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CA 2869344 A1 2013/10/10

(21) 2 869 344

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) **Date de dépôt PCT/PCT Filing Date:** 2013/02/14
(87) **Date publication PCT/PCT Publication Date:** 2013/10/10
(85) **Entrée phase nationale/National Entry:** 2014/10/02
(86) **N° demande PCT/PCT Application No.:** EP 2013/052988
(87) **N° publication PCT/PCT Publication No.:** 2013/149750
(30) **Priorité/Priority:** 2012/04/04 (DE10 2012 2055 68.1)

(51) **Cl.Int./Int.Cl.** ***F04B 13/02*** (2006.01),
F04C 2/12 (2006.01)

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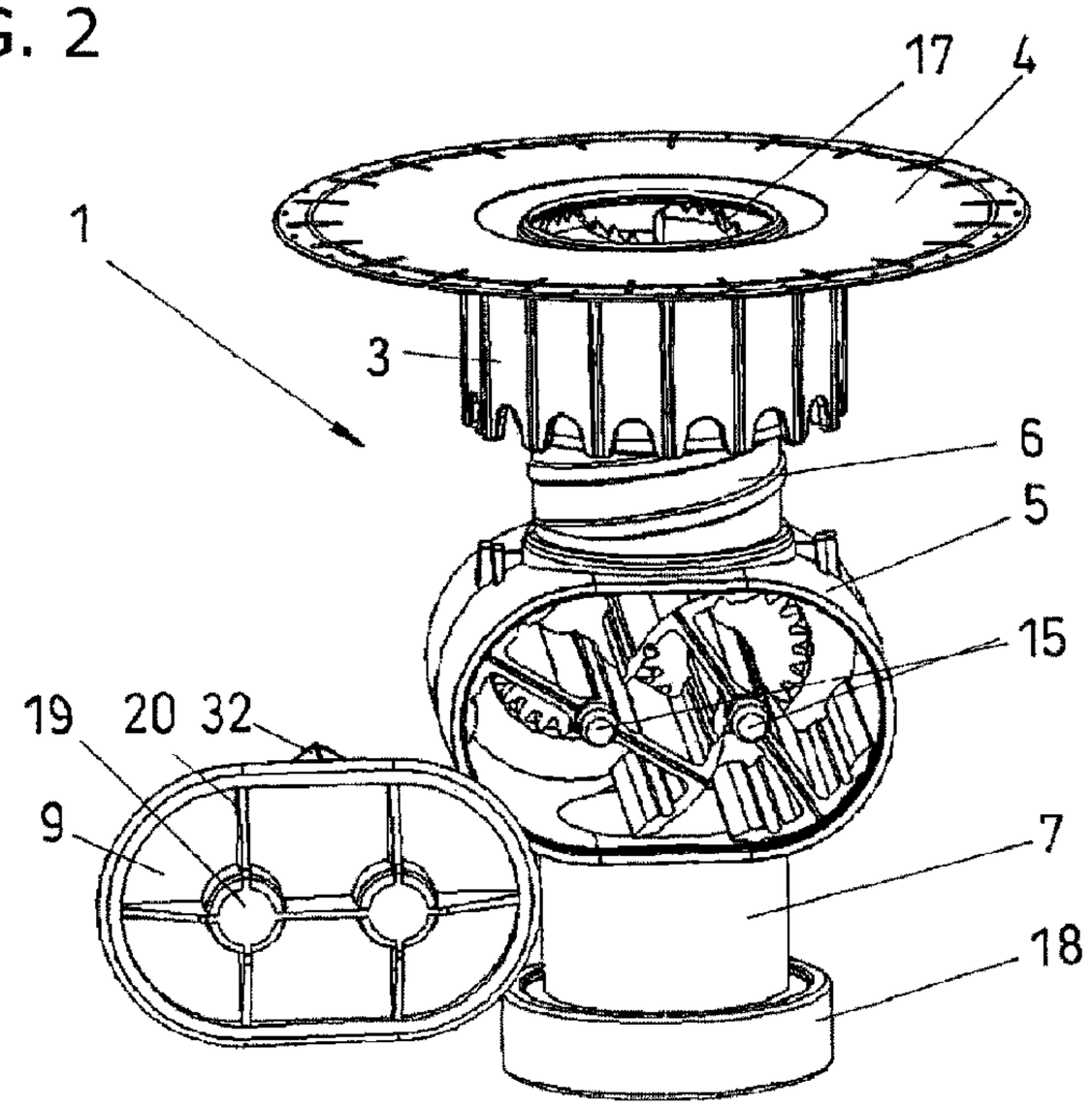
(54) **Titre : POMPE DE DOSAGE EN MATIERE PLASTIQUE**
(54) **Title: METERING PUMP MADE OF PLASTIC**

FIG. 2



(57) **Abrégé/Abstract:**
The invention relates to a metering pump (1) made of plastic, with two rotors (10) coupled to one another via gears (11) and drivable in opposite directions, which are seated in a pump housing (5) equipped with suction ports (6) and outlet ports (7), wherein each rotor (10) has a rotor shaft (12), the rotor shaft ends (15) of which are seated in the walls (8, 4) of the pump housing (5). Each rotor (10) has two rotor blade walls (13) arranged diametrically on the rotor shaft (12), a partially cylindrical rotor blade shoe (14) being formed at each of the peripheral ends of said rotor blade walls, wherein the rotor blade shoes (14) on the one hand contact the cylindrical inside wall regions of the pump housing (5) and on the other contact the rotor blade shafts (13) of the adjacent rotor (10) in a sliding and sealing manner.

ABSTRACT

The invention relates to a metering pump (1) made of plastic, with two rotors (10) coupled to one another via gears (11) and drivable in opposite directions, which are seated in a pump housing (5) equipped with suction ports (6) and outlet ports (7), wherein each rotor (10) has a rotor shaft (12), the rotor shaft ends (15) of which are seated in the walls (8, 4) of the pump housing (5). Each rotor (10) has two rotor blade walls (13) arranged diametrically on the rotor shaft (12), a partially cylindrical rotor blade shoe (14) being formed at each of the peripheral ends of said rotor blade walls, wherein the rotor blade shoes (14) on the one hand contact the cylindrical inside wall regions of the pump housing (5) and on the other contact the rotor blade shafts (13) of the adjacent rotor (10) in a sliding and sealing manner.

