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(71) Applicant: **Alfa Laval Corporate AB**
221 00 Lund (SE)

(72) Inventors:
• **Hjorslev, Leon**
DK-2670 Greve (DK)
• **Danielsson, Jan**
SE-42372 Säve (SE)

(74) Representative: **Öberg, Markus Olof**
Alfa Laval Corporate AB
Patent Department
P.O. Box 73
221 00 Lund (SE)

(54) **Washing system for washing of tanks or the like**

(57) The present invention is related to a washing system for washing of tanks, or the like, the system comprising: a washing assembly (10) insertable into and retractable from a tank (2) to be washed, said washing assembly (10) comprising: a fluid delivery conduit (13), and a fluid outlet (14) connected to the fluid delivery conduit (13). The system further comprises: a support and guiding device (20) to be mounted inside the tank (2) and to be arranged to guide said washing assembly (10) through said support and guiding device (20) when said fluid delivery conduit (13) is inserted into and retracted from the tank (2) and to support said washing assembly (10) when said fluid delivery conduit (13) is inserted in the tank (2). The present invention also relates to a support and guiding device for supporting and guiding a washing assembly (10) in a washing system (1) for washing of tanks, or the like as well as a washing assembly in a washing system (1) for washing of tanks, or the like, wherein said washing assembly is insertable into and retractable from a tank (2) to be washed.

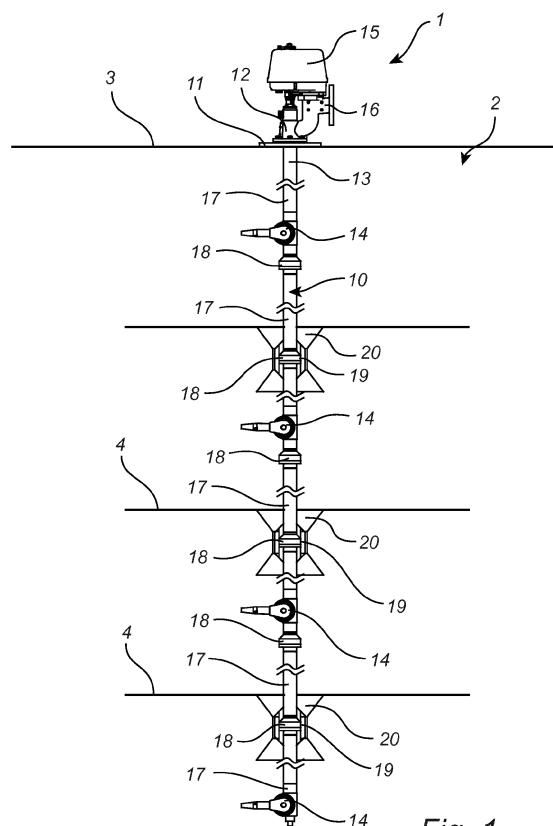


Fig. 1

Description

Technical Field

[0001] The invention relates to a washing system for washing of tanks, or the like. The invention also relates to a support and guiding device for supporting and guiding a washing assembly in a washing system for washing of tanks or the like. Furthermore, the invention relates to a washing assembly in a washing system for washing of tanks, or the like, wherein said washing assembly is insertable into and retractable from a tank to be washed.

Background

[0002] When a washing assembly of a washing system for washing tanks or the like is installed in a tank, the washing assembly is first inserted into the tank and thereafter supports for supporting the washing assembly have to be manually mounted by a person entering the tank. Some examples of such washing systems are found in e.g. US4716917 and US3140828. Entering the tank is a risky work that must be made with outermost care. First of all the person entering the tank may fall and hurt himself. Secondly the goods transported in the tank could potentially be toxic, whereby the person entering the tank must wear proper protecting equipment. When the washing assembly is to be removed from the tank a person must again enter the tank to dismount the supports supporting the washing assembly. The cleaning agents used for washing the tank are most often also hazardous for humans whereby proper protecting equipment must again be used. Moreover, the mounting and dismounting of the supports supporting the washing assembly is time consuming, resulting in unwanted down time in the use of the tank during which the tank may not be used.

