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The invention relates to a solids separating system, having at least one bulky-material collecting tank for wastewater which is guided through same and is loaded with bulky materials, and having a liquid collecting tank for the wastewater which has been rid of bulky materials and has been pretreated in the bulky-material collecting tank.

Such solids separating systems in the form of wastewater lifting installations are known in a variety of embodiments in the prior art. For this, reference should be made, purely by way of example, to EP 1 108 822 A1, or DE 1 609 166. As is known, solids separating systems of this kind are generally used to lift to a specific level wastewater which has been collected at the end of a wastewater storage space. After this, a subsequent treatment is then usually carried out in a wastewater treatment plant.

In the further prior art according to GB 522,499, improvements to liquid tanks in order to be able to absorb pressure peaks which arise in the interior are described. To this end, the side walls of the known liquid tanks, viewed from the floor up to the roof, are equipped with continuous reinforcing ribs. Similar continuous, and even wholly encompassing reinforcing ribs, are described by WO 2013/044320 A1 in respect of an apparatus for wastewater treatment.

In detail, in the solids separating system according to EP 1 108 822 A1, the adopted procedure is, for instance, that wastewater loaded with bulky materials or solids makes its way via a flow splitter and a supply line into the bulky-material collecting tank. Here, the wastewater is rid of the bulky materials, which remain in the bulky-material collecting tank. To this end, a sieve is usually provided in the bulky-material collecting tank. A pretreatment of the wastewater thereby takes place.

The pretreated wastewater makes its way via a discharge line into and through a pump and from there into the liquid collecting tank, to be precise counter to the direction of feed of the pump. Once the liquid collecting tank is filled with the

pretreated wastewater, then the pump is switched on. As a result, in the bulky-material collecting tank a swing valve is closed, so that further inflow is prevented and the bulky materials, together with the wastewater guided through the bulky-material collecting tank, are led off for further treatment.

Solids separating systems of this kind are typically set up in concrete shafts. The housings for, on the one hand, the bulky-material collecting tank and, on the other hand, the liquid collecting tank are normally made of metal, but can also be produced from plastic. In particular in respect of the liquid collecting tank, the problem arises in practice that not only does static pressure resulting from an inflow height have to be contained inside said tank, but on the inlet side, in the wastewater storage space or in a rain retention basin which is provided there, for instance, unexpected inflow volumes can accumulate. Much the same applies in the event of a power failure, when the pump is unable to pump the filled liquid collecting tank dry. – The invention here aims to provide a remedy.

The invention is founded on the technical problem of refining a solids separating system of this type such that, in particular, the housing of the liquid collecting tank can reliably absorb possible rises in pressure in the interior, to be precise hand in hand with a material-saving construction and consequently at reduced cost.

In order to solve these technical problems, a solids separating system of the generic type, within the scope of the invention, is characterized in that at least one metallic housing defining the liquid collecting tank is equipped on at least one housing wall with wall reinforcing elements which are in the form of reinforcing ribs, wherein the reinforcing ribs of two adjacent housing walls of the housing which adjoin one another at an angle and with a predominantly vertical edge are offset laterally and do not merge into one another, and describe at least two spatial planes which differ from one another and extend predominantly parallel to and at a distance from one another.

According to the invention, the housing of the liquid collecting tank is made of metal. The wall reinforcing elements are integrated in the housing wall as wall reinforcements.

Within the scope of the invention, at least the housing defining the liquid collecting tank is thus reinforced by the wall reinforcing elements on the at least one housing wall. In principle, the housing which accommodates the bulky material-collecting tank can also be equipped with such wall reinforcing elements. It is generally sufficient, however, to configure the housing for the liquid collecting tank appropriately, because the liquid collecting tank, in relation to the inflow or a flow splitter, has the greatest inflow height and the wastewater passes through the bulky-material collecting tank and is collected in the liquid collecting tank, so that it is primarily there that possible pressure peaks of the wastewater pressure are observed. In any event, the wall reinforcing elements ensure that such pressure peaks are absorbed in a simple, reliable and cost-effective manner.

