

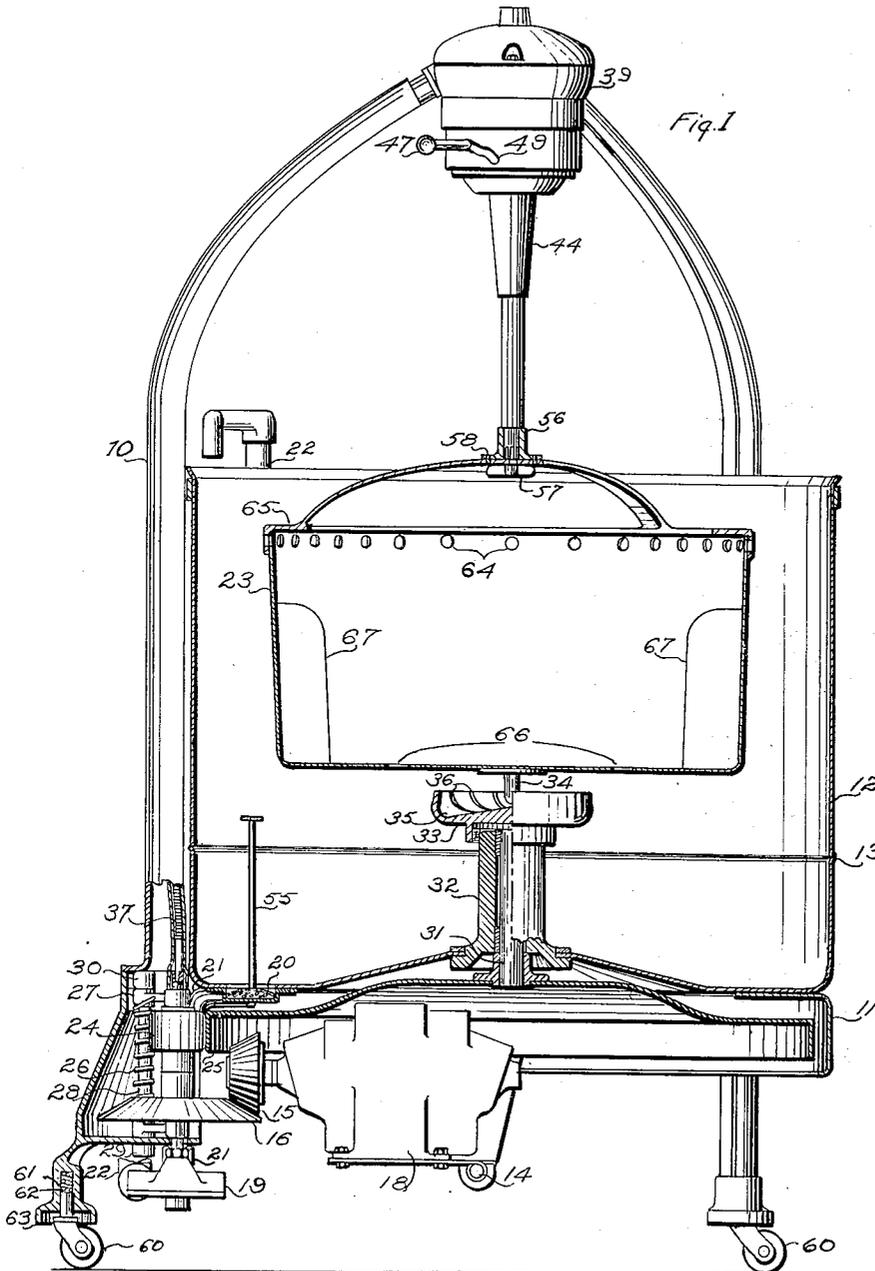
March 10, 1936.

J. MOTYCKA
WASHING MACHINE

2,033,146

Filed April 16, 1930

4 Sheets-Sheet 1



INVENTOR.
Joseph Motyka

March 10, 1936.

