

Description

Plastic container with flow-guiding component

5 The invention relates to an arrangement having a plastics container and a flow-guiding component having a casing.

10 An arrangement of this kind may be for example a wastewater pump station. Pump stations conduct water that arises below the backwash level, in a manner that prevents backflow. They are used to convey wastewater arising in the cellars of residential buildings, this wastewater including that free of fecal matter and that
15 containing fecal matter. The wastewater that arises is collected in a plastics container. The liquid level is detected using a level sensor. If a particular limit value is reached, a flow-guiding component that conveys the wastewater out of the plastics container is
20 switched on.

The flow-guiding component may be for example a centrifugal pump.

25 In conventional wastewater pump stations, the plastics container has an opening into which the pump system is inserted, wherein the casing having the suction port is submerged in the wastewater, and the motor projects out of the container. The seal with the container is
30 complex and is usually made for example using special flange rings or disks. The flange rings or disks carry the pump system. Costly sealing systems are required between the flange rings or disks and the plastics container, and these increase the expense of assembly.

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DE 10 2007 008 692 A1 discloses an arrangement having a plastics container in which wastewater collects. Provided on the upper side of the plastics container is an opening into which a flow-guiding component

projects. The flow-guiding component takes the form of a centrifugal pump system and includes a casing in which an impeller is arranged. The casing having the impeller projects into the wastewater. The wastewater
5 is removed by suction, by way of a suction port, and is conveyed out of the plastics container by the centrifugal pump. The motor of the pump system is connected to the impeller by way of a shaft.

10 The centrifugal pump system, which comprises the pump casing having the impeller and the motor connected by way of a shaft, forms a unit. The motor part of the centrifugal pump system projects out of the container. The centrifugal pump system is carried by flange rings
15 or disks that are arranged between the part projecting into the container and the part above the container. Between the flange rings or disks and the plastics container there are arranged sealing devices, with the result that neither wastewater nor unpleasant odors
20 leak out.

DE 199 13 530 A1 describes a water pump arrangement having a collecting container that is made from plastics and receives liquid, which flows into the
25 plastics container at irregular intervals and in differing quantities. The liquid is conveyed out of the collecting container and into a sewerage system by a flow-guiding component that takes the form of a pump. The pump casing, with the suction port, projects into
30 the container. The drive part of the pump projects out of the container. With this construction too, complex sealing between the centrifugal pump system and the plastics container is required.

35 The object of the invention is to provide an arrangement in which a flow-guiding component and a plastics container interact efficiently and at the same time a reliable seal is ensured between the two

components. The arrangement is to be characterized by simple assembly and a reliable mode of operation. Furthermore, the arrangement is to be as inexpensive as possible to produce, and to have a long service life.

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This object is achieved according to the invention by an arrangement having the features of claim 1 and a method for producing the arrangement having the features of claim 11. Preferred variants are specified
10 in the subclaims.

According to the invention, the casing of the flow-guiding component is connected form-fittingly to the container by rotational sintering. This has the effect
15 of integrating the casing of the flow-guiding component into the container such that a reliable seal is ensured even without complex sealing devices. This is a major advantage, in particular in the wastewater sector. The arrangement according to the invention reliably
20 prevents the escape of medium and unpleasant odors.

The form-fitting connection of the casing to the plastics container provides a compact unit that considerably simplifies final assembly. A motor can be
25 connected in a simple manner to the casing of the flow-guiding component that is integrated into the container. In contrast to conventional arrangements, no additional carrier parts are required, such as disks or flange rings, which in conventional constructions are
30 needed between the lower part, which projects into the container, and the upper part, which projects out of the container. Complex seals may also be dispensed with.

35 According to the invention, the form-fitting connection of the casing to the container is performed by rotational sintering, which is also called rotational molding. To produce the arrangement according to the

invention, for this purpose the casing of the flow-guiding component is arranged in a mold. The mold may be made of steel or aluminum, for example. The mold is mounted on a mold carrier. The casing may be fastened
5 to the mold by various connection devices, such as screw or clamp connections.

