March 5, 1940. C. K. SKINNER 2,192,758

WASHING MACHINE

Filed Oct. 24, 1936 2 Sheets-Sheet 1

Fig. 1.

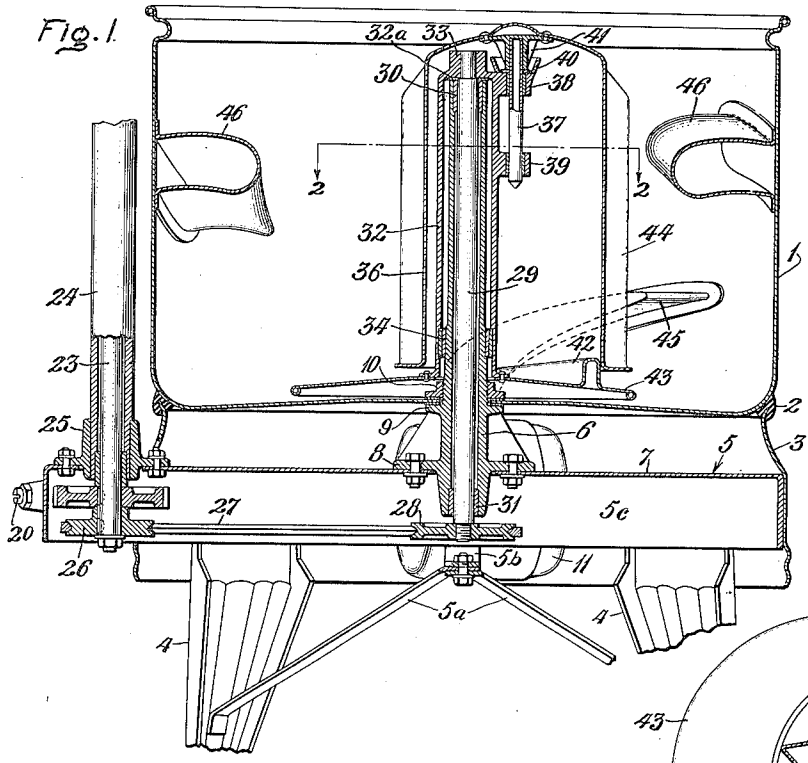


Fig. 2.

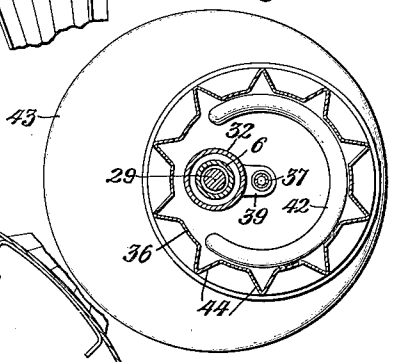
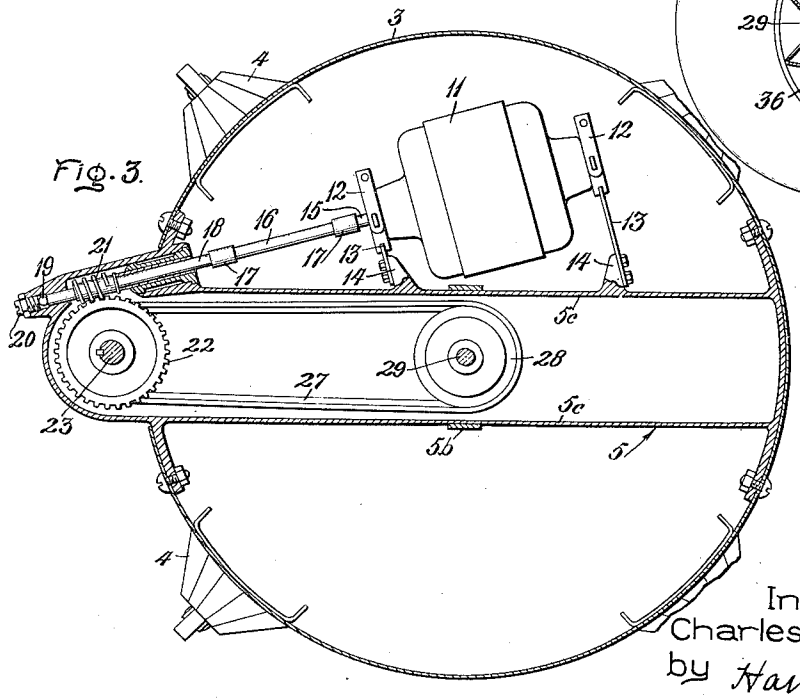


Fig. 3.