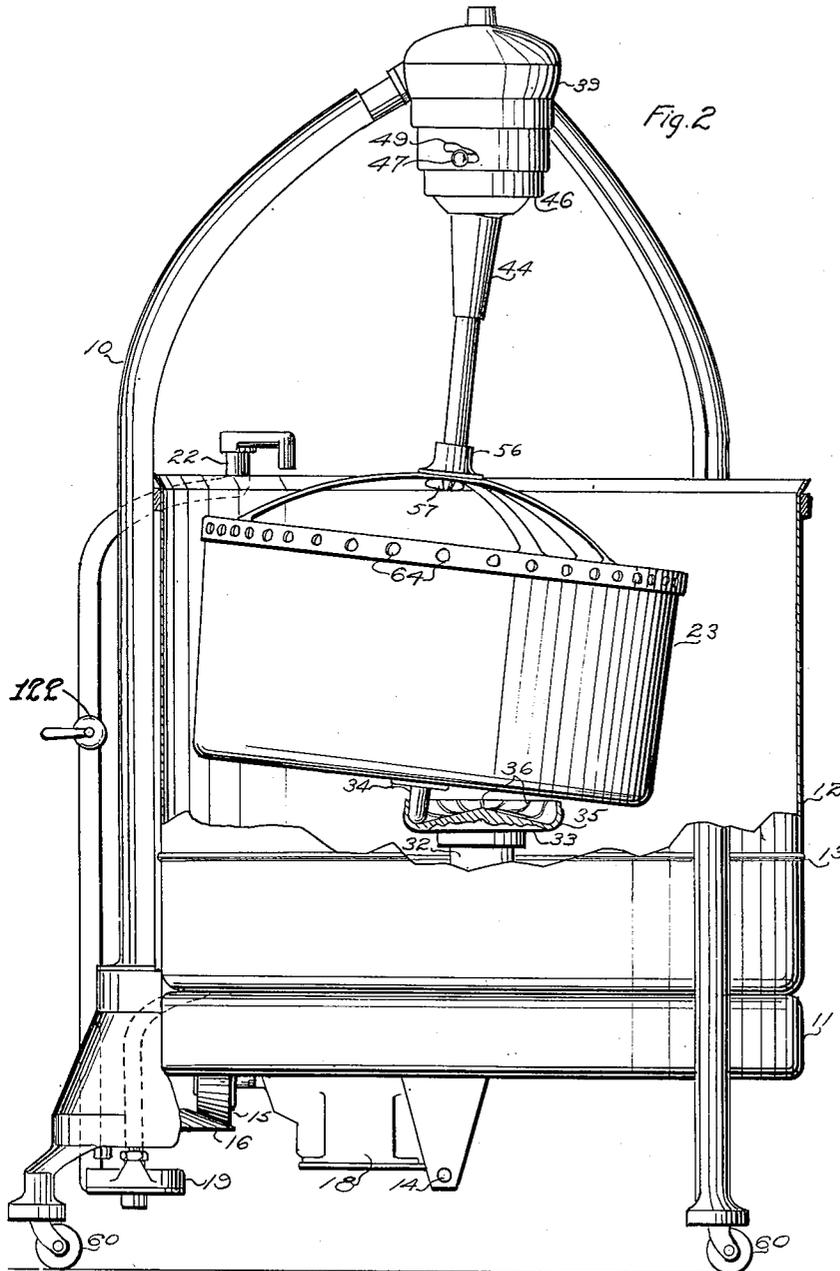
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4 Sheets-Sheet 2



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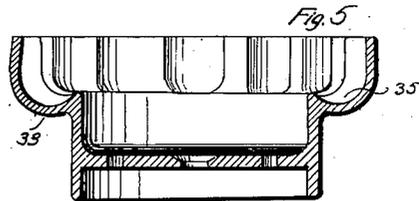
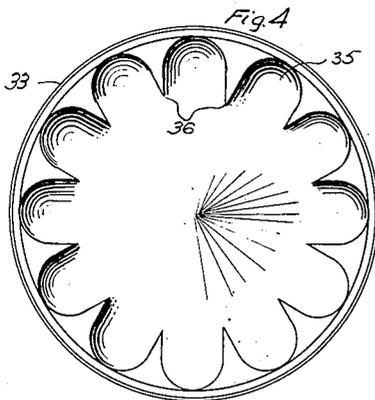
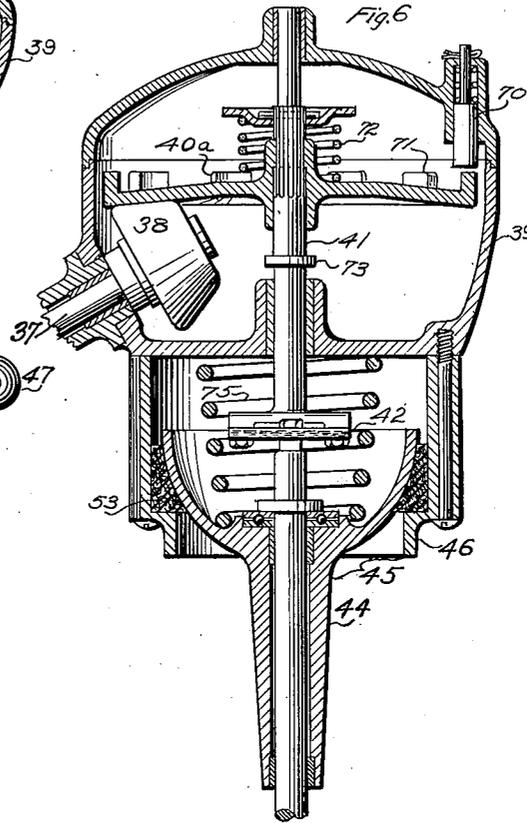
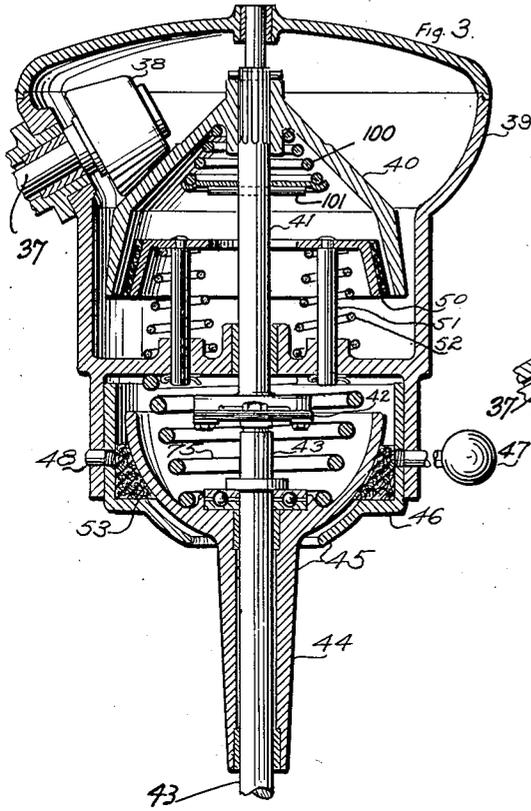
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2,033,146