Summary

[0003] An object of the invention is to provide a washing system for washing tanks wherein the washing assembly of the washing system may be installed from the deck without going into the tank for mounting supports supporting the washing assembly.

[0004] According to a first aspect of the present invention a washing system for washing tanks or the like is provided. The system comprising a washing assembly insertable into and retractable from a tank to be washed, said washing assembly comprising a fluid delivery conduit, and a fluid outlet connected to the fluid delivery conduit. The system further comprising a support and guiding device to be mounted inside the tank and to be arranged to guide said washing assembly through said support and guiding device when said washing assembly is inserted into and retracted from the tank and to support said washing assembly when said washing assembly is inserted in the tank.

[0005] Thus, according to the present invention a sup-

port and guiding device to be mounted inside the tank is used to guide said washing assembly through said support and guiding device when said washing assembly is inserted into the tank. The support and guiding device is also used to support said washing assembly when said washing assembly is inserted in the tank. Furthermore, the support and guiding device is also used to guide said washing assembly through said support and guiding device when said washing assembly is retracted from the tank. Once mounted inside the tank, the support and guiding device may be repeatedly used. Accordingly, the washing assembly may be repeatedly inserted and retracted from the tank without the need of manually mounting and dismounting any supports supporting the washing assembly inside the tank.

[0006] The washing assembly may be arranged to be rotatably supported in said support and guiding device. During normal operation the fluid delivery conduit is rotating simultaneously as the fluid outlets revolve or turn in relation to the fluid delivery conduit. By doing so the whole volume area of the tank may be reached by the washing fluid ejected from the fluid outlets.

[0007] The fluid delivery conduit may further comprise a bearing arranged to provide a longitudinal guiding surface and a radial support surface in view of said support and guiding device. The bearing, being circular, is adopted to bear against the internal circular surface of the support and guiding device. Thus, both a very good radial support as well as a longitudinal support of the washing assembly is achieved.

[0008] Said support and guiding device may comprise a funnel shaped inlet section arranged to guide said fluid delivery conduit through said support and guiding device when said washing assembly is inserted into the tank, a circular cylindrical middle section arranged to support said fluid delivery conduit when said fluid delivery conduit is inserted in the tank and a funnel shaped outlet section arranged to guide said fluid delivery conduit through said support and guiding device when said fluid delivery conduit is retracted from the tank. The funnel shaped inlet and outlet sections are advantageous since the funnel shape allows a very good guiding of the washing assembly. For example, if the fluid outlet is not directed along the fluid delivery conduit when the washing assembly is inserted in the tank or retracted from the tank the funnel shaped inlet section or outlet section, respectively, guides the fluid outlet to be oriented along the fluid delivery conduit. Moreover, the funnel shaped inlet and outlet allow a certain amount of angular adjustment of the washing assembly, especially when inserting the washing assembly into the tank. Thus, when the washing assembly is inserted into the tank the funnel shaped inlet section of the support and guiding device guides the washing assembly to be properly aligned with the middle section of the support and guiding device.

[0009] Said bearing may be a flange bearing circumferentially surrounding said fluid delivery conduit. A flange bearing is a strong bearing being hard to bend and

thus the lifetime of the bearing is long.

[0010] Said bearing may comprise a plurality of bearing sections distributed along the circumference of said fluid delivery conduit.

[0011] The bearing surface of said bearing may comprises a low friction material. The low friction material is used in order to reduce the friction between the washing assembly and the support and guiding device, both when the washing assembly is guided through the support and guiding device and when the bearing is acting as a radial support surface when the washing assembly is supported by the support and guiding device.

[0012] The inner surface of said support and guiding device may comprise a low friction material. The low friction material may be used in order to reduce the friction between the washing assembly and the support and guiding device both when the washing assembly is guided through the support and guiding device and when the bearing is acting as a radial support surface when the washing assembly is supported by the support and guiding device.

[0013] Said low friction material may be Polytetrafluoroethylene (PTFE).

