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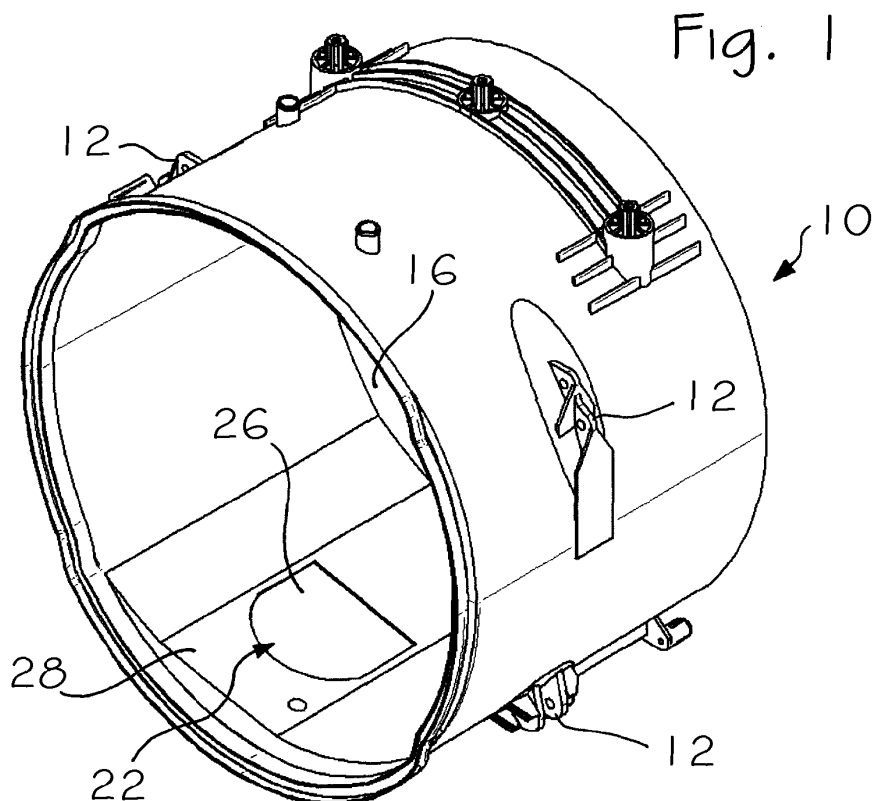
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(54) **Laundry washing machine with a hidden electric resistance**

(57) A laundry washing machine with hidden electric resistance comprises a substantially cylindrical washing tank (10), provided externally with hooking seats (12) for ties and/or shock absorbers, and a rotating drum (14) arranged inside the tank; the electric resistance (20) is fixed to a plate-shaped metal support (22) that forms part of the lower lateral surface of the tank. Said configuration

allows the space between the drum and the tank to be reduced and/or kept virtually constant, thus optimising the washing bath by reducing water consumption and electric absorption for high loads and further allowing to assure contiguity between the washing bath and laundry including also with different types of loads in terms of kilograms.



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Description

DESCRIPTION

[0001] The present invention relates to a laundry washing machine with hidden electric resistance.

[0002] More in particular, the present invention relates to a laundry washing machine in which the electric resistance for heating the washing water is designed and located such that it is integrated within a customised support that does not protrude in regard to the washing tank.

[0003] It is known that laundry washing machines are traditionally provided with a resistance powered electrically that, in the programmed context of specific washing cycles, heats the water in the tank. Such resistances are housed at the bottom of this tank, from which they protrude to an appreciable extent, and require specific housings of considerable dimensions that involve significant drawbacks.

[0004] Indeed, it becomes necessary to utilise significant quantities of washing water, in general between 16 and 18 litres, which also enters these housings. Such quantities of water, not strictly indispensable for the purposes of a correct wash, require proportional consumption of electricity to heat the water; in consequence, also the washing detergents must be used at higher doses, so as to maintain an adequate concentration of detergent substances in the water.

[0005] These requirements are obviously in contrast with today's widespread trend toward rationalising the use of water, limiting energy consumption and using the smallest possible quantity of detergents, which subsequently require treatment in water purification plants.

[0006] The use of traditional resistances, whose dimensions and those of their housings are significant, also produces a further restriction in regard to the rotating washing drum situated inside the tank.

[0007] The aim of the present invention is to remedy the drawbacks mentioned above.

