Nov. 30, 1954 K. CLARK 2,695,510

WASHING MACHINE

Filed July 8, 1948 2 Sheets-Sheet 1

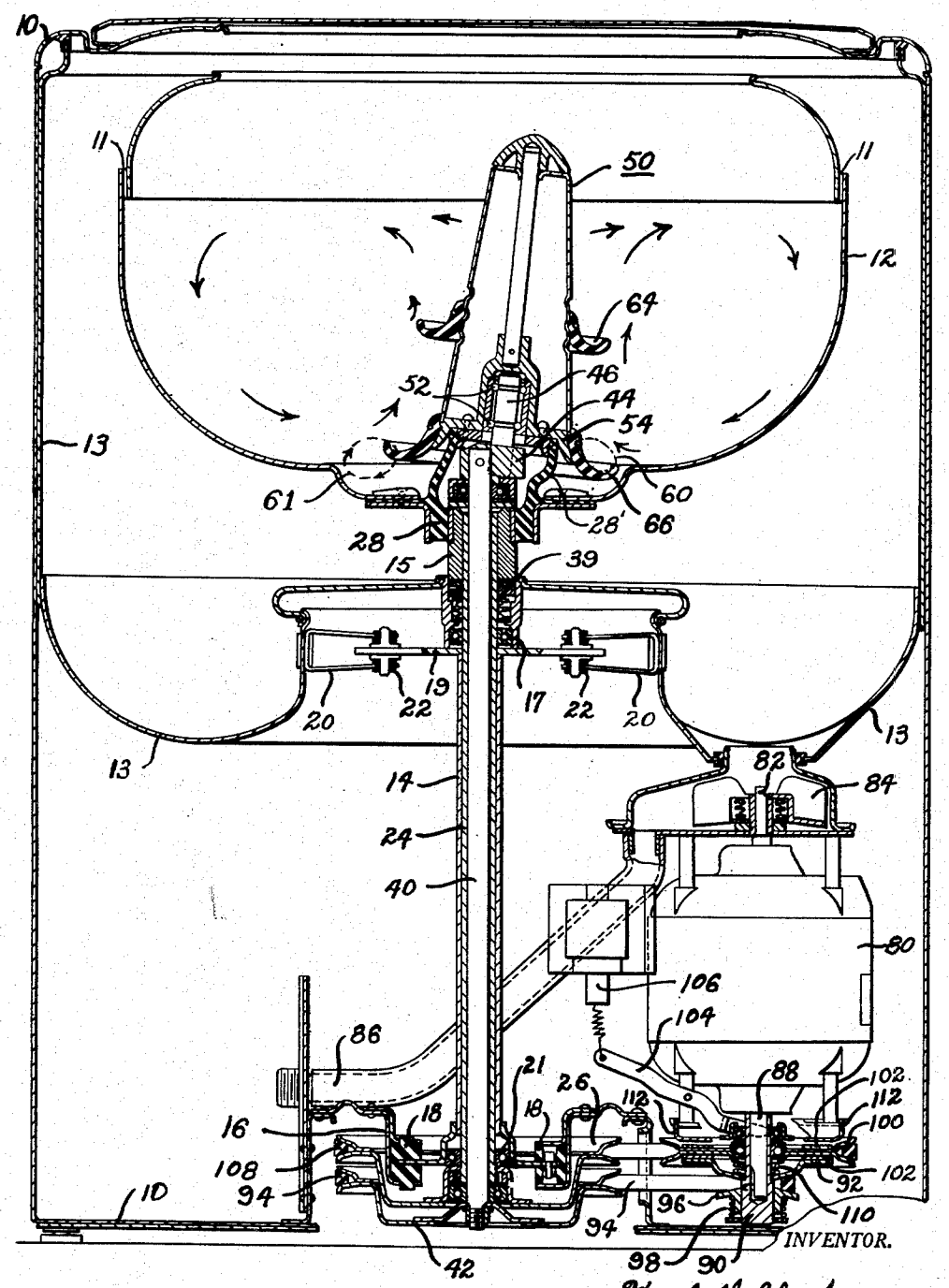

Fig. 1

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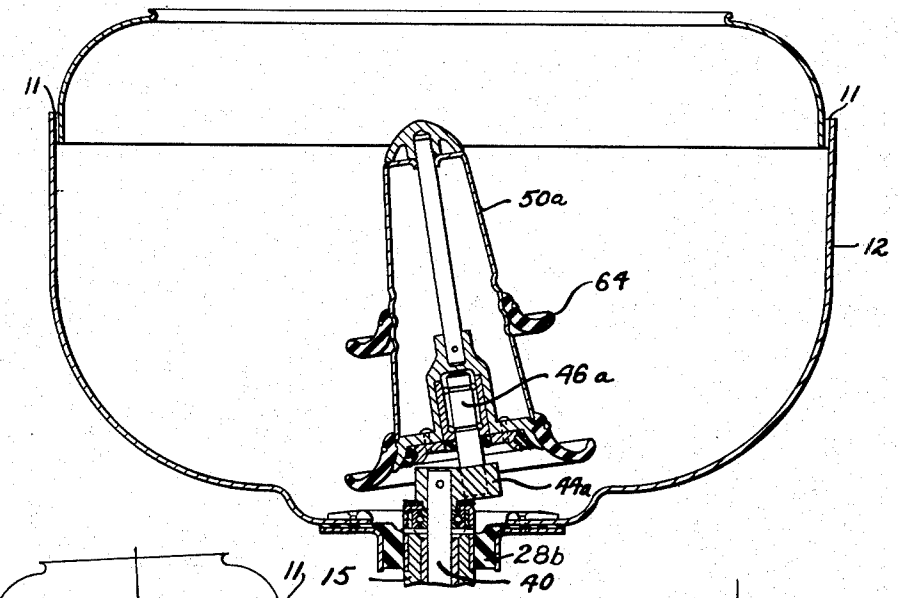

Fig. 2

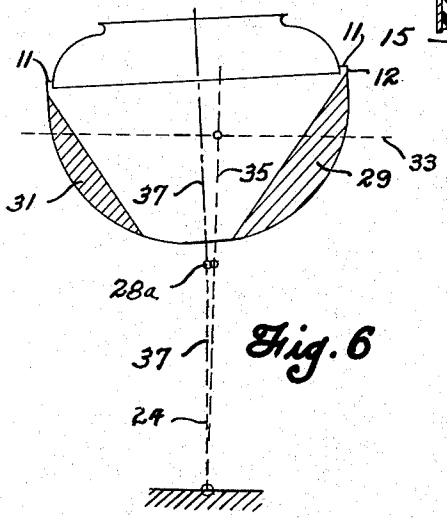

Fig. 6