Inventor:
Charles K. Skinner,
by Harry E. Dunham
His Attorney.

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Fig. 4.

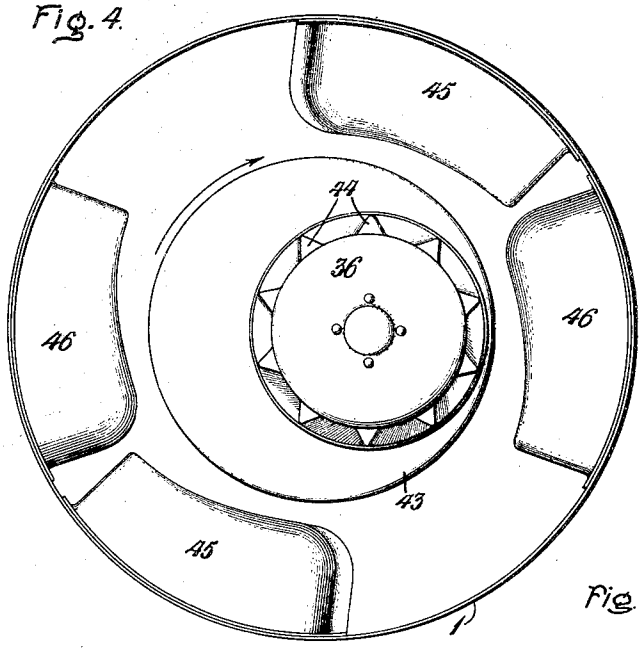


Fig. 6.

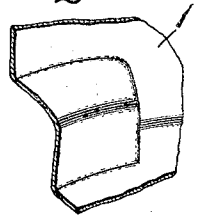


Fig. 7.

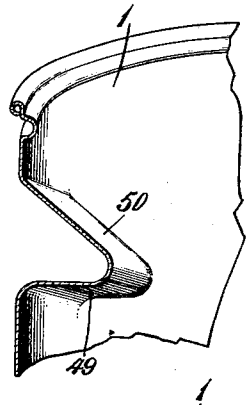


Fig. 5.

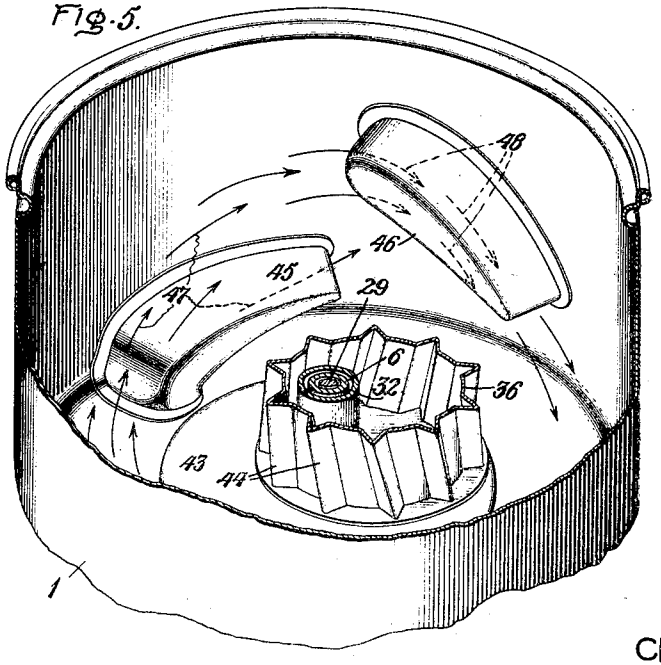
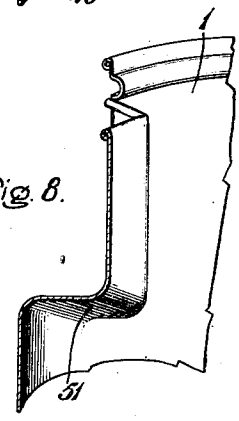


Fig. 8.



