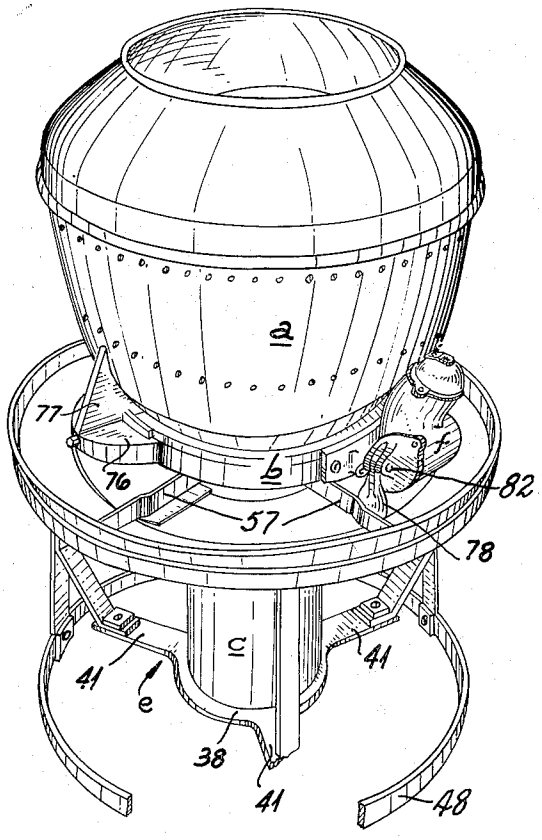
Aug. 22, 1961 P. ORTIZ DE ZARATE 2,996,908