In the next step, the rotational mold and the casing are pre-heated using a suitable heating device,
10 preferably a heat blower. Plastics particles are introduced into the mold. These may be for example granules of plastics and/or a plastics powder. Favorably, thermoplastic material is used. Polyolefins, in particular polyethylene, for example PE-LLD, have
15 proved particularly advantageous here for producing the arrangement according to the invention.

Plastics particles are caused to bear against the mold and the casing by rotation. During the procedure of
20 rotation, a temperature that results in fusion of the plastics particles is maintained. The rotational forces press the plastics particles against the mold and the casing, where they fuse and solidify.

25 As a result, a unified structure made from a plastics container and a casing, at least in part integrated therein, of a flow-guiding component is provided. Walls are formed that are in one piece with the container and form-fittingly surround the casing.

30 The use according to the invention of a rotational sintering method produces a form-fitting connection between the casing and the plastics container that has a high degree of stability and forms a reliable seal.

35 Once the rotation phase is complete, the arrangement is removed from the mold. The arrangement is now a unified module having a plastics container into which the

casing of a flow-guiding component has been incorporated by rotation.

Preferably, the casing of the flow-guiding component is made from a metal material. For example, this may be a cast material. The metal casing is in this case embedded in the plastics walls of the container by the rotational sintering method such that additional sealing elements between the outer wall of the metal casing and the walls of the container can be dispensed with. According to the invention, the walls of the container bear sealingly against the casing, so no medium or odors can escape.

In a particularly favorable embodiment of the invention, the metal casing is a volute casing of a centrifugal pump.

By embedding the casing in a wall of the container by a rotational molding, the wall of the container bears sealingly against the casing. Preferably, the wall of the container in this case bears against the casing without a gap. This provides a seal-free construction.

Preferably, movable components are arranged in the casing. For example, these may be the impeller of a centrifugal pump, which is arranged in a metal volute casing.

As an alternative, it is also conceivable for the flow-guiding component to be a fitting, wherein a shut-off element is arranged in the casing of the fitting. For example, this may be a valve casing that according to the invention is form-fittingly connected to a plastics container by rotational sintering, wherein the shut-off element uses an actuation arrangement to enable flow.

It has proved particularly favorable if parts that are adjacent to the casing that has been incorporated by rotation are constructed by the rotational sintering at the same time, such as suction or pressure ports.

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In a variant, a wall of the container forms a port. It is possible for the medium that has collected in the container to flow through this port and into the casing of the flow-guiding component. As a result of the use according to the invention of a rotational sintering method, this suction port is made from a plastics material. The port is made in one piece with the container. The contours of the mold that are needed for this are brought up to the casing and/or passed through the casing in a suitable manner. If container openings are closed off during the rotational procedure, they must be opened again later by a mechanical secondary finishing.

20 In a particularly favorable variant of the invention, a pipe element is arranged on the casing for guiding medium in and/or away. According to the invention, this pipe element is surrounded by plastics material as a result of rotational sintering. The surrounding with plastics material has the effect of protecting the pipe element and/or the casing against corrosion.

A metal elbow piece may for example be arranged on the casing of the flow-guiding component, as a pipe element.

Further features and advantages of the invention will emerge from the description of an exemplary embodiment, given with reference to drawings, and from the drawings themselves.

In the drawings:

Figure 1 shows a perspective illustration of an arrangement,

Figure 2 shows a plan view of the arrangement,

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Figure 3 shows a sectional illustration along the line A-A, and

10 Figure 4 shows a sectional illustration along the line B-B.

Figure 1 shows a perspective illustration of an arrangement having a plastics container 1. In the exemplary embodiment, the plastics container 1 is a
15 collecting container that is intended for unpressurized operation. The wastewater that arises undergoes interim storage and is then conveyed to a sewer. It has proved particularly favorable if the nominal volume of the container 1 is less than 500 liters, preferably less
20 than 300 liters, in particular less than 100 liters. In the exemplary embodiment, the nominal volume of the container 1 is forty liters.

