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(54) A LAUNDRY-WASHING MACHINE FITTED WITH DEVICES FOR DAMPING MOVEMENTS OF THE TANK

(71) We, THOMSON-BRANDT, a French Body Corporate, of 173 Boulevard Haussmann, 75008, Paris, France(do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a laundry-washing machine fitted with devices for damping movements of the tank.

A laundry-washing machine generally has, around its laundry drum, a water-tight tank which is resiliently suspended from the framework of the machine. When the laundry drum rotates with the laundry distributed within it in an unbalanced fashion, this often causes the tank to perform a complex oscillating movement. This complex oscillating movement, which takes place in all directions, may result in mechanical damage to the machine when its amplitude exceeds a certain value. It is known to fit damping devices to the machines to limit this oscillating movement. Often, such known damping devices each consist of a plate which is attached perpendicularly to the outer face of the lower part of the tank, and also of two pads which have a good coefficient of friction and which are rigidly held in place and resiliently applied, against the two faces of the plate, by a support which is attached to the framework of the machine. In such devices the resilient application of the pads against the said plate is often achieved either by means of a spring or else by a resiliently deformable support which is produced from a resilient metal wire, while the rigid connection between the pads and the said support is achieved either by moulding the pads directly onto the free ends of the support or by making the free ends of the support a force or sliding fit in corresponding holes in the pads. Such known damping devices have the drawback of being relatively ineffective in braking the movement of the tank.

As mentioned above, the oscillating movement of the tank is in fact a complex movement which takes place in all directions. The resilience of an intermediate support or spring enables the pads to be applied continuously against the plate secured to the oscillating tank but does not ensure that the pads are correctly orientated relative to the plate. The rigid connection between the pads and the support in known devices increases still further this misorientation of the pads relative to the moving plate. The result is that often only a very small working surface of the pads is used to brake the movement of the said plate. Because of this the effectiveness of such known damping devices becomes inadequate. In certain known devices the support for the pads is attached to the framework of the machine in such a way as to be moveable about a fixed horizontal axis. This method of achieving a mechanical connection provides the support for the pads with freedom of movement in a plane perpendicular to this horizontal pivot axis. However, this restricted freedom of movement is found to be inadequate to allow satisfactory orientation of the pads relative to the moving plate and also has the disadvantage of allowing the plate a greater or lesser amount of free movement, that is to say unbraked movement, in the said perpendicular plane.

It is an object of the invention, substantially to reduce or avoid the disadvantages mentioned above and to provide an improved laundry-washing machine which is fitted with devices which ensure that the movements of the tank are effectively damped.

The present invention consists in a laundry-washing machine comprising a suspended tank housing a rotatable laundry drum whose rotation causes the tank to per-

form a complex oscillating movement, and a plurality of devices for damping such movement, each of said devices being formed by a friction plate which is attached to the surface of the lower part of said tank and which extends substantially perpendicularly thereto, as well as by two pivotable friction pads which are mounted to rub against the two opposite faces of said plate, and by a support for said pads which is resiliently attached to the framework of the machine, each said support being formed by a resilient wire which is in the form of a loop having two mutually inclined limbs, wherein one end of the support is held trapped within a resiliently deformable material which permits the support to pivot to a limited extent in any direction and which is covered by a cap which is secured to the framework and clamps the resiliently deformable material against the said one end of the support, said cap being provided with means which restrict the extent to which it can clamp the resiliently deformable material and said one end of the support together.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic partial perspective view of one embodiment of a laundry-washing machine according to the invention, showing a suspended tank and devices for damping the movement of the latter;

Fig. 2 is a partial perspective view on a larger scale of a device for damping the movement of the tank of the machine of Fig. 1; and

Fig. 3 is an exploded view, on a different scale, of the damping device of Fig. 2.

In the context of the present invention, the term "laundry-washing machine" signifies any machine which handles laundry and which has a suspended water-tight tank housing a laundry drum which, during its rotation, imparts a complex oscillating movement to the said tank. The term covers both machines for washing or spin-drying laundry, machines for washing and spin-drying laundry, and machines for washing, spin-drying and otherwise drying laundry.