Description

Title

Metering pump made of plastic

The present invention relates to a metering pump made of plastic with two oppositely drivable rotors which are intercoupled via gearwheels and are supported in a pump housing which is provided with an inlet connector and an outlet connector, wherein each rotor has a shaft, the ends of which are supported in the walls of the pump housing.

Metering pumps are known in all sizes and constructional types. Especially known as metering pumps made of plastic are hand-operated piston pumps as are known on soap dispensers for liquid soap, or, as particularly of interest here, also in the hospitality industry where in fast food businesses, for example, mustard, ketchup or coffee creams are dispensed in a metered manner by means of such hand-operated piston pumps. Despite these metering pumps, the dispensed quantity varies to a relatively high degree, however, since in the case of piston pumps, especially such pumps as are currently described here, the stroke distance should actually be fully utilized during each operation, but this is mostly not the case. Instead of this, one, two or three short strokes are often executed and the quantity correspondingly varies to a very high degree. Providing this quantity is only dispensed to a hamburger as an

accompaniment, this is of only minor consequence. Where, however, such metering pumps are also used in order to add a specific quantity of a liquid foodstuff to a recipe, the taste is varied as a result of incorrect operation, which is not always appreciated by the customers.

A variety of other types of pumps are indeed well known, in particular also rotor-type pumps, but these are mostly designed as relatively highly-priced metering pumps made of metal and this is also necessary in the foodstuff industry where large quantities have to be dispensed in a metered manner. For commercial use, however, in most cases very inexpensive disposable metering pumps are used mostly at no cost. Accordingly, such metering pumps have to be produced from plastic, have a construction which is as simple as possible and operate reliably.

The metering pump made of plastic which is of interest here is to be especially designed for foodstuffs which are dispensed in so-called flow packs or other soft packaging made of plastic film, wherein in an embodiment which is preferred here the metering pump is specially adapted for this purpose, as disclosed in claim 12.

Many liquid foodstuffs also contain larger proportions of solid material. Typical examples of such liquid foodstuffs are, for example, tartar sauce, mustard sauces with pickles, vanilla sauce with chocolate or almond slices, etc. Such solid-liquid foodstuffs cannot be dispensed in a metered manner by means of the conventional metering pumps of today. This can hardly be

realized particularly by means of so-called gear pumps, like a pump of this type which is described in FR-2313971, for example. In the case of larger solid material particles, such as almond slices, these are crushed by the rotors or block the rotors. Accordingly, especially metering pumps in which the rotors have two-vaned or multi-vaned revolving bodies are a possibility for such metering pumps. Examples of such pumps are known from US 3054417, where a metering pump for liquid media for adding additional liquids is shown, wherein in this case each rotor has three vane arms and these vane arms roll against each other and so further transport the medium. In the case of such pumps, there is sufficient space between the housing and the individual rotor vanes in order to also transport liquids with solid material constituents. In this case, the larger solid material constituents are less of a problem than rather the smaller solid material constituents which remain adhered to the rotor vanes, which mutually roll against each other, and are completely crushed during the rolling process, whereupon a coating can form and can reduce the output capacity and even lead to blockages.

The same also applies to a metering pump according to WO 95/24556, in which are described only two-vaned rotors, but which also roll mutually both against each other and against the housing wall.

It is consequently the object of the present invention to create an improved metering pump which has a relatively large output capacity and is particularly suitable for

delivering solid-liquid mixtures without having the previously described disadvantages in the process.

This object is achieved by means of a metering pump made of plastic of the type referred to in the introduction which is distinguished by each rotor having two rotor vane walls arranged diametrically on the rotor shaft and on the peripheral ends of which a partially cylindrical wall is formed as a rotor vane shoe in each case, wherein the rotor vane shoes butt against the cylindrical inner wall regions of the pump housing on one side and against the shafts of the adjacent rotor on the other side in a sliding manner and with sealing effect.

In an especially preferred embodiment, each rotor vane shoe, on the outer side of the partially cylindrical wall, has at least one sealing edge which extends parallel to the rotor axis and is arranged close to the leading edge - in the direction of rotation - of the respective partially cylindrical wall of the rotor vane shoe. As a result of this, it is ensured that no deposits can build up on the housing wall.

Further advantageous embodiments of the subject matter of the invention are apparent from the dependent claims and their relevance and principle of operation are described in the following description with reference to the attached drawing.

Represented in the drawing is a preferred exemplary embodiment of the subject matter of the invention. In the drawing:

Fig. 1 shows a preferred application of the metering pump according to the invention attached to a flow pack.

Fig. 2 shows a perspective view of the metering pump with the fastening connector, wherein the detachable pump housing wall has been removed.

Fig. 3 shows the metering pump once more in a side view, again with omission of the detachable pump housing wall, whereas

Fig. 4 shows in perspective view the two rotors in isolation in the correct relative position to each other.

Fig. 5 shows a perspective partial view of the pump housing in isolation and

Fig. 6 shows the detachable pump housing wall in perspective view with a view in the direction of its inner side.

Fig. 7 finally shows the inlet connector of the metering pump with an opening means and a fastening connector with a flange for the welded connection to a flow pack.

Symbolically shown in Fig. 1 is a preferred application of the metering pump according to the invention - which overall is designated 1 - on a flow pack 2. The metering

pump 1 is mounted on the flow pack 2 by means of a fastening connector 3 which is provided with a flange 4 on the flow pack 2. The connecting of the flange 4 to the flow pack 2 is preferably carried out by means of ultrasonic welding.

The metering pump itself has a pump housing 5 with an inlet connector 6 and an outlet connector 7. The inlet connector 6 is connected to the fastening connector 3 by means of a screw thread. The metering pump itself is shown here with a view in the direction of a fixed end wall 8 of the pump housing 5, wherein in this case a rotor shaft end 15, provided with a drive coupling part 16, penetrates through the mentioned fixed end wall 8 and the drive coupling part 16 is seen. The drive coupling part serves for being connected in a form-fitting manner to a drive means, which is not shown here.