In this context, it has particularly proved beneficial for the wall reinforcing elements to be configured as reinforcing ribs. Moreover, the configuration is usually made such that the reinforcing ribs extend continuously between two housing edges, thus reach from one to the other housing edge of respectively adjacent and connected wall parts or housing walls.

A particularly cost-effective configuration provides that the reinforcing ribs are in the form of housing inward mouldings and/or housing outward mouldings. In this case, the reinforcing ribs constitute integral component parts of the respective housing wall. Moreover, work is usually conducted such that the reinforcing ribs are configured as channel-shaped housing beads. Such channel-shaped housing beads can be introduced without difficulty into the individual wall parts or housing walls. For the housing is typically composed of metal plates and, in particular, stainless steel plates, which are generally welded together. That is to say that the housing for the liquid collecting tank and/or for the bulky-material collecting tank is respectively of metallic configuration.

In order now to introduce the reinforcing ribs or channel-shaped housing beads into these metal plates defining the individual wall parts or housing walls, the adopted procedure is, for instance, that the housing bead in question is pressed into the associated metal plate with the aid of a beading machine and using at least two beading rollers. Through the choice of beading roller, the cross-sectional shape of the thus realized housing bead can be predefined. Other and particularly preferred variants for realizing the reinforcing ribs or channel-shaped housing beads provide that the relevant metal plate undergoes a desired deformation by folding and/or deep-drawing.

In this context, it has actually proved beneficial if the respective reinforcing rib or the channel-shaped housing bead which is usually provided at this location is triangular, semi-circular trapezoidal, etc, in cross section. It here lies entirely within the scope of the invention to employ both rectilinear channel-shaped housing beads and arcuate channel-shaped housing beads, or even sinusoidal channel-shaped housing beads. In fact, the greater the stiffening effect which is observed, the more uneven is the course of the relevant channel-shaped housing bead. For reasons of simple and cost-effective production, rectilinear channel-shaped housing beads will usually be employed.

In order to be able to cope with the cramped spatial conditions when solids separating systems of this kind are set up in, for instance, existing or prefabricated shafts, particularly compact housing dimensions of the liquid collecting tank or of the solids separating system according to the invention are altogether necessary. The invention addresses this, inter alia, by virtue of the fact that the surface of the relevant housing is mostly divided into inner rib regions and outer rib regions. The inner rib regions are typically observed where, in wall-proximity to the relevant housing wall or to the relevant wall part of the housing, other units, such as the obligatory pump, for instance, must be set up or accommodated. By contrast, outer rib regions are typically provided where no cramped spatial conditions are observed, for instance in the region of the inflow.

Moreover, the division of the surface of the housing for the most part into the inner rib regions and outer rib regions pays regard to the filling of the tank and, in this context, any air cushions which are formed, which latter are to be avoided for optimal utilization of space. In this way, typically in ceiling-proximate regions of the housing edges, inner ribs are consistently employed in order to avoid the formation of air cushions at this location. In general, the configuration is made such that the reinforcing ribs are arranged and shaped in such a manner that, inside the liquid collecting tank or its housing, no air cushions are formed. In this case, action is taken to prevent any air cushions from possibly reaching a blind alley in the housing, but rather a tank part is available into which the relevant air cushion can escape.

Moreover, in this context, the reinforcing ribs have a wholly deposition-free configuration. That is to say that, on the side or top of the reinforcing ribs, there are hence no depositions formed in the inner and/or outer region. That is realized by an appropriate outward moulding or inward moulding of the reinforcing ribs or their surface. For the representation of the relevant reinforcing rib, the inward mouldings or outward mouldings in question can also extend at an angle in relation to the associated wall part or the housing wall.

In the design of the housing, it is not only important to make the best possible use of the cramped installation space and prevent possible air cushions in the interior, as well as to increase the stability for the absorption of pressure peaks, but also dirt depositions are to be avoided. At this point, the invention proposes that the respective reinforcing rib merges in the region of the housing edge into a recess or outward moulding of the angularly adjoining housing wall. Since the respective reinforcing rib generally extends from one to the opposite housing edge, the regions of the associated housing edges should respectively be viewed in this context.