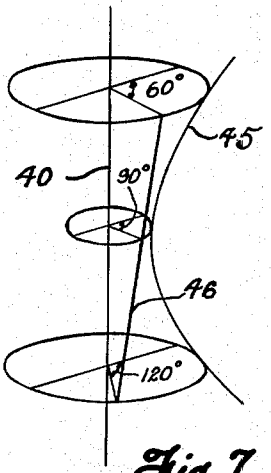

Fig. 7

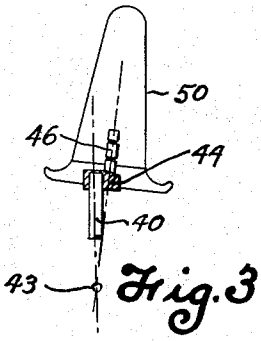

Fig. 3

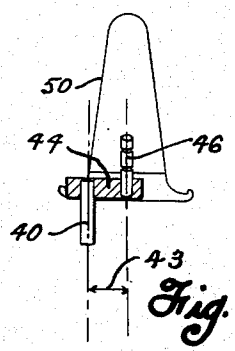

Fig. 4

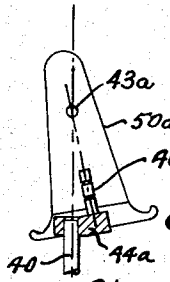

Fig. 5

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WASHING MACHINE

Kendall Clark, Glen Ellyn, Ill.

