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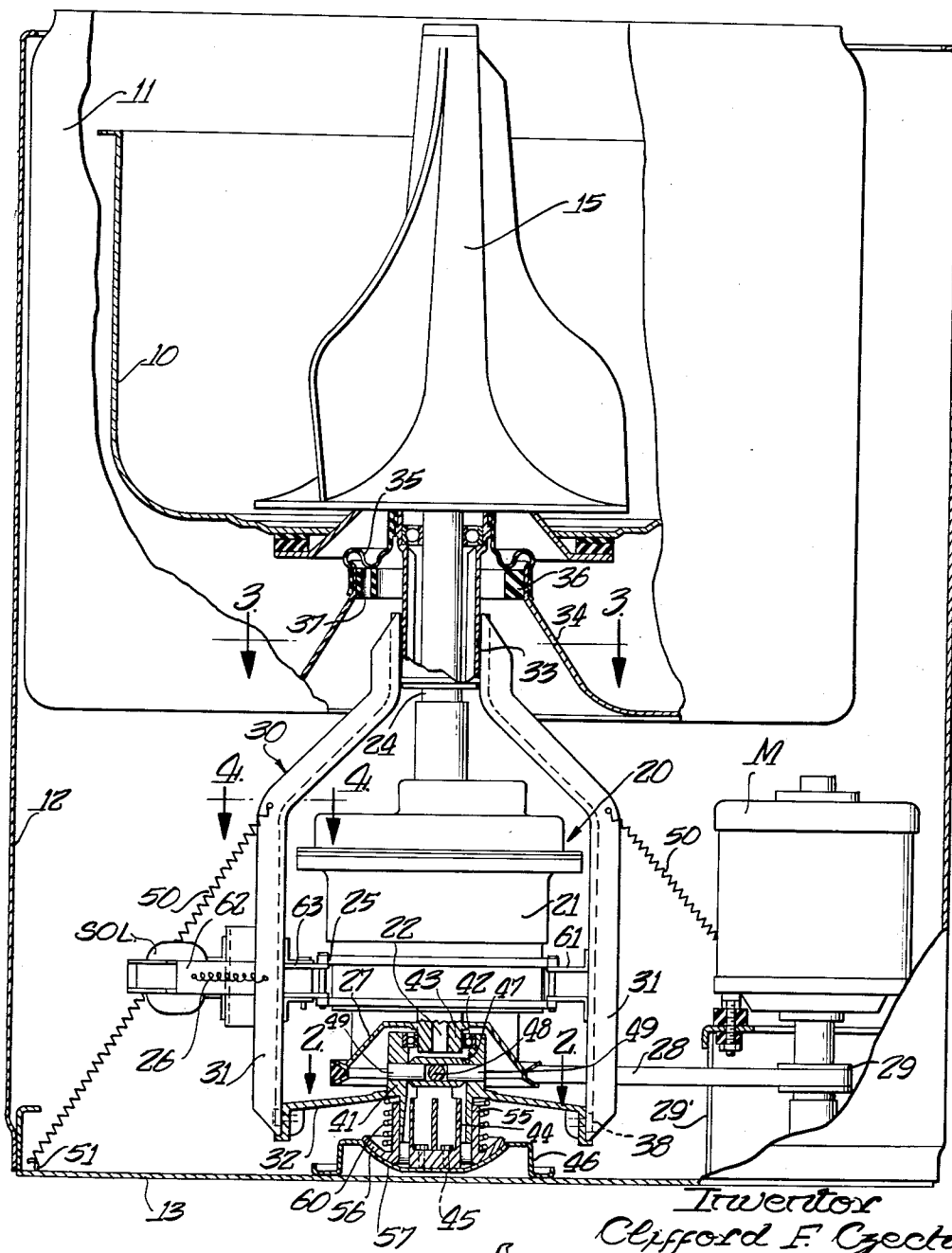
C. F. CZECH
WASHING MACHINES

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2 Sheets-Sheet 1

Fig. 1.