WASHING MACHINE

Filed April 16, 1930

4 Sheets-Sheet 3



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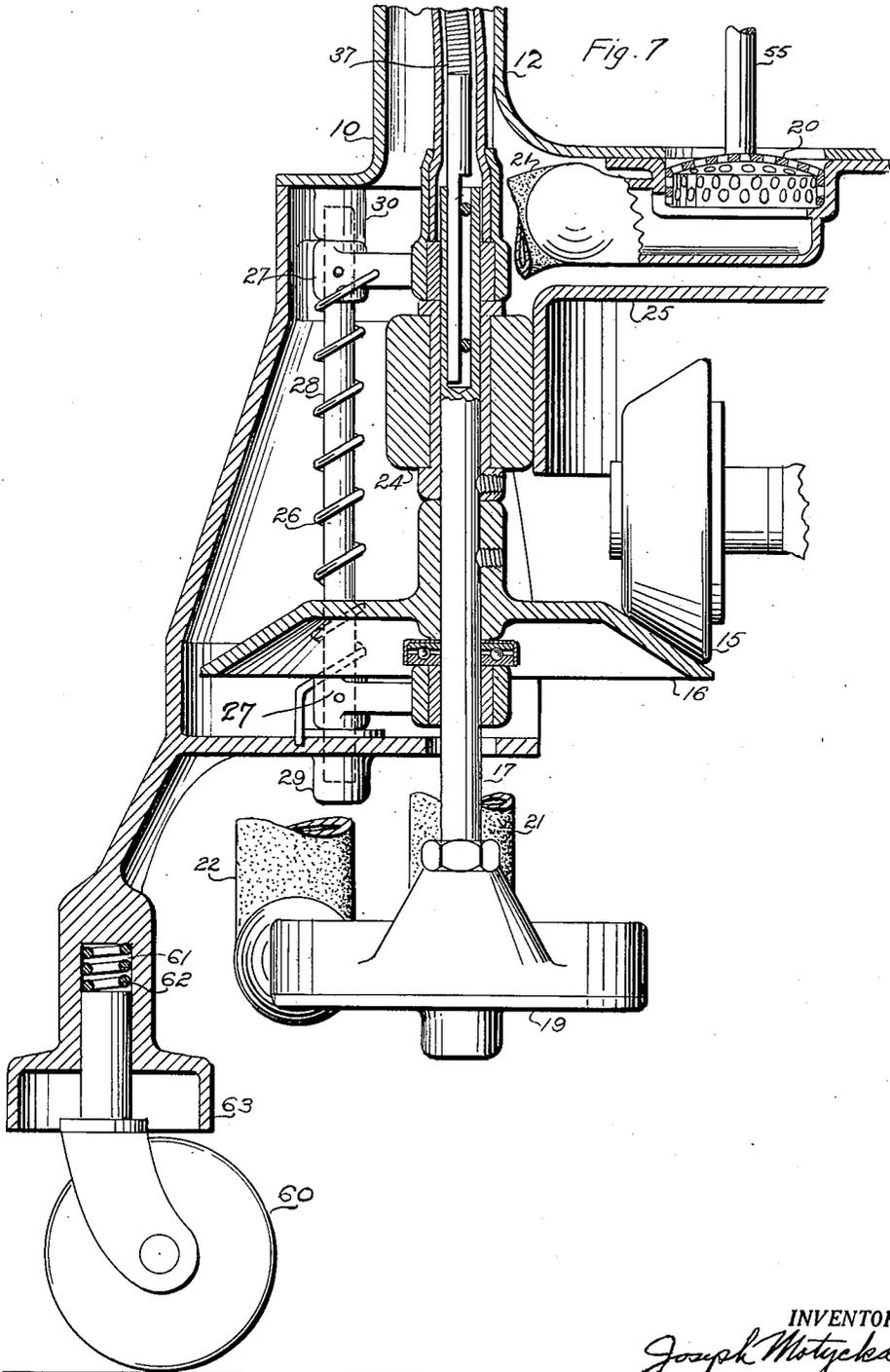
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WASHING MACHINE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,033,146

WASHING MACHINE

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Application April 16, 1930, Serial No. 444,651

18 Claims. (Cl. 68—18)

This invention relates to a centrifugal apparatus and particularly to a washing machine.

It is an object of my invention to provide a centrifugal apparatus such as a washing machine, in which the spinning basket is self-balancing and in which gyration or wobbling due to out of balance forces of the spinning basket is substantially avoided.

Another object of the invention is to provide an improved washing apparatus in which the basket is capable of washing by a gyrating movement, and of drying by a spinning movement substantially without gyration.

Another object of the invention is to provide an improved washing apparatus in which a gyrating basket may be so operated that the contents of the basket are thrown against the bottom of its walls and thus held down in the basket by inertial forces, and particularly such an apparatus in which the basket is perforated to permit the expulsion of water when the basket is spun, but in which the washing is principally effected in a part of the basket sufficiently imperforate to maintain a body of liquid about the clothes and avoid tendency of the liquid to hold the clothes against the wall of the basket.

Another object of the invention is to provide an improved gyrating device. Other objects of the invention will be apparent and readily understood from the following description and claims.