[0008] More in particular, the aim of the present invention is to provide a laundry washing machine in which the electric resistance for heating the water is arranged in such a manner that it does not require housings of significant dimensions that cause the need for large quantities of water in the tank.

[0009] A further aim of the invention is to provide a laundry washing machine in which the electric resistance is arranged such that it does not protrude towards the rotating drum of the washing machine.

[0010] Not least, an aim of this invention is to provide a laundry washing machine in which energy consumption and the quantities of detergents used are in consequence appreciably reduced.

[0011] A further aim of this invention is to make available to users a laundry washing machine in which the electric resistance for heating the water can provide a high degree of reliability over time and furthermore is such as to be easily and economically produced.

[0012] These and further aims are achieved by the laundry washing machine subject of the present invention, which comprises a washing tank that is substantially cylindrical, provided externally with seats to attach ties and shock-absorbers, and a rotating drum arranged inside the tank, fundamentally characterised in that the electric resistance is fixed to a plate-shaped metal support that forms part of the lower lateral surface of said tank.

[0013] The construction and functional characteristics of the laundry washing machine according to the present invention will be clarified in the description that follows, in which reference is made to the figures in the attached drawings that represent one preferred embodiment and have no limiting intent, and in which:

- figure 1 schematically shows, in a perspective view looking towards the inner surface, the washing tank of the laundry washing machine of the present invention;
- figure 2 schematically shows a perspective view looking towards the outer surface of the same washing tank;
- figure 3 schematically shows a perspective view of said washing tank with the rotating drum arranged inside it;
- figures 4 and 5 schematically show, in plan and lateral view at enlarged scale, the electric resistance for heating the water of the laundry washing machine of the present invention, and its support.

[0014] With reference to said figures, the laundry washing machine of the present invention comprises, within a housing and support casing of known type (not illustrated) a washing tank 10, of substantially cylindrical shape, bearing along its outer lateral surface a number of attach seats 12 for ties and shock-absorbers to be connected to the metal supporting frame. Said tank 10 is of preference made of plastic material and contains a conventional washing drum 14, disposed such that it can rotate inside the tank through known means. For clarity of description, the tank 10 is represented in figures 1-3 without the circular front cover facing to the back wall, the latter indicated as 16 in figure 1 and provided with a seat in which the hub of the rotating drum 14 engages and rotates. According to this invention, the electric resistance to heat the washing water is fixed to a plate-shaped metal support 22 that is an integral part of the lateral surface of the tank 10. Said electric resistance, indicated schematically as 20, for example of the armoured type, is preferably made integral with the support 22 by brazing and is at least partially housed in a recess of shaped profile 24, of limited depth, practised on the support itself. The rest surface for the electrical resistance 20 defined by the recess 24 is of planar development or possibly slightly arched to follow the profile of the lower lateral surface of the tank 10; in the preferred embodiment illustrated in the figures, the rest surface

defined by said recess 24 is completely flat and, in consequence, does not define any concave or convex portions on the opposite face. The face of the support 22 opposite to that along which the electric resistance 20 is fixed is indicated as 26 in figure 1, from which it appears that also a part of the inner lateral surface of the tank 10 advantageously has a planar development. Said part with planar development is located in correspondence with the bottom, or central lower zone, of the tank 10 and is indicated as 28 in figure 1.

[0015] The face 26 of the support 22 opposed to that to which the electric resistance 20 is fixed is an integral part of the zone 28 with planar development of the inner lateral surface of the tank 10. Said support 22, in the preferred embodiment of the invention, is solidly fixed into the zone 28 of the tank 10 during the production process, so that the outer edge indicated as 30 of the support is embedded within the plastic material of which the tank is fabricated during the moulding process. The support is thus incorporated in the tank 10 and the electric resistance 20 faces towards the outside of the tank, without creating any hindrance internally in the tank, whereas the water heating is assured by conduction through the support itself. As an alternative, said support 22 with its electric resistance may be mounted over the tank 10, the latter being provided with an appropriate window, starting from the edge 30, and fixed with screws or equivalent fixing devices.

[0016] As may be seen from the above, the invention offers evident advantages.

[0017] In the laundry washing machine according to the present invention, the electric resistance 20 to heat the washing water does not require extensive housings which would make it necessary to use large quantities of water, with consequent increase in energy consumption and detergent requirement. A quantity of water between 10 and 12 litres is held to be appropriate for correct washing on the basis of experimental tests and technical trials carried out by the applicant.