WASHING MACHINES

Filed Dec. 26, 1956 4 Sheets-Sheet 1

Fig. 1



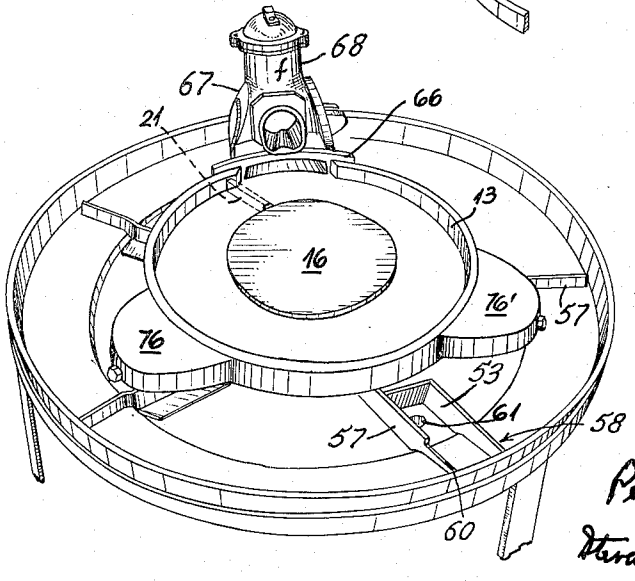


Fig. 2

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WASHING MACHINES

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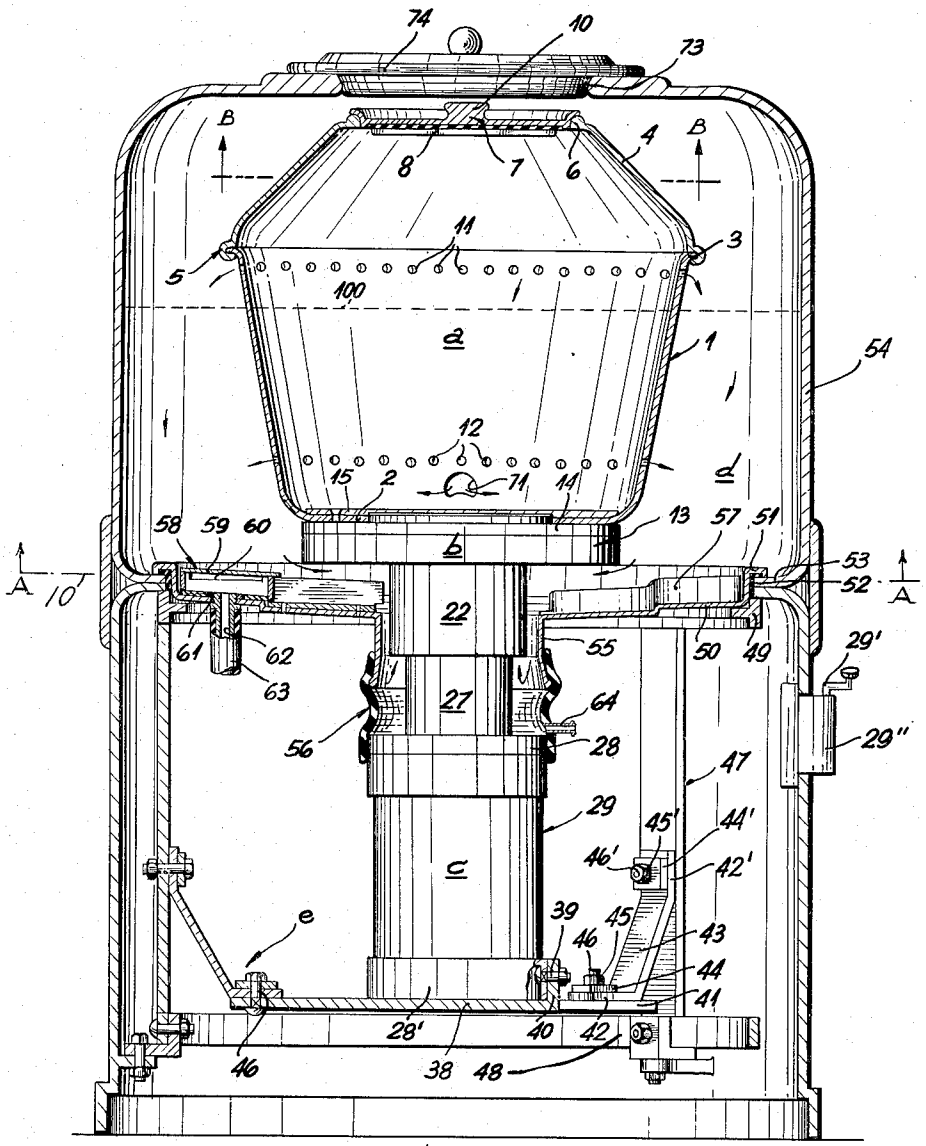


Fig. 3

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WASHING MACHINES

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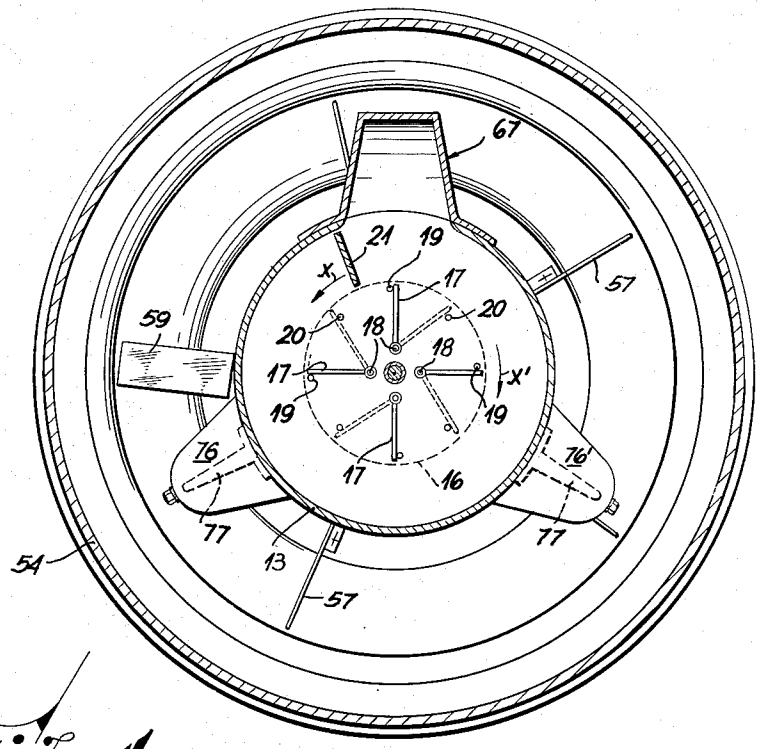