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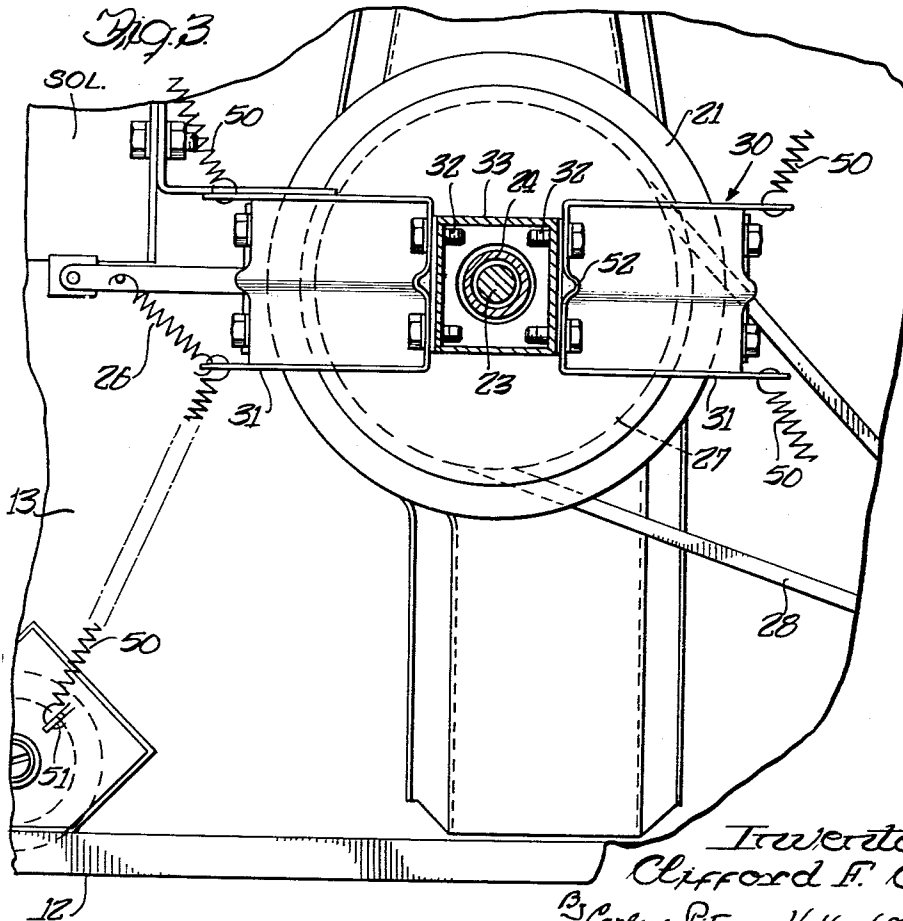
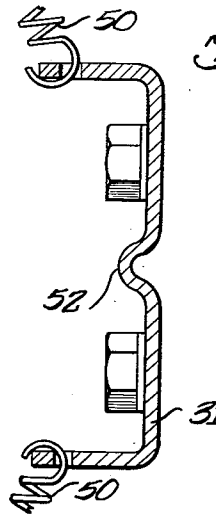
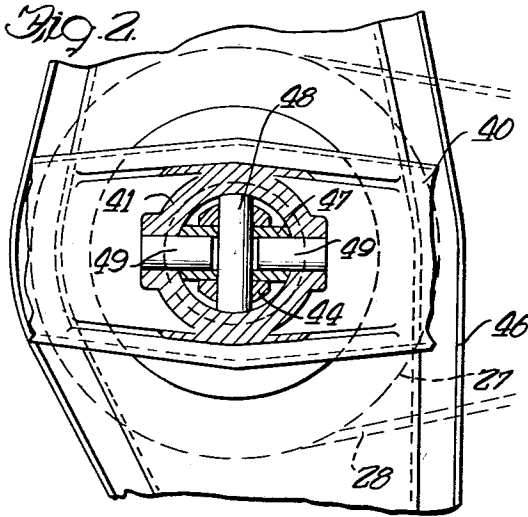
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WASHING MACHINES

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The invention relates to washing machines of the type in which washing is effected by agitating liquid and the material to be washed in an upright receptacle or basket which is subsequently rotated at high speed to centrifugally extract the washing liquid from the material.

One object of the invention is to provide a washing machine of the above general character having improved means for supporting the receptacle which permits it to be driven at high speed with a minimum of vibration.