[0018] The resistance 20 also creates no hindrance inside the tank 12, with the consequent possibility of a minimum difference in volume between the tank itself and the rotating drum 14 located inside it, to the advantage of the capacity of the drum. In the laundry washing machine according to the present invention, there is a minimum and almost constant space between drum and tank, with consequent optimisation of the washing bath, and contiguity between washing bath and laundry also with different types of loads in terms of kilograms.

[0019] Although the invention has been described above with particular reference to one embodiment, given by way of example only and without limiting intent, numerous modifications and variants appear clear to a skilled man in the light of the above description. The present invention thus intends to encompass all modifications and variants covered by the spirit of the claims that follow and lying within their scope.

[0020] The support 22 of the electric resistance 20 may

at least in part present an arched development, corresponding to the shape of the lateral surface of the tank 10.

[0021] The thickness of the support 22 is preferably reduced at its outer edge 30 destined to be embedded within the plastic material forming the tank 20.

[0022] The lower region of the tank 10 of which the support 22 is an integral part is preferably of greater thickness than the remainder of the circumference wall of the tank and is shaped so as to reduce the space between drum and tank.

Claims

1. Laundry washing machine with hidden electric resistance (20), comprising a substantially cylindrical washing tank (10), provided externally with hooking seats (12) for ties and/or shock absorbers, and a rotating drum (14) arranged inside the tank, **characterised in that** the electric resistance (20) is fixed to a plate-shaped metal support (22) that forms part of the lower lateral surface of said tank, in particular allowing the space between said drum and said tank to be reduced and/or kept virtually constant, thus optimising the washing bath.
2. Machine according to claim 1, **characterised in that** the tank (10) is made of plastic material and the support (22) holding the resistance (20) is integrated into the tank itself during the moulding process, preferably starting from its outer edge (30).
3. Machine according to claims 1 or 2, **characterised in that** the electric resistance (20) is at least partially housed in a recess (24) of the support (22) to which it is attached by brazing.
4. Machine according to claim 3, **characterised in that** the rest surface of the electric resistance (20) defined by the recess (24) presents at least in part a planar development.
5. Machine according to one or more of the preceding claims, **characterised in that** the face (26) of the support (22) opposed to that to which the electric resistance (20), is fixed faces towards the inner lateral surface of the tank (20), in correspondence with a planar zone (28) formed in the lower region of the tank itself, in a substantially central position.
6. Machine according to one or more of the preceding claims, **characterised in that** the support (22) of the electric resistance (20) is mounted over the tank (10) with screws or equivalent fixing means.
7. Machine according to one or more of the preceding claims, **characterised in that** the support (22) of the electric resistance (20) has at least in part an

arched development so as to correspond to the shape of the lateral surface of the tank (10).

8. Machine according to one or more of the preceding claims, **characterised in that** the electric resistance (20) faces towards the outside of the tank (10). 5
9. Machine according to one or more of the preceding claims, **characterised in that** the support (22) of the electric resistance (20) has a reduced thickness in correspondence with its outer edge (30). 10
10. Machines according to claim 2, **characterised in that** the lower region of the tank (10), into which the support (22) of the resistance (20) is integrated, has a greater thickness than the remaining part of the circumference wall of the tank itself and is shaped so as to reduce the space existing between the drum (14) and the tank (10) **in that** area. 15