Fig. 4

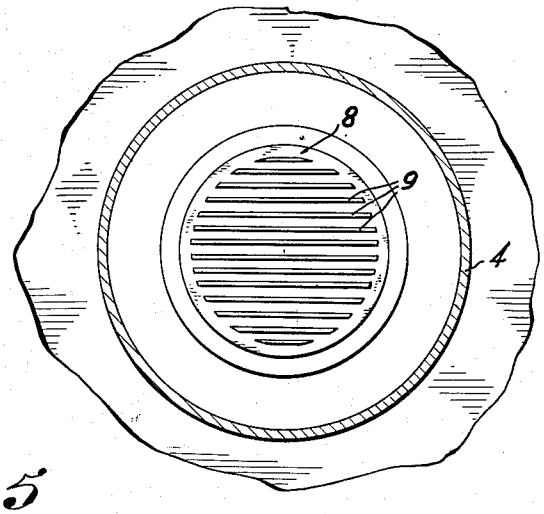


Fig. 5

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WASHING MACHINES

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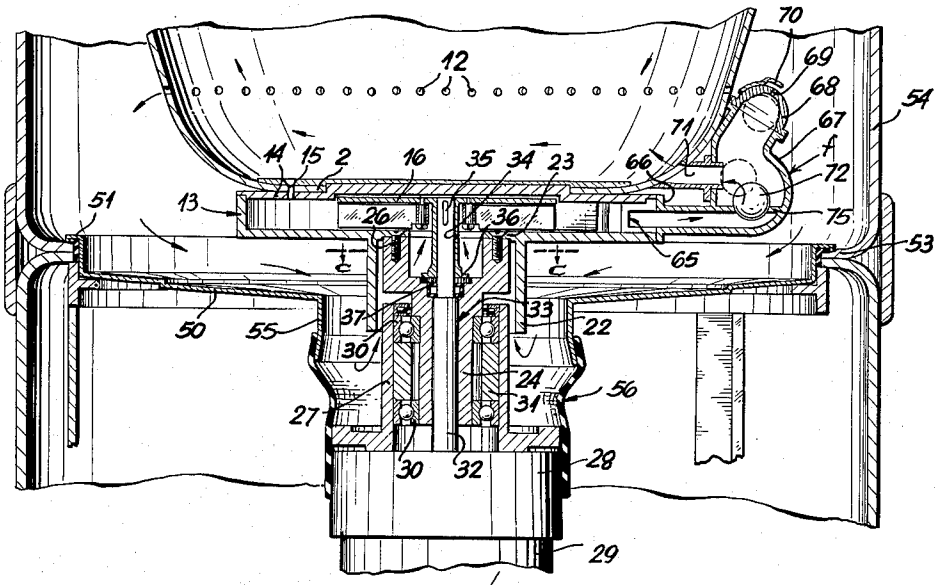


Fig. 6

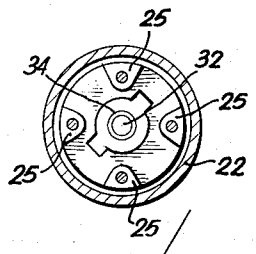


Fig. 7

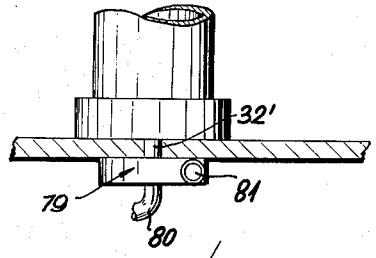


Fig. 8

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WASHING MACHINES

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10 Claims. (Cl. 68—23)

This invention refers to improvements in washing machines and more particularly to a washing machine with an hydraulic coupling for the centrifugal process.