[0014] Said fluid delivery conduit may comprise a joint, wherein said bearing may be arranged at said joint.

[0015] Said washing assembly may further comprise an operation rod for maneuvering of said fluid outlet.

[0016] According to a second aspect of the present invention, a support and guiding device for supporting and guiding a washing assembly in a washing system for washing of tanks, or the like, is provided. The support and guiding device is arranged to be mounted inside a tank to be washed. Said support and guiding device comprising: an inlet section arranged to guide said washing assembly through said support and guiding device when said washing assembly is inserted into the tank, a middle section arranged to support said washing assembly when said washing assembly is inserted in the tank, and an outlet section arranged to guide said washing assembly through said support and guiding device when said washing assembly is retracted from the tank.

[0017] Said inlet section may be funnel shaped, said middle section may be circular cylindrical and said outlet section may be funnel shaped.

[0018] According to a third aspect of the present invention, a washing assembly in a washing system for washing of tanks, or the like, is provided. Said washing assembly is insertable into and retractable from a tank to be washed. Said washing assembly comprising: a fluid delivery conduit and a fluid outlet connected to the fluid delivery conduit. The fluid delivery conduit comprising a bearing arranged to provide a longitudinal guiding surface and a radial support surface in view of the support and guiding device according to the above.

[0019] The bearing surface of said bearing may comprise a low friction material.

Drawings

[0020] These and other aspects of the present invention will now be described in more detail, with reference to appended drawings showing embodiments of the invention. The figures should not be considered limiting the invention to the specific embodiment; instead they are used for explaining and understanding the invention.

Fig. 1 shows a system for washing of tanks according to one embodiment of the invention.

Fig. 2 shows a guiding device according to the disclosed embodiment of the invention.

Fig. 3a shows a cross section through a fluid delivery conduit and a bearing mounted thereto according to the disclosed embodiment of the invention.

Fig. 3b shows a cross section through a fluid delivery conduit and an alternative bearing mounted thereto according to a second embodiment of the invention.

Detailed description

[0021] Fig. 1 shows a system 1 for washing of tanks 2, or the like, according to one embodiment of the invention. The system 1 is especially suited for washing of tanks in vessels or ships. The system 1 comprises a washing assembly 10 as well as a plurality of support and guiding devices 20. Although a plurality of support and guiding devices are disclosed, it is to be understood that depending on the design of the tank, only one support and guiding device might be sufficient.

[0022] The washing assembly 10 is arranged to be inserted into the tank 2 when washing of the tank is needed and thereafter to be retracted from the tank 2 when the washing is completed. In Fig. 1 the washing assembly 10 is disclosed as inserted in the tank 2.

[0023] The washing assembly 10 has a mounting plate 11 which when the washing assembly 10 is inserted in the tank 2 is mounted on a top surface 3 of the tank 2. The washing assembly 10 also comprises an inlet housing 12, a fluid delivery conduit 13, a plurality of fluid outlets 14 connected to the fluid delivery conduit 13 and a driving assembly 15. The inlet housing 12 is located on top of and attached to the mounting plate 11. The fluid delivery conduit 13 is rotatably mounted on the inlet housing 12. The fluid delivery conduit 13 protrudes from the inlet housing 12 down into the tank 2 to be washed. The fluid outlets 14 are pivotally mounted on the fluid delivery conduit 13. The fluid outlets 14 are adopted to revolve or turn in relation to the fluid delivery conduit 13 while simultaneously rotating the fluid delivery conduit 13. The washing assembly 10 further comprises a supply conduit 16. The supply conduit 16 is adapted to feed washing fluid to the fluid delivery conduit 13 and through the fluid delivery conduit 13 to the fluid outlets 14 which are adapted to direct jets of washing fluid towards the interior walls or wall portions of the tank 2.

[0024] The flow of washing fluid may be pressurized.