Application July 8, 1948, Serial No. 37,573

18 Claims. (Cl. 68—23)

This invention relates to a washing machine and more particularly to a machine of the automatic type.

It is an object of this invention to provide an improved form of agitator in which the clothes in the machine are agitated without causing any objectionable tangling.

It is another object of this invention to provide a washing machine of the automatic type in which the agitator scoops the water and clothes radially inwardly along the bottom of the tub and then upwardly so as to circulate the clothes within the tub.

Another object of this invention is to provide a washing machine of the automatic type in which the agitator causes floating dirt and scum, if any, to collect adjacent the wall of the tub, so that when the spinning operation takes place, the scum will leave the tub without coming in contact with the clothing in the tub.

Another object of this invention is to provide an improved two-speed drive for the agitator and the tub.

Still another object of this invention is to provide an improved arrangement for automatically compensating for improper distribution of load in the basket during the spinning operation.

Other objects and advantages reside in the construction of parts, the combination thereof and the mode of operation, as will become more apparent from the following description.

In the drawings,

Figure 1 is a vertical sectional view showing a first embodiment of my invention;

Figure 2 is a fragmentary vertical sectional view showing a second or modified agitator construction which may be substituted for the agitator construction shown in Figure 1;

Figure 3 is a fragmentary diagrammatic view showing the relationship between the agitator drive shaft and the agitator supporting shaft in the first embodiment of my invention;

Figure 4 is a fragmentary diagrammatic view showing the relationship between the drive shaft and the agitator support and taken at right angles to the corresponding construction shown in Figures 1 and 3;

Figure 5 is a view similar to Figure 3 showing the relationship between the agitator drive shaft and the agitator supporting shaft in the second type of agitator construction shown in Figure 2 of the drawings;

Figure 6 is a diagrammatic view illustrating the manner in which the basket adjusts itself during the spinning operation to compensate for any uneven distribution of the clothes in the basket; and

Figure 7 is a diagrammatic view illustrating a radial element **45** of a hyperbolic figure of revolution generated by the axis of the agitator supporting shaft shown in Figures 1, 3 and 4 while in operation.

Referring now to the drawings wherein there is illustrated two preferred embodiments of my invention, reference numeral **10** designates generally the main outer housing for the washing machine within the upper end of which a clothes washing tub or basket **12** is disposed. A circular trough or drain basin **13** is arranged beneath the tub **12** as shown. Reference numeral **14** designates a stationary hollow housing and bearing support element which is resiliently supported at its lower end on the stationary brackets **16** by means of a plurality of rubber or rubber-like grommets or mounting elements **18**. The upper end of the hollow element **14** is provided with a snubbing plate **19** which is frictionally engaged by the snubber pads **22** which are supported by means of suitable resilient brackets **20** carried by the trough or drain basin **13**, as shown in Figure 1. This construction permits relative lateral snubbing movement between the element **14** and the stationary trough **13** for a purpose to be explained more fully hereinafter.

A hollow shaft **24** is supported within the element **14** by means of the ball bearing assemblies **17** and **21** and has secured thereto a drive pulley **26** at its lower end. The drive shaft **24** is drivingly connected to the basket or tub **12** through the rubber or rubber-like member **28** which is vulcanized or otherwise secured to the lower portion of the basket **12** and also to the adapter **15** secured to the upper portion of the shaft **24**. The member **28** thus constitutes a universal joint for connecting the basket **12** to the shaft **24**.

A solid shaft **40** is arranged to rotate within the hollow shaft **24** and is adapted to operate the agitator **50**. A motor and pulley arrangement to be described more fully hereinafter is adapted to operate the agitator drive shaft **40** at a relatively slow speed during the clothes washing period and to operate the tub or basket spinning shaft **24** at a relatively high speed for removing water from the clothes after the clothes have been washed.