Inventor:
Charles K. Skinner,
by Harry E. Dunham
His Attorney.

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UNITED STATES PATENT OFFICE

2,192,758

WASHING MACHINE

Charles K. Skinner, Southport, Conn., assignor to General Electric Company, a corporation of New York

Application October 24, 1936, Serial No. 107,417

18 Claims. (Cl. 68—28)

The present invention relates to washing machines of the type in which the washing is effected by an agitating member which is moved orbitally in the tub.

The object of my invention is to provide an improved construction and arrangement in washing machines of this type, and particularly to provide a construction in which the clothes are given a roll-over movement changing the distribution of the clothes so that all parts of the clothes are subjected to the washing action of the agitating member.

In the accompanying drawings, Fig. 1 is a sectional side elevation of a washing machine embodying my invention; Fig. 2 is a top plan view of the agitating member and the driving arrangement therefor in section on line 2—2 of Fig. 1; Fig. 3 is a top plan view in section through the driving mechanism of the washing machine; Fig. 4 is a top plan view of the washing machine; Fig. 5 is a perspective view of the washing machine, partly in section; Fig. 6 is a fragmentary sectional view of the bottom of the tub showing a construction in which the bottom deflecting vane is formed integrally from the side and bottom walls of the tub; Fig. 7 is a sectional view showing a construction in which the top deflecting vane is formed integrally from the side walls of the tub; and Fig. 8 is a sectional view showing a modified construction in which the top deflecting vane is formed integrally from the side walls of the tub.

Referring to the drawings, the washing machine has a sheet metal tub 1 peripherally supported at its lower end on a rubber bead 2 on the upper edge of a skirt 3 to which are attached supporting legs 4. A channel-shaped housing 5, supporting the driving mechanism for the washing machine, extends diametrically across the skirt and is secured at each end thereto. The supporting legs 4 are braced by struts 5a extending from the inside of each of the legs to a strap 5b secured across the flanges 5c of the housing 5.

A tubular post 6 is secured to the web 7 of the housing 5, for example, by bolts extending through a flange 8 on the post. The post 6 projects vertically through a central opening in the bottom of the tub, its upper end extending above the normal water level in the tub. The bottom wall of the tub rests on a flange 9 on the post 6 and is clamped thereto by a nut 10 threaded on the post. When the nut 10 is tightened the bottom of the tub is wedged within the skirt 3 against the bead 2, thereby stiffening the upper end of the skirt.

The washing machine is driven by an electric motor 11 clamped at each end to supports 12 on brackets 13 which are secured to bosses 14 on one of the flanges 5c. The motor shaft 15 is connected through an intermediate shaft 16 and flexible couplings 17 to a worm shaft 18 journalled in the housing 5. The end thrust of the worm shaft 18 is taken by a ball 19, which is adjusted by means of a plug 20 threaded into the housing. On the shaft 18 is a worm 21 which meshes with a worm wheel 22 keyed on a vertical shaft 23. The shaft 23 extends through and is journalled in a tubular post 24, the upper end of which (not shown) is adapted to support a wringer. The wringer post 24 is carried on the housing 5 by means of a sleeve 25 which is bolted to the top of the housing. On the lower end of the shaft 23 is keyed a pulley 26 over which runs a belt 27 for driving a pulley 28 fixed on the lower end of shaft 29. The shaft 29 is journalled in the tubular post 6 by means of upper and lower sleeve bearings 30 and 31. The shaft 29 projects above the upper end of the post 6 and the projecting end is fixed to the hub 33 of a sleeve 32 which depends around the post 6. The shaft 29 is supported by means of a thrust washer 32a arranged between the hub 33 and the upper end of the post 6. The lower end of the sleeve 32 is guided by a bearing 34 fixed on the post 6.