If the respective reinforcing rib is constituted, for instance, by an inner rib, then this inner rib merges into a recess of the angularly adjoining housing wall, which recess conforms to the shape of the inner rib. This recess can be attained and

realized, for instance, by a notch in the adjoining housing wall. If the reinforcing rib, on the other hand, is configured as an outer rib, the housing wall angularly attached to the housing edge connects with an outward moulding in order to close off the reinforcing rib to the outside and to provide transitions which are as smooth as possible.

That is necessary from a hygienic viewpoint in order to avoid possible depositions or a build-up of liquid, to be precise not only inside the liquid collecting tank, but also of rainwater, for instance, on the outer surface.

Within the scope of the invention, it has proved particularly favourable that the reinforcing ribs of two angularly mutually adjoining wall parts or housing walls of the housing describe at least two mutually different spatial planes, for instance in the form of mirror planes. In the simplest case, these mutually different spatial planes can extend at a distance from one another. That is the case, for instance, when two wall parts are angularly connected to one another at a housing edge, and the reinforcing rib on the one wall part does not merge into the reinforcing rib of the other wall part. Rather, at this location, an offset of the two reinforcing ribs is deliberately realized in order to increase the rigidity overall.

As a further alternative, it is also possible that the spatial planes defined by the reinforcing ribs of two angularly mutually adjoining wall parts of the housing are not only distanced apart from one another and extend parallel to one another, but intersect in space. That is the case, for instance, when the course of the reinforcing rib intersects the face of the adjoining wall part on the housing edge at an angle differing from 90°, thus "obliquely" so to speak. Such courses of the reinforcing ribs should be classified as altogether uneven and result in an enhanced and desired stiffening effect.

In conclusion, a solids separating system, which is distinguished by a particularly rigidly configured housing that primarily defines the liquid collecting tank is provided. In fact, the housing in question is easily capable of being able to absorb interior pressure peaks which deviate from normal operation. That can be

successfully achieved in a particularly cost-effective manner by virtue of the reinforcing ribs or continuous housing beads integrated in the individual wall parts or housing walls of the housing. Furthermore, these are configured and arranged distributed over the surface of the housing such that consideration is given both to the cramped installation conditions and to a greatest possible volume of the liquid collecting tank. At the same time. the housing offers a minimal attack surface for possible depositions and is configured such that, as far as possible, air cushions in the interior cannot even be formed.

The housing itself can in principle assume any form, yet is usually composed of geometric and mostly prismatic basic shapes, wherein, of course, not only straight wall parts are observed, but also curved wall parts can be realized. All that is able to be implemented and realized in a problem-free and cost-effective manner with due regard to the introduced housing beads and with due regard to the respectively welded-together wall parts. The fundamental advantages can be seen herein.

The invention is explained in greater detail below on the basis of a drawing representing an illustrative embodiment, wherein:

Fig. 1 shows an overall representation of the solids separating system according to the invention,

Fig. 2 shows an individual representation of the liquid collecting tank, and

Fig. 3 shows a view of the liquid collecting tank according to Fig. 2 from direction A and direction B respectively.

In the figures, a solids separating system is represented in the embodiment as a wastewater lifting installation, which possesses an inflow 12 via which wastewater loaded with bulky materials is supplied. The entire solids system depicted in Fig. 1 can be accommodated in a shaft (not represented explicitly) made of concrete, for instance. Via the inflow 12, the wastewater firstly makes its way into a bulky-material collecting tank 9 for wastewater which is guided through this same and is loaded with the bulky materials. On the outlet side of the bulky-material collecting tank 9 is provided a pump 8, which is connected to the floor of the wastewater shaft (not represented) and stands on this. It can be seen that the pump 8, due to

cramped spatial conditions inside the wastewater shaft, is positioned very close to a liquid collecting tank 1, 2, 3; 10.

The liquid collecting tank 1, 2, 3; 10 serves to receive and collect the wastewater which has been rid of the bulky materials and has been pretreated in the bulky-material collecting tank 9. As soon as the liquid level in the liquid collecting tank 1, 2, 3; 10 has exceeded a predefined value, the pump 8 is switched on and ensures that the pretreated wastewater is removed from the liquid collecting tank 1, 2, 3; 10 the pump 8, via the bulky-material collecting tank 9, and finally a discharge line 11.

