

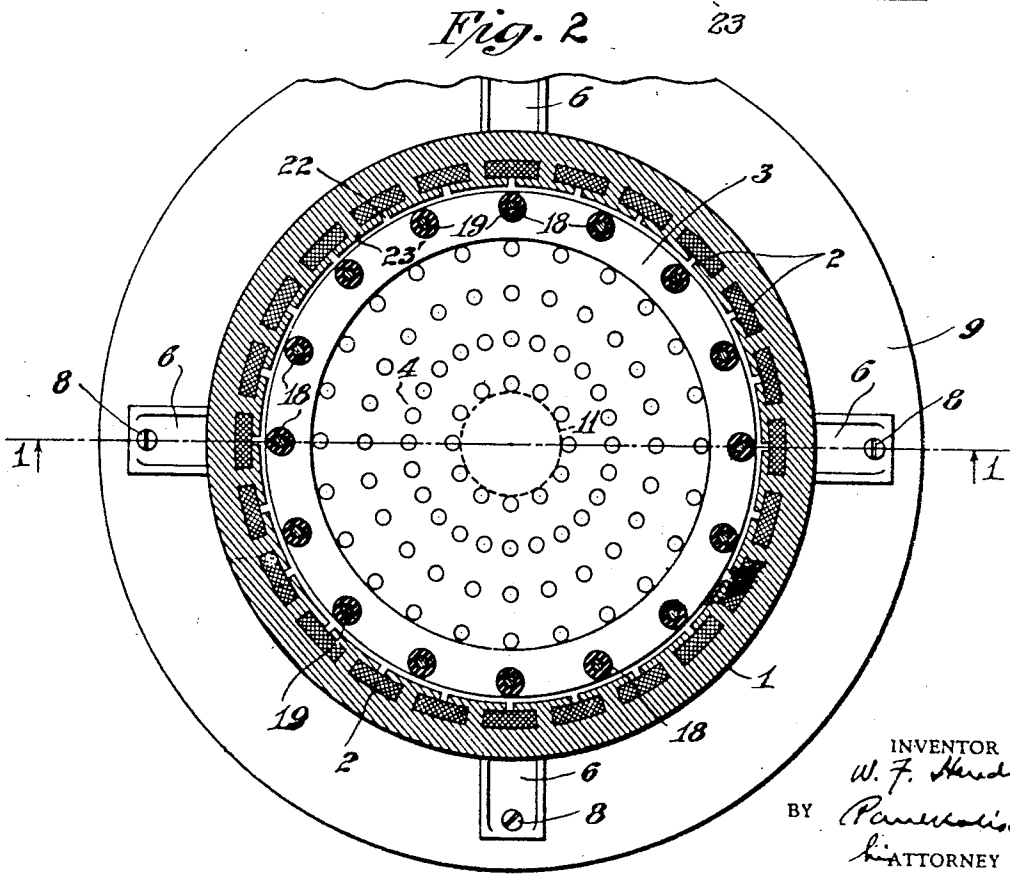
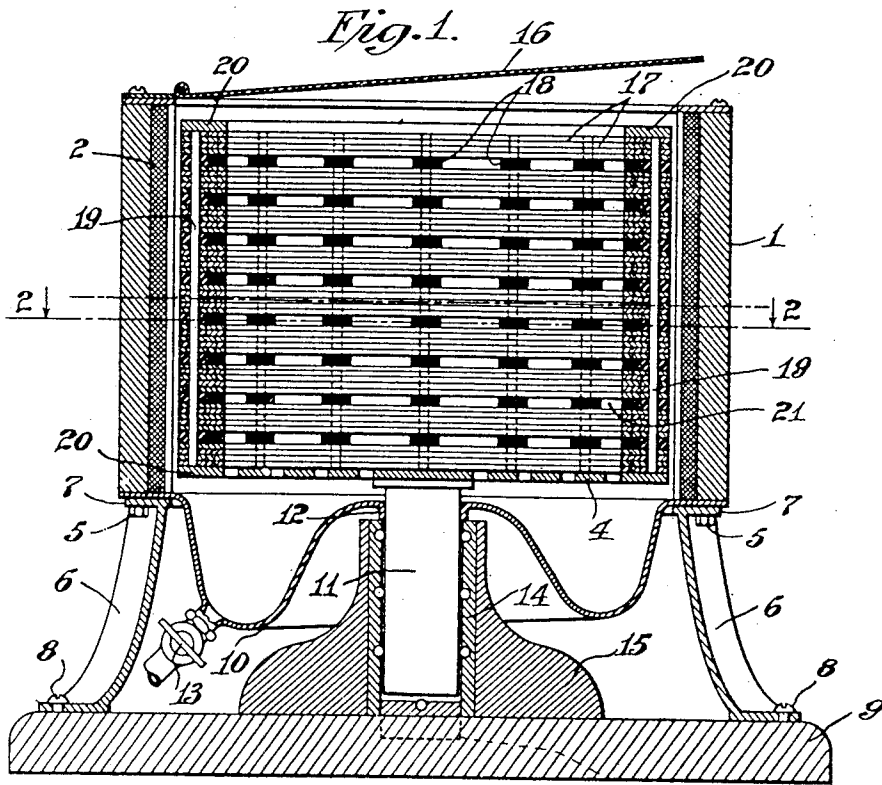
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LAUNDRY APPARATUS

