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(54) Title: PIPE ARRANGEMENT IN CONNECTION WITH A CONTAINER FOR TRANSPORT OF SLUDGE OR OTHER LIQUID

(57) Abstract: A pipe arrangement which includes a pipe socket (3) fastened to a container (2) and a pipe which essentially consists of a first pipe (4) coupled to the pipe socket and a second pipe (5) connected to the first pipe by means of a hinge (13, 14) and a flexible pipe arrangement (12), is characterised in that the first pipe (4) is coupled at its end (6) with bearings to the pipe socket (3) so that it forms in relation to the general direction of the pipe (4) an angle (0) which is within 20 to 70 degrees, the pipe socket (3), the pipes (4, 5) and the hinge (13, 14) are arranged so that in the rest state the first pipe (4) is placed conformably with the container (2) and the second pipe (5) is folded on top of it, and the pipe arrangement comprises means (7, 8) for operating the pipe (4, 5) by rotating it whereby by turning the first pipe (4) along a conical surface the pipes (4, 5) may be guided as a whole and in relation to each other into various operating positions.


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PIPE ARRANGEMENT IN CONNECTION WITH A CONTAINER FOR TRANSPORT OF SLUDGE OR OTHER LIQUID

FIELD OF THE INVENTION

The invention is related to a pipe arrangement in connection with a container for transport of sludge or other liquid, and especially to a pipe arrangement which comprises a pipe socket fastened to a container and a pipe which essentially consists of a first pipe coupled to the pipe socket and a second pipe connected to the first pipe by means of a hinge and a flexible pipe arrangement.

BACKGROUND OF THE INVENTION

The invention may be applied in e.g. agriculture for transport of liquid manure or urine from collection containers to fields or to another storage place or a handling plant. The collection containers may be totally or partly underground. Also the location of the containers in relation to buildings and roads varies. Therefore, a pipe arrangement is needed in connection with a transport container with which arrangement the end of a suction pipe may be brought in every case at a suitable height and distance from the transport container.

In some known solutions, a pipe arrangement of a sludge trailer is mehanized by means of articulated joints and hydraulics so that also two or three hydraulic cylinders with necessary valve blocks and control accessories are included. That kind of solution is expensive.

For containers concerned here, there are also solutions in which the most of the pipe is flexible pipe, and the pipe arrangement comprises various controllable beams and racks and also means for feeding and retracting flexible pipe. This kind of solutions have been presented in the documents GB 2371323 A, DE 3038339 Al, EP 1394329 A2 and EP 0663481 Al. Also this kind of solutions are mechanically complicated and so inevitably expensive.

WO 03/095754 presents conduit cleaning means for cleaning sewage conduits, for example, in which an extraction pipe is formed of several pipe portions connected pivotally to each other, whereby the extraction pipe may be folded together so that it is accommodated to the frame of the vehicle and opened to various positions. The operation of the extraction pipe is not presented in further detail in the document.

DE 8608467 U1 presents a pipe of a liquid transport trailer which pipe is formed by a first pipe starting from a container and three additional pipe portions which form certain angles with each other and are connected successively to each other with three joints which allow rotation. The pipe may be set so that it is in rest position accommodated to the shape
of the container. The pipe is used at least by rotating the second pipe portion in relation to
the first pipe and additionally by rotating by means of a hydraulic motor the fourth pipe
portion in relation to the second and third pipe portions, for example. The angle between the
first pipe portion extending from the container and the second pipe portion rotatable in
relation to it is essentially right. The solution is quite complicated.

ES 8504059 presents a similar type solution operating by means of two rotatable pipe
joints and two hydraulic cylinders.

SUMMARY OF THE INVENTION

An object of the invention is to present a more simplified and economically
advantageous pipe arrangement in connection with a container for transport of sludge or
other liquid.

To achieve this object, a pipe arrangement of the invention in connection with a
container for transport of sludge or other liquid, which pipe arrangement comprises a pipe
socket fastened to a container and a pipe which essentially consists of a first pipe coupled to
the pipe socket and a second pipe connected to the first pipe by means of a hinge and a
flexible pipe arrangement, is characterized in that which is defined in the characterizing part
of the independent claim 1.

Other claims define some embodiments of the invention.