The container 1 has a region of greater overall height, with two inlets 2, and a region of smaller overall
25 height, in which the flow-guiding component that takes the form of a pump system is arranged.

Connection ports for the inlet 2 are made in one piece with the container 1. Furthermore, the container has an
30 emptying connection 3 whereof the connection port is likewise made in one piece with the container 1.

On its upper side, the container 1 is provided with a
35 hand hole that is closed off by a cover 4. A level sensor for detecting the liquid level is arranged in the container 1. The part of a sensor module 5 that projects out of the container is visible in Figure 1,

wherein the sensor module in the exemplary embodiment takes the form of a level measuring device. For example, a float switch is used here. Furthermore, the container 1 has a vent connection 6. The wastewater
5 that collects in the container 1 is conveyed away by way of an outlet 7 arranged on the container 1.

According to the invention, a casing 8 of a flow-guiding component is integrated into the part of the
10 container 1 that is of smaller overall height. In the exemplary embodiment, the casing 8 is the volute casing of a centrifugal pump, made from a cast material. The casing 8 has fastening projections 9 that are arranged on the casing 8 in the manner of tabs. In the exemplary
15 embodiment, the fastening projections 9 are each offset from one another by 90°. In an alternative variant which is not illustrated, only three fastening projections 9 are provided, each offset from one another by 120°. The fastening projections 9 are
20 integrally formed on the casing 8 and are thus made in one piece with the casing 8.

Figure 2 shows a plan view of the arrangement.

25 A sectional illustration along the line A-A in Figure 2 is illustrated in Figure 3. It will be seen that the casing 8 of the flow-guiding component is surrounded form-fittingly by walls 10 of the container 1. The walls 10 that surround the casing 8 are made in one
30 piece with the rest of the container 1. The casing 8 is thus embedded in the container 1. According to the invention, this is achieved by rotational sintering. In the method, the following steps are carried out:

- 35 - fastening the casing 8 in a rotational mold,
- pre-heating the rotational mold and the casing 8 with the aid of a suitable heat blower,

- introducing plastics particles and closing the mold,
- carrying out a procedure of rotation while maintaining the temperature,
- 5 - slight cooling and prompt demolding of the plastics/metal composite part,
- supporting the casing 8 using a suitable device,
- complete cooling of the arrangement,
- mechanical secondary finishing.

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To incorporate the casing 8 by rotation, it is first fastened to the rotational mold by a suitable connection.

- 15 The casing 8 and the mold are pre-heated, and during the entire procedure of rotation the temperature thereof is controlled, with monitoring, by a heating device. Here, the temperature is adjusted to the plastics used.

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- In the exemplary embodiment, a thermoplastic is used as the plastics granules. This is preferably polyethylene (PE-LLD). As a result of the procedure of rotation and a fusion and solidification, the container 1 and the
25 desired wall 10 are formed. As a result of the inventive use of rotational sintering, the wall 10 of the container 1 surrounds the casing 8 such that no additional sealing is required.

- 30 During the procedure of rotation, all the connection points between the mold and the casing 8 are sealed or made leak-tight, for example as a planar surface, so that there are no gaps into which the liquid plastics could penetrate, since this would result in the
35 formation of undesired shapes.

After the rotation phase, the molding is demolded. The metal casing 8 cools more slowly than the plastics. For

this reason, a suitable device is used for support, in order to orient it in the desired position during cooling.

- 5 Depending on the construction, it is also possible for a plurality of parts to be incorporated, and likewise for more complex shapes to be formed.

10 As a result of the plastics particles fusing, being caused to bear against the casing and solidifying because of the rotational movement, the casing 8 and the container 1 form a unit in which the casing 8 is at least in part surrounded by a wall 10 of the container 1, with a form-fitting connection being formed, with
15 the result that the casing 8 is integrated into the container 1 and forms a structural unit.