Within the many concepts of the centrifugal type of washing machines, it has become a common practice to employ mechanical transmissions for the process of washing and drying.

In the machine of this invention, the mechanical transmission system has been replaced by a hydraulic one, which performs both the washing operation and, subsequently, the centrifugal drying step.

So as to be able to perform both operations, a device has been created which during the washing process functions as a recirculating pump and, during the centrifugal process of drying, acts as a coupling between the motor unit and the tub that contains the clothes.

Within the essential characteristics and advantages of the present invention, it is important to realize the fact that the machine, as a whole, referring to its moving parts, acts as a unit when rotating, and due to the uniform distribution of the masses, said machine maintains dynamic and static equilibrium.

Other details of the invention reside in the fact that the motor unit is aligned with what may be defined as the vertical symmetry axis of the machine and that the motor acts also as the supporting element for the hydraulic unit.

As has been mentioned before and will be described in further detail, the coupling of the driving shaft of the motor with the tub for the centrifugal process of drying is hydraulically performed, and it is important to point out that the coupling medium is water. It may be understood that, therefore, if the necessary amount of water is not present in the interior of the machine, the above mentioned coupling cannot be produced and in consequence the centrifugal process of drying cannot be performed.

The washing process is performed by a pressurized water recirculation through the pump and stationary tub, which washing process in consequence also contributes to form a perfect homogeneity between the soap or lye and the water.

In order to facilitate the comprehension of the invention, a preferred embodiment has been illustrated in several drawings, by way of example, so as to be able to permit a correct interpretation of its functional and constructive features.

In the drawings:

FIG. 1 is a general perspective view, which illustrates a washing machine, conceived in accordance with this invention, but without the cabinet.

FIG. 2 is also a perspective view showing the recirculating pump and part of the coupling on which the tub for washing is supported.

FIG. 3 is a longitudinal section of the same machine with the cabinet and showing the relative position of elements forming the machine.

FIG. 4 is a cross section along line A—A of FIG. 3.

FIG. 5 is a cross section along line B—B of FIG. 3.

FIG. 6 is a longitudinal sectional view, showing the constructive details and mounting of the recirculating pump and coupling.

FIG. 7 is a cross section along line C—C of FIG. 6.

FIG. 8 is a detail in elevation of a modified embodiment for discharging the water contained in the washing machine.

This machine comprises essentially the following parts which will be later described in detail:

a, a tub for washing (see FIGS. 1 and 3).

b, a pump or device for recirculating and coupling (see FIGS. 1 and 3).

c, an electric motor (see FIGS. 1 and 3).

d, a container in which the washing tub *a* is lodged (see FIG. 3).

e, an oscillatory suspension system in stable equilibrium, which supports the weight of elements *a*, *b*, *c*.

f, a valve which shuts off the recirculating and coupling device when said device acts as a hydraulic coupling (see FIG. 6).

The washing tub *a* (FIGS. 1 and 3) has a lateral surface **1** slightly frusto-conical in shape so that the bottom **2** is smaller in diameter than the top part **3**. Tub *a* rests on the pump casing **13**, **14**.

The top part of the washing tub *a* is defined by a lateral frusto-conical surface **4**. The edge **5** is joined with top part **3** while its opposite edge **6** of a tub *a* determines the inlet for the fabrics to be washed and supports a lid **7** the internal surface **8** of which has ridges **9** of rounded contex, as can be seen in FIG. 5. This lid **7** may have a handle **10** (FIG. 3) so as to facilitate its removal or it may be hinged (not shown) to the tub *a* by any well known hinge means.