This invention relates particularly to a type of washing and drying machine in which a basket adapted to receive the clothes or other objects to be washed may be gyrated without spinning or may be spun without gyrating. A body of washing liquid, which is usually soapy water, is maintained in a reservoir outside of such basket and is forced or allowed to flow into the basket during the washing operation. During the washing operation the basket is tilted so that its axis is at a substantial angle to the vertical and is gyrated at a speed sufficient to cause a substantial centrifugal action and thus to set up a more or less circular flow about a substantially vertical axis. In this type of washing apparatus the gyration, after causing the stream of liquid to assume a circular flow as described above, leaves the stream at first unsupported on one side except by its own inertia and then, as the gyration continues, the bottom of the basket is raised on that side so that it batters the stream and causes an effective agitation thereof. When the washing operation is complete the basket may be returned to a substantially vertical position and spun at high speed so that the water is forced

through perforations in the side of the basket by centrifugal force.

According to my present invention the basket is advantageously supported from above so that the gyration during the washing operation causes the washing liquid and clothes to be thrown against the bottom of the walls of the basket. The basket is supported by a universal joint and rotated by a flexible coupling. Thus the basket, when spinning, may assume any position, slightly off from the vertical, which is required in order to bring the center of mass of the basket and its contents into vertical alignment with the center of rotation of said flexible coupling. This mounting permits the basket to be perfectly balanced during the spinning operation even though it may be unevenly loaded and thus, so long as its axis of rotation remains vertical the highly objectionable vibration which commonly results from uneven loading of a spinner basket is avoided. Unfortunately the flexible mounting has not heretofore been a solution of the problem of vibration because the basket could not be kept on a vertical axis but would almost immediately begin to precess, that is, to rotate about an axis which, following a spiral path, swings farther and farther out toward the horizontal, and will bring the basket eventually against the casing unless some stop is provided. It is not possible to solve this problem by directly opposing the outward swing of the basket since whatever means is used to oppose this swing and to attempt to hold the basket to its proper axis would serve only to transmit the gyrational forces to the supporting apparatus. I have now discovered that it is possible by suitably directed forces to avoid the precession in the spiral path by introducing a new precession toward the desired position of the axis of rotation.

This invention is based upon the law of rotating bodies that a force applied to the axis of the rotating body does not produce the same reaction which it would if the body were at rest but, on the contrary, produces a motion perpendicular to that which would be produced in a body at rest. My invention takes advantage of this law by applying to the axis of a rotating body supported by a universal joint on the axis of rotation a force which is always perpendicular to the vertical plane through its axis of rotation. The reaction to such a force is in a direction perpendicular to the force, that is, it will be in such direction as to bring the axis of rotation either toward or away from the vertical, depending upon the direction of the force and the direction in which

the body is rotated. If the direction in which the force is applied is properly related to the direction of rotation of the basket, the basket is brought back to its desired position and the spiral precession which would naturally result from the force of gravity is thereby avoided.

In the drawings

Figure 1 is a partial cross section through an apparatus constructed according to my invention;

Figure 2 is a partial cross section similar to Figure 1 but showing the basket in the washing position;

Figure 3 is a cross section in detail of the supporting and spinning mechanism;

Figure 4 is a top plan view of the gyrating cup drive;

Figure 5 is a cross section through a modified form of gyrating cup;

Figure 6 illustrates a modified form of the supporting and spinning mechanism adapted particularly for use with the gyrating mechanism illustrated in Figure 4; and

Figure 7 is a cross section through the lower part of the transmission mechanism.

Referring particularly to Figure 1, I have illustrated a washing machine suitable, for example, for use as a domestic washing machine. This comprises broadly a tripod frame 10 which is illustrated as made of U-shaped section and on which is secured a base 11. A casing 12 is carried by the base 11 and the frame 10 and in the present instance is formed with a groove 13 which is intended to indicate a proper water level for the operation of the machine. The lower part of the casing 12 below the groove 13 is adapted to form a reservoir to contain the washing liquid, ordinarily soapy water. The upper part of the casing serves both as a guard to protect the operator from the rotating basket and also to collect the water which is thrown from the basket and to return it to the reservoir at the bottom of the casing. Beneath the casing and supported from the base 11 through the hinge 14 is a suitable electric motor 18. This motor through the frictional gears 15 and 16 serves to drive the vertical shaft 17. Due to the hinged mounting of the gears 15 and 16 in frictional engagement. By suitable placing of the hinge 14, depending upon the weight of the motor 18, any desired pressure between the frictional gears 15 and 16 may be secured and this pressure is advantageously such as to provide for slip in case of overload on the motor.

On the bottom of the shaft 17 I have provided a centrifugal circulating pump 19 which is adapted to withdraw water through the strainer 20 in the bottom of the casing and the drain pipe 21 and to circulate the water through the pipe 22 back into the basket 23 during the washing operation. The pipe 22 is also provided with a movable outlet, by which the liquid from the pump 19 may be diverted from the pipe 22 and thus drain the liquid from the machine. Instead of this construction the pipe 22 or part of it may be flexible as, for example, a rubber hose, so that the upper discharge nozzle shown above the casing 12 of the drawings may be removed from the position shown and placed over the edge of a tub or drain when the liquid is being removed from the machine. A valve 122 may be provided in the pipe 22, as indicated, to stop the flow through pipe 22 from pump 19.