One of the major problems in designing a washing machine in which the basket or tub is spun at a high rate of speed for removing the water from the clothes is that of compensating for uneven loading of the clothes within the machine. The purpose of the resilient connection **28** is to automatically allow the basket to shift its axis so as to compensate for such uneven loading without causing excessive vibration when the basket spins at the desired high speed necessary for effectively removing the water from the clothes. The resiliency of the rubber or rubber-like element **28** is selected such that it is capable of holding the basket substantially upright when the basket is at rest and when filled with water and clothes, but it is made sufficiently yieldable to permit the basket to tilt during the spinning operation. The construction and arrangement of the connection **28** and the resilient mounting for the hollow main bearing support **14** is such that the basket is held upright at slow basket speeds but is allowed to shift at higher speeds so as to compensate for uneven distribution of load within the basket and thereby avoid excessive vibration and strain on the washing machine housing.

Figure 6 somewhat diagrammatically illustrates the principle of operation involved. In this figure the reference numerals **29** and **31** designate unequal quantities of clothes within the tub **12**. The dotted line **35** indicates the plane of maximum polar inertia when the basket is spinning. Reference numerals **35** and **37** designate respectively the axis of spin and the axis of symmetry of the basket and the basket driving shaft. Reference numeral **28***a* is used to designate the flexible joint **28** which allows the basket to tilt relative to the axis of the drive shaft. The axis of symmetry of the drive shaft designated by the reference numeral **37** is not necessarily in direct alignment with the axis of symmetry of the basket. By virtue of the above described arrangement, the basket shifts automatically so as to compensate for uneven loading and thereby prevents excessive vibration and strain on the parts.

Any unbalance in load occurs in the lower portion of the basket and the plane of maximum polar inertia would thus be inclined to the axis of symmetry of the basket. When the basket and its load then begins to spin about their mutual center of gravity with such an unbalanced load, there is a tendency for the plane of maximum polar inertia to become perpendicular to the axis of spin and in so doing the common axis of symmetry bends at the universal joint, with the result that the axis of shaft **14** is forced nearer to the axis of spin. This reduces the gyration of the supporting tubular shaft **14** and consequently less vibration is transmitted through snubbing disc **19** and the snubber pads **22** to the trough or drain basin **13**.

A conventional shaft seal of the type commonly used in refrigerating systems is provided at **39** for preventing the escape of water between the rotating shaft **24** and the bottom of the water compartment. Suitable ball bearings are used throughout, as shown, for supporting

the various rotating parts. The type of bearings used and the number and location of the bearings may be varied without departing from the spirit of my invention and for that reason the specific details of the bearings used need not be described in further detail.

A solid shaft **40** is rotatably supported within the hollow shaft **24** and has secured thereto at its lower end a V-belt pulley **42** which is used in operating the main agitator generally designated by the reference numeral **50**. The upper end of the solid shaft **40** has secured thereto a crank arm **44** which in turn carries the agitator supporting shaft **46** to which the agitator assembly **50** is rotatably supported by means of a suitable ball bearing assembly **52** and agitator support **54**. The shaft **46** is preferably anchored in the crank arm **44** so as not to rotate relative to the arm **44** but so as to rotate about the axis of the shaft **40**. The longitudinal axis of the shaft **46** lies in a plane parallel to but offset from a plane passing through the longitudinal axis or axis of rotation of the shaft **40**.

As indicated in Figures 1 and 3 of the drawings, the agitator supporting shaft **46** is arranged with its axis inclined to, but not intersecting, the axis of shaft **40**. A line **43** (see Figure 4) designates the position of minimum distance between the axes of the shafts **46** and **40**. The axes of the agitator supporting shaft **46** and the drive shaft **40** lie in two parallel planes respectively which are mutually perpendicular to the line **43**. The length of line **43** may be constructed at any length from zero to slightly less than the radius of the tub. The minimum distance position between the axes of shafts **40** and **46** (designated by radius **43**) may be located at any vertical position on the axis of shaft **40** or projected extensions thereof; for example, Figures 3 and 4 show it below the crank arm **44** and Figures 2 and 5 show it above the crank arm. The agitator assembly **50** is prevented from actually rotating about its own axis by means of the flexible element **28** secured to the upper end of the hollow shaft **24**, as shown in Figure 1, or it may be rotated as it gyrates when in contact with fabrics in the basket as in the construction shown in Figure 2.