The washing action is effected by means of an agitating member 36 which is rotatably carried on the sleeve 32 by means of a pin 37 which extends through bearings in arms 38 and 39 projecting from the sleeve. The agitating member, which may have any desired shape, is shown as a cylindrical roller. The agitating member 36 is supported by a thrust washer 40 arranged between the arm 38 and a boss 41 on the agitating member. The lower end of the agitating member fits over a bead or shoulder 42 on a disk 43 which is secured to the lower end of the sleeve 32. The agitating member is eccentrically located with respect to the shaft 29 so that as the shaft 29 is rotated, the agitating member is moved orbitally about the shaft. This movement of the agitating member causes the clothes to be squeezed between it and the sides of the tub and also causes the clothes to have a relatively slow rotational or swirling movement around the tub in the same direction as the rotation of the shaft 29. The sides of the agitating member are provided with spiral ribs 44 which increase the rubbing action between it and the clothes. Due to the spiralling, the ribs also tend to move the

clothes vertically along the agitating member. Since other clothes are drawn in to take the place of the clothes which are moved by the ribs, the ribs are helpful in producing a turnover of the clothes which results in more uniform washing. Since the agitating member is free to turn, the friction between it and the clothes holds it relatively stationary during its orbital movement.

It is important that the friction in the mounting for the agitating member be kept at a minimum so that the agitating member can turn freely. This decreases the swirling of the liquid and clothes.

The disk **43** keeps the clothes from being drawn under the lower edges of the agitating member. This is partly due to the bead **42** which fits loosely inside of the agitating member and partly to the downward inclination of the disk which causes the clothes to slide radially outward away from the agitating member.

In order to increase the uniformity of the washing action two sets of vanes are provided projecting from the side walls of the tub. The lower vanes **45** are inclined upwardly from the bottom of the tub with respect to the direction of rotation of the shaft **29**. The upper vanes **46** are inclined downwardly toward the bottom of the tub. In the operation of the machine the clothes are given a rotational movement around the tub which is in the same direction as the rotation of the shaft **29**, although considerably slower. This rotational movement is assisted by the friction between the clothes and the continuously rotating disk **43**. The vanes **45** and **46** utilize this rotational movement of the clothes for the purpose of giving the clothes a roll-over movement which will continuously change the distribution of the clothes in the tub so that all parts of the clothes will be subjected to the washing action. The action of these vanes is shown diagrammatically in Fig. 5. As shown in this figure, the vanes **45** deflect the clothes upwardly from the bottom of the tub in the direction generally shown by arrows **47**. There are also upward currents on the under side of the vanes **45** which carry the clothes upwards. These upwardly deflected clothes strike against the under side of the vanes **46** and are deflected downwardly toward the bottom of the tub as shown by the arrows **48**. The vanes **45** and **46**, therefore, cause the clothes to be moved from one level to another level, producing a roll-over movement of the clothes which changes the distribution of the clothes in the tub so that uniform washing action is secured. The roll-over movement can be described, roughly, as about a horizontal radial axis which is continually moving around the tub. Some washing is also accomplished by the rubbing of the clothes against the upper and lower surfaces of the vanes **45** and against the lower surfaces of the vanes **46**.

From another aspect, the vanes **46** have a "combing" action on the clothes preventing tangling or knotting. The mass of clothes on striking the leading ends of the vanes is deflected on either side. Slight tangling of the clothes is thereby straightened.

Figs. 6, 7, and 8 show constructions in which the vanes are formed integrally with the walls of a sheet metal tub. In the construction shown in Fig. 6, the lower vane is formed by a die which draws material inward from the side wall of the tub and upward from the bottom wall of the tub. There is sufficient material so that the metal can flow during the drawing operation to form the vane. When the vane is formed in this manner there is no undersurface, thus avoiding a reentrant portion beneath the vane which would be difficult to clean. From the standpoint of the operation of the machine, a vane formed in this manner is satisfactory since the upper surface of the vane is the important surface.

Fig. 7 shows an arrangement for forming the upper vane. In this construction the vane is formed by a die which draws material inward from the side walls of the tub. The lower surface **49** is substantially the same as the lower surface of the vane **46**. The upper surface **50** is inclined toward the side walls of the tub. The purpose of this inclination is to provide sufficient material so that the material can flow under the operation of the forming die. The inclined surface **50** does not affect the operation of the washing machine since it is a relatively inactive surface.