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LAUNDRY APPARATUS.

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This invention relates to laundry machines and more especially to machines of the rotating drum type wherein washing, extracting and drying are accomplished by centrifugal force.

It is well known that in laundry machines of the centrifugal type, when the rotating drum is charged with wet garments, the said garments tend to distribute themselves away from the center of the drum but because of their varying kinds the distribution is not effected equally in all directions, resulting in what is known in the art as "unbalance." This "unbalance," if not counteracted, results in a gyratory motion of the main shaft which, together with the main bearings, is subjected to destructive wear, which in turn aggravates the unbalance effect. Heretofore, the problem of eliminating the harmful effects of unbalance has been solved by providing specially designed bearings for the drum shaft, or by suspending the drum, and having it rotate around a vertical axis rather than a horizontal one. Other solutions are directed to the construction of drums of particular shapes which more or less counteract the unbalance. However, the solutions of the prior art have necessitated for the most part relatively complex and expensive mechanisms. Accordingly, it is one of the principal objects of the present invention to provide a drum type washing machine or extractor wherein the detrimental effects of "unbalance" are reduced to a minimum.

It has been found that if the rotary driving force for centrifugal laundry machines is applied circumferentially the effects of unbalance are materially reduced. It is, therefore, another object of the invention to provide a centrifugal washer or extractor in which the driving force is applied directly and circumferentially to the drum and substantially equally over the peripheral surface thereof.

In attaining the above mentioned objects, it is proposed to use the drum of a rotary laundry machine as the armature or field of an electric motor whereby a simple and inexpensive laundry machine is provided which is substantially unaffected by centrifugal unbalance. Accordingly, it is a feature of the present invention to provide a rotary

laundry machine which can be economically manufactured, easily assembled and does not require expensive bearings.

Another feature of the invention relates to a drum type laundry machine in the form of an electric motor in which the weight of the revolving drum is partially taken off the bearing when the drum is rotating, thus requiring only a relatively simple sleeve bearing for steadying the drum in a vertical position.

A still further feature relates to a laundry machine in the form of an electric motor, wherein the heating of the machine due to electrical or electromagnetic losses is utilized to expedite the drying operation.

For the purpose of illustrating a preferred embodiment of the invention wherein the above noted advantages are secured it has been chosen to embody the invention in a machine wherein the drum constitutes the rotor of an induction motor of the squirrel cage type. However, it will be understood that the invention in its broad aspects is not limited to this particular kind of motor.

Referring to the drawings, there is shown in Fig. 1 a vertical cross-section of a laundry machine embodying the present invention.

Fig. 2 shows a horizontal section of the machine taken along line 2—2 of Fig. 1. The machine proper comprises an outer cylindrical casing 1 which is preferably of iron for the purpose of enabling the same to serve as the field structure of an induction motor. The design of this magnetic structure so far as size and constitution of material may be in accordance with established principles of motor design and according to whether the machine is to be used on single phase or poly-phase circuits. While in the drawing this magnetic structure is shown as of solid material, it is understood that the showing in this respect is schematic. The field structure 1 is provided with the usual slots having field windings 2 disposed therein which may be of any well known type, depending on whether the machine is to be used as a single or poly-phase machine. If the machine is to be used on single phase circuits any of the well known means may be employed for rendering the motor self-starting. An inner basket-like drum 3 serving as a clothes receptacle is

