A suds container for a washing machine includes a cylindrical vessel surrounding a drum of the washing machine. The cylindrical vessel includes a cylindrical wall and a front wall. A hub unit for receiving a drive shaft for the drum is integrated into the front wall. A fabric reinforcing mat is integrated in the front wall. The fabric mat at least partially covers the hub unit.
SUDS CONTAINER FOR A WASHING MACHINE AND METHOD FOR MAKING A SUDS CONTAINER

[0001] Priority is claimed to German patent application DE 10 2005 046 010.0, filed Sep. 26, 2005, which is hereby incorporated by reference herein.

[0002] The invention relates to a suds container for a washing machine, including a cylindrical vessel that surrounds the drum, whereby a hub or a metallic bearing block having a hub to receive a drive shaft for the drum is integrated into a plastic compound in one of the front walls. The invention also relates to a method for the production of such a suds container.

BACKGROUND

[0003] Suds containers made of plastic for washing machines are known, said containers being in the form of a cylindrical vessel that surrounds the drum. Here, a metallic bearing block with a hub to receive a drive shaft for the drum is integrated into the plastic compound in one of the front walls. The encapsulation of the metallic bearing block by injection molding gives rise to considerable intrinsic stresses in the suds container resulting from the fact that the plastic cools off from the hardening temperature down to room temperature, shrinking in the process. Forces resulting from this exert such a strong effect on the bearing block that the component can become deformed in this process. This has a detrimental impact on the homogeneity of the suds container so that stress peaks can give rise to hairline cracks that are particularly responsible for greatly reducing the service life of a suds container created in this manner.

[0004] In this context, EP 1 528 136 A2 describes a suds container produced in this manner. For this purpose, the metallic bearing block, as a one-piece component, is placed into the injection mold, the block having centering shoulders so that it can be affixed at a precise angle as well as bearing shoulders to prevent it from tilting in the injection mold. Then the bearing block is encapsulated in the mold by injection molding with an especially fiberglass-reinforced plastic in such a way that the metallic bearing block is embedded at least almost completely into the material of the front surface. When such an injection-molded part cools off, the different materials give rise to shrinkage stresses that can cause the above-mentioned hairline cracks in the material.

[0005] German utility model DE 1 918 222 U describes producing containers for washing machines and dishwashers and the use of a plastic with a fiberglass reinforcement to provide an elevated resistance against stress corrosion.

[0006] The problem that nevertheless arises despite the use of a fiberglass-reinforced plastic is that these hairline cracks occur, particularly in the integration area of the metallic bearing block, especially at the boundary between the plastic and the metal, which translates into a shortened service life for the suds container.

SUMMARY

[0007] In an embodiment, the present invention provides a suds container for a washing machine. The suds container includes: a cylindrical vessel configured to receive a drum of the washing machine, the cylindrical vessel including a cylindrical wall and a front wall; and a hub unit configured to receive a drive shaft for the drum, the hub unit being integrated into the front wall. A fabric reinforcing mat is integrated in the front wall in an area thereof, the fabric mat at least partially covering the hub unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] A number of embodiments of the invention will be explained in greater detail with reference to the drawings. The drawings show the following:

[0009] FIG. 1 a perspective depiction of a suds container;

[0010] FIG. 2 a first embodiment of a metallic bearing block with reinforcement elements sketched in certain areas;

[0011] FIG. 3 another embodiment of a bearing block with complete encapsulation of the reinforcement elements;

[0012] FIG. 4 a schematic depiction of a reinforcement element;

[0013] FIG. 5 a schematic depiction of a washing machine;

[0014] FIG. 6 an embodiment of a hub with a reinforcement element arranged in certain areas; and

[0015] FIGS. 7a,7b,7c a schematic depiction of an injection mold for the production of the suds container made of plastic.

DETAILED DESCRIPTION

[0016] With the suds container according to the invention, fabric mats are additionally integrated as reinforcement elements into the plastic compound, at least in certain areas, especially where stress peaks are more likely to occur during the shrinkage process or during the operation of the washing machine. Here, the reinforcement elements consist of flat fabric mats that can be laid into the mold and that are arranged in the area of the metallic bearing block and/or the hub and that at least partially cover the bearing block and/or the hub. This creates a positive connection of the bearing block and/or of the hub to the front wall of the container.

[0017] It is advantageous to configure the fabric mats in the area of the covered bearing block and/or of the hub with a contour that differs from the plane of the container wall so that the fabric mat in these areas corresponds to the contour or the shape of the bearing block and/or of the hub. Here, the fabric mat adapts to the bearing block and/or to the hub, thus improving the connection to the areas of the bearing block and/or of the hub that are to be covered.

[0018] In an embodiment of the invention, the fabric mats are made of fiberglass-plastic fibers or fiberglass-plastic filaments. If high strength or a special extensibility is required, the fabric mats can be made of polyester fibers or polyester filaments, Kevlar fibers or Kevlar filaments, or carbon fibers or carbon filaments in alternative embodiments. A combination of fibers or filaments is likewise conceivable.