Fig. 8 shows another construction for forming the upper vane. In this construction the entire side wall of the tub above the lower surface **51** of the vane is drawn inward by the forming die. This construction has the disadvantage that the rim of the tub is not circular but it is satisfactory from the washing standpoint.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine having a tub, an agitating member in the tub, means for moving said agitating member orbitally in the tub whereby the clothes are squeezed between the agitating member and the sides of the tub and the clothes are given a relatively slow rotational movement around the tub, and means including stationary vanes having a radial dimension of the order of the radius of the agitating member for effecting movement of the rotating clothes at one level toward another level whereby the clothes are given a roll-over movement about a horizontal axis said vanes extending circumferentially around the tub and having leading ends presented to the rotating mass of clothes whereby the vanes have a combing action thereon preventing tangling.

2. In a washing machine having a tub, a vertical shaft in the tub, an agitating member in the tub, eccentric means on the shaft rotatably carrying said agitating member, means for rotating said shaft whereby said agitating member is given an orbital movement in the tub squeezing the clothes between it and the sides of the tub and giving the clothes a relatively slow rotational movement around the tub, and a stationary vane having a radial dimension of the order of the eccentricity of the eccentric means said vane extending circumferentially around the tub and having a leading end presented to the rotating mass of clothes whereby the vane has a combing action thereon preventing tangling.

3. In a washing machine having a tub, a vertical shaft in the tub, an agitating member in the tub, eccentric means on the shaft rotatably carrying said agitating member, means for rotating said shaft whereby said agitating member is given an orbital movement in the tub squeezing the clothes between it and the sides of the tub and giving the clothes a relatively slow rotational movement around the tub, and a stationary vane having a radial dimension of the order of the eccentricity of the eccentric means inclined downwardly toward the bottom of the tub for deflecting the rotating clothes toward

the bottom of the tub whereby the clothes are given a roll-over movement, said vane extending circumferentially around the tub and having a leading end presented to the rotating mass of clothes whereby the vane has a combing action thereon preventing tangling.

4. In a washing machine having a tub, a vertical shaft in the tub, an agitating member in the tub, eccentric means on the shaft rotatably carrying said agitating member, means for rotating said shaft whereby said agitating member is given an orbital movement in the tub squeezing the clothes between it and the sides of the tub and giving the clothes a relatively slow rotational movement around the tub, a lower stationary vane inclined upwardly from the bottom of the tub in the direction of rotation of the clothes for deflecting the clothes upwardly, and an upper stationary vane inclined downwardly with respect to the first mentioned vane toward the bottom of the tub for deflecting downwardly said upwardly deflected clothes whereby the clothes are given a roll-over movement.

5. In a washing machine of the type having a rotatable agitating member therein, a sheet metal tub having a portion extending in from the side and bottom walls, the upper surface thereof providing a vane inclined circumferentially upward from the bottom of the tub which is substantially free of reentrant portions beneath its upper surface.

6. In a washing machine of the type having a rotatable agitating member therein, a sheet metal tub having a portion extending in from its side walls having its lower surface extending circumferentially around the tub and radially inward a distance of the order of the radius of the agitating member and having its upper surface inclined radially toward the top of the tub, said vane extending circumferentially around the tub and having a leading end presented to the rotating mass of clothes whereby the vane has a combing action thereon preventing tangling.

7. In a washing machine of the type having a rotatable agitating member therein, a sheet metal tub having a portion of its side walls extending inward, the lower surface thereof providing a circumferentially extending vane extending radially inward a distance of the order of the radius of the agitating member, said vane having a leading end presented to the rotating mass of clothes whereby it serves to comb and untangle the clothes.

8. In a washing machine having a tub, a tubular post extending through the bottom of the tub, a shaft extending through said post, a member connected to the upper end of said shaft having a sleeve depending around said post and having a disk at its lower end, said sleeve and disk being restrained from rotation relative to said shaft, eccentric means on said member, an agitating member rotatably carried on said eccentric means, means for rotating said shaft whereby said agitating member is given an orbital movement about the tub, squeezing the clothes between it and the sides of the tub, and a shoulder on said disk projecting within the agitating member and providing a bearing therefor.