mounted for rotation within the casing 1 and forms the armature or squirrel cage of the induction motor, said drum being provided with a perforated bottom plate 4. The field structure 1 is fastened by bolts 5 or by any suitable means to a pedestal comprising the legs 6 which are formed integrally at their upper ends with the ring 7, and at their lower ends are fastened by bolts 8 to the floor or heavy base 9. For the purpose of enclosing the lower portion of the machine there is provided an annular dish-shaped bottom 10 which serves as a reservoir and is secured at its periphery between the ring 7 and the field structure 1 as shown more clearly in Fig. 1. The member 10 is provided with a central opening through which extends the main shaft 11, and the inner edge 12 is so shaped with respect to shaft 11 that water is prevented from leaking out of reservoir 10 on to the adjacent exposed parts of the machine. As shown in Fig. 1 the member 10 is not of equal depth throughout but has the bottom inclined toward the left and is provided with a valve 13 which may be opened to allow the water to leave the reservoir as required.

The shaft 11 is mounted for rotation in any suitable bearing preferably such as a step-bearing and provided with means for taking care of end thrust, as represented schematically in the drawing by the numeral 23. When the drum 3 is at rest the lower end of shaft 11 rests on the bearing 23 which then supports the entire weight of the drum and the center line of the drum is slightly lower than the center line of the field. As the field becomes energized the drum is attracted vertically until the center lines of both drum and field are coincident as shown in Fig. 1, thus taking part of the weight of the drum off bearing 23. For the purpose of supporting the shaft in a vertical position, a suitable sleeve bearing 14 of the ball-bearing type is provided. The sleeve 14 is supported within the casing 15 which may be formed integral with the base 9. Shaft 11 at its upper end is fastened in any suitable manner to the perforated bottom 4 of the drum 3. For the purpose of preventing access to the interior while the drum is rotating, a hinged cover 16 is fastened to the casing 1 and is provided with an appropriate latch or lock.

As mentioned hereinabove the drum 3 forms the armature or squirrel-cage of an induction motor, and is provided with a magnetic structure comprising a cylindrical iron body which may be built up of circular laminations 17 as is well known in the art of motor design. The drum laminations are arranged in groups which are separated by suitable bushings 18 to provide a relatively large area through which moisture from the interior of the drum may be ejected. Passing through the laminations and bushings 18 are the conducting bars 19 which are welded to

the end rings 20. This structure is similar to one well-known type of squirrel cage rotor except for the fact that the laminations are arranged in spaced groups. Inasmuch as the stator 1 and its winding 2 when in use may be subjected to the action of the chemicals contained in the washing fluid, it is preferable to cover them with a layer of an insulating compound which is not attacked by the washing chemicals.

When it is desired to use the machine as a washer the valve 13 is closed, drum 3 is charged with the garments to be washed and water is poured into the interior to the required depth. Cover 16 is then closed and fastened by a suitable lock and the current turned on to energize the field windings 2 whereupon drum 3 rotates. Inasmuch as, for washing, the drum should be rotated at a relatively low speed as compared with its speed when used as an extractor, it may be desirable to provide separate sources of alternating current of different frequencies and suitable switches for connecting the field winding to the sources. For example, 60 cycle current may be used for the drying operation and 25 cycle current for washing. Furthermore, the direction of rotation may be reversed periodically by any suitable means to expedite the washing. As a result of the basket-like construction of the rotor and the notched character of the stator, the water is churned in and out and washing of the garments is effected. After the washing operation the valve 13 is opened and the water allowed to drain out and the wet garments are subjected to the centrifugal extracting process, the moisture being ejected from the garments out through the spaces 21 between the laminations. The ejected moisture is conducted downwardly to the reservoir 10 through the spaces between the squirrel cage and stator. The spaces 22 between the field poles 23' also provide additional paths for conducting the water to reservoir 10. The air gap between the rotor and stator may be of such width as to facilitate the downward flow of the ejected water. As is well known in designing induction motors, it is highly desirable to have as small an air gap as is possible in order to avoid the generation of excessive heat. However, in the present machine the air gap while it is made larger than in ordinary induction motors serves the dual purpose of providing a larger space for the water to flow out, and also when the machine is used as an extractor or dryer the heat due to the large air gap is taken advantage of to effect the drying operation more rapidly.

Finally, when it is desired to stop the machine all that is necessary is to momentarily reverse the current through the field coils by a suitable switch, whereupon due to the great retarding torque the machine is brought to rest in a comparatively short time. In prior

machines, due to the very great inertia of the rotating drum when the drying operation is complete a considerable time interval elapses between the opening of the main power circuit and the actual stopping of the machine, requiring in many cases the employment of special braking apparatus. By the simple expedient of reversing the direction of the field current in the present machine this costly braking apparatus is eliminated.

