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(54) **Washing machine with a concrete tub**

(57) A washing machine (1) having: a casing (2); a revolving perforated drum (5) supported by the casing

(2); and a tub (12), which is supported by the casing (2), encloses the drum (5), is made of concrete, and acts as both a water container and counterweight.

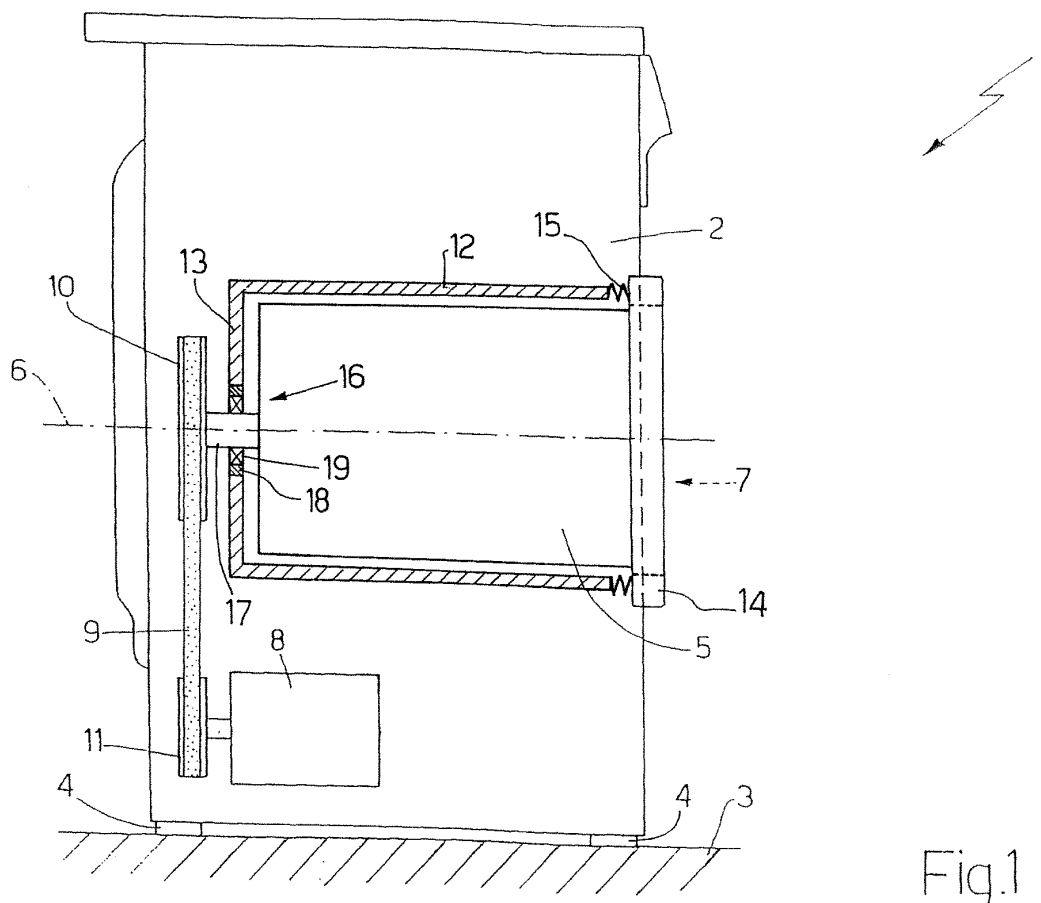


Fig.1

Description

TECHNICAL FIELD

[0001] The present invention relates to a washing machine, preferably for home use.

BACKGROUND ART

[0002] A known washing machine comprises a casing resting on a floor and supporting a revolving perforated drum housed for rotation inside an enclosed plastic tub; and the bottom portion of the casing supports one or two concrete counterweights for balancing machine vibration during spinning of the drum.

[0003] Today the cheapest solution for producing the plastic tub is using a kind of plastic material known as "Carboran". However, every effort is currently being made to further reduce the manufacturing cost of washing machines, and the plastic tubs made of "Carboran" are still too expensive.

DISCLOSURE OF INVENTION

[0004] It is an object of the present invention to provide a washing machine which is cheap and easy to produce.

[0005] According to the present invention, there is provided a washing machine, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view of a washing machine in accordance with the present invention; and

Figures 2 and 3 show two different schematic views in perspective of a tub of the Figure 1 washing machine.

PREFERRED EMBODIMENTS OF THE INVENTION

[0007] Number 1 in Figure 1 indicates as a whole a washing machine comprising a casing 2 resting on a floor 3 on a number of feet 4. Casing 2 supports a revolving perforated drum 5 which rotates about a horizontal rotation axis 6 (in alternative embodiments not shown, rotation axis 6 may be tilted or vertical), and front access to which is closed by a door 7 hinged to casing 2.