Within the scope of the illustrative embodiment, the liquid collecting tank 1, 2, 3; 10 possesses a housing 1, 2, 3; 10 which defines this same and which in the present case is equipped on at least one housing wall 1, 2, 3 with wall reinforcing elements 4.1, 4.2; 5, 7. In the illustrative embodiment, only the housing walls 1, 2, 3 are equipped with wall reinforcing elements 4.1, 4.2; 5, 7, whereas a housing wall 10 which terminates at the top end is not equipped with such wall reinforcing elements 4.1, 4.2; 5,7, even though, of course, this is also possible.

In fact, various housing walls 1, 2, 3 of the housing 1, 2, 3; 10 of the liquid collecting tank 1, 2, 3; 10 are discernible, which are referred to in yet greater detail below and in isolation. Individual wall parts or housing walls 1, 2, 3; 10 of the housing 1, 2, 3; 10 are respectively constructed from metal plates and, in particular, stainless steel plates, and are welded together in the region of housing edges. That is to say that the housing 1, 2, 3; 10 of the liquid collecting tank 1, 2, 3; 10 is of metallic configuration. The same may apply to the housing of the bulky-material collecting tank 9.

It can be seen that the wall reinforcing elements 4.1, 4.2; 5, 7 are altogether configured as reinforcing ribs. In fact, the reinforcing ribs in question are constituted by channel-shaped housing beads 4.1, 4.2; 5, 7. The housing beads 4.1, 4.2; 5, 7 are integrated in the respective housing wall 1, 2, 3 or the associated wall part and introduced into the metal plate which has been worked to constitute the

wall part. That can be realized by folding and/or deep-drawing. The individual housing beads 4.1, 4.2; 5, 7 extend continuously between two housing edges.

It can be seen that both inwardly facing channel-shaped housing beads 4.1, 4.2; 7 are realized, housing beads 5 which face outwards. Accordingly, the surface of the housing 1, 2, 3 is divided for the most part into an inner rib region 4.1, 4.2; 7 and an outer rib region 5. The respective reinforcing rib or housing bead 4.1, 4.2 is triangular in cross section, as is made clear by the view A according to Fig. 3. The housing bead 7 too possesses a triangular form in cross section. For reasons of stability, the triangle is typically chosen such that this is equipped with two inwardly or outwardly facing equally long sides to form an isosceles triangle, as is made clear by the view A according to Fig. 3. In principle, also an equilateral triangle can be provided at this location.

In contrast, the outwardly facing housing bead 5 is trapezoidal in cross section. In this case too, an isosceles trapezium is advisable for reasons of stability. Furthermore, other cross-sectional shapes can also, of course, be provided for the housing beads 4.1, 4.2; 5, 7, for instance those with semi-circular cross section.

From Fig. 2 it becomes clear that the reinforcing ribs 4.1, 4.2; 5, 7 of two angularly mutually adjoining wall parts or housing walls 1, 2, 3; 10 of the housing 1, 2, 3; 10 describe at least two mutually different spatial planes. That becomes particularly clear from a viewing of Fig. 2 and 3. For instance, the two reinforcing ribs or housing beads 4.1 and 4.2, in the representation according to Fig. 2, are arranged spatially offset from one another, if their transition in the region of the housing edge at the connecting point between the wall part 1 and the wall part 2 or between the housing walls 1, 2 is considered. That also becomes particularly clear from the view A and B according to Fig. 3.

As a result of this lateral offset of the associated reinforcing ribs or housing beads 4.1, 4.2 in the considered example, a particularly high stability and rigidity of the housing 1, 2, 3; 10 of the liquid collecting tank 1, 2, 3; 10 is provided. For the two spatial planes which in the example are spanned by the reinforcing ribs or housing

beads 4.1, 4.2 extend at a distance from one another and, in the considered example, predominantly parallel to one another. In any event, that applies insofar as a predominantly vertical edge or housing edge between the two considered wall parts or housing walls 1, 2 is assumed, as is shown in dash-dot representation in the view B according to Fig. 3.