This tub *a* must have perforations such as rows **11** and **12**, so that the recirculation of the liquid, from tub *a* into container *d* and therefrom into the recirculation and coupling device *b* and back into tub *a* may take place.

The device *b* for recirculating and coupling consists of a pump casing **13** which includes a top **14** (FIGS. 3 and 6) to which is connected the bottom of tub *a* by means of screws **15**. In the interior of casing **13**, a disk like rotor **16** is placed (FIGS. 2, 4 and 6), which on one of its surfaces, which in this case due to the position of the machine is the bottom surface, carries a number of spaced apart vanes **17** which are pivoted on pivots **18** (see FIG. 4), in such a manner that the angle of displacement can be varied and in consequence also the pressure the pump delivers may be varied, as will be seen later on.

If the rotor **16** turns in the direction indicated by the arrow X, in FIG. 4, the vanes **17** turn in a direction opposite arrow X (dotted position) and their angular displacement remains limited by butts **20** which form an integral part of the disc **16**; but if the rotor **16** turns in the opposite direction such as it appears indicated by arrow X', the vanes **17** rotate in opposite direction until abutting against butts **19**, which as well forms an integral part of disc **16**.

It is easy to observe in the drawing of FIG. 4, that this angular displacement of the vanes **17** implies also a variation in the useful diameter of the rotor.

Reference numeral **21** identifies a partition separating the inlet from the outlet of pump *b*, the specific purpose of which will be understood when the operation of the

pump *b* is described in its double purpose of a recirculating and hydraulic coupling device.

As may be seen in FIGS. 3 and 6 the casing **13** of the pump *b* has a neck **22** and an inwardly projecting ring **23** to which a supporting element **24** is joined. The upper end portion of said supporting element **24** consists of four or more evenly spaced apart columns **25** on which ring **23** is fixed by screws or bolts **26**, see also FIG. 6.

The supporting element **24** is journalled within a tube **27** having to this effect ball-bearings **30**, **30'**. Tube **27** rests on cover **28**, of the housing **29** of the motor *c*. Upper ball-bearing **30** is spaced apart from lower ball bearing **30'** by spacer tube **31**.

Shaft **32** of motor *c*, is rotatably located in bore **33**, which is defined by the lower portion of the supporting element **24** and which forms a journal bearing. The shaft **32** is telescopically fitted in a tubular shaft **34** by means of a cotter-pin **35**, and which shaft **34** is integral with the rotor disc **16**.

It can be seen that the free end of the tubular shaft **34** has an annular boss **36** which rests upon a stuffing-box **37** located in a recess in the supporting element **24**.

The motor unit *c* rests with its base portion **28'**, on a suspended platform **38**. Base portion **28'** is joined to the platform **38** by means of screws or bolts **39** which are secured to the supports **40**. The platform **38** is resiliently supported by the frame **47** with the platform being provided with radial arms **41** to which the ends **42** of connecting straps **43** are joined by means of washers **44** and nuts **45** that are attached onto the bolts **39**. The opposite ends 42^1 of the straps **43** are joined by bolts 46^1 and washer and nut assemblies 44^1 and 45^1 to the frame **47**.

Frame **47** is linked to lower and upper rings **48** and **49** which are integral with the cabinet.

The bottom of the container *d* is formed by an annular bottom plate **50** having an external rim **51** resting on the inner edge **53** of the wall **54**, defining container *d*. A rubber seal **52** is interposed between rim **51** and edge **53**. A tubular projection **55** is formed in the center portion of the bottom plate **50**, and which encircles the neck **22** of the pump casing **13**, as is shown in detail in FIG. 3. An annular band **56**, preferably made of rubber, joins the said tubular projection **55** with the cover **28** of the motor *c*, thus obtaining an hermetic, elastic seal with a freedom of movement for the suspended elements.