Preferably the washing fluid is pressurized to a pressure of 3-12 bar but also higher pressurization may be used e.g. 25 bar. The type of washing fluid may vary depending on the substance which has been stored in the tank 2 to be cleaned. The washing fluid may e.g. be cold or hot water with or without additives. If the tank 2 has contained oil, the washing fluid may be heated oil which is used for removing impurities on the interior walls or wall portions of the tank 2. The person skilled in the art realizes that other suitable washing fluids also may be used in the system 1 for washing tanks 2, or the like.

[0025] In order to more easily insert the washing assembly 10 into the tank 2, the fluid delivery conduit 13 may be divided into a plurality of fluid delivery conduit sections 17. The fluid delivery conduit sections 17 are joined together at joints 18 in order to form the fluid delivery conduit 13. By dividing the fluid delivery conduit 13 into a plurality of fluid delivery conduit sections 17, the length of the fluid delivery conduit 13 may be adapted to fit tanks of various depths. Moreover, the fluid delivery conduit sections 17 of the fluid delivery conduit 13 may have different lengths to better fit in the tank 2 to be cleaned.

[0026] The guiding devices 20 are mountable inside the tank 2. The guiding devices 20 are arranged to be mounted on a stringer of the tank 2 or on a stay, or similar, inside the tank 2. In Fig. 1 the guiding devices 20 are mounted on a respective stringer 4 of the tank 2. The guiding devices 20 are arranged to guide said washing assembly 10 through said support and guiding devices 20 and to support it when said washing assembly 10 is inserted into and retracted from the tank 2. The guiding devices 20 are preferably mounted at a distance of 1-10 meters, more preferably 3-8 meters and even more preferably 5-7 meters from each other inside the tank 2. The distance between the guiding devices 20 depend on the size of the tank as well as on the rigidity of the fluid delivery conduit 13 of the washing assembly 10.

[0027] The fluid delivery conduit 13 further comprises a plurality of bearings 19. The bearings are arranged to provide a longitudinal guiding surface and a radial support surface in view of said support and guiding device 20. Hence, the fluid delivery conduit 13 is rotatably arranged within the support and guiding devices 20. In the disclosed embodiment, the bearings 19 are flange bearings circumferentially surrounding the fluid delivery conduit 13. It is however to be understood that other types of bearings might be equally suitable. An example of a flange bearing circumferentially surrounding the fluid delivery conduit 13 is shown in Fig 3a. The radial extension of the bearing 19 is adapted so that the bearings 19 fit inside the support and guiding device 20. More precisely, the radial extension of the bearing 19 corresponds to the internal diameter of a middle section 22 (see Fig. 2) of the support and guiding device 20. When inserted in the support and guiding device 20, the bearing surface of the bearing 19 bear against the internal surface of the middle section 22 of the support and guiding device 20.

[0028] In the embodiment shown in Fig. 1, the bearings 19 are arranged at joints 18 between two fluid delivery conduit sections 17. The bearing surface of the bearings 19 may comprise a low friction material, e.g. Poly-tetrafluoroethylene (PTFE), or any other suitable low friction material. The low friction material is used in order to reduce the friction between the washing assembly 10 and the support and guiding device 20, both when the washing assembly 10 is guided through the support and guiding device 20 and when the bearing 19 is acting as a radial support surface when the washing assembly 10 is supported by the support and guiding device 20.

[0029] In Fig. 2 a guiding device 20 is shown in more detail. The support and guiding device 20 is arranged to be mounted inside the tank to be washed. In Fig. 2 the support and guiding device 20 is shown before it is mounted inside the tank. The support and guiding device comprises an inlet section 21, a middle section 22 and an outlet section 23. The inlet section 21 is funnel shaped. The middle section 22 is circular cylindrical. The outlet section 23 is funnel shaped. The inlet section 21 is arranged to guide the washing assembly through the support and guiding device 20 when the washing assembly is inserted into the tank. The middle section 22 is arranged to support the washing assembly when the washing assembly is inserted in the tank. The outlet section 23 arranged to guide the washing assembly through said support and guiding device when the washing assembly is being retracted from the tank.