Above the gear 16 on the shaft 17 is a second

friction gear 24. This gear is held in engagement with a large ring gear 25 by spring 26. The spring 26 is coiled about rod 28 and has its upper end resting against the upper arm 27 and has its lower end anchored to the casing of pivot 29 as indicated. The rod 28 is journaled in pivots 29 and 30 and has rigidly secured thereto the arms 27 in which is journaled the shaft 17. Thus the spring 26 operating between the upper arm 27 and between the casing of pivot 29, which is secured to the frame of the machine, tends to rotate the rod 28 and upper and lower arms 27 to yieldably force the friction gear 24 against the ring gear 25.

The ring gear 25 is secured to a vertical shaft 31 journaled in a hub 32 which extends up into the casing 12 above the water line. At the top of the hub 32 and secured to the shaft 31 is a cup 33 which serves as one element of a flexible driving connection adapted to produce a gyrating motion in the basket 23. A projection 34 from the bottom of the basket 23 is formed with a hemispherical end adapted to fit into the depressions 35 of the cup 33 and it may be driven with the rotation of the cup 33 by engagement with the partitions 36 which separate the depressions 35 of the cup 33. In the embodiment illustrated in Figures 1 and 4 the cup 33 is made in the form of a rosette and the depressions are in the form of channels or grooves which lead outwardly from the center. This construction is advantageous since the lowering of the projection 34 into engagement with the cup 33 near its center causes at first only a slight gyration due to the short radius at which the cup acts upon the projection 34. However, as the basket assumes its gyrational motion the projection 34 is driven toward the edge of the cup by centrifugal force. In the example illustrated in Figures 1 and 4, a slope toward the outside is also provided so that the force of gravity is added to the centrifugal force. With this construction the inertia of the basket is overcome gradually and without excessive starting torque. Thus the projection 34 can engage in one of the depressions 35 without slipping around the cup 33 or jumping over the partitions 36. If this latter should happen due to the basket being lowered when away from its vertical position no injury will be done and the only objection would be the unpleasant noise and vibration which will result. The rim of the cup 33 may also serve when the basket is in the spinning position to limit the outward swing of the basket 23 by engaging its projection 34.

The shaft 17 is also connected through the flexible shaft 37 to a friction gear 38. The flexible shaft 37 together with its housing in the embodiment illustrated passes through the U-shaped frame 10 and into the housing 39. The friction gear 38 is adapted to drive the gear 40 when the latter is in its raised position and the friction gear 40 is keyed to the spinning shaft 41 which serves to spin the basket 23 through the flexible coupling 42 and the shaft 43. In the present embodiment the friction wheel 40 is keyed to the shaft 41 by fluting on the shaft and is mounted so as to slide somewhat on the fluting. The friction wheel 40 in this construction is spring-pressed upwardly by spring 100 acting against pin 101 fastened to the shaft 41 so that it will operative-ly engage the friction gear 38 before the handle 47 is moved quite to its highest position and will be spring-pressed against the friction gear 38 with sufficient force to transmit the necessary torque. The shaft 43 is journaled in a housing 44 so as to be rotatable therein but fixed thereto

axially. The housing 44 forms the movable member of the universal joint 45. The supporting member 46 of the universal joint 45 is carried in the housing 39 by a handle 47 and stud 48, secured thereto and which pass through slots 49 in the housing 39 so as to slide on the bottoms of said slots when the member 46 is rotated by means of the handle 47. The slots 49 in the present embodiment are made with two sloping portions and an intermediate dwell. When the handle 47 is rotated from the lowest point in its slot 49 onto the dwell the basket is lifted so that the projection 34 is raised free of the partitions 36 in the gyrating cup 33 but is not raised sufficiently to bring the friction gear 40 into engagement with the friction gear 38.

Beneath the friction gear 40 a conical friction brake 50 is carried by the slidable studs 51 and urged upwardly by the springs 52. Beginning with the handle 47 in the highest position in the slot 49, when the friction gear 40 is in engagement with the friction gear 38 and is therefore being rotated, if the handle 47 is moved onto the dwell of the slot 49, the gear 40 is lowered onto the brake 50, which brake serves to arrest the rotation of the friction gearing 40 and therefore of the basket 23. If the handle 47 is now further moved into its lowest position the weight of the basket compresses the springs 52, thus maintaining the braking action of the brake 50, but permitting the basket 23 to be lowered so that its projection 34 engages the cup 33. In this position the basket will be gyrated by the cups 33, but the brake 50 will prevent its rotation during the gyrating movement.

Within the supporting member 46 a band of friction material 53 is mounted so as to form the actual bearing surface on which the housing 44 is supported. If the friction surface is not sufficient of itself to provide the friction necessary, a spring 75 may be used to press the housing 44 against the friction material 53 and thereby increase the resistance to precessional movements. When the handle 47 is moved to its lowest position in the slot 49 the supporting member 46 is lowered sufficiently so that the friction material 53 no longer contacts with the housing 44. In this position the basket is free to gyrate without any hindrance from the friction material 53. However, when the handle 47 is moved to the upper part of its slot in which position the friction gears 38 and 40 are in engagement and the basket is being rotated at a high speed the entire weight of the basket and its contents is supported on the friction material 53 and the latter therefore offers a very substantial resistance to any gyratory motion. The force which this resistance exerts on the housing 44 is always opposed to the direction of precession due to gravity. The direction of the force which opposes the precession due to gravity is always such as to cause a secondary precession of the axis of rotation back toward the vertical. Thus by the simple expedient of providing a brake (friction material 53) in the universal joint I am able to substantially prevent precession of the basket due to gravity and yet to permit the basket to assume whatever position is necessary to bring the center of mass of it and its contents vertically beneath the center of the flexible coupling 42. In this manner I am able to stabilize the basket and to make it self-balancing.