As can be seen in FIGS. 3 and 4, the bottom **50** is sloped towards the center and has a number of radial partitions **57** of which one forms part of a box **58**, which can be seen more in detail in FIG. 2, and which is closed on the upper part by a lid **59**, but has a lateral slot-inlet **60**.

In the bottom of the box **58** there is a discharge orifice **61**, which by means of a coupling tube **62** connects a hose **63** to drain (see also FIG. 3).

The flexible annular band **56**, as can be seen in FIG. 3, has a spout **64** and to which can be joined a small hose (not shown) for draining purposes. During operation of the machine the outlet of said spout **64** is closed.

Referring again to FIG. 6, it can be seen that the pump casing **13** comprises a discharge outlet **65** to which is applied a flange **66** of the valve casing **67** of valve *f*. Valve casing **67** has a tubular projection **68** (see also FIG. 2) with a small bleeding orifice **69** carefully calibrated. A baffle plate **70** is mounted on the top of the valve casing **67** to direct the liquid passing through the orifice **69**, as will be later better explained, when describing the operation of the machine.

Casing **67** has an aperture or conduit **71** which opens into the interior of tub *a*. A float or floating ball **72** is placed within casing **67** which operates as a shutter or valve member.

The operation of the machine is as follows:

Through the hose **63** which can be clearly seen in detail in FIG. 3, or through the aperture of access **73** in which lid **74** is fitted, a certain quantity of water is added which floods the tub *a* and container *d* up to a determined level, for example, level **100**. The clothes are placed in the interior of the tub *a*.

When the water is at the level **100**, it is quite evident that the pump *b* will be completely flooded and that the float **72**, which can be clearly seen in detail in FIG. 6, is lodged in the topmost part of the tubular projection **68** of the valve case **67**. When the float **72** is in this position, the aperture or conduit **71** remains open so as to permit the discharge of the water into the interior of the tub *a* for washing.

By starting the motor *c*, by means of the handle **29'** (see FIG. 3) of the inversion switch **29''**, in the direction indicated by arrow X of FIGURE 4, the pump *b* injects the liquid into the interior of the tub *a* and, owing to the pressure exercised, produces the recirculating movement of the clothes within the before mentioned tub *a*, for washing.

The clothes rub softly against the ridged surface **9** of the lid **8**, facilitating also thereby the process of washing.

It is obvious that the ridged surface **9** can be made of any suitable substance, such as synthetic rubber, natural rubber, glass or plastics.

Simultaneously with the recirculation of the clothes in the interior of the tub *a*, liquid is discharged through perforations **11** and **12** of same, as can be clearly seen in FIGS. 3 and 6, whereby the same liquid is recirculated to the pump *b*, consequently providing a continuous recirculation.

Since all the pump output is used for recirculating the liquid, which is free to move, there is none or but a small tendency for tub *a* to rotate in the direction of arrow X. This can be avoided by a pivoted wing such as wing **78** mounted on the outside of valve casing *f* (see FIG. 1), due to the fact that the free end of wing **78** will butt against one of the radial partitions **57**, but actually on the other side as that shown in the example of FIG. 1.

The liquid can be mixed with a soapy or detergent substance, which is recirculated by the pump together with the liquid, thereby achieving a perfect homogenization. Once the process of washing has been concluded, the liquid is discharged through the hose **63** until the level of the liquid descends to plane **10**, clearly indicated in FIG. 3.

As the level of the liquid descends, the float **72** comes to rest on seat **75** of the valve case **67**, as can be seen in FIG. 6.

Inverting the direction of rotation of the motor *c* by means of the inversion switch **29''** so that rotor **16** will rotate in the direction indicated by arrow X' in FIG. 4, the vanes **17** change position and because their working surface becomes larger, they produce more pressure.

In these conditions, pump *b* injects the liquid (water) through the discharge outlet **65** into valve casing **67**, raising the ball **72** from seat **75**, and firmly lodging same against conduit **71** due to the suction exerted by pump *b* through conduit **71**.