Furthermore, the spatial planes in question which are defined by the reinforcing ribs or housing beads 4.1, 4.2; 5, 7 can also intersect at an angle. That can be seen in the view B according to Fig. 3. For it here becomes clear that the housing bead 4.2 in the wall part 2 meets at an angle α the, relative thereto, obliquely extending wall part 1 perpendicularly hereto in the edge region. A, relative thereto, perpendicular connection, and a consequentially vertical edge, is shown in dash-dot representation in Fig. 3 in the view B. As a consequence hereof, the spatial planes spanned by the reinforcing ribs or housing beads 4.1, 4.2 are arranged at an angle to one another and intersect, which, in turn, leads to the increase in rigidity of the entire housing 1, 2, 3; 10.

Finally, it can further be seen that the respective reinforcing rib or the housing bead 4.1, 4.2; 5, 7 merges in the region of the housing edge into a recess or outward moulding of the angularly adjoining housing wall. Because the housing bead 4.2, in the example, is constituted by an inwardly facing housing bead 4.2, the angularly adjoining housing wall 1 in the example of Fig. 2 possesses, in the region of the housing bead 4.2 in question, a recess. This recess conforms to the cross-sectional shape of the considered housing bead 4.2 in the shown example. Of course, differently shaped recesses are also conceivable and are covered by the invention. Likewise, boreholes in this region.

If the outwardly facing housing bead 5 on the wall 3 is considered, then it becomes clear that in this case the angularly adjoining housing wall or the angularly adjoining wall part 10 is equipped with an outward moulding corresponding to the trapezoidal form. In this way, the realized housing 1, 2, 3; 10 possesses an altogether smooth-faced structure without fissures and hidden cavities which

might possibly promote depositions. A build-up of liquid in the interior is hereby prevented.

P A T E N T K R A V

1. Faststofseparationssystem omfattende mindst én faststofopsamlingsbeholder (9) til faststofindeholdende spildevand som er ført herigennem, og en væskeopsamlingsbeholder (1, 2, 3; 10) til det for faststof befriede og i faststofopsamlingsbeholderen (9) foroprensede spildevand,

k e n d e t e g n e t ved, at mindst ét metallisk hus omfattende husvægge (1, 2, 3; 10) definerer væskeopsamlingsbeholderen, hvor mindst to husvægge (1, 2, 3; 10) er forsynet med vægforstærkningselementer (4.1, 4.2; 5, 7) som er udformet som forstærkningsribber, hvor de mindst to husvægge støder op til hinanden med en overvejende vinkelret kant og forstærkningsribberne (4.1, 4.2; 5, 7) af disse husvægge omfatter en lateral forskydning og går ikke sammen med hinanden og beskriver mindst to fra hinanden forskellige rumplaner som strækker sig overvejende parallelt og med afstand til hinanden.

2. Faststofseparationssystem ifølge krav 1, k e n d e t e g n e t ved, at forstærkningsribberne (4.1, 4.2, 5, 7) er udformet som husindpresninger og/eller husudpresninger.

3. Faststofseparationssystem ifølge krav 1 eller 2, k e n d e t e g n e t ved, at forstærkningsribberne (4.1, 4.2, 5, 7) er udformet som rendeformede hussikninger (4.1, 4.2; 5, 7).

4. Faststofseparationssystem ifølge et af kravene 1 til 3, k e n d e t e g n e t ved, at huset (1, 2, 3; 10) på sin overflade for størstedelen er opdelt i indvendige ribbeområder (4.1, 4.2; 7) og udvendige ribbeområder (5).

5. Faststofseparationssystem ifølge et af kravene 1 til 4, k e n d e t e g n e t ved, at hver forstærkningsribbe (4.1, 4.2, 5, 7) er udformet trekantformet, halvcirkelformet, trapezformet i tværsnittet.

6. Faststofseparationssystem ifølge et af kravene 1 til 5, k e n d e t e g n e t ved, at hver forstærkningsribbe (4.1, 4.2, 5, 7) i området af huskanten går sammen med en udsparing eller udpresning af den vinkelmæssigt tilstødende naboliggende husvæg (1, 2, 3; 10).

7. Faststofseparationssystem ifølge et af kravene 1 til 6, k e n d e t e g n e t ved, at huset (1, 2, 3; 10) er konstrueret af metalplader, især plader af rustfrit stål.