9. In a washing machine having a tub, a shaft extending through the bottom of the tub, eccentric means connected to said shaft for rotation thereby, an agitating member rotatably carried on said eccentric means, a disk adjacent the bottom of the tub connected to the shaft, the upper surface of the disk being adjacent the lower edges of the agitator and the periphery of the disk projecting beyond the lower edges of the agitator whereby the upper surface of the disk is in contact with the liquid around the agitator, and means for rotating said shaft whereby said disk and eccentric means are rotated and the agitating member is given an orbital movement about the tub squeezing the clothes between it and the sides of the tub.

10. In a washing machine having a tub, an agitator in the tub, means for moving the agitator orbitally in the tub squeezing the clothes between the agitator and the sides of the tub, and inclined ribs on the agitator whereby the clothes are moved vertically along the surface of the agitator during the operation of the agitator.

11. In a washing machine having a tub, an agitator having its lower end at the bottom of the tub, a disk rotatable relative to and between the bottom of the tub and the lower end of the agitator, the upper surface of the disk being adjacent the lower edges of the agitator and the periphery of the disk projecting beyond the lower edges of the agitator whereby the upper surface of the disk is in contact with the liquid around the agitator, means for moving the agitator orbitally in the tub, and means for rotating the disk relative to the agitator and to the tub.

12. In a washing machine having a tub, a disk adjacent the bottom of and rotatable relative to the tub, an agitator eccentric to the axis of rotation of the disk having its lower end adjacent the upper surface of the disk, the periphery of the disk projecting radially beyond the lower end of the agitator whereby the upper surface of the disk is in contact with the liquid around the agitator, a shoulder on the disk projecting within the agitator adjacent its inner surface, and means for rotating the disk relative to the agitator and to the tub.

13. In a washing machine having a tub, a rotatable agitator having its lower end adjacent the bottom of the tub, a disk flaring downward and outward from the agitator toward the bottom of the tub, the axis of rotation of the agitator being eccentric to the axis of rotation of the disk, means for rotating the agitator, and means for rotating the disk relative to the agitator and to the tub.

14. In a washing machine having a tub, a rotatable agitator having its lower end adjacent the bottom of the tub, a rotatable disk having a portion within its periphery adjacent the lower end of the agitator, the axis of rotation of the agitator being eccentric to the axis of rotation of the disk, a portion of the disk adjacent and extending upward above the level of the lower end of the agitator and preventing ingress of clothes between the agitator and disk, means for rotating the agitator, and means for rotating the disk relative to the agitator and to the tub.

15. In a washing machine having a tub, eccentric means rotatable in the tub and having a disk rotatable therewith adjacent the bottom of the tub, an agitator rotatably carried on the eccentric means and having its lower end within the periphery of and adjacent the disk whereby the upper surface of the disk is in contact with the liquid around the agitator, and means for rotating the eccentric means whereby the agitator is moved orbitally in the tub.

16. In a washing machine having a tub, eccentric means rotatable in the tub and having a disk

rotatable therewith adjacent the bottom of the tub, an agitator rotatably carried on the eccentric means and having its lower end within the periphery of and adjacent the disk, a shoulder on the disk projecting within the agitator adjacent its inner surface and preventing ingress of clothes between the agitator and disk, and means for rotating the eccentric means whereby the agitator is moved orbitally in the tub.

17. In a washing machine having a tub, an agitator in the tub and movable relative thereto for agitating the liquid and clothes and producing a unidirectional circulation of the clothes in a closed path, and a stationary vane projecting from the walls of the tub into said closed path a distance of the order of the radius of the agitator and having a leading end presented to circulating clothes and having a combing action thereon preventing tangling.

18. In a washing machine having a tub, an agitator in the tub rotatable on a vertical axis, means for rotating the agitator for agitating the liquid and clothes and producing a unidirectional circulation of the clothes around the tub, and a stationary vane on the side walls of the tub extending circumferentially around the tub for combing the circulating clothes to prevent tangling, said vane having a radial dimension of the order of the radius of the agitator and having a leading end presented to the circulating clothes.

CHARLES K. SKINNER.