A laundry-washing machine 1 as schematically and partially illustrated in Fig. 1, has a cabinet 2 which is indicated in broken lines, and a suspended tank 3 which houses a laundry drum, which is not shown. The tank 3 is provided at its lower part with two damping devices 4 which are symmetrical with respect to the axis of the tank and which are intended effectively to restrict the complex oscillating movement of the tank caused by the rotation of the laundry drum. Each of these damping devices 4 consists of a rigid friction plate 5 which is attached to and extends perpendicularly to the circumferential surface of the tank 3, and of two friction pads 6 which are held and applied resiliently against the two faces of the plate 5 by a support 7 which is secured to the framework 8 of the machine.

When subjected to a complex oscillating movement by the tank 3, the rigid friction plate 5 moves in all directions. In order quickly to damp the oscillating movement of the tank 3, or in other words effectively to brake the movement of the friction plate 5 during three-dimensional movement of the latter, the damping device 4 exerts, both a maximum constant frictional force against the plate 5 and an increasing resilient force to oppose the horizontal movements of the said plate 5. A maximum constant frictional force against the plate 5 is obtained only when the pads 6 are free to orientate themselves in order to follow the movements of the plate 5 in any direction and when the pads at all times apply the whole of their working frictional surfaces against the faces of plate 5.

In the example illustrated in Figs. 2 and 3, the pads 6 are circular in shape and contain in their friction faces 9 a cruciform recess. The pads 6 may be of any other geometrical shape. The supports 7 for these pads are each formed, in a known manner, by folding a length of a resilient metal wire into a closed, elongated flat loop which is bent transversely, i.e. out of plane, so as to form a support having two mutually inclined limbs. In this embodiment, each support is generally of V form with the two limbs being of unequal length. The supports so formed have a rectangular end 10 formed from the free, abutting ends of the resilient metal wire, and an end 11 which is of part-circular shape. The supports 7 are resiliently deformable. At the rectangular end 10, when the free abutting ends of the wire forming these supports are separated and then released, the resilience of the wire enables them to regain their original abutting position.

In the damping devices 4, the pads 6 are mounted on the free ends of wire which form the rectangular end 10 of the support 7 by means of ball joints 12. These ball joints 12 enable the pads 6 to orientate themselves freely, to follow any orientation of the friction plates 5, and at all times to apply the whole of their working frictional surfaces 9 against the two faces of the plates 5.

The part-circular end 11 of the support 7 is held in position between two flat parts 13 and 14 which are made of a resiliently deformable material such as rubber. Also, the part-circular end is attached to the framework 8 of the machine 1 by means of a rigid cap 15, a screw or bolt 16 and a nut 20. The peripheral wall 17 of the cap 15 encloses the two flat parts 13 and 14 on at least three sides and has a predetermined height so that, after the cap has been attached to the frame-

work by the screw 16, the peripheral wall 17 is pressed against the framework and the cap clamps the flat parts 13 and 14 against the support 7 to a predetermined dependent on the height of the peripheral wall. The part-circular shape of the end 11; the capacity which the flat parts 13 and 14 have for resilient deformation, the degree to which these latter are clamped throughout the extent of the part-circular end 11 of the support 7, and the natural resilience of the said support 7 all contribute to endowing the support 7 with the capacity to pivot in any direction about its part-circular end 11 by an amount which is restricted by the increasing mechanical resistance set up by the flat parts 13 and 14, and thus to co-operate with the ball joints 12 in order at all times correctly to orientate the pads 6 relative to the two faces of the moving plate 5, and to set up an increasing resistance and the maximum of friction in opposition to any movement of the plate 5. The cap 15 also includes a plurality of tabs 18 which extend from the peripheral wall 17 and which, by engaging with openings 19 in the framework 8 when the cap 15 is fitted, prevent any displacement of the cap. The cap 15 thus enables the support 7 and the flat parts 13 and 14 to be secured in place. The cap 15 may be formed, in an economical fashion, by a moulded or stamped part.

The sample structure of the devices 4 of the invention means that their component parts are easy to manufacture and quick to assemble and fit, and makes it possible to obtain economical damping devices thus substantially reducing the manufacturing cost of laundry-washing machines which are equipped with effective damping devices.