Another object is to provide improved supporting means for a washing machine receptacle which permits oscillation or gyration of the receptacle when rotated with an unbalanced load and embodying novel means for preventing the gyration and resulting vibration from becoming excessive.

A further object is to provide a mounting for a washing machine receptacle which effectively damps the oscillations of the receptacle when rotated at high speed with an unbalanced load and which reduces vibration of the machine structure to a minimum.

Still another object is to provide a receptacle mounting which is simple and inexpensive to manufacture, yet efficient and reliable in operation.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawings, in which:

FIGURE 1 is a side view of a washing machine embodying the features of the invention, parts of the machine being broken away and other parts sectioned to show internal structure.

FIG. 2 is a slightly enlarged fragmentary sectional view taken in a horizontal plane substantially on the line 2-2 of FIG. 1.

FIG. 3 is a fragmentary sectional view taken on a horizontal plane substantially enlarged on the plane 3-3 of FIG. 1.

FIG. 4 is an enlarged fragmentary view taken substantially on the line 4-4 of FIG. 1.

While a preferred form of the invention and its application to a particular type of washing machine has been shown and will be described in detail herein, this is not intended to limit the invention to the particular construction or application shown. The intention is to cover all modifications, adaptations and alternative constructions of the invention and its application to other types of washing machine to which it is suited consistent with the spirit and scope of the invention as defined in the appended claims.

Referring to FIG. 1 of the drawings, the invention has been shown by way of illustration as embodied in a washing machine having an upright open top receptacle or basket 10 for holding washing liquid such as water and the fabrics or other material to be washed. The receptacle 10 is mounted within an outer or splash tub 11 which is enclosed in a housing 12 including a base 13 equipped with suitable feet or legs (not shown) for supporting the machine structure.

For washing purposes the receptacle is fitted with a multiblade agitator 15 adapted to be driven with an oscillatory motion. Following a washing operation the water or other liquid used in the operation is centrifugally extracted from the washed material by rotating the receptacle 10 at a relatively high speed. Both the agitator

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and the receptacle are driven from a common motor M, in this instance an electric motor, through a transmission 20.

The particular transmission shown is similar to that disclosed and claimed in the copending application of George D. Conlee, Serial No. 593,678, filed June 25, 1956, now Patent No. 2,816,450. Briefly, the transmission includes a casing 21 enclosing the necessary clutch and gearing for translating the rotation of an input shaft 22 into an oscillatory drive for a shaft 23 (FIG. 3) connected to the agitator 15. Through the medium of a clutch incorporated in the transmission, the casing itself may be rotated to drive the receptacle 10 through the medium of a tubular shaft 24. When the agitator is to be operated, the casing 21 is held against rotation by a friction brake including a brake band 25 partially encircling the casing. The band is preferably urged to a braking position by a spring 26 and is adapted to be released by energization of a solenoid SOL.

The drive for the shaft 22 of the exemplary machine includes a grooved pulley 27 keyed or otherwise nonrotatably fixed to the lower end of the shaft 22 and drivingly connected by a V-belt 28 with a grooved pulley 29 on the shaft of the motor M. As will be seen by reference to FIG. 1 of the drawings, the motor M is mounted on a bracket 29' provided on the base of the washing machine housing. The weight of the receptacle-transmission assembly is thus substantially reduced and its gyrations are thus easier to control and neutralize.

In accordance with one aspect of the invention, the receptacle 10 and transmission 20 are assembled as a unit with a frame structure 30 and provision is made for supporting this assembly or unit in a substantially vertical or upright position while permitting limited gyrotory movement. The assembly may therefore take up a position to counteract static unbalance and thus reduce vibration when the receptacle is rotated at high speed with unevenly distributed load. Such support is provided by the frame structure 30 comprising a pair of upright side members 31 connected at their lower ends by a bottom member 32. In the particular embodiment shown, each side member has a straight lower portion, an inclined intermediate portion and a straight top portion disposed substantially parallel to the lower portion.