From the foregoing description, it is clear that an easily assembled and inexpensive machine is provided requiring only one simple bearing for the main shaft, inasmuch as the force for driving the drum receptacle is applied circumferentially and equally over the entire periphery thereof and the load is taken off this bearing during rotation. Furthermore, when unbalance occurs within the drum tending to tilt the same in a given direction, because of the interaction between the magnetic fields due to the windings 2 and squirrel-cage 3 respectively, as the drum tends to approach nearer the pole pieces on one side a greater repulsive force is exerted thus tending to hold the drum in its vertical position.

While in the foregoing description and in the drawings it has been chosen to illustrate a preferred embodiment of the invention it is to be understood that changes may be made without departing from the spirit of the invention. For example, instead of assembling the squirrel-cage in the manner described, a squirrel-cage assembled in the ordinary manner may be employed with perforations between the conducting bars, the broad aspect of the invention residing in the use of a hollow armature serving as the receptacle and drum for a laundry machine. Accordingly, any other type of motor may be employed provided the armature is capable of containing garments and is provided with perforations for the ejection of moisture and with suitable passageways for allowing the ejected moisture to flow away from the space between the rotor and stator.

What I claim is:

1. A laundry machine comprising a hollow motor armature serving as a clothes receptacle, a shaft supporting said armature, means comprising a magnetic field acting upon said armature for rotating the same and for substantially reducing the effects of unbalance.

2. A laundry machine adapted to act as a washer or dryer comprising a hollow outer casing forming a water receptacle, a cage-like inner drum forming a clothes receptacle, said inner and outer drums forming respectively the rotor and stator of an electric motor.

3. In a centrifugal extractor a rotatable drum serving as a receptacle for damp material, a bearing for supporting the weight of

said drum when at rest, means for rotating said drum and for relieving the weight of said drum from said bearing while said drum is rotating.

4. In a centrifugal extractor a rotatable drum serving as a receptacle for damp material, a step bearing adapted to support the drum when at rest, and electromagnetic means for partially supporting the weight of said drum during rotation.

5. A centrifugal extractor comprising an outer cylindrical casing, a basket-like drum mounted for rotation within said casing, a bearing for normally supporting the weight of said drum, and means for electromagnetically rotating said drum and for partially supporting the same.

6. A centrifugal extractor comprising an outer cylindrical casing, an inner basket-like drum, the center of said drum being normally displaced vertically with relation to the center of said casing and means for rotating said drum and for bringing said drum central with respect to said casing.

7. In a centrifugal extractor, a motor, stator, a motor rotor mounted within the stator and serving as a receptacle for damp material, said stator and rotor having passageways for conducting away the extracted moisture.

8. A centrifugal laundry extractor in the form of an electric motor comprising a hollow perforated cage-like rotor within which damp material is placed, a stator for said rotor, and means for conducting away the moisture ejected by the operation of said rotor.

9. A centrifugal extractor in the form of an electric motor comprising an outer cylindrical casing, a cage-like armature rotor mounted for rotation within said casing and serving as a basket, said rotor comprising a plurality of spaced groups of circular laminations and a plurality of conducting rods extending therethrough.

10. A combined extractor and dryer in the form of an induction motor having a relatively large air gap for the conducting away of extracted moisture and for the generation of heat to expedite the drying operation.

11. A laundry machine in the form of an electric motor comprising an outer cylindrical casing acting as a stator of the motor, a squirrel cage rotor mounted for rotation within said casing, said rotor serving as a receptacle for damp materials and having a magnetic structure comprising a plurality of spaced groups of circular laminations.

12. A combined extractor and dryer in the form of an induction motor comprising an outer cylindrical casing serving as the motor stator, a hollow rotor mounted for rotation within said casing and serving as a receptacle for damp materials, said rotor being spaced from said stator to provide conducting paths for extracted moisture and for generating heat to expedite the drying operation.

13. A laundry machine in the form of an electric motor comprising an outer cylindrical casing forming the stator of the motor, an inner cage-like drum forming the rotor and serving as a clothes receptacle, means for energizing said stator to cause rotation of said drum, and means for reversing the current through said stator to rapidly bring said rotor to rest. In testimony whereof, I have signed my name to this specification, this 1st day of December 1927.

WILLIAM FERRIS HENDRY.