In Fig. 2, the metering pump 1 together with the fastening connector is shown in isolation. In this perspective view, the mentioned flange 4 is viewed obliquely from above and the opening means 17 are seen, in this case being designed as perforating and cutting teeth and in this position before initial use still lying entirely inside the inlet connector 6. Before initial use, the pump housing 5 is screwed by its inlet connector 6 into the fastening connector 3 as far as it will go, wherein the mentioned opening means 17 cut open an aseptically closed receptacle, preferably a flow pack made of plastic film. In the transporting position of the metering pump 1 shown here, the outlet connector 7 is also provided with a sealing cover 18 which ensures that

during transportation and storage no foreign substances or foreign particles can find their way into the metering pump.

In Fig. 2, the pump housing 5 is shown in the open state. Whereas in Fig. 1 the view is in the direction of the fixed end wall 8 of the pump housing 5, as already mentioned, in this case the metering pump 1 is shown rotated by 180° and the view is in the direction of that side of the metering pump 1 with a detachable end wall 9. This detachable end wall 9 is shown offset to the side or detached. The detachable end wall 9 can also be referred to as the pump housing cover. In this figure, the view is in the direction of the outer side of the pump housing cover, and outwardly projecting closed bearing bushes 19, which are able to accommodate the rotor shaft ends 15 on the inner side, are seen. The outwardly closed bearing bushes 19 are mounted on the outer side of the detachable end wall 9 in a stabilized manner by means of stiffening ribs 20.

In Fig. 3, the metering pump 1 is shown in the lateral position, but in the same in-use position as in Fig. 2, but with omission of the detachable end wall of the pump housing 5. Clearly apparent in this view are the two rotors 10 supported in the pump housing 5, on which are formed, preferably in one piece, gearwheels 11 which cause the two rotors to move in opposite directions if one of the two rotors is driven. With regard to the exact design of the two rotors 10, reference is made to the subsequent Fig. 4. It is seen in Fig. 3 that each rotor is provided with a shaft 12, wherein here the view

is in the direction of the rotor shaft ends 15, and wherein two rotor vane walls 13, which are diametrically opposite each other, are formed on the rotor shafts 12 in each case. A rotor vane shoe 14 is formed in each case on the peripheral ends of the rotor vane walls 13. Each rotor vane shoe has a partially cylindrical shape which in curvature is adapted to the cylindrical part of the pump housing 5. As is apparent here, each rotor vane shoe 14 permanently butts either against the inner side of the pump housing or against the rotor shaft 12 of the adjacent rotor.

In Fig. 4, the design of the two rotors can now be seen in detail. These are shown in isolation in a correct relative position admittedly, as provided when installed, but with omission of the pump housing 5. The parts already mentioned in conjunction with Fig. 3, specifically the rotor shaft 12 and the corresponding rotor shaft ends 15, are not designated again here so as not to unnecessarily encumber the Fig. The specific embodiment of the rotor vane shoes 14 can be seen particularly clearly in this figure. The rotor shoes 14, as already mentioned, are formed in one piece on the peripheral ends of the rotor vane walls 13. The rotor vane shoes have a partially cylindrical outer surface 21. The curvature radius of this outer surface corresponds to the distance between the axis A, which passes through the rotor shaft 12 and extends centrally in its longitudinal direction, and the outer surface 21 of the rotor vane shoes.

The metering pump according to the invention is preferably designed at least in practice so that the pump seals the connection between inlet connector and outlet connector. To this end, the pump, or its rotors, and the pump housing 5 have a multiplicity of different sealing elements. These sealing elements, however, at the same time also act with cleaning effect and prevent deposits in the pump housing which can lead to a reduction in quality and to leaks, and, in the worst case, to blockages of the pump.

Accordingly, the rotor vane shoes 14 have a sealing edge 23 which at least in the direction of rotation is close to the leading edge in the direction of rotation. This sealing edge 23 essentially has the form of a bead which extends on the mentioned outer surface 21 parallel to the rotor shaft 12. As the name implies, the sealing edge 23 serves on the one hand for forming a seal between the inner cylindrical wall parts of the pump housing 5 and the rotor 10, but at the same time this sealing edge 23 is also to avoid the forming of deposits by means of its scraping action. Each rotor vane shoe 14 is preferably provided with two sealing edges 23, specifically both in the direction of the leading end edge 22 and also close to the trailing end edge 22. These edges are referred to as an end edge 22 on both occasions since both rotors 10 are preferably of an absolutely identical design so as to require only one injection mold. This also has the advantage that with the same design of the two rotors no source of error arises during assembly either.

The sealing edge 23, which preferably has a roughly triangular shape in cross section, leads to the outer surface 21 no longer butting fully against the inner wall of the pump housing 5. It is also caused by the rotor vane shoe 14 being deformed in the outer region. In order to alleviate this deformation, and therefore to achieve a spring-action contact pressure of the sealing edges 23, articulation grooves 25 are provided on the inner surface 24. These articulation grooves 25 are located closer to the rotor vane walls 13 than the sealing edges 23 which are arranged on the opposite side. The articulation grooves 25 therefore permit a flexible articulated movement of the corresponding end edges 22 in a pivotable manner around the articulation groove 25. If sealing edges 23 are formed on the outer surfaces 21 at both ends of the rotor vane shoes, then corresponding articulation grooves 25 are naturally provided on both sides of the inner surface 24.

Also apparent in Fig. 4 is that the rotor vane walls 13 have end faces 26. Arranged on each of the end faces 26, which come to lie towards the detachable end wall 25 or towards the pump housing cover in the installed state of the rotors in the pump housing 5, is a sealing lip 27 which extends centrally from the rotor shaft ends to the outer surface 21 of the rotor vane shoes. Butting against the opposite end face, which is not visible here, are the gearwheels which are connected in one piece to these end faces. In this case, such sealing lips are provided on the corresponding end face regions extending only from the corresponding gearwheel to the outer surface 21 of the rotor vane shoe.

So that the rotor vane shoes 14 are also sealed in relation to the rotor shaft 12, longitudinal scraper ribs 28 are also provided on the rotor shaft 12. These longitudinal scraper ribs 28 extend parallel to the axis A of the rotor shaft. In principle, it is sufficient in this case to provide a longitudinal scraper rib 28 on each rotor shaft, but preferably two such longitudinal scraper ribs are provided in each case on the same side so that the region between two rotor vane walls 13 is approximately divided into three. These longitudinal scraper ribs 28 act not only with sealing effect but also clean the rotor vane shoes 14 of deposits which possibly form there on their outer side 21. As a result of these constructional features, a self-cleaning metering pump is formed in practice.