[0008] Drum 5 is rotated about rotation axis 6 by an electric motor 8 connected to drum 5 by a transmission system, which comprises a belt 9 connecting a pulley 10, fitted to the shaft of drum 5, directly to a pulley 11 fitted to the shaft of electric motor 8. In an alternative embodiment not shown, electric motor 8 is coaxial with drum 5,

and the shaft of drum 5 is connected rigidly to the shaft of electric motor 8.

[0009] Washing machine 1 also comprises a cylindrical tub 12 supported by casing 2 and enclosing drum 5. A first end of tub 12 is closed by a back wall 13, and a second end of tub 12, opposite the first end, is open to define a door opening, and is connected to a circular fixed frame 14 of door 7 by an elastic watertight bellows.

[0010] Back wall 13 has a central through hole 16, through which extends a shaft 17 of drum 5. More specifically, a supporting hub 18 is fitted inside through hole 16 of back wall 13, is connected rigidly to back wall 13, and supports a bearing 19 of shaft 17.

[0011] According to the present invention, tub 12 is made of concrete and, in particular, of a composite concrete comprising a standard concrete, and additives for filling the natural micropores of the standard concrete to increase tensile strength (and improve impermeability). The additives also accelerate setting of the composite concrete to achieve a demoulding time of a few minutes. A reasonable concrete/additive ratio is around 50/50, but other ratios may also be used.

[0012] If necessary (for big loads and/or high spinning speeds), tub 12 may also be made of reinforced concrete and so comprise internal metal (steel) reinforcement.

[0013] Concrete tub 12 therefore acts as both a water container and counterweight. In other words, the weight of concrete tub 12 is sufficient to balance machine vibration with no need for any additional counterweight inside casing 2.

[0014] Preferably, supporting hub 18 is moulded into concrete tub 12, i.e. is placed inside the mould of tub 12 before feeding in the concrete. If necessary, supporting hub 18 may be provided with a number of metal (steel) radial wires to strengthen back wall 13 of concrete tub 12. Bearing 19 is then fitted inside, and connected rigidly to, supporting hub 18.

[0015] In a preferred embodiment, concrete tub 12 is formed in one piece, since the door opening can be closed by door frame 14 with no need for a front flange which reduces the size of the door opening.

[0016] In alternative embodiments, concrete tub 12 may be moulded by casting (pouring composite concrete into the mould) or by centrifugation.

[0017] Concrete tub 12 obviously has at least one through opening (non shown) for feeding water into and draining water from concrete tub 12, and which may either be drilled after concrete tube 12 is moulded, or moulded into concrete tub 12 by inserting a tube inside the mould.

[0018] Washing machine 1, as described above, has numerous advantages, by being easy and cheap to produce. In particular, the concrete material for producing concrete tub 12 is one fifth the cost of the plastic (Carboran) material used to produce an equivalent standard plastic tub. Furthermore, concrete tub 12 is produced much more quickly than an equivalent standard plastic tub, and assembly of washing machine 1 is also simplified

enormously by the counterweight function being an inherent part of concrete tub 12.

[0019] Another important point to note is that, using a concrete tub 12, the counterweight mass is evenly distributed around concrete tub 12, as opposed to being concentrated in one point, as in standard washing machines, so that washing machine 1 is balanced better, and the counterweight mass provides for better damping performance.

Claims

1. A washing machine (1) comprising:

a casing (2);
a revolving perforated drum (5) supported by the casing (2); and
a tub (12) supported by the casing (2) and enclosing the drum (5);
the washing machine (1) being **characterized in that** the tub (12) is made of concrete and acts as both a water container and counterweight.

2. A washing machine (1) as claimed in Claim 1, wherein the tub (12) is cylindrical; a first end of the tub (12) is closed by a back wall (13), and a second end of the tub (12), opposite the first end, is open to define a door opening.

3. A washing machine (1) as claimed in Claim 3 and comprising a door (7) having a fixed frame (14) for front access to the drum (5); the second end of the tub (12) is connected to the fixed frame (14) of the door (7) by an elastic watertight bellows.

4. A washing machine (1) as claimed in Claim 2 or 3, wherein the back wall (13) of the tub (12) has a central through hole (16), through which extends a shaft (17) of the drum (5).

5. A washing machine (1) as claimed in Claim 4, wherein a supporting hub (18) is fitted inside the through hole (16) of the back wall (13), is connected rigidly to the back wall (13), and supports a bearing (19) of the shaft (17).