[0030] The guiding device 20 further comprises a mounting plate 24. The mounting plate 24 is used for mounting the guiding device 20 to a stringer or stay located inside the tank.

[0031] The guiding device 20 is preferably made of a corrosion resistant material. Some examples of materials for manufacturing the guiding device 20 are stainless steel, aluminum, plastic material or a combination thereof. Moreover, a sheet material may be used for producing the guiding device 20.

[0032] Above some embodiments of the present invention are described. However, it is appreciated that the invention is not limited to the embodiments shown. Several modifications and variations are thus conceivable within the scope of the invention.

[0033] For example, instead of being flange bearings circumferentially surrounding the fluid delivery conduit, the bearings 19 may comprise a plurality of bearing sections 19a distributed along the circumference of said fluid delivery conduit 13. One example of such a bearing 19 is shown in Fig. 3b. It is however understood by the person skilled in the art that other kinds of bearings are also possible as long as the bearings are arranged to provide a longitudinal guiding surface and a radial support surface in view of said support and guiding device.

[0034] Moreover, the bearings may be arranged anywhere on the fluid delivery conduit, i.e. not necessarily at joints between two fluid delivery conduit sections.

[0035] Furthermore, the inner surface of the support

and guiding device may comprise a low friction material, e.g. Polytetrafluoroethylene (PTFE), or the like. The low friction material may be used in order to reduce the friction between the washing assembly and the support and guiding device both when the washing assembly is guided through the support and guiding device and when the bearing is acting as a radial support surface when the washing assembly is supported by the support and guiding device.

Claims

1. Washing system for washing of tanks, or the like, the system comprising:

a washing assembly (10) insertable into and retractable from a tank (2) to be washed, said washing assembly (10) comprising:

a fluid delivery conduit (13), and
a fluid outlet (14) connected to the fluid delivery conduit (13), the system further comprising:

a support and guiding device (20) to be mounted inside the tank (2) and to be arranged to guide said washing assembly (10) through said support and guiding device (20) when said washing assembly (10) is inserted into and retracted from the tank (2), and to support said washing assembly (10) when said washing assembly (10) is inserted in the tank (2).

2. Washing system according to claim 1, wherein said washing assembly (10) is arranged to be rotatably supported in said support and guiding device (20).

3. Washing system according to claim 1 or 2, wherein the fluid delivery conduit (13) further comprises a bearing (19) arranged to provide a longitudinal guiding surface and a radial support surface in view of said support and guiding device (20).

4. Washing system according to any one of claims 1-3, wherein said support and guiding device (20) comprises a funnel shaped inlet section (21) arranged to guide said washing assembly (10) through said support and guiding device (20) when said washing assembly (10) is inserted into the tank (2), a circular cylindrical middle section (22) arranged to support said washing assembly (10) when said washing assembly (10) is inserted in the tank (2), and a funnel shaped outlet section (23) arranged to guide said washing assembly (10) through said support and guiding device (20) when said washing assembly (10) is retracted from the tank (2).

5. Washing system according to claim 3 or 4, wherein said bearing (19) is a flange bearing circumferentially surrounding said fluid delivery conduit (13).

6. Washing system according to claim 3 or 4, wherein said bearing (19) comprises a plurality of bearing sections (19a) distributed along the circumference of said fluid delivery conduit (13).

7. Washing system according to any one of claims 3-6, wherein a bearing surface of said bearing (19) comprises a low friction material.

8. Washing system according to any one of claims 1-7, wherein the inner surface of said support and guiding device (20) comprises a low friction material.

9. Washing system according to claim 7 or 8, wherein said low friction material is Polytetrafluoroethylene (PTFE).

10. Washing system according to any one of claims 3-9, wherein said fluid delivery conduit (13) comprises a joint (18), and wherein said bearing (19) is arranged at said joint (18).

11. Washing system according to any one of claims 1-10, wherein said washing assembly (10) further comprises an operation rod for maneuvering of said fluid outlet (14).