In Fig. 5, the pump housing 5 is shown in isolation. The inlet connector 6 and the outlet connector 7 are shown only to a limited extent. Also in the case of this solution, the pump housing cover or the detachable end wall of the pump housing is again removed. The view is therefore in the direction of the inner side of the fixed end wall 8 of the pump housing. Second bearing sleeves 29, 30 are formed in the pump housing, wherein the one second bearing sleeve 29 is of closed design and the other second bearing sleeve 30 is open straight through to the outside. Formed in this open bearing sleeve 30 is preferably an encompassing sealing lip 31 with smaller height. A plurality of such encompassing sealing lips 31 may also be provided, however, and so in practice form a type of labyrinth seal.

The rotors 10 therefore have ends 15 on their shafts 12 on both sides and are designed as bearing journals. The rotor shaft journals on the side of the pump housing cover 9 have a smaller diameter, whereas the rotor shaft ends on the other side have a significantly larger diameter. Since, however, the two rotors are preferably of identical design, as already mentioned, both rotors, on each shaft end with the larger diameter, have a so-called drive coupling part 16 which has already been described with reference to Fig. 1. Whereas in Fig. 1 the open bearing sleeve 30 is arranged on the left and the drive coupling part 16 is seen there, in Fig. 1 the closed bearing sleeve 29 is shown on the right. In Fig. 5, in which the pump housing is now seen from the inner side, the closed, second bearing sleeve 29 can consequently be seen on the left and the second, open bearing sleeve 30 be seen on the right. The corresponding encompassing sealing lip 31 is provided only the second, open bearing sleeve 30.

In Fig. 6, the detachable end wall 9 or the pump housing cover 9 is now shown in isolation. Seen on the encompassing edge are a plurality of spring tongues 32 which hook into latching means 33, with corresponding cams 34, on the outside on the pump housing 5 in the closed state of the pump housing cover. Shown in Fig. 2 is an alternative form for the fastening of the detachable end wall 9. In this case, two spring tongues are formed on the inner side of the pump housing cover 9 and are essentially of stable design and in practice are formed as displacement bodies which penetrate into the

pump housing in that region which is not covered by the two rotors. In this case, it is naturally also possible to provide corresponding latching means on the rotor housing. In this way, it is also largely impossible for deposits to be able to form in that edge region. The openings of the inlet connector 6 and of the outlet connector 7 are provided more towards the inside, where no deposits can form anyway. These slightly more stable spring tongues 32 can correspondingly have latching means which are not evident here and which instead of behind cams can engage behind the edges of the inner side of the inlet connector 6 or outlet connector 7.

As already mentioned, bearings are also formed in the detachable end wall 9. These, however, are referred to as closed bearing bushes 19 here. Since these bearing bushes 19 are closed, no additional sealing means are required in this case. The diameter of these closed bearing bushes 19 is significantly smaller than the diameter of the two bearing sleeves 29 and 30. The rotor shaft ends 15, which are designed as bearing journals 30, engage in these closed bearing bushes 19, as is very clearly evident in Fig. 4.

Finally, reference is also made to Fig. 7, in which is seen the fastening connector 3 with the flange 4 shown in a state separated from the inlet connector 6. The opening means 17, which are formed in one piece on the inlet connector 6, are also clearly to be seen here. The inlet connector 6, moreover, has a male thread 36. This male thread 36 is matched to the female thread 37 in the fastening connector 3.

Using the metering pump 1 described here, liquids and also mixtures of liquids and solid materials can be dispensed in a problem-free manner. In this case, the size of the solid material particles is practically irrelevant, but they naturally have to be of such size that this is smaller than the distance between the two rotor shafts. It makes no difference, however, whether the solid material parts are coarse-grained or fine-grained and therefore prone to deposits to a greater or lesser extent. For one thing, the solid material parts are not crushed and for another thing the previously described means of their depositing on the pump housing and also on the rotor vane shoes or on the rotor shafts are continuously removed. As a result, it is ensured that the metering pump, which serves as a disposable metering pump, always operates reliably for the necessary life span. Since due to the previously described construction a high sealing integrity exists between the outlet connector 7 and the flow pack 2, moreover, a practically aseptic state is maintained in the flow pack during the entire emptying process. Accordingly, the foodstuff, which is delivered in the fully closed aseptic flow pack, can be supplied without preservatives, or at least with substantially fewer preservatives.

CLAIMS:

1. A metering pump (1) made of plastic with two oppositely drivable rotors (10) which are intercoupled via gearwheels (11) and are supported in a pump housing (5) which is provided with a inlet connector (6) and an outlet connector (7), wherein each rotor (10) has a shaft (12), the ends (15) of which are supported in the walls (8, 4) of the pump housing (5), characterized in that each rotor (10) has two rotor vane walls (13) which are arranged diametrically on the rotor shaft (12) and on the peripheral ends of which a partially cylindrical rotor vane shoe (14) is formed in each case, wherein the rotor vane shoes (14) butt against the cylindrical inner wall regions of the pump housing (5) on one side and against the rotor vane shafts (13) of the adjacent rotor (10) on the other side in a sliding manner and with sealing effect.

2. The metering pump (1) as claimed in claim 1, characterized in that a gearwheel (11) is formed in one piece on each rotor shaft (12).

3. The metering pump (1) as claimed in claim 1, characterized in that the pump housing (5) has an end wall (8) which is fixedly connected to the pump housing (5) and an end wall (9) which is detachably connected thereto, wherein at least one rotor shaft end (15) has a drive coupling part (16) which passes through the pump housing (5) and passes through the

end wall which is fixedly connected to the pump housing (5).

4. The metering pump (1) as claimed in claim 3, characterized in that both rotors (10) are identical and both therefore have a drive coupling part (16), wherein the one drive coupling part (16) is supported in a second, open bearing sleeve (30) and the other is supported in an outwardly closed bearing sleeve (29).

5. The metering pump (1) as claimed in claim 1, characterized in that each rotor vane shoe (14), on its outer surface (21), has at least one sealing edge (23) which extends parallel to the rotor axis (A) and is arranged close to the end edge (22) - in the direction of rotation - of the respective rotor vane shoe (14).

6. The metering pump (1) as claimed in claim 5, characterized in that each rotor vane shoe (14) in each case a sealing edge (23) is arranged extending parallel to the rotor axis (A) close both to the end edge (22) which is provided in the direction of rotation and to the end edge which is provided in the direction of counterrotation.