The pipe arrangement of the invention is mechanically simplified and is operating by
means of one simple driving device. However, the operation may be controlled from the
cabin of a vehicle. The pipe arrangement as a whole may be manufactured as one component
which may be installed either to transport containers during the manufacturing phase in a
factory or afterwards to containers which are in use. When installing afterwards, the pipe
arrangement may be realized in connection with a manhole. The simple structure of the pipe
arrangement reduces pumping loss and makes pumping faster. Due to simplicity, the pipe
arrangement is lightweight and makes possible to use a pump also at the suction end of the
pipe. By that means the solution is suitable for both containers provided with a vacuum
pump and containers in which the pumping is carried out with a pump located at the end of
the pipe. When there is a vacuum pump in the container, using an auxiliary pump at the
suction end makes the charging of the container significantly faster. Because of the
simplicity of the solution, also the need of service and spareparts is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention and some of its embodiments are described in further detail in the
following with reference to the accompanying drawings, in which:
Figs. 1 to 3 present in front, plan and rear views, respectively, a possible realization of the pipe arrangement of the invention in connection with a container;

Fig. 4a is a sectional view presenting an example of coupling a pipe to a pipe socket;

Fig. 4b is a partly sectional view presenting schematically a possible realization of operating the pipe by rotating it;

Figs. 5 to 7 present in more detail an example of realizing a hinge included in the pipe arrangement of the invention;

Fig. 8 presents in plan view another possible realization of the pipe arrangement of the invention in connection with a container;

Figs. 9 to 11 present the realization of Fig. 8 and its operation in rear view;

Fig. 12 presents a further example of realizing a hinge included in the pipe arrangement of the invention; and

Figs. 13 to 18 illustrate in a simplified way the operation of the solution of Figs. 1 to 3, each figure including a perspective view above, a rear view in the middle and a bottom view below.

**DETAILED DESCRIPTION OF THE INVENTION**

In Figs. 1 to 3, a trailer 1 provided for transport of sludge or like liquid and including wheels and a drawbar comprises a container 2 to which a pipe socket 3 is fastened by welding, for example, in vicinity to its rear end. The pipe socket is directed horizontally forwards in an angle of about 45 degrees in relation to the longitudinal direction of the container. A rigid pipe 4 is coupled at its end 6 to the pipe socket 3. The end 6 is a short straight part of the pipe coupled with bearings to the inside of the pipe socket in a way described in Fig. 4a, for example. In the inside of the pipe socket 3, teflon bearings 20 and 21 have been placed at a long enough distance from each other, the pipe 4 being supported at its end 6 slidably on said bearings. Flanges 21 have been fastened on the outside of the pipe, between which flanges retaining claws 22 are coupled locking the pipe longitudinally in place.

On the part 6 of the pipe also a tooth-wheel 7 surrounding coaxially the pipe is fastened being located quite close to the end of the pipe socket. In this example, a hydraulic motor 8 fastened to the pipe socket is coupling to the tooth-wheel, whereby the hydraulic motor may be controlled to rotate the pipe to one or the other direction. The gear, the hydraulic motor and the control means as such fall within conventional technology and are presented here only in a very schematical way as an example of a possible realization. For a person skilled in the art it is obvious that also a toothed bar driven by a hydraulic cylinder or an electric motor provided with a suitable gear, for example, could be coupled to the tooth-wheel.
Fig. 4b presents schematically another possible realization of operating the pipe by rotating it. The wall of the end 6 of the pipe 4 coupled with bearings to the pipe socket is thickened, as indicated by reference sign 25, and a spiral groove 26 running around the pipe is worked on it. On the pipe socket there is a longitudinal narrow opening 27 through which a pin 28 is extending into the groove 26. The pin is fastened to the driving device, e.g. hydraulic cylinder (not shown), by suitable means 29. The spiral arrangement may, of course, be of another kind. Instead of spiral groove, there may be a spiral ridge to which e.g. a slide driven by a hydraulic cylinder or a gear driven by a hydraulic motor is coupling.

The short part 6 of the pipe 4 forming the coupling end is in an angle $\alpha$, which in this example is about 45°, in relation to the general direction of the pipe. So, the pipe 4 is in the rest state described in Figs. 1 to 3 placed at the side of the container parrellely with it, and a bracket 16 is attached on the side of the container for it. For providing a good extension, the pipe 4 is advantageously almost as long as the container 2. Another straight and rigid pipe 5 is connected to the other end of it by means of an articulated joint 9 formed by a hinge 13, 14 and flexible pipes 12.

For realizing the articulated joint, the ends of the pipes 4 and 5 are two-branched at 10 and 11, whereby the hinge 13, 14 between the pipes may be placed in the middle and flexible pipes 12 on both sides of the hinge. In this way, the hinge may be placed at a suitable distance from the ends of the pipes and it causes no interference with the operation of the flexible pipes.