8. Faststofseparationssystem ifølge et af kravene 1 til 7, k e n d e t e g n e t ved, at vægforstærkningselementerne (4.1, 4.2; 5, 7) er arrangeret og udformet på en sådan måde, at de ikke danner nogen luftpuder.

9. Faststofseparationssystem ifølge et af kravene 1 til 8, k e n d e t e g n e t ved, at vægforstærkningselementerne (4.1, 4.2; 5, 7) omfatter en aflejringsfri udformning i det indvendige og/eller udvendige område.

Fig. 1

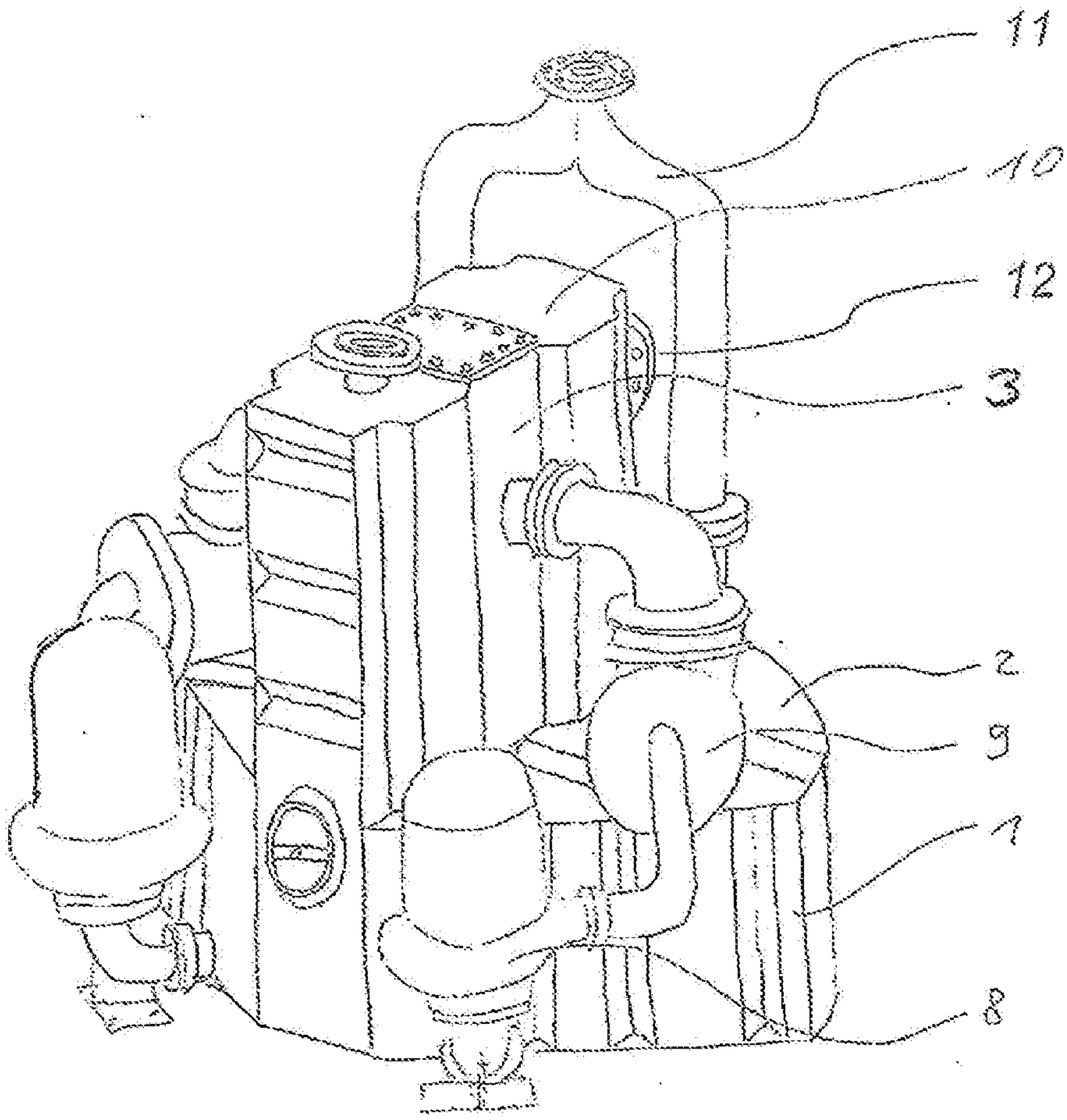

Fig. 2

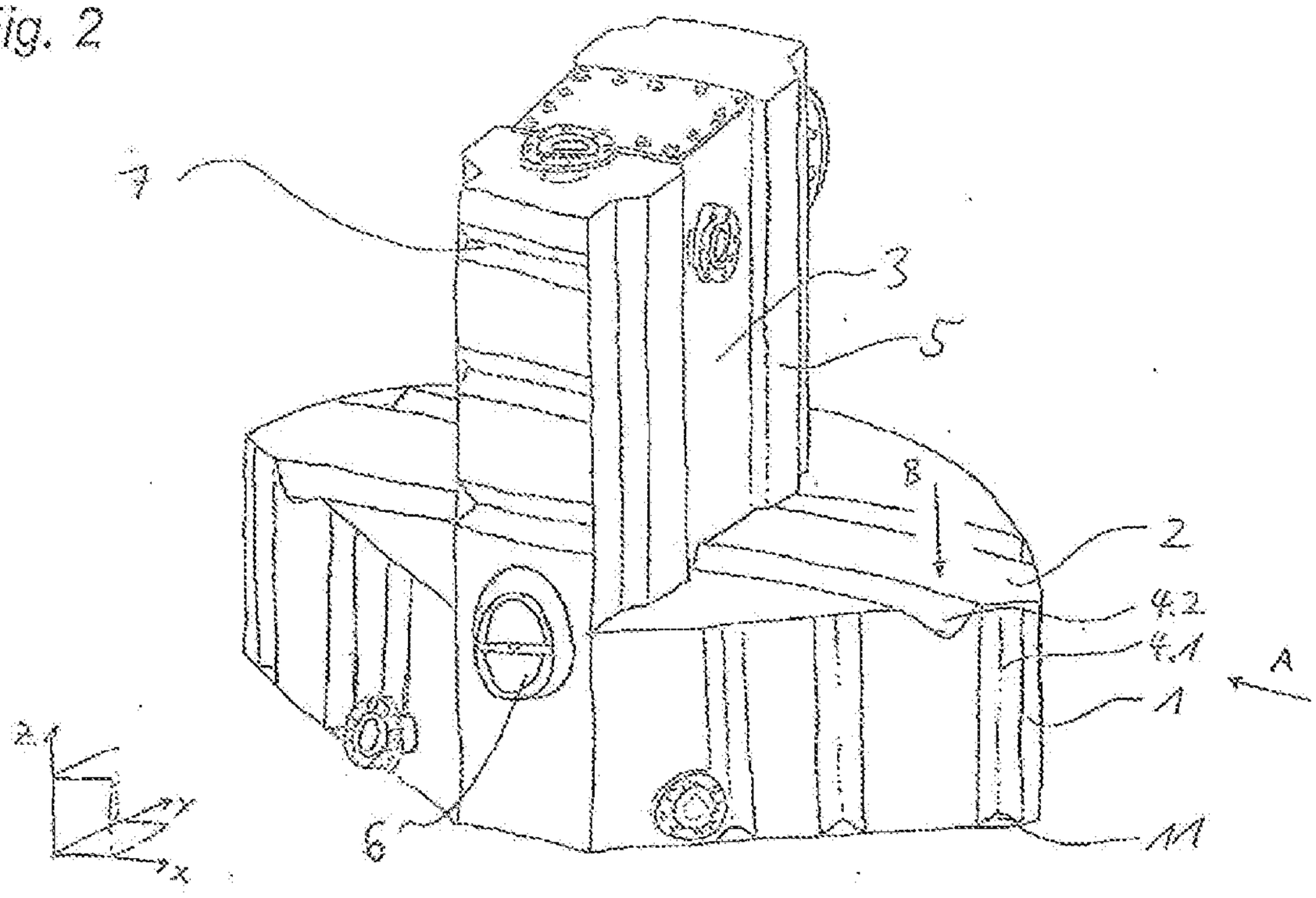

Fig. 3