardly from the impeller in a path at an angle to a radial plane, and reciprocation of the impeller in the other direction causes the washing fluid and clothes to move outwardly in an opposite non-radial direction.

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