By virtue of the above described arrangement, it will be observed that rotation of the main drive shaft **40** will cause the agitator **50** to gyrate in a circular path about the axis of the shaft **40** without rotating in unison with the shaft **40**. The construction and arrangement of the drive shaft **40** and the agitator supporting shaft **46** are such that as the shaft **40** is rotated, the projection of each and every point on the agitator **50** on a vertical plane through the axis of shaft **40** will travel in an elliptical path relative to the vertical plane, as illustrated by the representative ellipses **60** and **61** shown in dotted lines in Figure 1 of the drawings. Thus it will be observed that the periphery of the agitator member **66** describes an elliptical path as projected on a vertical plane as shown in Figure 1, while the axis of the agitator assembly describes a hyperbolic figure of revolution **45**, one radial element of which appears as indicated by the reference numeral **45** in Figure 7. The arrangement of shaft **46** or **46***a* with respect to the shaft **40** may be referred to as a hyperbolic crank, due to the fact that every point in the axis of the shaft **46** or **46***a* generates a circle about the longitudinal axis of the shaft **40**. The loci of points formed by the intersection of this family of circles with any plane lying in the longitudinal axis of the shaft **40** forms a hyperbolic curve. In other words, the axis of shaft **46** or **46***a* may be referred to as a generatrix revolving about the shaft **40** generating or sweeping out a figure of revolution which is a hyperbolic figure; hence, it seems the term "hyperbolic crank" very aptly describes the arrangement of shafts **40** and **46** or **46***a*.

In order to increase the effectiveness of the agitator **50** in producing circulation of liquid within the tub **12**, there is provided a pair of rubber or rubber-like members **64** and **66** which serve to assist in propelling the wash water in the tub. The elliptical motion of the periphery of the agitator members **64** and **66** is such that the water will tend to flow in the direction indicated by the arrows when the agitator is rotated in the proper direction or opposite to the arrows if the shaft is rotated in the opposite direction. The agitator causes both a scooping action and a wobbling action. It will be noted that with the water traveling in the direction indicated by the arrows, any scum or foam which might collect on the top of the wash water will tend to collect adjacent the outer edge of the basket, so that when the basket is caused to spin for drying clothes, the scum will be carried along with the first water to leave the basket.

The exact construction of the basket **12** may be varied considerably without departing from the spirit of my invention. For purposes of illustration, I have shown the basket made up in two parts which have their meeting edges partially telescoped together with clearance between the edges, so as to provide an outlet **11** for the water during the spinning operation. Baskets of this type are well known and need no further description. The basket **12** constitutes an inner water receptacle and the upper portion of the main housing **10** constitutes an outer water receptacle for receiving the water leaving the receptacle **12** during the spinning operation.

For purposes of illustrating the invention, I have shown an electric motor **80** for supplying power for operating the agitator **50**, for spinning the basket **12**, and for operating the water pump **84**, whereas an internal combustion engine or any other type of power unit could be used. In the preferred embodiment, the electric motor **80** is provided with an upper shaft extension **82** to which a water impeller or pump **84** is secured so as to forcefully pump water out of the trough **13** to the line **86** to which a hose or the like may be attached for conveying the water to any desired point such as a drain or to a point of reuse. The motor **80** is also provided with a lower shaft extension **88** to which there is secured a pulley supporting element **90** which is keyed to rotate with the shaft **88** at all times. A combination clutch plate and pulley flange **92** is secured to the element **90**, so as to rotate with the element **90** at all times. A complementary pulley flange **96** is slidably supported on the element **90** and is biased into belt engaging position by a coil spring **98** which serves to maintain the proper tension of the belt **94** which is arranged for driving the V-belt pulley secured to the lower end of the agitator drive shaft **40**. The arrangement is such that the agitator shaft **40** is driven by the motor **80** at a relatively slow speed whenever the motor **80** is operating. A floating V-belt pulley **100** is slidably and rotatably supported on the element **90** and is provided with friction material **102** on its opposite sides as indicated. A pulley shifting arm **104** is provided which serves to shift the pulley **100** axially. The arm **104** is controlled by the solenoid assembly **106** which when energized serves to shove the pulley **100** and its associated friction material **102** into driving engagement with the rotating clutch flange **92** which rotates with the motor shaft at all times. Consequently, whenever the solenoid **106** is energized, the hollow shaft **24**, to which the spinner tub **12** is secured, will be driven through the medium of the pulley **100**, the V-belt **108**, and the pulley **26** which is secured to the shaft **24**.