The strainer 20 in the embodiment illustrated in the drawings is provided with a handle 55 extending above the water level so that in case

the strainer should become clogged with lint or other material it may be removed for cleaning without the necessity for reaching below the water level.

In order to provide for the easy removal of the basket 23, for cleaning the machine or for any other purpose, the basket is held to the hub 56 by a wing nut 57 and is keyed thereto by means of studs 58. However, for simply cleaning the machine it is unnecessary to remove the basket, but it may be readily swung to one side or the other to permit ready access to the bottom of the casing 12.

At the bottom of the frame 10 I have provided casters 60 which are mounted in tubular openings 61. Above the casters in these openings are springs 62 which are of sufficient strength to hold the caster wheel away from the skirt 63 of the frame 10, so long as the machine is not loaded. As soon as the casing 12 is filled with water to the indicated water line, however, the weight of the machine is so far increased as to compress the springs 62 and cause the skirts 63 to be pressed against the wheels of the casters 60. Thus the machine may be readily rolled around when empty, but, when operating, the wheels of the casters are locked and thus the "creeping" which might otherwise result from the slight vibration due to the operation of the motor and other rotating parts is avoided.

In the preferred operation of the apparatus just described the casing 12 is first filled with hot water to the water line 13. To this is added a suitable amount of soap to produce the desired washing liquid. When this is done the springs 62 are compressed and the casters 60 are locked as already described. A valve 122 in the pipe 22 is closed to prevent the liquid being drawn from the casing by the pump and the motor 18 is then started. If the basket 23 is engaged either with the cup 33 or through the friction gear 40 with the gear 38, the friction gearing 15 and 16 between the motor and the shaft 17 or the friction gearing 24 and 25 or 38 and 40 between the shaft 37 and the basket may slip a little at first so as to avoid excessive load on the motor during starting. It is preferable, however, to have the handle 47 positioned on the dwell in the slot 49 so that the basket 23 is disengaged from both the gear 38 and the gyrating cup 33. Thus the load on the motor will be light and there will be no slippage.

The clothes in the meantime have been put into the basket 23 and the valve 122 is opened to permit the water from the reservoir to be pumped into the basket. The handle 47 is now moved into the lowest part of the slot so that the friction band 53 in the supporting member 46 of the universal joint 45 is released from the housing 44 and the projection 34 at the same time is engaged by the cup 33. Since the cup, in the embodiment illustrated and thus far described, is continuously rotated, the gyrating movement of the basket will begin almost as soon as the projection 34 touches near the center of the cup 33 and will increase until the projection 34 has been moved by centrifugal force and by gravity to the outer edge of the cup.

The basket 23, as shown in Figure 1, is made with its outer sides sloping outward slightly toward the top. Near the top are openings or perforations 64 and above the top the supporting frame 65 projects inward slightly so as to form a rim to prevent the clothes from rising, due to centrifugal force, over the top of the walls.

Near the center of the bottom of the basket 23 are other openings 66; but between the openings 64 and the openings 66 the basket is substantially imperforate. Under the influence of the gyrating motion the body of liquid and clothes is continually being lifted and shifted in the direction of gyration so that it tends to assume an annular form which is substantially horizontal and in which the liquid flows in the direction of gyration. As one side reaches its lowest position, as shown at the right of Figure 2, the body of water tends to fall under the influence of gravity while in the other side, which simultaneously reaches a position farthest from the axis of gyration, the body of liquid tends, under the influence of centrifugal force, to spread out toward the receding wall of the basket 23. As the gyration continues the right hand side of the basket is raised and moved outward while the left hand side is lowered and moved inward. The result is that the stream of water is battered by the walls of the basket 23, by the side wall on the left in this case, and by the bottom on the right. In addition to this natural agitation resulting from the rapid gyration I have also provided, in the present embodiment of the invention, baffles 67 which tend to interrupt or disturb the circular flow which would otherwise occur.

It will be observed that in the washing operation as just described, a continual supply of fresh liquid will be entering the basket through the nozzle of the pipe 22. Obviously, the excess liquid must also flow back into the casing 12 and this will occur partly through the openings 64 and partly through the openings 66. This overflow, however, will be from the edges of the body of liquid since the inertia of the body will tend to throw the main part into the imperforate portion of the basket between the openings 64 and the openings 66. In this way the clothes are thoroughly agitated in a constantly changing bath of washing liquid and the excess bath is drawn away without having to pass through the clothes. If the walls of the basket between the upper rim and the center of the bottom were perforate the centrifugal action would tend to force the water through such perforations and consequently to hold the clothes against this portion of the wall. The result would be to impair the free agitation of the clothes in the body of liquid and also to cause at least some of the liquid to pass through the clothes in such a way that the clothes would tend to filter the water and thus reverse the washing action. If the perforation in this area is slight the impairment of the washing action if it occurs at all will also be slight. Even if the perforation is sufficiently great to impair some of the advantages just described, nevertheless other advantages of my invention will be attained and I do not therefore intend to exclude such a construction from the scope of my invention.

When the washing operation is complete the valve 122 is closed so as to stop or divert the flow into the basket. The handle 47 is then moved into the upper part of its slot 49 so as to engage the friction gear 38 with the gear 40 and at the same time raising the basket to disengage the projection 34 from the gyrating cup 33. When the gear 40 is thus raised it is released from the brake 50, which has held it against rotation during the washing operation; and at the same time the supporting member 46 of the universal joint 45 engages the housing 44 through the friction material 53 in order to oppose any gyrational movements during the spinning operation. When the basket is

thus raised free of the gyrating cup 33, it is freely supported from the universal joint 45, and thus will assume the position in which the center of mass of the basket and its contents is almost perfectly aligned vertically beneath the center of the flexible coupling 42. The friction of the brake 53 is sufficient to prevent substantial swinging or pendulum action, but is not sufficient to prevent substantial balancing.