The frame members 31 are assembled with their lower portions parallel and spaced apart to afford clearance for the transmission casing. The top portions of the members are secured as by screws or other suitable fasteners to the squared lower portion of a sleeve 33 which carries a bearing journalling the shaft 24 and which supports the weight of the receptacle 10. As shown in FIG. 1, the sleeve extends through a central aperture in a raised portion 34 in the bottom wall of the splash tub 11. A flexible diaphragm 35 of rubber or other suitable material seals the aperture, the diaphragm being corrugated to permit movement of the assembly transversely of the tub. A bumper 36 in the form of a rubber annulus pierced by a series of axially disposed holes is provided on the tub adjacent the aperture to prevent the assembly from swinging far enough to bring the sleeve 33 into actual contact with the tub as when the rotating mass is passing through its critical speed range.

At their lower ends the frame members 31 of the frame structure are rigidly secured as by screws 38 to opposite ends of the transverse bottom member 32. The bottom member, which may conveniently comprise a casting, is formed with an integral, hollow central boss or sleeve 41 presenting cylindrical projections at both sides of the bottom member. The upper projection of the boss 41 is recessed to provide a seat for an antifriction bearing 42 journalling the hub 43 of the pulley 27

in which the input shaft 22 of the transmission is keyed or otherwise nonrotatably fixed. The boss thus supports the transmission 20 for rotation.

To accommodate the gyratory movements of the receptacle and transmission assembly, the boss 41 is mounted for universal pivotal movement on an upright post 44 rigidly supported on the base of the housing 12 and projecting upwardly into the boss. As herein shown the post is anchored by studs or screws 45 to a cross member 46 which extends across and is suitably attached to the machine base 13. The cross member 46 may conveniently comprise an elongated sheet metal stamping flanged along both edges for strength and rigidity.

At its upper end, the post 44 is apertured to receive a metal block 47 which is secured to the post by a transverse pivot pin 48 as shown in FIG. 2. The block, in turn, is fitted loosely in the boss 41 and is secured thereto by axially aligned pivot pins 49 having their common axis disposed perpendicular to the axis of the pin 48 and lying in the same horizontal plane as that axis. Accordingly, while the frame portion of the receptacle and transmission assembly is held against rotation, the entire assembly can tilt in any direction about the pivot point defined by the intersection of the pin axis.

The receptacle and transmission assembly is yieldably urged to an upright position by a series of tension members herein shown as relatively light springs 50 interposed between the frame structure 30 and the housing 12. In the exemplary washing machine four of the springs are employed, respective springs being anchored at one end to lugs 51 provided at the corners of the base 13 as shown in FIG. 1. At their other ends, the springs are connected to the side members 31 of the frame structure substantially at the top of the straight lower portion. It will be observed on reference to FIGS. 3 and 4 of the drawings that the frame members 31 are of channel shaped cross section and each has a longitudinal stiffening rib 52. Accordingly, the springs 50 may be simply hooked through holes provided in the flange portions of the members.

In accordance with another aspect of the invention, means is provided for damping the oscillations resulting from rotation of the receptacle with an unbalanced load. This damping means is constructed and related to the other elements of the machine assembly so that its action is substantially uniform in all positions of the assembly. Moreover, the arrangement is such that the damping means is effective to relieve the pivot bearing of a part of the weight of the assembly.

In its preferred form the damping means comprises a friction shoe including a hollow cylindrical sleeve or body 55 with an outwardly turned flange 56 at its lower end. This flange is shaped to define a downwardly facing friction surface in the form of a segment of a sphere. While the face of the flange may be lined with a suitable friction material, it is preferred to form the entire shoe of such material as, for example, of asbestos phenolic resin cast or molded to the desired shape.

The body of the shoe is dimensioned for sliding fit over the depending lower end of the boss 41. When so mounted the spherical friction surface of the shoe is positioned for engagement with a complementary friction surface 57 formed on or carried by the transverse member 46 on the machine base. The friction surface 57 is co-axial with the post 44 and that surface, as well as the cooperating surface of the shoe, are preferably generated about the point upon which the assembly pivots, namely, the intersection of the axis of the pins 48 and 49. Gyration of the assembly will therefore shift one friction surface relative to the other.