7. The metering pump (1) as claimed in claim 5 or 6, characterized in that an articulation groove (25) is arranged in the region between each sealing edge (23) and the rotor vane wall (13) on the inner

surface (24) of the rotor vane shoe (14), that is to say on the side remote from the sealing edge (13).

8. The metering pump (1) as claimed in claim 4, characterized in that at least one encompassing sealing lip (31) is formed in one piece in the second open bearing sleeve (30).

9. The metering pump (1) as claimed in claim 2, characterized in that on the rotor vane walls (13), on their end faces (26) remote from the gearwheels (11), provision is made for at least one sealing lip (27) for sealing contact on the detachable end wall (9) of the pump housing (5).

10. The metering pump (1) as claimed in claim 1, characterized in that at least one longitudinal scraper rib (28), which is radially outwardly oriented and extends parallel to the rotor shaft axis (A), is arranged on each rotor shaft (12).

11. The metering pump (1) as claimed in claim 10, characterized in that two parallel longitudinal scraper ribs (28) are arranged between the two diametrically extending rotor vane walls (13) on both sides of the rotor shaft (12).

12. The metering pump (1) as claimed in claim 1, characterized in that the inlet connector (6) is provided with cutting and/or perforating opening means (17) and a fastening connector (3), which can be welded to a container wall, with a flange (4).

13. The metering pump (1) as claimed in claim 12, characterized in that the outlet connector (7) is provided with a sealing cover (18).

14. The metering pump (1) as claimed in claim 3, characterized in that closed bearing bushes (19) are formed in the detachable end wall (9) of the pump housing (5) for both rotors (10).