In the realization of Figs. 1 to 3, also a shallow trough 24 is fastened to the pipe 4, which trough in the rest state of the pipe is placed on the upper side of the pipe 4 and in alignment with the pump 15 at the end of the pipe 5. The trough is provided firstly for collecting runoffs from the pump and secondly for supporting the pump 15 and at the same time the pipe 5 so that they are held better in place on the pipe 4. Otherwise the pipes would be against each other and supported only by the articulated joint 9. It may be contemplated also that there would be irons extending upwards from the sides of the pipe 4 or a fork attached to the pipe 4 which would place the pipes 4 and 5 in alignment with each other and support the pipe 5 laterally. Besides that, it may be contemplated that there would be both the trough and the fork or similar means also in the case (when the container is provided with a vacuum pump) in which there is no pump at the end of the pipe 5.

The hinge may be realized in a way presented in Figs. 5 to 7, for example. At the ends of the pipes 4 and 5 there have been attached e.g. by welding angle plates 13a and 13b which a hinge provided with a pivot pin 14 couples together. The pipe 5 may be turned in the rest state on the pipe 4 and against it and in the other extreme position of the hinge (Fig. 7) to form a straight extension of the pipe 4.
The pipe described in Figs. 8 to 11 differs from that described above in that instead of the pipe socket 3 fastened to the container or the frame of the container there is a suitably bent pipe 3' for the same purpose and operating similarly, the pipe being coupled turnably to the upper part of the rear wall of the container 2. For coupling there is a sleeve to which the pipe 3' is coupled with bearings in a similar way as the pipe 4 to the pipe socket 3. In the claims, for example, also the pipe 3' is termed pipe socket.

The pipe 3' may be turned and locked so that it works as the said pipe socket in rear view either at the right side or the left side of the container. On the rear wall of the container there are support pieces 18a and 18b, respectively, for holding the pipe 3' in the right position and corresponding lugs 19a and 19b provided with holes for a suitable locking pin with which the pipe may be prevented from turning upwards. A hydraulic motor 8' is now fastened to the pipe 3' on its outside. Fig. 10 presents how the hydraulic motor may be used to help in start the turning of the pipe arrangement from one side to the other by rotating the motor to "the wrong direction", as indicated by arrow R2, whereby the pipe 4 is turned in the way indicated by arrow R2 and, when being supported by the bracket 16a, turns the pipe 3' in the way indicated by arrow R3.

In Fig. 11 and drawn by broken line in Fig. 8, the pipe arrangement is in rear view in rest state at the left side of the container. When changing the pipe arrangement from one side to the other, also the operation of the joint coupling the pipes 4 and 5 to each other must be changed. Therefore, for example a double hinge of Fig. 12 is needed in which there are, in relation to the angle plates 13a and 13b and the hinge provided with the pivot pin 14, similar angle plates 13c and 13d and a hinge provided with a pivot pin 14'. When changing the side of the pipe arrangement, it must be turned in some suitable phase to the totally straight position, in which the pivot pin may be put in place in the hinge of the other side and then the pivot pin removed from the hinge of the one side.

By means of Figs. 13 to 18, the operation of the pipe arrangement of Figs. 1 to 3 is illustrated. In the figures, only the container 2, the pipe socket 3, the pipe 9 formed by pipes 4 and 5, and the pump 15 at the end of the pipe are presented. In each figure it is indicated at the uppermost drawing, which is in perspective view, how much the pipe arrangement has been rotated at the base of the pipe 4. In Fig. 13 the pipe has been rotated 45°, and the pipe arrangement is just raised to the position in which it extends obliquely upwards at the side of the container. In Fig. 14 the pipe has been rotated 90°, and the pipe arrangement is turned to the uppermost position in which it is extending obliquely sidewards. The hinge 9 and the pivot are in the position in which the pipe 5 is still close to the pipe 4 but, as the rotation is continued, starts under the influence of gravity to turn away from it. The end of the pipe and the pump 15 are at the height from which they start to descend as the rotation is continued.
In Fig. 15 the pipe has been rotated 135°. The pipe arrangement has been started to descend and the pipe 5 and the pump 15 to turn to extend downwards from the hinge 9. In Fig. 16 the pipe has been rotated 180°. The pipe 4 is now directed horizontally outwards from the container 2 in right angle and the pipe 5 straight downwards from it. In Fig. 17 the pipe has been rotated 225° and the pipe 4 is directed obliquely downwards and a little forwards and the pipe 5 still obliquely forwards from it. In Fig. 18 the pipe has been rotated 270° and the pipes 4 and 5, which now are straight extensions of each other, extend into the lowest position so that the suction end of the pipe and the pump are longitudinally placed close to the front end of the container. If the rotation is continued in this direction, the pipe starts to raise in the straight position upwards and towards the container. Rotating the pipe to the opposite direction returns the pipe arrangement finally back to the rest state.