When the basket is thus raised so that the gyration has stopped, the body of liquid and clothes tend to fall back onto the bottom of the basket 23 and the liquid to run out through the openings 66. If the handle 47 were moved only onto the dwell of the slot 49 this draining through the opening 66 would continue. However, when the handle 47 is moved into its highest position so that the basket is rotated through the gearing 38 and 40 and flexible coupling 42, the centrifugal force resulting from the rapid rotation drives the clothes outwardly against the walls of the basket; and, due to the slight slope of the walls, the liquid will rise under the influence of centrifugal force and pass out through the perforations 64. The clothes, on the other hand, will be held against the wall both by friction and by the restraining rim 65. Thus the clothes are effectively freed from the excess liquid. If it is desired also to rinse clothes in this operation clear water may be allowed to flow into the center of the rotating basket, or the washing operation may be repeated with clear water flowing into the basket and the drying operation repeated to remove the excess rinse water.

When the drying operation is completed the handle 47 is moved back onto the dwell in the cam slot 49. This disengages the gear 40 from the gear 38 and at the same time engages the gear 40 with the brake 50 so as to stop further spinning of the basket.

In Figures 5 and 6, I have illustrated modified drive connections. In this case the gyrating cup, as illustrated in Figure 5, is made with a series of depressions in a ledge near the outside of the cup while the inner part of the cup is substantially lower. The rotating drive connection in this case includes, as shown in Figure 6, a friction wheel 40a to engage the friction gear 38 and a stop 70 engaging dogs 71 on the back of the friction wheel 40. In this embodiment no handle 47 or cam slots 49 are necessary. When the washing operation is to be begun the basket is grasped manually and lifted so that its projection 34 falls into one of the depressions 35 in the gyrating cup 53. The motor is then started and run until the washing operation is complete. The motor is then shut off or released by suitable means from the drive connections and the basket is again manually raised out of the depression 35 and permitted to fall so that the projection 34 falls into the central part of the cup 33 and the housing 44 is engaged on the friction material 53. This also permits the friction wheel 40a to drop into engagement with the friction wheel 38. The fluting of the shaft 41 permits the housing 44 to fall completely into engagement with the friction material 53, while the spring 72 serves to hold the friction wheel 40a in engagement with the gear 38. A collar 73 on the shaft 41 below the hub of the friction wheel 40a serves to raise the friction wheel 40 against the pressure of the spring 72 when the basket 23 is raised as already described. The operation of this modification except for the method of changing it from the washing to

the drying positions is substantially the same as that already described.

Although I have described above a preferred embodiment and one modification thereof, it will be understood that these are only illustrative of my invention and that the invention may be embodied in many other forms.

Many other changes than those specifically enumerated may be made within the scope of my invention and without departing from the scope of this application and in so far as the advantages of my invention or any of them are attained by the same or similar means I intend to include such structures within the scope of this application.

In the accompanying claims I have used the term "basket" as including not only the basket proper which I have indicated on the drawings by the numeral 23 but also such parts as rotate with the basket and on the same axis and particularly the projection 34, the supporting frame 65 and the shaft 43. This is for the sake of brevity since these parts affect the balance and must swing with the basket proper.

I claim:—

1. A washing machine comprising a basket having sides which slope slightly away from its axis toward the top, having means for preventing objects being washed from rising over the top of said basket under influence of centrifugal force, having openings near its widest part to permit escape of water by centrifugal force and a bottom with openings near the center at substantially the lowest part of the bottom to permit escape of water by gravity when said basket is at rest; means for spinning said basket about a vertical axis, a universal pivot for the basket, and means for gyrating said basket about said pivot substantially above the bottom of the basket.

2. In a washing and drying machine, a basket, a universal pivot device on the axis of said basket and connected thereto, means for gyrating said basket about said universal pivot device for washing purposes, and means for spinning said basket about its axis for drying.

3. A washing machine comprising a basket, a universal pivot, means for connecting the upper part of said basket to said pivot, a projection on the lower part of said basket, a rotatable cup below said basket having depressions in its bottom near the periphery thereof, means for causing said projection and said cup to engage, and means for gyrating said basket by rotating said cup with said projection disposed in one of said depressions.

4. A washing machine comprising a basket, means including a vertically adjustable universal pivot for supporting the basket from above and so as to permit rotation or gyration thereof, means operating through said universal pivot for spinning said basket, means for gyrating the basket, said gyrating means comprising a projection on the bottom of the basket and a rotatable cup therebeneath having depressions formed in its bottom near its periphery and the remainder of its bottom having means so that the projection will, if dropped anywhere within said cup, be led into one of said depressions by the forces acting on the basket.

5. In a gyrating device, a gyrating member, a universal pivot, means holding one end of said gyrating member by said universal pivot, a rotating member having on its end a cup formed with depressions adjacent its periphery and guide channels leading from the center to said depres-

sions, a projection mounted centrally upon the gyrating member so as to project centrally into said cup when the gyrating member is at rest and freely supported on said pivot, means for relatively moving said projection and cups together so that said projection is engaged first in said channels and then in said depressions, whereby the cup will act upon said projection first on a short radius and on a longer radius only as the inertia of the gyrating member is overcome.