When it is desired to discontinue the spinning operation, the solenoid **106** is deenergized, with the result that the V-belt pulley **100** will be moved upwardly by the spring **110**, so as to cause disengagement between the pulley **100** and the rotating element **92** and so as to cause the pulley **100** to engage the stationary brake surface **112** which is fixed to the stationary motor housing. In other words, the floating pulley **100** rotates with the motor shaft **88** when the solenoid **106** is energized so as to force the pulley **100** downwardly into driving engagement with the clutch element **92** but is prevented from rotating whenever the solenoid **106** is deenergized and the spring **110** forces the floating pulley out of driving engagement with the clutch **92** and into engagement with the brake surface **112**.

In the form of invention illustrated in Figures 1, 3 and 4 of the drawings, the agitator shaft **46** has a wider sweep at its upper end than at its lower end, with the result that the upper surface of the water in the tub **12** is rather violently pushed around. In Figure 2 of the drawings, I have shown a modified agitator arrangement in which all of the parts are identical to the corresponding parts shown in Figure 1 of the drawings except that the crank arm **44***a*, which supports the agitator shaft **46***a* on the main drive shaft **40**, is arranged to support the agitator shaft **46***a* at a different angle, as best illustrated in Figure 5 of the drawings. Also the rubber-like element **28***b* does not include an upwardly extending portion for preventing relative rotation between the agitator **50** and the agitator supporting shaft **46***a*. By arranging the agitator shaft **46***a* so as to taper inwardly toward the central axis of the shaft **40**, the upper end of the agitator

does not agitate the water to as great an extent as the agitator arrangement shown in Figure 1 of the drawings.

Inasmuch as the crank arm at the base of the agitator shown in Figure 2 is substantially the same as the crank arm in the construction shown in Figure 1 of the drawings, the amount of agitation produced adjacent the bottom of the tub will be much the same as the agitation produced in the bottom of the tub in Figure 1. The length of the crank arm **44** or **44***a* may be varied somewhat depending upon the amount of agitation desired. When looking at right angles to the construction shown in Figure 5, one would see a construction similar to the construction shown in Figure 4 of the drawings in that the agitator supporting shaft **46***a* would appear as being in a plane parallel to the axis of the drive shaft **40** when viewed in the one direction.

Figure 7 schematically shows the relationship between the agitator drive shaft, the agitator supporting shaft **46**, and also shows the hyperboloid generated by the member **46** as it rotates about the axis of shaft **40**.

Although the preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. In a washing machine, an outer water receptacle, an inner water receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a crank arm on said drive shaft arranged within said inner receptacle, said crank arm having its longitudinal axis lying in a plane parallel to but offset from a plane containing the axis of rotation of said drive shaft, and an agitator support carried by said crank arm and projecting upwardly in a direction towards the axis of rotation of said shaft, said agitator support being arranged to operate said agitator.

2. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said drive shaft arranged within said inner receptacle, said lateral extension including a hyperbolic crank shaft the axis of which lies in a plane parallel to but offset from a plane containing the longitudinal axis of the drive shaft, and an agitator support carried by said lateral extension and projecting upwardly in a direction away from the central axis of said shaft.

3. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said drive shaft arranged within said inner receptacle, an agitator support carried by said lateral extension and projecting upwardly, said agitator support having its longitudinal axis lying in a plane parallel to but offset from a plane containing the axis of rotation of the drive shaft, so that the longitudinal axis generates a hyperbolic surface of revolution, and means for resiliently supporting said agitator within said inner receptacle.

4. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said drive shaft arranged within said inner receptacle, an agitator support carried by said lateral extension, said agitator support having its longitudinal axis lying in a plane parallel to but offset from a plane containing the axis of rotation of the drive shaft, so that said longitudinal axis generates a hyperbolic surface of revolution when the drive shaft is rotated, and means for resiliently supporting said agitator within said inner receptacle, said last named means including means for preventing rotation of said agitator about its own central axis.

5. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed and having walls sloping upwardly and outwardly towards the outlet thereof, an agitator disposed within said inner

receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said drive shaft arranged within said inner receptacle, an agitator support carried by said lateral extension, said agitator support having its longitudinal axis lying in a plane parallel to but offset from a plane containing the axis of rotation of the drive shaft, so that said longitudinal axis generates a hyperbolic surface of revolution when the drive shaft is rotated, means for resiliently supporting said agitator within said inner receptacle, said last named means including means for preventing rotation of said agitator about its own central axis, a prime mover, means for supplying power from said prime mover to said drive shaft, and torque transmitting means between said prime mover and said inner receptacle whereby said inner receptacle may be caused to spin for centrifugally removing water therefrom.

6. In a washing machine, a basket adapted to contain material to be washed and a washing fluid, an agitator disposed within said basket, and means for operating said agitator including a drive shaft having a horizontally disposed offset within said basket and having an agitator supporting shaft carried by said offset, said last mentioned shaft and the offset causing the agitator to both wobble and scoop, said agitator including means formed thereon for scooping the washing fluid radially inwardly adjacent the bottom of said basket, the axis of said agitator supporting shaft moving in such a manner as to generate a hyperbolic surface of revolution.

7. In a washing machine, an outer water receptacle, an inner water receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a crank arm on said drive shaft arranged within said inner receptacle, and an agitator support carried by said crank arm and projecting upwardly in a direction towards, but not intersecting, the axis of rotation of said shaft, said agitator support being arranged to operate said agitator.

8. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said drive shaft arranged within said inner receptacle, and an agitator support carried by said lateral extension and projecting upwardly in a direction away from, but not intersecting, the central axis of said shaft, so that the longitudinal axis of said support generates a hyperbolic surface of revolution when the drive shaft is rotated.

9. In combination, a driving element, a driven element, power transmitting means between said elements comprising a hyperbolic crank.

10. In a washing machine, a basket adapted to contain material to be washed and a washing fluid, an agitator disposed within said basket, means for supporting said basket and said agitator in an elevated position, means for operating said agitator including a vertically extending drive shaft having a horizontally disposed offset within said basket and having an agitator supporting shaft carried by said offset, the mounting of said supporting shaft being such that the longitudinal axis thereof generates a hyperbolic surface of revolution when the drive shaft is rotated.

11. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, means for supporting said drive shaft within said outer receptacle, a laterally disposed extension on said drive shaft arranged within said inner receptacle, an agitator support carried by said lateral extension, said agitator support having its longitudinal axis lying in a plane parallel to but offset from the plane containing the axis of rotation of the drive shaft, said agitator support being so mounted that as the drive shaft is rotated the longitudinal axis of said agitator support generates a hyperbolic surface of revolution, a prime mover, and means for supplying power from said prime mover to said drive shaft.

12. In a washing machine, an outer receptacle, an inner receptacle adapted to receive material to be washed, an agitator disposed within said inner receptacle, an agitator drive shaft, a prime mover for supplying power to said drive shaft, means for supporting said drive shaft within said outer receptacle, a lateral extension on said

drive shaft arranged within said inner receptacle, an agitator support carried by said lateral extension, the longitudinal axis of said agitator support generating a hyperbolic surface of revolution when the drive shaft is rotated, and means for resiliently supporting said agitator within said inner receptacle, said last named means including means for preventing the rotation of said agitator about its own central axis.