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Fig. 1

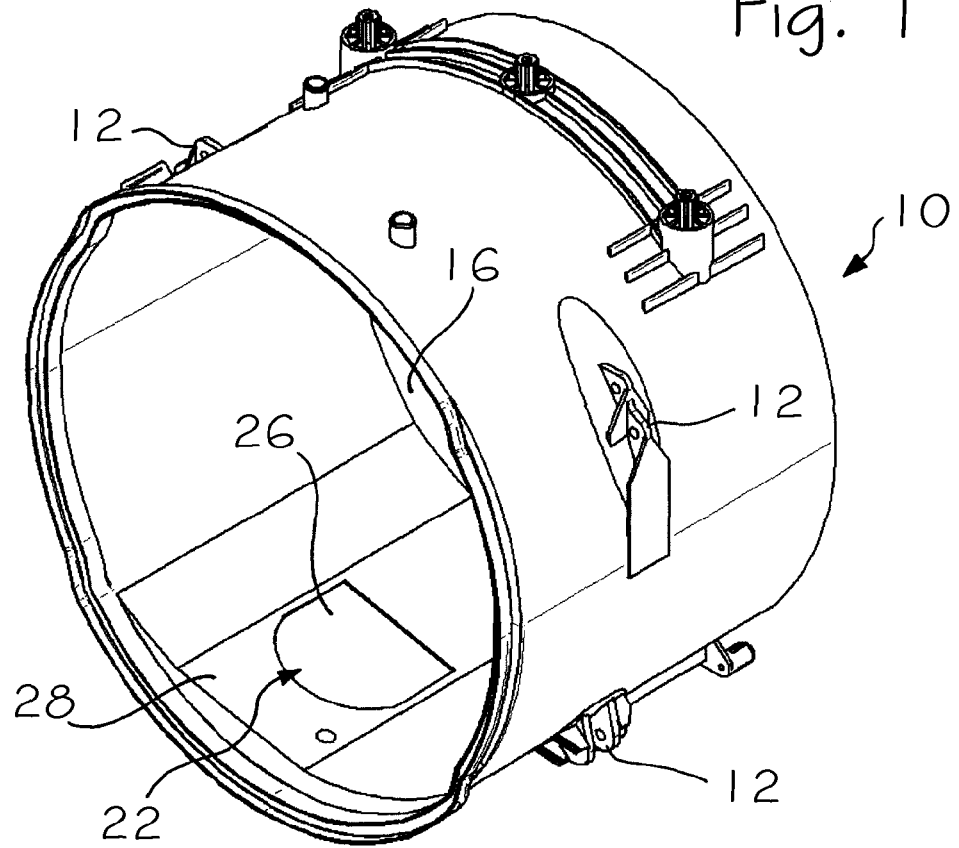


Fig. 2

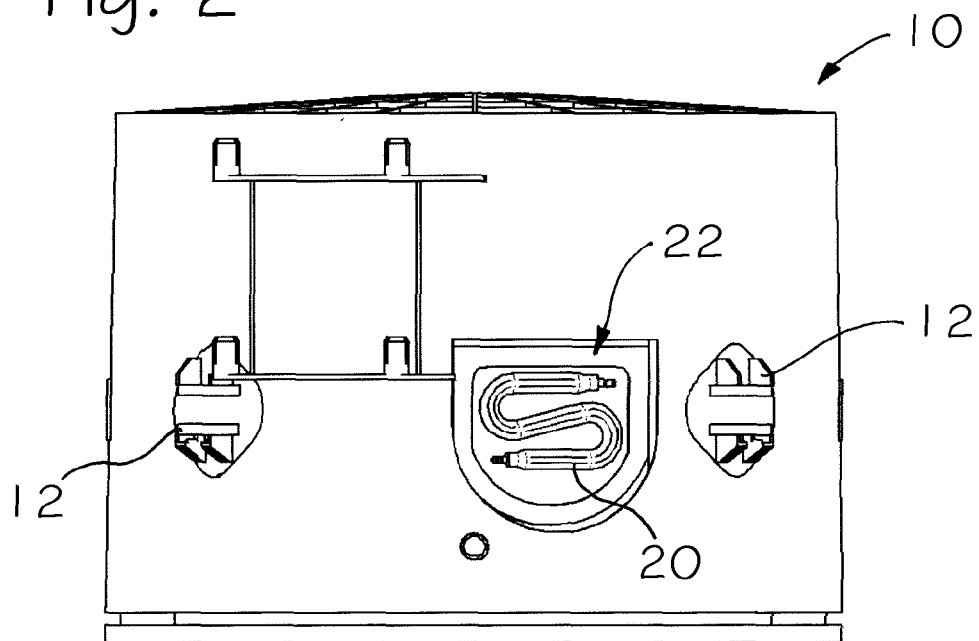


Fig. 3

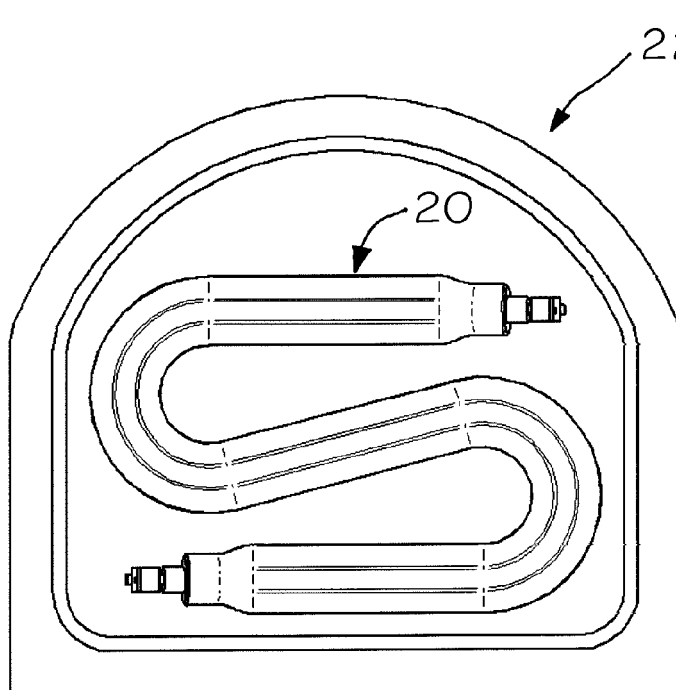
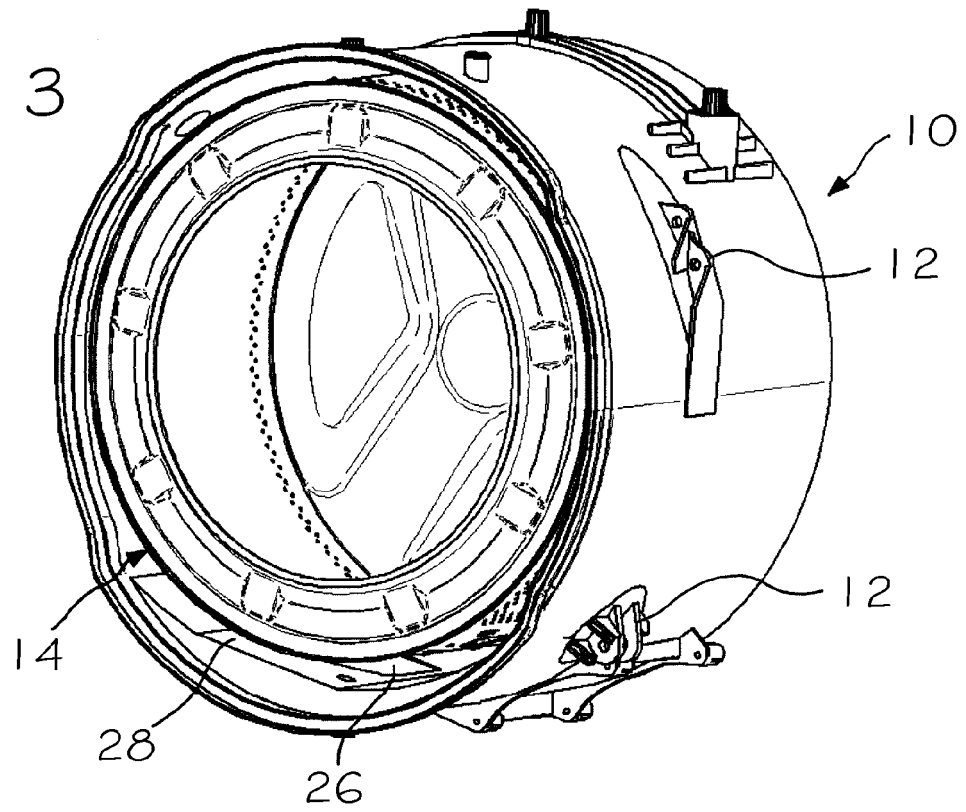


Fig. 4

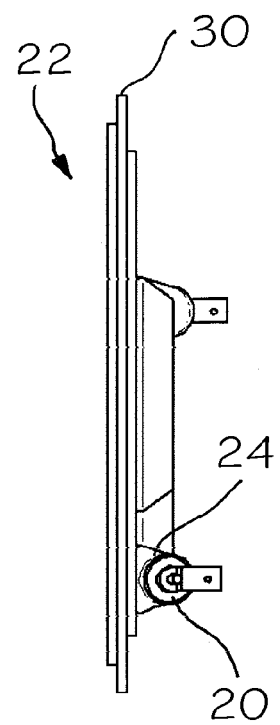


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 05 11 2979

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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 5 April 2006	Examiner DIAZ, M
CATEGORY OF CITED DOCUMENTS 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 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 11 2979

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The members are as contained in the European Patent Office EDP file on
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