12. Support and guiding device for supporting and guiding a washing assembly (10) in a washing system (1) for washing of tanks, or the like, the support and guiding device being arranged to be mounted inside a tank (2) to be washed, said support and guiding device comprising:

an inlet section (21) arranged to guide said washing assembly (10) through said support and guiding device when said washing assembly (10) is inserted into the tank (2),
a middle section (22) arranged to support said washing assembly (10) when said washing assembly (10) is inserted in the tank (2), and
an outlet section (23) arranged to guide said washing assembly (10) through said support and guiding device when said washing assembly (10) is retracted from the tank (2).

13. Support and guiding device according to claim 12, wherein said inlet section (21) is funnel shaped, said middle section (22) is circular cylindrical and said outlet section (23) is funnel shaped.

14. Washing assembly in a washing system (1) for washing of tanks, or the like, wherein said washing assembly is insertable into and retractable from a tank

(2) to be washed, said washing assembly comprising:

a fluid delivery conduit (13), and
a fluid outlet (14) connected to the fluid delivery conduit (13),
wherein the fluid delivery conduit (13) comprises
a bearing (19) arranged to provide a longitudinal
guiding surface and a radial support surface in
view of the support and guiding device according
to claim 12 or 13.

- 15.** Washing assembly according to claim 14, wherein
the bearing surface of said bearing (19) comprises
a low friction material.

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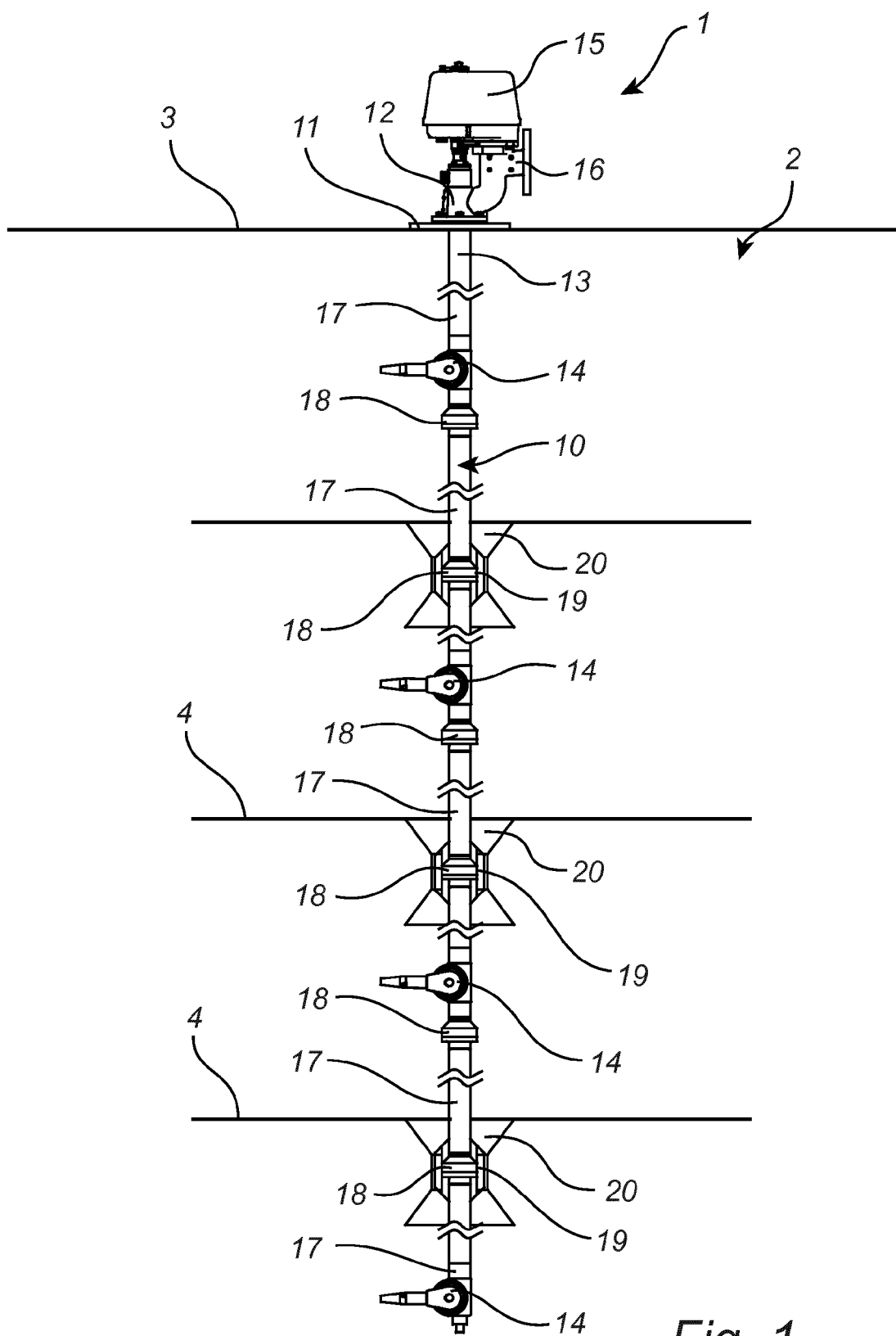