13. In a washing machine an outer receptacle, a clothes basket disposed within said outer receptacle, an agitator disposed within said basket, a first shaft arrangement for driving said agitator, a prime mover for driving said shaft, a second hollow shaft concentric to said first shaft, a unitary resilient member having a first portion connected to said second shaft and said basket so as to form a resilient connection between said second shaft and said basket and having a second portion yieldably connecting said agitator to said second shaft, an agitator supporting means connected to the first shaft but offset therefrom, said agitator supporting means including a shaft the longitudinal axis of which generates a hyperbolic surface of revolution when the first shaft is rotated.

14. In a washing machine an outer receptacle, a clothes basket disposed within said outer receptacle, an agitator disposed within said basket, a first shaft for driving said agitator, a prime mover for driving said shaft, a second shaft concentric to said first shaft, a unitary resilient member having a first portion connected to said second shaft and said basket so as to form a resilient connection between said second shaft and said basket and having a second portion yieldably connecting said agitator to said second shaft, said agitator having its longitudinal axis lying in a plane parallel to but offset from the plane containing the axis of rotation of said first shaft, said agitator being so mounted that as the first shaft is rotated the longitudinal axis of the agitator generates a hyperbolic surface of revolution.

15. In a washing machine, an outer receptacle, a clothes spinning basket disposed within said outer receptacle and having water outlet means arranged adjacent its outer periphery at a point above the normal water level within said basket, an agitator disposed within said basket, a first shaft arrangement for driving said agitator, a prime mover for driving said shaft, a second shaft concentric to said first shaft, a unitary resilient member having a first portion connected to said second shaft and said basket so as to form a resilient connection between said second shaft and said basket and having a second portion yieldably connecting said agitator to said second shaft, and supporting means for supporting the agitator upon the first shaft so that as the first shaft is rotated the agitator is gyrated, said supporting means including a shaft projecting into the agitator, the longitudinal axis of said supporting shaft generating a hyperbolic surface of revolution when the first shaft is rotated.

16. In a washing machine, a basket adapted to contain material to be washed and a washing fluid, an agitator disposed within said basket, means for supporting said basket and said agitator in an elevated position, means for operating said agitator including a drive shaft having a horizontally disposed offset within said basket and having an agitator supporting projection carried by said offset, the longitudinal axis of said supporting projection being so disposed that as the drive shaft is rotated the longitudinal axis of the projection generates a hyperbolic surface of revolution, a second hollow shaft concentric with the drive shaft, and a flexible connection between said hollow shaft, said agitator and said basket.

17. In a washing machine, a basket adapted to contain material to be washed and a washing fluid, an agitator disposed within said basket, means for supporting said basket and said agitator in an elevated position, means for operating said agitator including a first drive shaft having a horizontally disposed offset within said basket and having an agitator supporting projection carried by said offset, the longitudinal axis of said supporting projection being so disposed with respect to the drive shaft that as the drive shaft is rotated the longitudinal axis generates a hyperbolic surface of revolution, a second shaft comprising a hollow sleeve surrounding said first drive shaft, and a flexible connection between said second drive shaft, said agitator and said basket.

18. A spinner basket mounted on a joint that deters tilting movement while at rest, a drive shaft, an agitating mechanism on said drive shaft, said agitating mechanism being mounted within said basket, said basket and the agitating mechanism being adapted to spin on extraction of water, the basket and the agitating mechanism rotating in unison so that there is no mechanical interference between the two.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
333,328	Peare	Dec. 29, 1885
1,952,574	Adams	Mar. 27, 1934
2,145,453	Miller	Jan. 31, 1939
2,215,288	Hays	Sept. 17, 1940
2,267,786	Chayie	Dec. 30, 1941
2,269,190	Dunham	Jan. 6, 1942
2,302,012	Dyer	Nov. 17, 1942
2,363,184	Jacobs	Nov. 21, 1944
2,453,367	Giblin	Nov. 9, 1948