In the exemplary embodiment, a pipe element 11 is arranged on the casing 8. The pipe element 11 in the
20 exemplary embodiment is a metal elbow piece that forms a pressure port having an angle of 90°. The pipe element 11 is surrounded by a plastics wall 12 of the container 1. The plastics wall 12 is made in one piece with the rest of the container 1 and according to the
25 invention is formed by a rotational sintering method. In the casing 8 there is arranged an impeller of the flow-guiding component in the form of a centrifugal pump. The casing 8 has an opening, to which the motor that drives the impeller by a shaft is connected.

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In the exemplary embodiment, the flow-guiding component is a centrifugal pump system that includes the following parts: casing, impeller, shaft, motor. According to the invention, the casing 8 of the
35 centrifugal pump system is connected form-fittingly to the plastics container 1 by rotational sintering.

Figure 4 shows a sectional illustration along the line B-B in Figure 2. In Figure 4, it can be seen that a wall 13 of the container 1 forms a suction port through which the medium flows into the casing 8. The wall 13 is made in one piece with the rest of the container 1.

When the arrangement is operated, liquid flows into the plastics container 1 through an inlet 2. At an upper limit value of the liquid level in the container 1, a control receives, for example from a float switch, a switch signal that triggers the command to switch on the pumping-out operation. The flow-guiding component, which takes the form of a centrifugal pump, is switched on by the control device. Consequently, the liquid level in the plastics container 1 falls. As soon as a lower limit value of the liquid level is reached, the centrifugal pump is switched off.

The arrangement is arranged below a backwash level. The centrifugal pump conveys the wastewater through the outlet 7 and into a sewer, by way of a non-return valve (not illustrated).

The arrangement according to the invention enables a more cost-efficient and overall smaller construction. By introducing metal casing parts into a rotational sintering mold, a unit comprising the plastics container 1 and a metal casing 8 of a flow-guiding component is produced. The casing 8 is surrounded by plastics during production of the rotational molded part and is thus integrated form-fittingly and optionally force-fittingly into the container without the need for additional fastening devices and sealing arrangements.

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The walls 10 of the plastics container in the arrangement according to the invention are shaped into a hollow such that a casing 8 of a flow-guiding

component is embedded therein, and a form-fitting connection is produced in the flow-guiding component between the container 1 and the casing 8 by rotational sintering. The plastics walls 10 of the container, 5 which surround the casing 8 form-fittingly, are made in one piece with the container 1.

Claims

1. Arrangement having a plastic container (1) and having a flow-guiding component which has a casing (8),

characterized in that

the casing (8) is a pump casing which consists of a metallic material, wherein the casing (8) is connected in a form-fitting manner to the plastic container (1) by rotational sintering.

2. Arrangement according to Claim 1, characterized in that the casing (8) is surrounded at least partially by at least one wall (10) of the container (1), wherein the wall (10) is formed in one piece with the container (1).

3. Arrangement according to either of Claims 1 and 2, characterized in that the casing (8) is embedded into a wall (10) of the container (1), wherein the casing (8) is preferably embedded so as to be load-bearing, in particular so as to be load-bearing for a drive unit.

4. Arrangement according to one of Claims 1 to 3, characterized in that a wall (10) of the container (1) bears sealingly, in particular without a gap, against the casing (8).

5. Arrangement according to one of Claims 1 to 4, characterized in that movable components are arranged in the casing (8).

6. Arrangement according to one of Claims 1 to 5, characterized in that an impeller of a centrifugal pump is arranged in the casing (8).

7. Arrangement according to one of Claims 1 to 6, characterized in that a wall (13) of the container (1) forms a connector for entry of a medium into the casing (8), wherein the wall (13) is formed in one piece with the container (1).

8. Arrangement according to one of Claims 1 to 7, characterized in that a line element (11) for discharge of medium is arranged on the casing (8) and, by rotational sintering, is surrounded by a wall (12) of the container (1), wherein the wall (12) is formed in one piece with the container (1).

9. Method for producing an arrangement according to one of Claims 1 to 8, comprising the following steps:

- arranging a pump casing (8) of a flow-guiding component in a mould,
- causing plastic particles to bear against the mould and the pump casing (8) by rotation
- melting and solidifying the plastic particles on the mould and the pump casing.