WHAT WE CLAIM IS:—

1. A laundry-washing machine comprising a suspended tank housing a rotatable laundry drum whose rotation causes the tank to perform a complex oscillating movement, and a plurality of devices for damping such movement, each of said devices being formed by a friction plate which is attached to the surface of the lower part of said tank and which extends substantially perpendicularly thereto, as well as by two pivotable friction pads which are mounted to rub against the two opposite faces of said plate, and by a support for said pads which is resiliently attached to the framework of the machine, each said support being formed by a resilient wire which is in the form of a loop having two mutually inclined limbs, wherein one end of the support is held trapped within a resiliently deformable material which permits the support to pivot to a limited extent in any direction and which is covered by a cap which is secured to the framework and clamps the resiliently deformable material against the said one end of the support, said cap being provided with means which restrict the extent to which it can clamp the resiliently deformable material and said one end of the support together.

2. A machine as claimed in claim 1, wherein the means for restricting the extent to which the cap can clamp the deformable material and support is the peripheral wall of the cap which presses against the framework of the machine, and wherein tabs extend from the peripheral wall and engage with openings in the framework of the machine so as to lock the cap in position.

3. A machine as claimed in claim 1 or 2, wherein the friction pads are pivotally mounted on their respective supports by means of ball joints which enable the pads to orient themselves freely, so as to apply the full extent of their working frictional faces against the opposite surface of the plate.

4. A laundry-washing machine having damping devices, substantially as hereinbefore described with reference to the accompanying drawings.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1

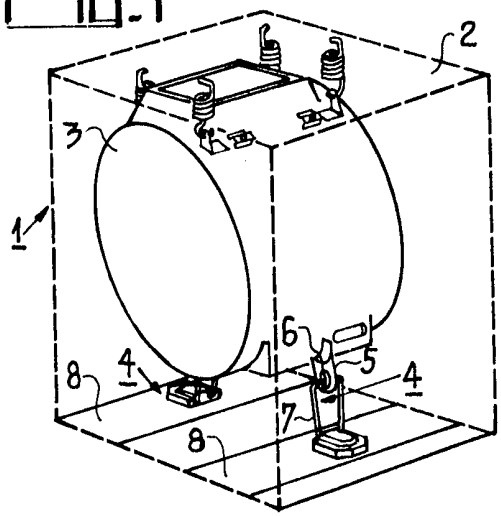
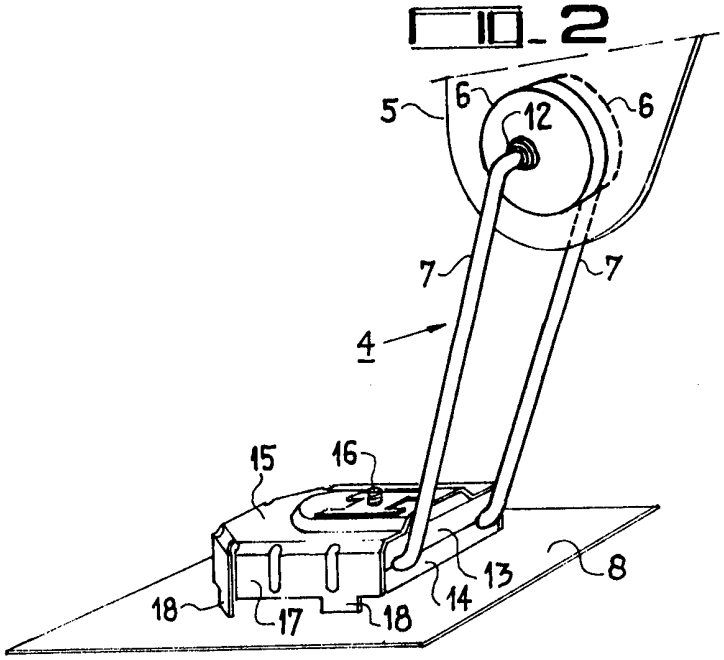


FIG.2



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Sheet 2

FIG. 3