In the solution of the invention, the pipe 4 is rotating forming a conical surface the apex of which is the bending point close to its base. Also the other parts are moving during the rotation quite accurately along a certain path. The user of the container and the pipe arrangement learns quickly these paths and is able to place the container trailer in every case and situation properly. The paths may also be affected to some extent by moving suitably the trailer during the rotation.

In the examples described above, the pipe socket is directed horizontally forwards in an angle of about 45 degrees in relation to the longitudinal direction of the container, and the bending angle of the first pipe coupled to the pipe socket is also 45°. These angles are advantageous in view of the extension of the pipe, for example. It is clear that similar operation may be provided with other angles, too. What is essential in the operation of the solution is that said angles differ enough from right angle and are in every case within the range of 20 to 90° or preferably within the range of 30 to 60° or 35 to 55°. As stated above, usually the best solution is that the angles are 45 ± 5°.

The pipe socket and the corresponding pipe may be fastened to the container in many other ways than those described above. As stated above, e.g. a manhole may be replaced by a structure to which the pipe socket is fastened and which is suitable for the same attachment. It may be contemplated also that the position of the pipe socket may be changed for other purposes than changing the side of the pipe arrangement described above. For example, the pipe socket may be fastened by means of a horizontally turnable lockable attachment whereby the locking may be released at need and then the pipe arrangement turned e.g. manually in a certain situation to a suitable position for necessary extension.

The invention may vary within the scope of the accompanying claims.
CLAIMS

1. Pipe arrangement in connection with a container for transport of sludge or other liquid, which pipe arrangement includes a pipe socket (3, 3') fastened to a container (2) and a pipe which essentially consists of a first pipe (4) coupled to the pipe socket and a second pipe (5) connected to the first pipe by means of a hinge (13, 14) and a flexible pipe arrangement (12), characterised in that:
   the first pipe (4) is coupled (20, 21, 22, 23) at its first end (6) with bearings to the pipe socket (3, 3') so that said first end (6) forms in relation to the general direction of the pipe (4) an angle (α) which is within 20 to 70 degrees;
   the pipe socket (3, 3') is placed and directed and said first and second pipes (4, 5) and the hinge (13, 14) arranged so that in the rest state of the pipe arrangement the first pipe (4) is placed in close vicinity to the container (2) and the second pipe (5) is folded on top of it; and
   the pipe arrangement comprises means (7, 8; 25, 26, 27, 28, 29) for operating the pipe (4, 5) by rotating it on said coupling (20, 21, 22, 23) whereby by turning the first pipe (4) along a conical surface the pipes (4, 5) may be guided as a whole and in relation to each other into various operating positions.

2. Pipe arrangement of claim 1, characterised in that said angle is 45 ± 5 degrees.

3. Pipe arrangement of claim 1, characterised in that the pipe socket (3, 3') is placed and directed and said first and second pipes (4, 5) and the hinge (13, 14) arranged so that in the rest state of the pipe arrangement the first pipe (4) is placed in longitudinal direction of the container (2) on its side.

4. Pipe arrangement of claim 1, characterised in that the pipe socket (3') is coupled to the container (2) so that its position is changeable.

5. Pipe arrangement of claim 4, characterised in that the pipe socket (3') and its coupling (17) to the container (2) are such that the pipe socket is turnable from one side of the container to its other side.

6. Pipe arrangement of claim 5, characterised in that the hinge (13a, 13b, 14; 13c, 13d, 14') is changeable from one side of the pipes (4, 5) to the other side of them for turning the pipes against each other alternatively on opposite sides of the pipes.
7. Pipe arrangement of claim 1, **characterised** in that the means for operating the pipe by rotating it include a tooth-wheel (7).

8. Pipe arrangement of claim 1, **characterised** in that the means for operating the pipe by rotating it include a spiral arrangement (25, 26, 28).

9. Pipe arrangement of claim 1, **characterised** in that the means for operating the pipe by rotating it include a hydraulic driving device (8).

10. Pipe arrangement of claim 1, **characterised** in that the means for operating the pipe by rotating it include an electric driving device.
INTERNATIONAL SEARCH REPORT

INTERNATIONAL APPLICATION

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

A CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC8: B60P, A01C, E03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, DK, NO, SE

Electronic database consulted during the international search (name of data base and, where practicable, search terms used)

EPDOC, WPI, TXTE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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