6. A washing machine (1) as claimed in Claim 5, wherein the supporting hub (18) is moulded into the tub (12).

7. A washing machine (1) as claimed in Claim 5 or 6, wherein the supporting hub (18) has a number of metal radial wires to strengthen the back wall (13) of the tub (12).

8. A washing machine (1) as claimed in any of Claims 1 to 7, wherein the tub (12) is made of a composite

concrete comprising a standard concrete, and additives to increase tensile strength by filling the natural micropores of the standard concrete.

9. A washing machine (1) as claimed in Claim 8, wherein the concrete/additive ratio is around 50/50.

10. A washing machine (1) as claimed in any of Claims 1 to 9, wherein the tub (12) is made of reinforced concrete, and comprises internal metal reinforcement.

11. A washing machine (1) as claimed in any of Claims 1 to 10, wherein the tub (12) is formed in one piece.

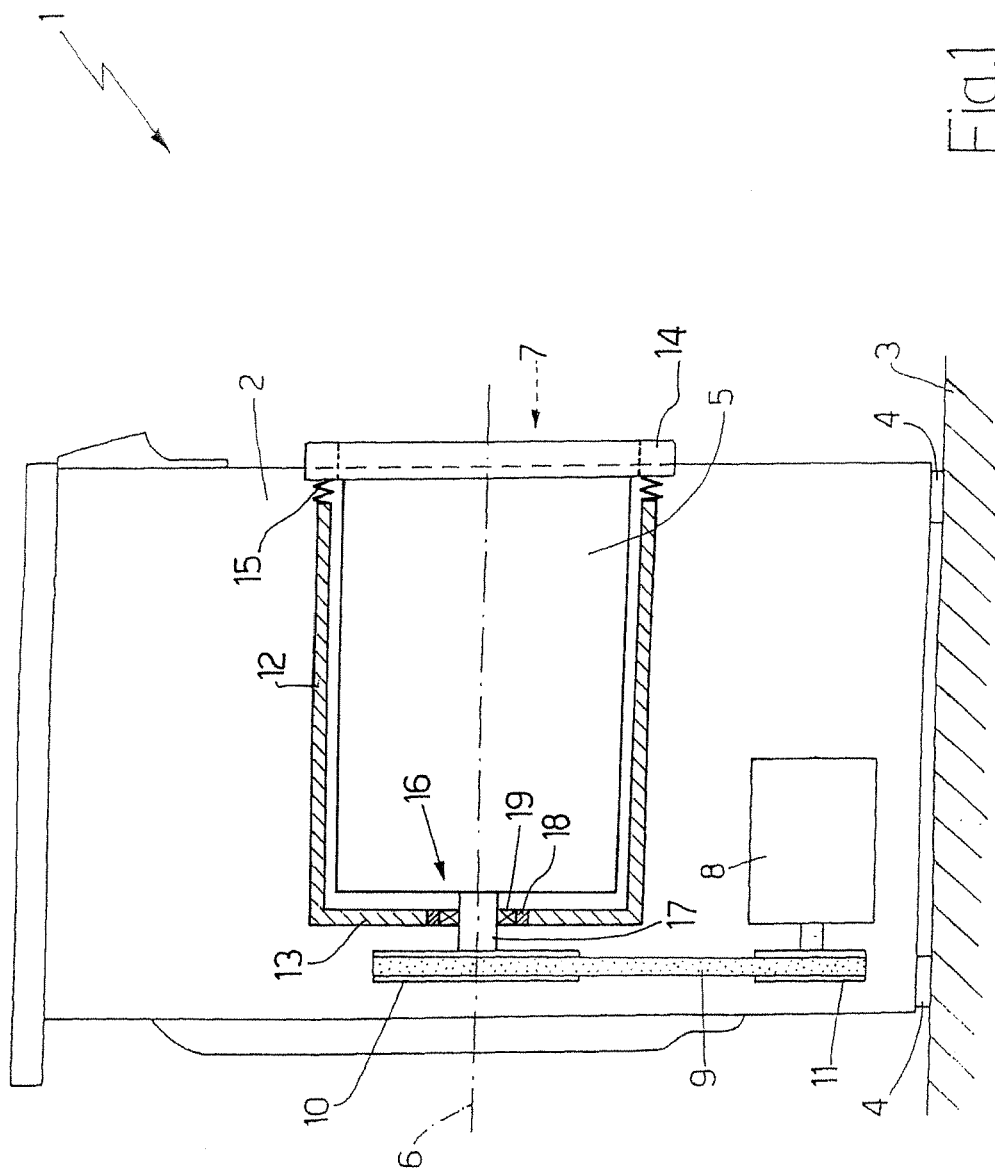


Fig.1

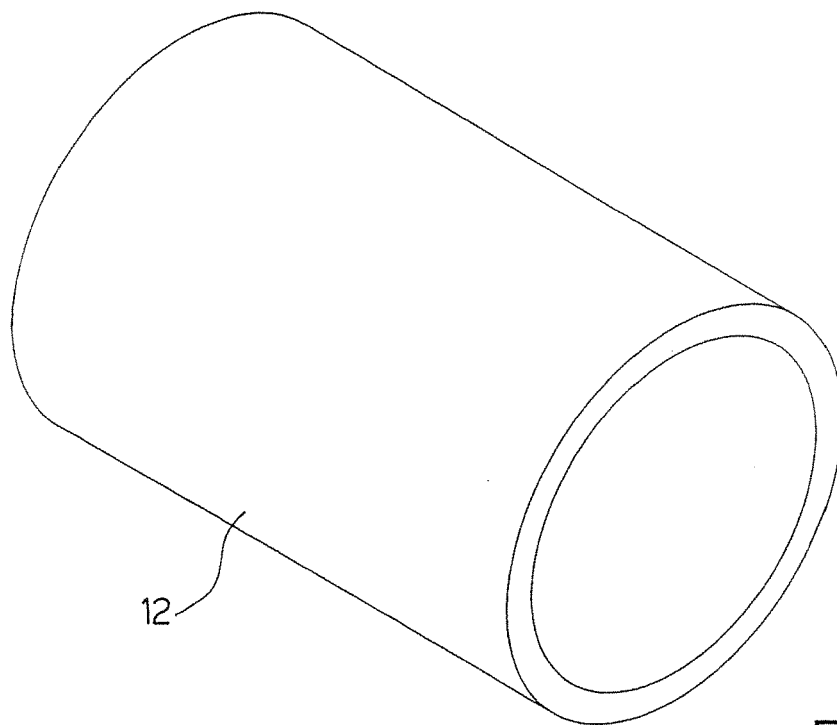


Fig.2

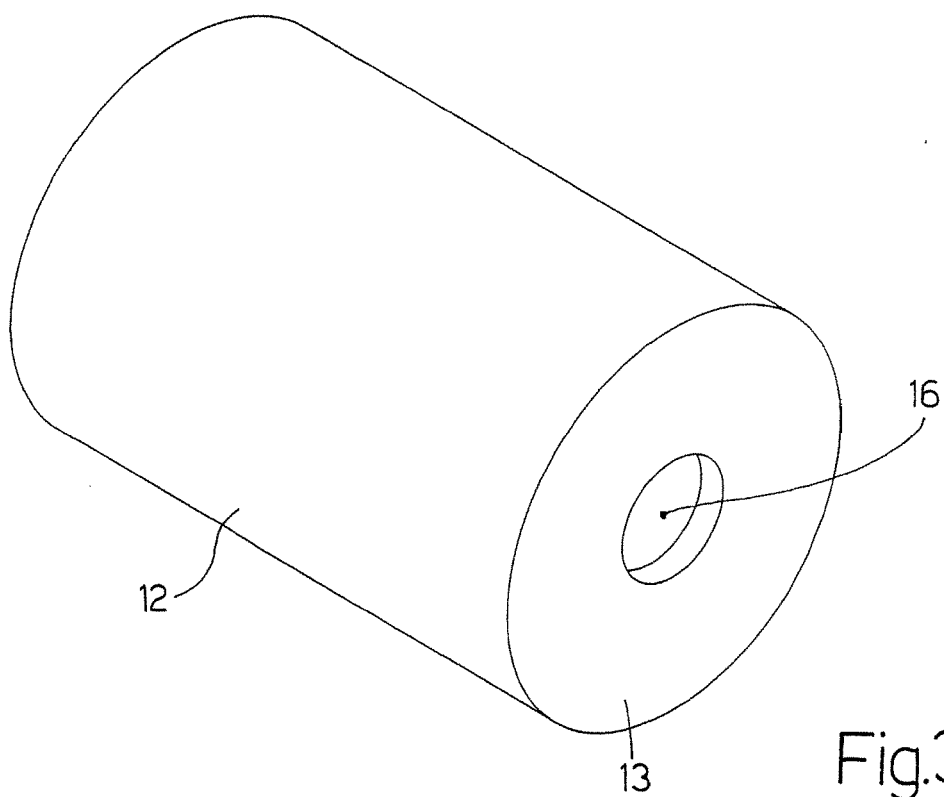


Fig.3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 12 1573

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 November 2006	Examiner DIAZ, M
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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