A coiled compression spring 60 interposed between the flange 56 of the friction shoe and the bottom member 40 of the frame structure urges the shoe downwardly against the stationary friction surface 57. The spring thus supports a part of the weight of the assembly and

relieves the load on the universal joint. Additionally, it determines the resistance opposed by the friction elements to their relative movement due to the gyration of the assembly. The size and force of the spring is selected to provide the resistance required to damp the gyrations so that they do not become excessive. The rotating receptacle, however, is permitted to take up a position to substantially counteract any unbalance in the load so that vibrations transmitted to the housing are reduced to a minimum.

In the operation of the exemplary washing machine the motor M when rotated in one direction drives the input shaft 22 of the transmission to oscillate the agitator 15 and thus perform the washing action. In this phase of the operating cycle the transmission casing is held against rotation by the brake band 25 and the transmission, in turn, holds the receptacle 10 stationary.

As will be seen by reference to FIG. 1 of the drawings, the brake band 25 is pivotally attached at one end to a bracket 61 carried by one of the frame members 31. At its other end the brake band is attached to one end of a lever 62 pivoted on a bracket 63 carried by the other frame member 31. The brake applying spring 26 is connected between the frame member and the lever 62 so as to yieldably urge the lever in a direction to apply the brake to the transmission casing. Release of the brake is effected by the solenoid SOL which is supported on the other frame member in a position to swing the lever 62 to brake release position against the force exerted by the spring 26.

With the brake released, reversal of the motor is effective to rotate the transmission casing and with it the receptacle 10. If the load in the receptacle is unevenly distributed, as is usually the case, the unbalanced condition will tend to cause gyration of the receptacle sufficient to enable the receptacle to rotate about its center of mass. Such gyration is permitted by the universal pivotal mounting of the receptacle-transmission assembly but is maintained within safe limits by the action of the damping means which dissipates a substantial amount of the energy produced at the cooperating friction elements.

To minimize interference by the driving connection for the transmission, it will be observed that the transmission pulley 27 and the motor pulley 29 are positioned so that their belt grooves lie in a common plane with the center of the universal joint. Tilting or gyration of the assembly therefore does not change the belt tension and the pulley grooves are deep enough to prevent displacement of the belt within the limits of gyration set by the bumper ring 36.

The improved mounting for the assembly permits sufficient gyratory movement to compensate for any load unbalance likely to occur in the normal operation of the washing machine. Such movement is effectively damped and a large portion of the energy generated is dissipated by the friction shoe 56 in rubbing over the friction surface 57. Accordingly, the vibration transmitted to the housing is reduced to a degree such that it is not objectionable.

It will be apparent from the foregoing that the invention provides a simple, efficient support for the upright receptacle of a washing and centrifugal drying machine which permits the receptacle to be rotated at high speed with a minimum of vibration. Assembly of the receptacle and transmission as a compact, unitary structure and the supporting of this assembly for limited gyratory movement, coupled with novel friction damping means, materially reduces the vibration transmitted to the washing machine housing. Moreover, it permits the motor to be mounted independently of the receptacle-transmission assembly, thus reducing the weight of the gyrating structure. In general, it will be apparent that the mounting is simple in construction, inexpensive to manufacture, yet efficient and reliable in use.

I claim as my invention:

1. In a washing machine having a housing including a rigid base, a receptacle for liquid and material to be washed, means for supporting the receptacle in a generally upright position for tilting movement relative to the housing comprising a drive assembly having a universal pivotal mounting on the base, spring means connected between the base and said drive assembly resiliently resisting tilting of the assembly from the upright position, friction damping means including a member on said base defining a segmental spherical friction surface having its center coincident with the pivot for said assembly, a friction shoe mounted on said assembly for movement toward and from said member defining a complementary friction surface adapted to coact with said first mentioned friction surface, and spring means interposed between said assembly and said shoe yieldably urging said surfaces together, said spring means acting to relieve said receptacle supporting means of a part of the load imposed by the weight of the assembly.

2. In a washing machine, in combination, an assembly including a receptacle, a transmission for rotating said receptacle, a frame carrying said transmission and said receptacle, means supporting said assembly adjacent its lower end, spring means acting on the assembly yieldably urging it toward a position in which the rotational axis of the receptacle is substantially vertical while permitting the entire assembly to gyrate about a pivot adjacent the bottom of the assembly, said supporting means comprising a hollow cylindrical member depending from said frame having its axis aligned with the rotational axis of the receptacle, a stationary post extending into said member, and a universal joint connecting said post with said member.