[0019] It is advantageous to orient the fibers of the individual mats in such a way that the individual fibers or individual filaments are aligned with the course of the occurring stress lines. This makes it possible to absorb the forces that occur, thereby reducing expansion or shrinkage movements.
In an embodiment, the at least one fabric mat is dimensioned in such a manner that it essentially surrounds or covers the entire area of the metallic bearing block. Here, the hub is at least partially covered since at least the area for the inserted bearing remains free.

In an embodiment, the at least one fabric mat protrudes beyond the area of the front wall into the edge area of the cylindrical container wall. As a result, the bearing block is connected over a large surface area, thus avoiding force peaks in the transition area between the fabric mat and the plastic compound. In addition, the connection of the one front wall to the cylindrical container wall is reinforced, so that the entire suds container made of plastic is stabilized.

In an embodiment, the invention provides a method for the production of a suds container made of plastic for a washing machine, comprising a cylindrical vessel that surrounds the drum, whereby a metallic bearing block having a hub to receive the drive shaft for the drum is integrated into the plastic compound in one of the front walls whereby, to start with, in a first step, a reinforcement element configured as a mat is laid around the metallic bearing block, then, in a second step, the metallic bearing block with the reinforcement element is affixed in the injection mold and then, in a third step, the plastic compound is fed into the mold after the mold has been closed.

In another embodiment, the present invention provides a method for the production of the suds container made of plastic, in which it is likewise proposed that, to start with, in a first step, a reinforcement element configured as a mat is laid around the metallic bearing block, then, in a second step, the metallic bearing block with the reinforcement element is affixed in the injection mold and then, in a third step, the plastic compound is fed into the mold after the mold has been closed. In this manner, the reinforcement element lies very tightly against the metallic bearing block, so that the reinforcement elementstit can perform its function here in the transition area where the main stresses occur. In a refinement of the method, it is proposed that the reinforcement element configured as a mat is placed into the mold in certain areas or onto the metallic bearing block.

In an embodiment, after the mold has been closed, the plastic compound is fed into the mold by means of a two-plastic technique. Here, first a non-reinforced plastic compound which does not contain any fibers is placed or injected into the closed mold. Subsequently, a reinforced plastic compound containing, for instance, fiberglass-plastic fibers, is placed into the mold. The non-reinforced plastic compound reliably encapsulates the mats that have been laid into the mold and integrates them securely into the plastic compound. The reinforced plastic compound introduced in the second step increases the stability and strength of the entire suds container made of plastic. The fiber-reinforced plastic compound enhances the stability and strength of the areas with the fabric mats as well as of the areas without the fiber mats.

FIG. 1 shows a perspective depiction of a suds container made of plastic for a washing machine, comprising a cylindrical vessel surrounding the drum, whereby a metallic bearing block having a hub to receive a drive shaft for the drum is integrated into a plastic compound in one of the front walls.

FIG. 5 shows by way of example a washing machine, comprising a suds container made of plastic with a drum that can rotate inside said washing machine. On at least one end, said drum has a drive shaft that is mounted in the hub of the bearing block attached to the suds container.

As can be seen in FIG. 2, certain areas of the bearing block have been provided with fabric mats configured as reinforcement elements, which are integrated into the plastic compound. Here, the essentially flat fabric mats at least partially cover the bearing block and some of the bearing block arms. The hub is also at least partially covered by the fabric mats. The fabric mats are configured in such a way that they follow the spatial contour of the bearing block in the covered area and consequently they have a shape that differs from that of the container wall.

As can be seen in FIG. 3, certain areas of the metallic bearing block have been passed or covered by at least one fabric mat configured as a reinforcement element. Here, all of the bearing block arms are completely or almost completely surrounded by the fabric mat. Here, too, the fabric mat has a shape that corresponds to that of the bearing block, whereby only one area at the front of the hub remains free. The mat can also be pressed as a flat component onto the contour of the bearing block, as a result of which it acquires a shape that differs from that of the plane accordingly. As an alternative, the at least one fabric mat can be prefabricated as a molded part having the appropriate spatial shape, so that it corresponds to the contour of the bearing block.

As can be seen in FIG. 4, the individual fibers or filaments of the fabric mat are oriented in a manner corresponding to the occurring stress lines. The course of the filaments essentially corresponds to the course of the stress lines since the fabric mat has its greatest resistance to strain in the alignment direction of the filaments.

FIG. 5 depicts an embodiment of the invention in which a suds container made of plastic having a cylindrical vessel has a hub in a front wall instead of a bearing block. This hub is at least partially covered with fabric mats, whereby these fabric mats extend into the area of the front wall. It is also possible to lengthen the fabric mats so that they project into the front wall and into the edge area of the cylindrical vessel, as a result of which the stability of the suds container is further increased.

FIG. 7a depicts an injection mold in its open state. According to the invention, is also proposed that, during the production of the suds container made of plastic, first of all, in a first step, a fabric mat configured as reinforcement element is laid into the injection mold and then, in a second step, the metallic bearing block with the hub is affixed in the injection mold. During these steps, the inner part is outside of the mold. After the fabric mats have been laid into the mold and the bearing block has been affixed in the mold, the inner part is moved into the mold, and then the mold is closed.