6. A washing machine comprising a rotatable basket for holding objects to be washed, a support above said basket, means for suspending said basket from said support, so as to permit rotation and free movement of the basket with its axis assuming any position within a limited cone, means for gyrating said basket about its support for washing, and means for spinning the basket for drying.

7. A washing machine comprising a rotatable basket for holding objects to be washed, a support above said basket, means for suspending said basket from said support to permit rotation and free movement of the basket so that its axis may assume any position within a limited cone, means for spinning said basket, means for gyrating said basket about its support, means for resisting spinning of said basket during its gyration, means for resisting gyration of the basket during its spinning, and means for selectively applying to said basket said gyration resisting means and said spinning means on the one hand or said gyrating means and said spinning resisting means on the other hand.

8. In a washing machine, a machine body, a tank on said body, operating devices for causing said tank to vibrate, a plurality of rollers supporting said body on the floor, spring devices operating between said rollers and body and of sufficient strength to hold said body clear of said rollers when the tank is empty, said spring means being sufficiently weak to permit said body to engage said rollers when the tank is filled to prevent rolling movement of the machine on the floor.

9. In a centrifugal machine, a basket, a support above said basket, a vertical drive shaft journaled in said support, a basket shaft secured to said basket, a universal joint connecting said drive shaft and basket shaft, frictional ball and socket members concentric with said universal joint, means for securing one of said members to said support, means for journalling the other of said members on said basket shaft, means for transferring the weight of said basket to said support, whereby said ball and socket members exert a frictional retarding force on said basket, when it precesses, to overcome such precession, said force being in a direction tangential to the path of precession.

10. In a centrifugal apparatus, a rotatable basket, a support for said basket, means for universally mounting said basket on said support to permit perfect self-balancing of the basket and its contents, means for freely spinning said basket about an axis passing through the center of gravity of the basket and its contents, a stabilizing member journaled on said basket, means for applying to said stabilizing member, while the basket is spinning, a resultant net corrective force in a direction tangential to the path of precession of said basket without affecting substantially the speed of spinning of the basket, whereby to overcome precession of said basket.

11. In a centrifugal apparatus, a rotatable body, 75

a support for said body, means for universally mounting said body on said support to permit perfect self-balancing thereof, means for spinning said body about an axis passing through the center of gravity thereof, means for applying to said body a resultant net corrective force in a direction tangential to the path of precession of said body as a part of the spinning operation, whereby to overcome precession of said body.

12. In a centrifugal apparatus, a rotatable basket, a support above said basket, means for universally suspending said basket from said support to permit perfect self-balancing of the basket and its contents, means for freely spinning said basket about an axis passing through the center of gravity of the basket and its contents, means normally in position for applying to said basket continuously during the spinning operation for the purpose of overcoming precession a resultant net corrective force in a direction tangential to the path of precession, said resultant net corrective force being directed opposite to the precessional movement, such corrective force being set up by the precessional movement.

13. A centrifugal apparatus comprising a rotatable basket, means for universally supporting said basket from above to permit perfect self-balancing thereof, means for freely spinning said basket about an axis passing through the center of gravity of the basket and its contents, and means for applying the force of friction as the principal active force to resist precession concurrently during the spinning operation.

14. In a centrifugal machine, a basket, means for spinning said basket, a support above said basket, a basket shaft secured to said basket, friction members, means for securing one of said members to said support and for journalling the other of said members on said basket shaft in such manner that said members rub against each other when the basket precesses, and means for transferring the weight of said basket to said support, whereby said friction members during precession exert a frictional retarding force on said basket in a direction tangential to the path of precession.

15. In a centrifugal machine, a basket, a shaft attached to said basket, a support for said basket, means for spinning said basket, means for trans-

ferring the weight of said basket to said support, a set of stabilizing members, means for journalling one of said members on said shaft, means for securing the other of said members to said support, and means for applying during precession a net tangential corrective force from one said stabilizing members to the other tangential to the path of precession and in such direction to overcome such precession.

16. In a clothes washer and drier embodying centrifugal apparatus for drying, a rotatable receptacle, a support for said receptacle, means for universally mounting said receptacle on said support to permit perfect self-balancing thereof, means for spinning said receptacle about an axis passing through the center of gravity thereof, means for applying to said receptacle a resultant net corrective force in a direction substantially tangential to the path of precession of said body as a part of the spinning operation, whereby to overcome precession of said receptacle.

17. In a centrifugal machine, a rotatable basket having a shaft secured thereto on the axis thereof, a support for said basket, devices for universally mounting said basket on said support to exert a radial force on said basket when it is displaced from central vertical position, said mounting devices including frictional spherical stabilizing members, one of which is secured to said support, the other constituting a sleeve journalling said shaft, spring devices for tightly engaging the frictional surfaces of said stabilizing members, driving means engaging said shaft to spin said basket, whereby said stabilizing members exert a frictional retarding force on said basket, when it precesses, tangential to the path of precession.

18. In a centrifugal apparatus, a rotatable basket, a support for said basket, means for universally mounting said basket on said support so as to exert a radial force on said basket when its axis passing through the center of gravity is displaced from central vertical position, means for spinning said basket about said axis, means for applying to said basket a resultant net corrective frictional force tangential to the path of precession of said basket, but opposite to the precessional movement, as a part of the spinning operation, whereby to overcome the precession of said basket caused by said radial force.

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