3. In a washing machine, in combination, an assembly including a receptacle, a transmission for rotating said receptacle, a frame carrying said transmission and said receptacle, means supporting said assembly with the rotational axis of the receptacle substantially vertical while permitting it to gyrate about a pivot adjacent the bottom of the assembly, said supporting means comprising a hollow cylindrical element having a portion rigidly secured adjacent the bottom of said frame with its axis aligned with the rotational axis of said receptacle, a stationarily supported post projecting upwardly into said element, a universal joint connecting said post with said element, and a bearing seated in said element rotatably supporting said transmission.

4. In a washing machine, in combination, an upright rotatable receptacle for liquid and material to be washed, driving means for the receptacle including a transmission operative to rotate the receptacle at high speed, a frame assembled as a unit with and supporting said transmission and said receptacle for universal movement about a pivot adjacent the base of the machine, spring means yieldably holding said unit in an upright position while permitting it to gyrate when the receptacle is rotated with an unbalanced load, means for damping the gyrations of the unit including a stationarily supported member defining a segmental spherical friction surface having its center substantially coincident with the pivot for said frame, a member mounted on said frame for gyratory movement therewith and for movement relative thereto toward and from said stationary member, a flange on said member defining a segmental spherical friction surface engageable with the stationary friction surface, and spring means interposed between said flange and said frame for urging the friction surfaces together with a force independent of the weight of the unit.

5. In a washing machine having a housing, an upright shaft, a receptacle supported in the housing for rotation and adapted to be rotated by said shaft, a bearing member journaled said shaft, a frame supporting said mem-

ber, said frame comprising a pair of side members each secured at its upper end to said bearing member, a bottom member extending between and secured to the lower ends of said side members, a cylindrical sleeve element integral with and depending from said bottom member, an upright post rigidly supported on the housing and extending into said sleeve element, means connecting said sleeve element to said post for universal pivotal movement, friction damping means resisting pivotal movement of said frame comprising a member mounted on the housing and presenting a segmental spherical friction surface coaxial with said post, a cylindrical shoe slidably supported on said sleeve element, said shoe having a flange at its lower end defining a segmental friction surface complementary to said first mentioned friction surface, and spring means interposed between the bottom member of said frame and the flange on said shoe yieldably urging said friction surfaces together.

6. In a washing machine, in combination, an assembly including a receptacle, a transmission for rotating said receptacle, a frame assembled as a unit with said transmission and said receptacle, means supporting said assembly, spring means acting on said frame to yieldably urge the assembly to a position in which the rotational axis of the receptacle is substantially vertical while permitting the assembly to gyrate about a pivot adjacent the bottom of the assembly, said supporting means comprising a hollow cylindrical member rigid with and disposed adjacent the bottom of said frame with its axis aligned with the rotational axis of said receptacle, a stationarily supported member defining a segmental spherical friction surface disposed below said cylindrical member, a post rigidly mounted on said stationary member and projecting into said cylindrical member, a universal joint connecting said post and said cylindrical member and defining the pivot for the assembly, a shoe having a sleeve portion slidable axially on said cylindrical member, and a flange on said sleeve portion defining a friction surface complementary to said first mentioned friction surface and adapted to cooperate with it to damp the gyrations of the assembly.

7. In a washing machine, in combination, an assembly including a receptacle, a transmission for rotating said receptacle, a frame carrying said receptacle and said transmission, means supporting said assembly adjacent its lower end for universal pivotal movement, spring means acting on said frame to yieldably urge the assembly to an upright position, and means for damping the movements of the assembly from the upright position including a friction member stationarily supported below the pivot axis of the assembly, a friction shoe supported on said frame for gyrating movement with the assembly and for movement toward and from said friction member, and a spring interposed between said frame and said shoe urging the latter into engagement with said member.

8. A washing machine as defined in claim 7 in which the coating surfaces of the friction member and shoe are complementary segments of a sphere having its center at the pivotal axis of the assembly.

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