Fig. 1

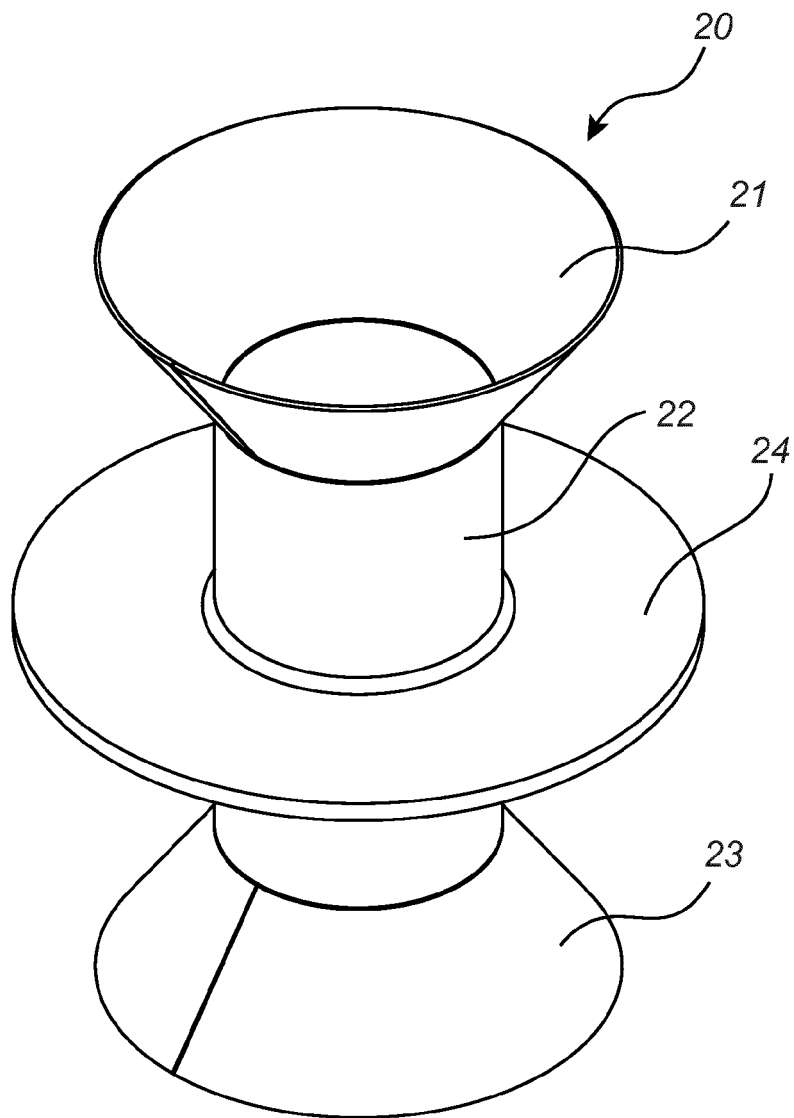


Fig. 2

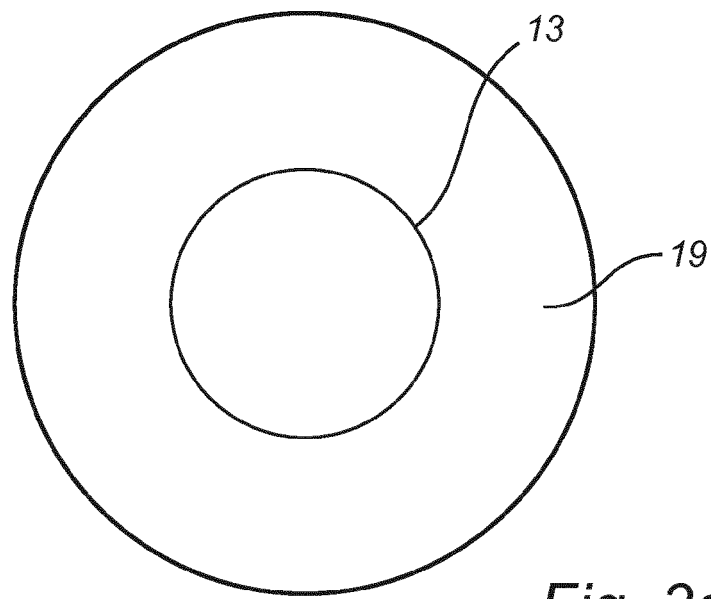


Fig. 3a

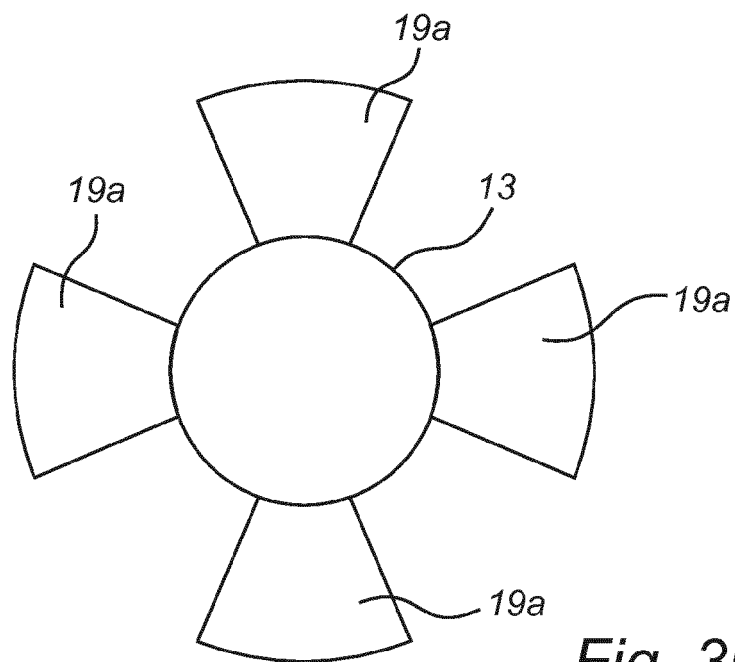


Fig. 3b



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 9364

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 082 439 A5 (OUEST ATELIERS FRANCAIS) 10 December 1971 (1971-12-10) * claims 1-9; figure 1 *	1-3	INV. B08B9/093
X	US 4 163 455 A (HERBERT CHRIS J [US] ET AL) 7 August 1979 (1979-08-07) * abstract; figures 1-3 *	1-3	
A	US 3 745 960 A (DEVINE W) 17 July 1973 (1973-07-17) * abstract; figure 3 *	1-15	
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A	US 7 089 949 B1 (ROGERSON R BRIAN [US] ET AL) 15 August 2006 (2006-08-15) * abstract; figures 1,3a,3b,4 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B08B B63B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 January 2013	Examiner Muller, Gérard
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 17 9364

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The members are as contained in the European Patent Office EDP file on
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24-01-2013

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