FIG. 1

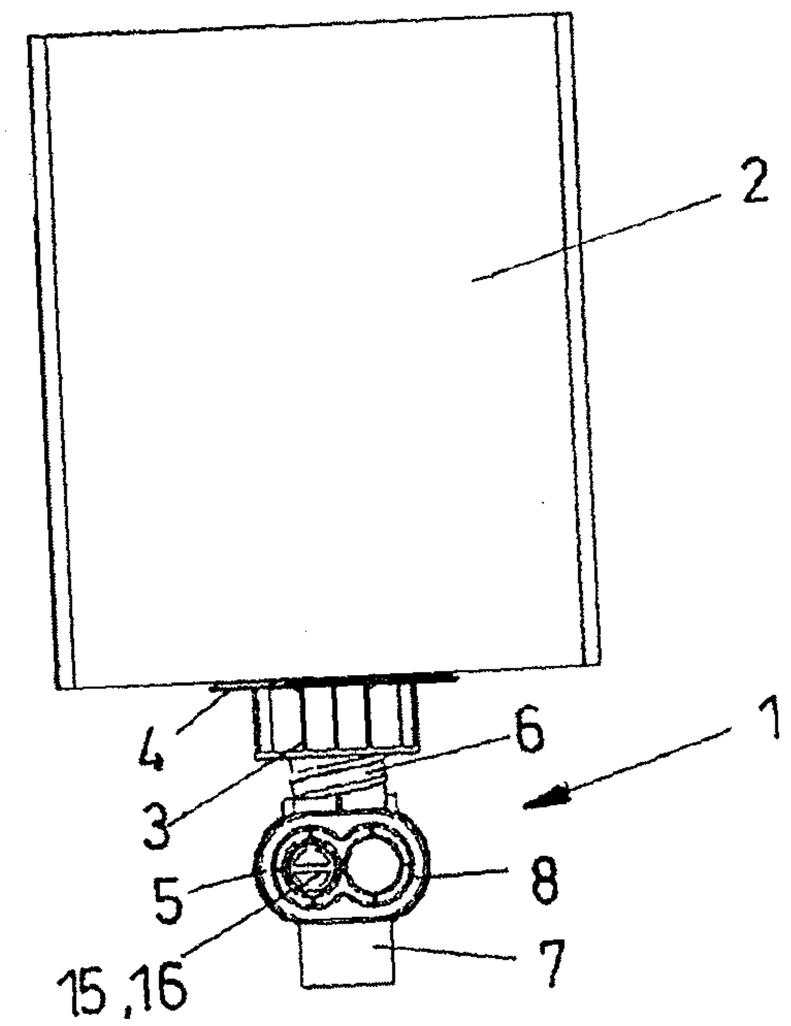


FIG. 2

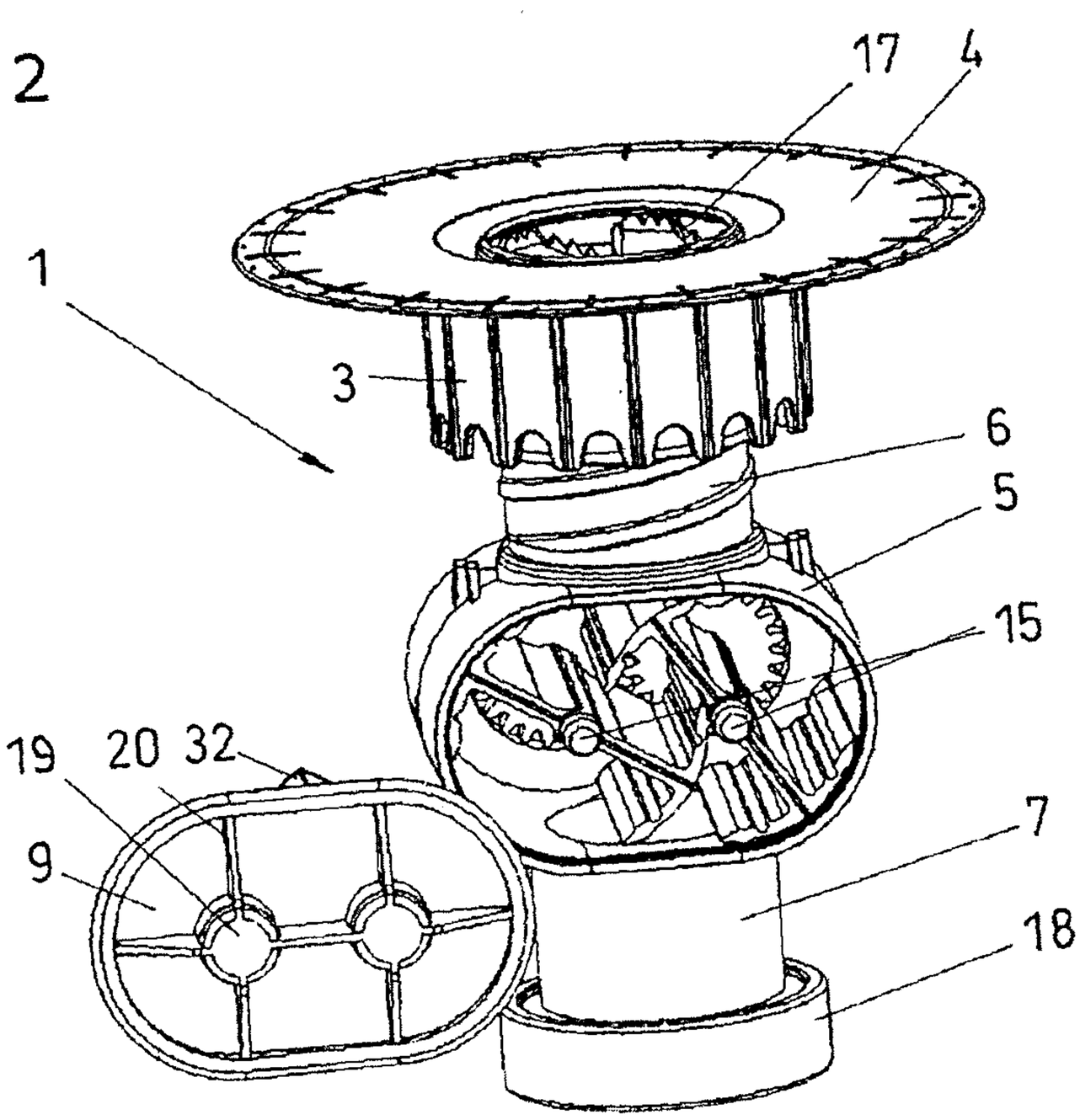


FIG. 3

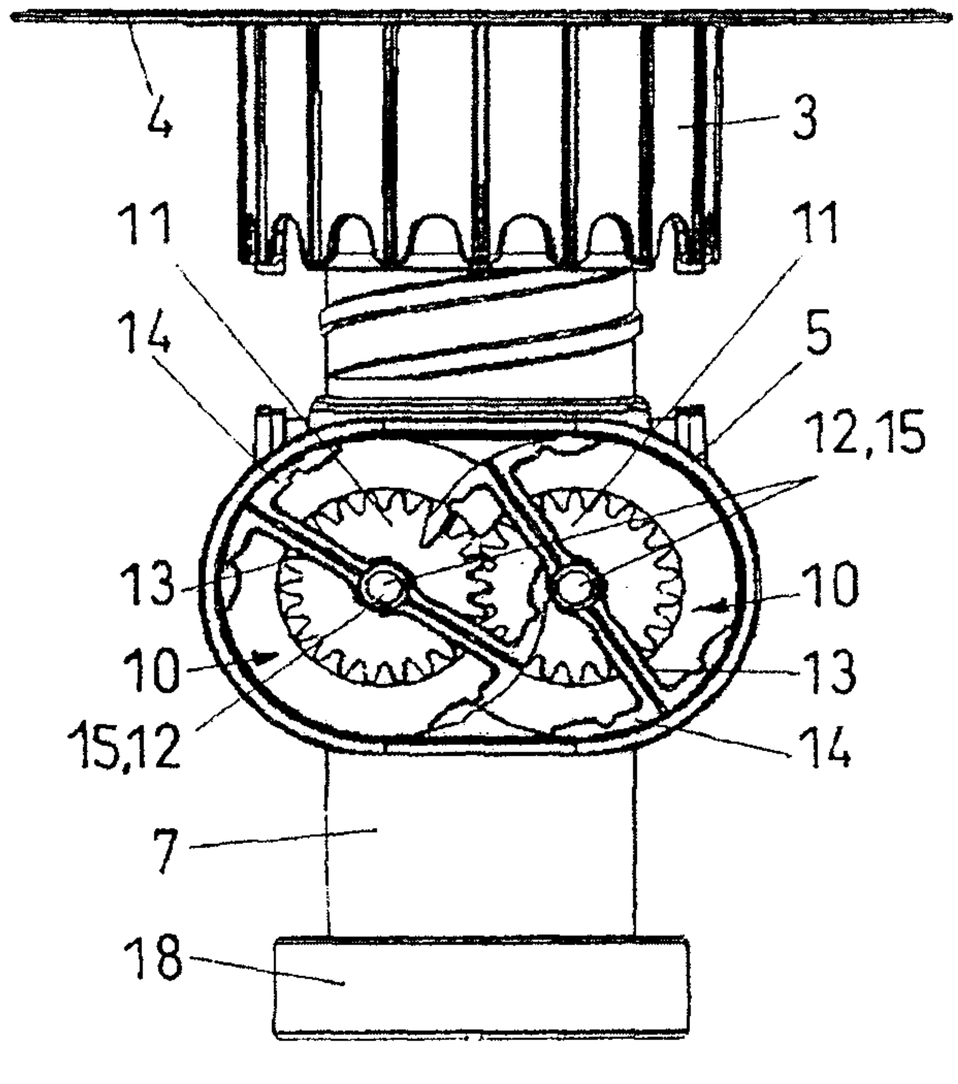