Since pump *b* continues to operate, the liquid taken into its inlet is sent through discharge outlet **65** filling ball blocked valve casing **67**. The greater pressure produced thereby, as has been previously explained by pump *b* acting in valve casing **67**, maintains the ball **72** against conduit **71**. During the centrifugal step, the float **72** is in contact with the conduit **71** because of the greater pressure exerted by the pump *b* produced by the larger working surfaces in the vane **17** of the rotor **16**. In such position of adherence to the conduit **71**, the float causes the circulation of water to be blocked from the tub *a* and the water then enters the valve casing **67** and presses the float **72** firmly against the conduit **71**, thereby preventing the float from becoming dislodged by centrifugal force.

As the rotor **16** and shaft **32** of electric motor *c* are

co-axially arranged, the speed of this assembly is the same. Since only a very small amount of liquid can be ejected through bleeding orfice **69** (to which reference in detail will be made later on) in relationship to the volume of liquid transported by pump *b*, the pressure within casing **13** of pump *b* and also obviously within casing **67** of valve *f* will increase to such an extent that the rotor **16** will be hydraulically coupled to casing **13** having the lid **14** rigidly connected to tub *a*, whereby said tub *a* starts to rotate together with casing **13**, thus providing the centrifuging and drying step of the process.

Furthermore, tub *a* may rotate in the direction of arrow X', since wing **78** (which is actually located on the other side of casing *f* as previously mentioned) will rotate about its pivot **82** in counter-clockwise direction, raising thereby its free end above the upper edge of radial partitions **57**.

The desired centrifugal speed is accurately graduated by the size of bleeding orifice **69** since it allows pump *b* to provide only a predetermined maximum pressure. The larger the bleeding orifice **69**, the lower the speed, as the pressure in the pump *b* is consequently less and vice-versa.

Baffle plate **70** acts as a diffuser of the liquid jet from orifice **69** thus cleansing container *d* during the centrifuging process and avoiding possible obstruction of said orifice **69** due to foreign matter which may float within container *d* during the switch over to the centrifugal step when the liquid level is lowered from level **100** to level **10**.

It may be added that box **59**, with its groove **60**, allows the outlet of excess liquid, down to level **10**, so that the necessary liquid for the centrifugal process remains in the machine, whereby the dividing partitions **57** channel the liquid towards the center part of the bottom **50**, so that the pump *b* remains permanently fed.

As the case of the valve **67** and associated parts have a determined weight, it is necessary and convenient to counterbalance the system by means of counterweights **76** and **76'**, clearly shown in FIGS. 1, 2 and 4.

It is also advisable to provide the tub *a* with small radial vanes **77**, which are placed on the external and bottom part of the tub *a*, and which are integral with the counter-weights **76** and **76'**, so that when the rotary inversion is made from the washing operation to the centrifugal process, the liquid contained in container *d* descends gradually, and these vanes equalize the pressure that the valve casing **67** exercises on the liquid mass.

In FIG. 8, a complementary detail is shown as a possible modified embodiment, consisting of a small discharge pump **79** connected to the lower end **32'** of shaft **32** of motor *c*. The inlet **80** of pump **79** is to be connected to hose **63**.

The outlet **81** may be provided with a hose (not shown) for conveying the liquid discharged when the machine switches from the washing step to the centrifuging step.

To completely empty the machine, once the centrifugal processes is finished, spout **64** is opened.