FIG. 7b shows the injection mold in its closed state. In this state, the plastic compound is fed into the mold as the third step. To this end, the mold has at least one feed line which the liquid of the viscous plastic compound is injected into the mold.

Alternatively, it is also proposed according to a method that, to start with, in a first step, a fabric mat...
configured as a reinforcement element is laid around the metallic bearing block 4, as shown in FIG. 2 or 3, then, in a second step, the metallic bearing block 4 with the fabric mat 6 is affixed in the injection mold 14, after which, in a third step, the plastic compound 17 is fed into the mold 14 once the mold has been closed.

[0034] FIG. 7c depicts a mold 14 closed by the inner part 15, with the mats 6 and the bearing block 4 laid into said mold 14. First of all, a plastic compound 17 without fibers is injected into the mold via the feed line 16, as a result of which the mat 6 is integrated into the plastic compound 17. Subsequently, a fiber-reinforced plastic compound 17a is introduced into the mold 14 via the feed line 16a, as a result of which all of the components 4, 6 placed into the mold 14 are thoroughly integrated into the fiber-reinforced plastic compound 17a. It is also possible to introduce the fiber-reinforced plastic compound 17a into the mold via the feed line 16 for the non-reinforced plastic compound 17.

[0035] FIGS. 7a, 7b, 7c only depict the positioning of the feed lines 16, 16a by way of example; alternative positions or a configuration with more feed lines 16, 16a are likewise possible.

[0036] Of course, the present invention is not limited to the exemplary embodiments described herein; reference should be had to the appended claims.

What is claimed is:

1. A suds container for a washing machine, comprising:
a cylindrical vessel configured to receive a drum of the washing machine, the cylindrical vessel including a cylindrical wall and a front wall; and
a hub unit configured to receive a drive shaft for the drum,
the hub unit being integrated into the front wall;
wherein a fabric reinforcing mat is integrated in the front wall in an area thereof, the fabric mat at least partially covering the hub unit.

2. The suds container as recited in claim 1 wherein the cylindrical container includes a plastic material.

3. The suds container as recited in claim 1 wherein the hub unit includes a metallic bearing block, the fabric mat at least partially covering the bearing block.

4. The suds container as recited in claim 1 wherein the fabric mat has, in an area of the hub unit, a contour that differs from a plane of a surface of the front wall, the contour substantially corresponding to a shape of the hub unit.

5. The suds container as recited in claim 1 wherein the fabric mat includes a plurality of at least one of fiberglass-plastic fibers and fiberglass-plastic filaments.

6. The suds container as recited in claim 1 wherein the fabric mat includes a plurality of at least one of Kevlar fibers and Kevlar filaments.

7. The suds container as recited in claim 1 wherein the fabric mat includes a plurality of at least one of carbon fibers and carbon filaments.

8. The suds container as recited in claim 1 wherein the fabric mat includes a plurality of at least one of fibers and filaments oriented so as to substantially respectively correspond to respective stress lines occurring in the front wall.

9. The suds container as recited in claim 1 wherein the fabric mat at least partially covers the hub unit.

10. The suds container as recited in claim 3 wherein the fabric mat substantially covers an entire area of the metallic bearing block.

11. The suds container as recited in claim 3 wherein the fabric mat at least partially protrudes beyond an outer area of the metallic bearing block.

12. The suds container as recited in claim 11 wherein the fabric mat at least partially protrudes from the front wall into an edge area of the cylindrical wall.

13. A method for making a suds container for a washing machine, the suds container including a cylindrical vessel configured to receive a drum of the washing machine, the cylindrical vessel including a cylindrical wall and a front wall; and a hub unit configured to receive a drive shaft for the drum, the hub unit being integrated into a plastic material of the front wall; the method comprising:

   disposing at least one fabric reinforcement mat in an injection mold;
   disposing the hub unit in the mold;
closing the mold; and then
feeding the plastic material to the mold.

14. The method as recited in claim 13 wherein the hub unit includes a metallic bearing block.

15. The method as recited in claim 13 wherein the plastic material includes a non-reinforced plastic compound, and further comprising feeding a fiber-reinforced plastic compound into the mold after the feeding of the non-reinforced plastic compound.

16. A method for making a suds container for a washing machine, the suds container including a cylindrical vessel configured to receive a drum of the washing machine, the cylindrical vessel including a cylindrical wall and a front wall; and a hub unit configured to receive a drive shaft for the drum, the hub unit being integrated into a plastic material of the front wall; the method comprising:

   disposing at least one fabric reinforcement mat around at least a portion of the hub unit;
   disposing the hub unit and the at least one fabric mat in the mold;
closing the mold; and then feeding the plastic material to the mold.

17. The method as recited in claim 16 wherein the hub unit includes a metallic bearing block.

18. The method as recited in claim 16 wherein the plastic material includes a non-reinforced plastic compound, and further comprising feeding a fiber-reinforced plastic compound into the mold after the feeding of the non-reinforced plastic compound.