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FIG. 4

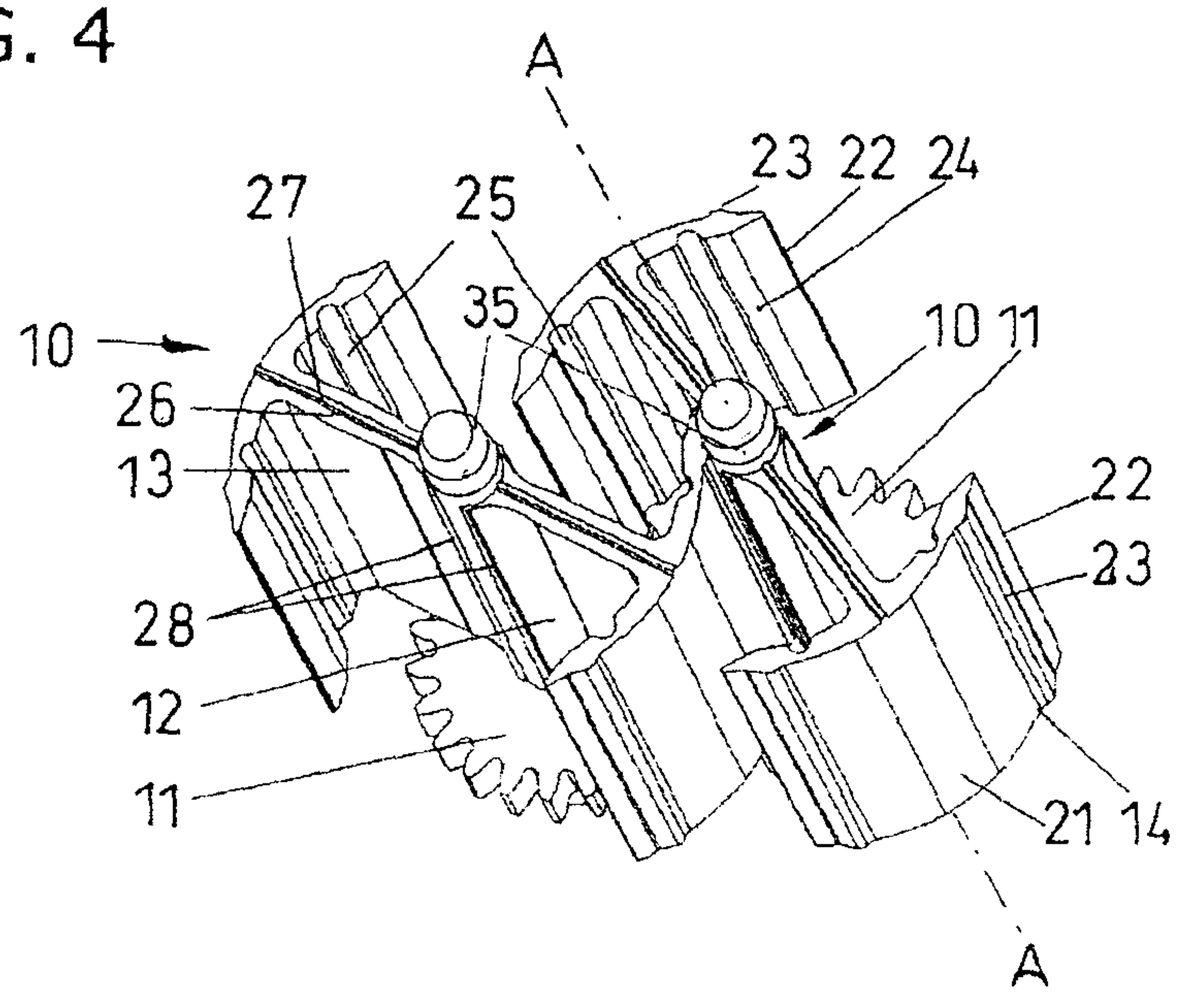
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FIG. 5