I claim:

1. A washing machine having a container, a tub housed in said container and spaced apart therefrom, clutch and driving means coaxially arranged with said tub and below the latter for maintaining said tub stationary during the washing and rinsing steps and for rotatively driving said tub during the centrifuging and drying step, said clutch and driving means comprising a centrifugal pump defining the clutch means and a motor defining the driving means, said centrifugal pump having a pump casing including a top, said tub including a bottom mounted on said top, a rotor rotatably housed in said casing and having a shaft projecting out of said casing, said casing having an opening through which the shaft projects, said tub being provided with an opening adjacent the bottom, said motor being coupled to said shaft for driving the latter, said motor and shaft being coaxial with the axis of said tub, said casing having an inlet opening for the pump provided adjacent to said shaft and through which water in the opening at the bottom of the tub passes, said casing having a discharge outlet provided adjacent the periphery of said rotor, means connecting said discharge opening with the interior of said tub and responsive to the water level in said tub for blocking the fluid connection between said pump and tub and hydraulically coupling said rotor to said tub, said means including a fluid level control blocking valve, and said tub having at least one perforation connecting the interior thereof with the container to establish a fluid connection with said inlet opening.

2. In a washing machine having a cabinet provided with an upper and a lower portion, a tub housed in the upper portion of said cabinet, said tub having a vertical axis, clutch and driving means housed within said cabinet and co-axially arranged with said tub and below the latter, said clutch and driving means being adapted to maintain said tub stationary during the washing and rinsing steps and being further adapted to rotatably drive said tub during the centrifuging and drying step, said clutch and driving means comprising a centrifugal pump defining the clutch means and a motor defining the driving means, said centrifugal pump having a pump casing, said tub having a bottom and said bottom being rigidly connected to said casing, a rotor rotatably housed in said casing and having a shaft projecting out of said casing and being co-axial with said axis, said casing having an inlet opening surrounding the shaft and said opening being provided for the passage of the water from the tub, said casing having a discharge outlet adjacent the periphery of said rotor, a conduit connected to said tub adjacent said casing, a water level controlled float blocking valve connecting said discharge opening with said conduit, a float in said valve for blocking said conduit when the level of the water contained in said tub is below said conduit, at least one perforation in said tub above said conduit connecting the interior of said tub with said cabinet, said pump intaking water through its inlet opening from said cabinet and transporting it through said valve and conduit into said tub during the washing action whereby said float is out of contact with said conduit so that said tub will not rotate, and said float hydraulically coupling said rotor to said casing and to said tub upon blocking said conduit, when said water level is below said conduit, to thereby rotate said tub at a predetermined speed, said rotor being driven at the same speed of said motor.

3. A washing machine as claimed in claim 2, wherein said rotor consists of a disc having a plurality of circumferentially spaced apart pivoted vanes, a pair of butts for each vane integral with said disc for establishing two end positions for each vane to obtain thereby a variation in the useful diameter of the rotor, and switch means for changing the direction of rotation of said rotor.

4. A washing machine as claimed in claim 3, wherein said vanes in one position lie on the radius of the rotor.

5. A washing machine as claimed in claim 2, wherein said cabinet comprises an annular bottom plate dividing said cabinet into an upper portion and a lower portion, said tub and centrifugal pump being housed in said upper portion, said bottom plate having a central opening through which said shaft passes and said bottom plate being sloped towards said central opening for supplying water from said upper portion of said cabinet into said inlet opening of said casing.

6. A washing machine as claimed in claim 5, wherein said bottom plate has a discharge orifice for controlling the minimum water level within said upper portion of said cabinet, whereby said pump is always maintained in primed condition.

7. A washing machine as claimed in claim 2, wherein said water level controlled float blocking valve is mounted adjacent to the outside of said tub, two spaced apart coun-

ter-weights also mounted adjacent to the outside of said tub to dynamically counterbalance said valve, said valve and counter-weights being angularly spaced apart substantially 120°.

8. A washing machine as claimed in claim 2, wherein said water level control float blocking valve includes a bleeding orifice.

9. A washing machine as claimed in claim 5, wherein said bottom plate is provided with spaced apart radial partitions arranged in said upper portion, said valve including a valve casing, a wing pivotally mounted on the outside of said casing for engaging in blocking contact

with one of said radial partitions during the washing action and for rising above said partitions during the centrifuging action.

10. A washing machine as claimed in claim 5, wherein said tub has a top portion, an opening in said top portion, a lid mounted in said opening and having an inner ridged surface.

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