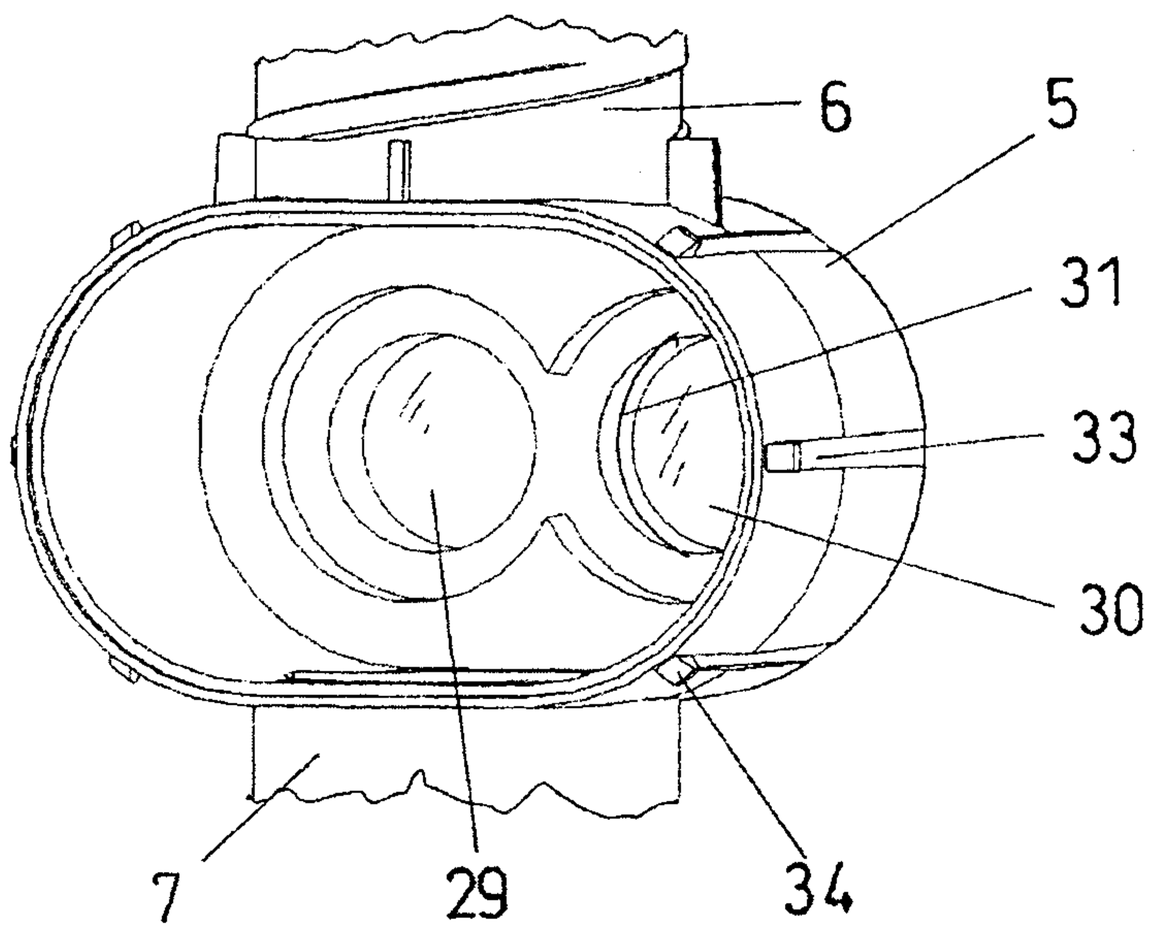

FIG. 6

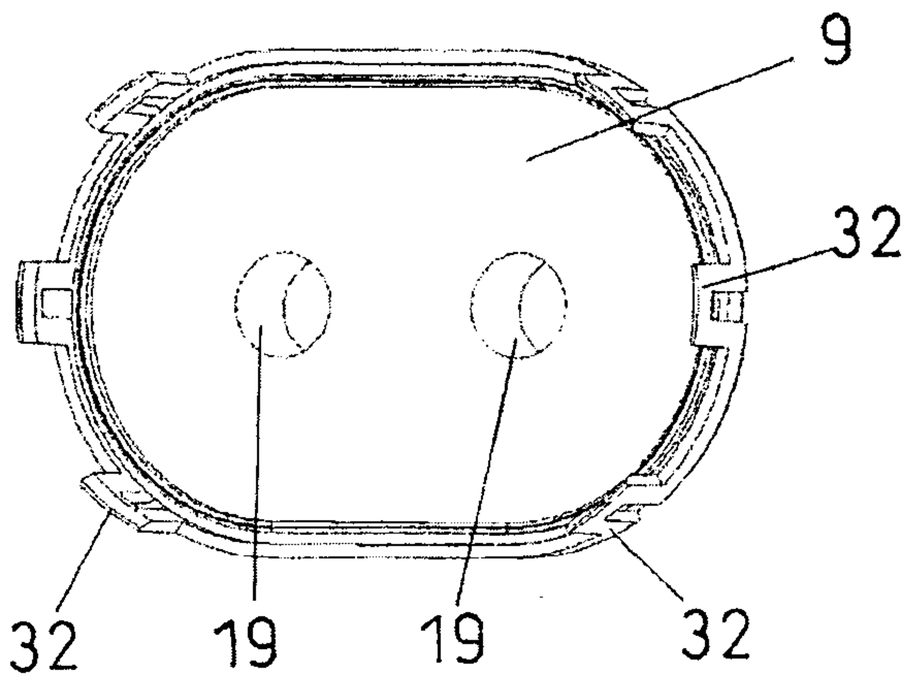

FIG. 7

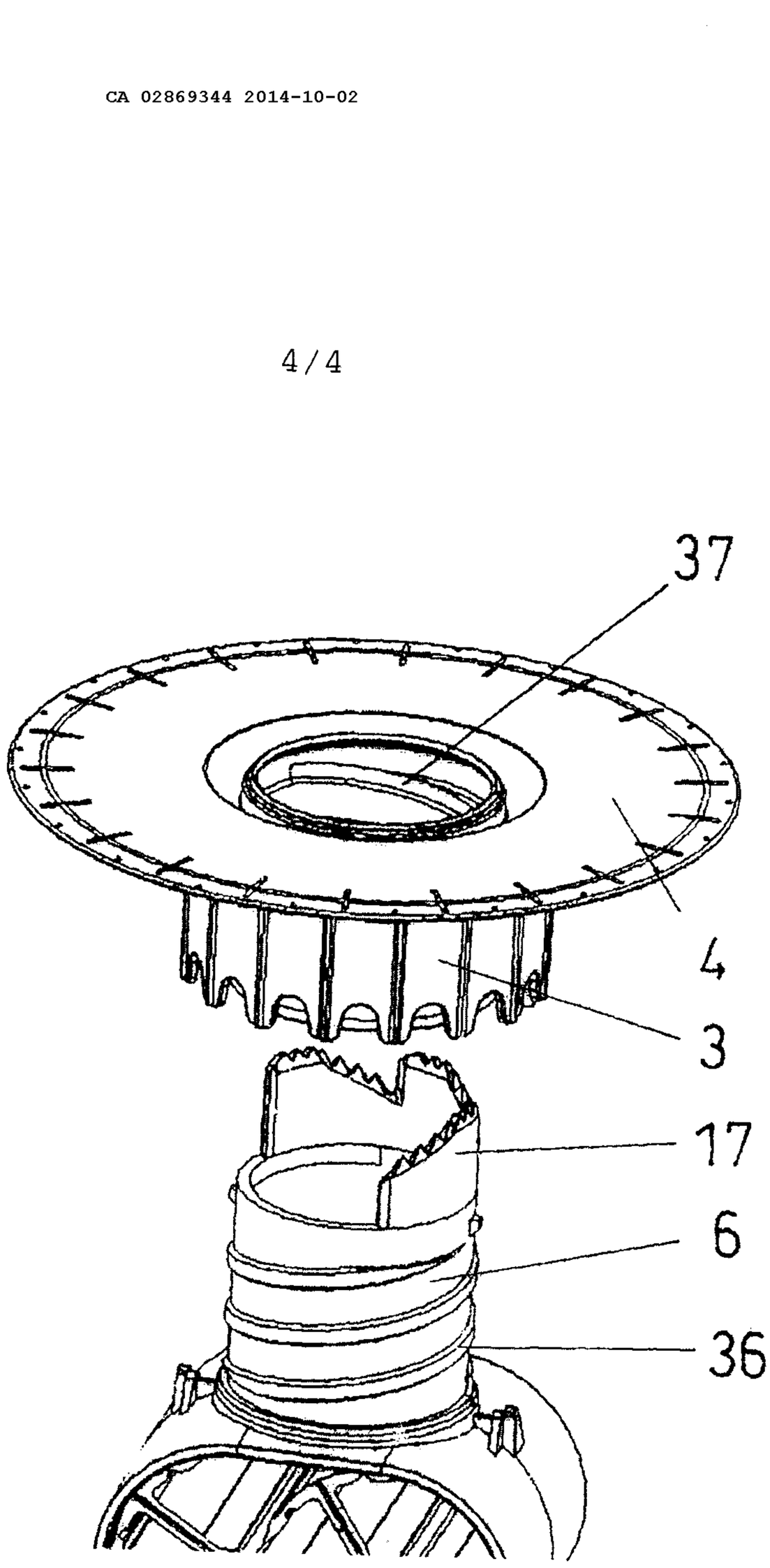

FIG. 2