

Hose

The invention relates to a hose comprising a tubular section, said tubular section comprising an outer tube and an inner tube, wherein the inner tube forms a liner for said outer tube. The hose may
5 be a floating hose wherein the outer tube is a float body, or the hose may be a non-floating hose, wherein the outer tube is a pipe, such as a metal pipe.

Such hoses may be used for transporting abrasive slurry in, for example, the dredging industry, the sand and gravel extraction industry, the diamond mining industry and the oil-sand industry. The
10 internal diameter of such hoses is typically between 50 and 200 cm, for instance approximately 90 cm. Pipes for slurry transportation are generally built up of an interior wearing layer of rubber (or another polymer) , and a structural outer layer. For floating hoses the outer layer forms or comprises a float body. The lining that covers the inner wall of the outer layer will eventually wear away after the hose has been used for some time, after which the hose has to be replaced,
15 refurbished or recycled.

The invention aims to provide a hose which can be easily refurbished and/or which allows for easier inspection for damage.

20 To that end, according to the invention, apart from being connected by connecting means near both ends of the tubular section the inner tube is unconnected to said outer tube. Thereby a worn inner tube can be taken out of the outer tube by disconnecting the connecting means near both ends, and be replaced by a new inner tube which is inserted in the outer tube, where after the connecting means connects the new inner tube to the outer tube near both ends.

25 The inner tube preferably comprises first flanges at both outer ends which flanges are arranged to releasably connect two adjacent inner tubes to each other. Preferably at least one of said first flanges at at least one outer end of the inner tube is a removable first flange releasably attached to the inner tube, such that when said removable first flange is removed from the inner tube the inner
30 tube can be moved in axial direction out of the outer tube.

Said connecting means preferably each comprise a second flange attached to and extend around the inner tube near the outer end thereof, and a third flange at the outer end of the outer tube, wherein the second flange is releasably connected to the third flange. At least one of said second flanges
35 attached to and extending around the inner tube near at least one outer end thereof is preferably a removable second flange releasably attached to the inner tube, such that when said removable

second flange is removed from the inner tube the inner tube can be moved in axial direction out of the outer tube. Preferably said removable first and/or second flange(s) comprises two or more separate circular flange sections which together form a circular flange when the flange sections are connected, wherein the inner tube is provided with a stepped portion which prevents axial
5 movement of the removable flange towards the respective flange to which it is attached. The inner tube is preferably provided with a second stepped portion which prevents axial movement of the removable flange towards the outer end of the tubular section. Said stepped portions are preferably formed by retainer rings which are attached to and extend around the inner tube. Said second and third flanges are preferably connected to each other by means of bolts and nuts.

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The outer diameter of said retainer rings is preferably smaller than or equal to the inner diameter of the outer tube, such that the inner tube can be moved out of the outer tube in axial direction. The outer diameter of the inner tube is preferably smaller than the inner diameter of the outer tube, such that there is space between the inner tube and the outer tube and the inner tube can be easily moved
15 out of the outer tube in axial direction. Furthermore, the gap between the inner tube and the outer tube allows for an early detection of leaks, as the transported liquid will soon flow out of the gap between the tubes. The lengths of the inner tube and of the outer tube are preferably chosen such, that if no tension force is applied to either tube there is a space between the second flange and the third flange to which said second flange is connected near at least one outer end of the tubular
20 section.

The inner tube is preferably made of flexible polymer, preferably a rubber such as NR or SBR. The outer end parts of the inner tube preferably comprise metal cylinders on which the first and second flanges are mounted. In a preferred embodiment the inner tube comprises wear resistant rings,
25 preferably made of cast iron, hard-faced steel or a ceramic material.

The invention will now be explained in more detail in the following description of embodiments thereof, which are illustrated in the figures, in which:

30 Figure 1A is a perspective view of a floating dredging hose in accordance with the invention;

Figure 1B is an exploded view of the floating dredging hose of Figure 1A;

Figure 2 is a partial cross section of two mutually connected floating dredging hoses of Figures
35 1a/1B;

Figures 3 and 4 are partial cross sections of two mutually connected hoses, which may be the floating dredging hoses of Figure 2 (shown without the float body) or which may be non floating-hoses;

- 5 Figure 5 is a partial cross section of two mutually connected hoses of figures 3 and 4 in exploded view, wherein some elements are not shown for clarity;

Figure 6 is an end view of a removable flange comprising two circular flange sections; and

- 10 Figure 7 is a perspective view of a non-floating hose in accordance with figures 3 – 6.

According to figures 1A/B a floating dredging hose 1 comprises a generally tubular section, which comprises an outer tube 2 and an inner tube 3. The outer tube 2 is provided with a float body 21 which is filled with a foam and which causes the floating dredging hose 1 to float on water.

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Figure 7 shows a non-floating hose 1', which also comprises a generally tubular section, and which comprises an outer tube 2 and an inner tube 3. The outer tube 2 of the non-floating hose 1' may be a metal pipe, which in this case is not provided with a float body 21.

- 20 According to the figures the outer end parts of the inner tube 3 comprise metal cylinders 33 on which the first flanges 31, 31' and second flanges 32, 32' are mounted. The inner tube 3 may be made of flexible polymer, preferably a rubber such as NR or SBR. The inner tube 3 may be reinforced by a layer 34 of aramid fibres, which may be attached to the metal cylinders 33 near the outer ends of the inner tube 3. The inner tube 3 may furthermore comprise wear resistant rings (not
25 shown) embedded in said flexible polymer, which rings may be made of cast iron, hard-faced steel or a ceramic material.

- The inner tube 3 is provided with first flanges 31, 31' at both outer ends which are arranged to connect two adjacent inner tubes 3 to each other by means of bolts and nuts. A rubber seal ring 4 is
30 clamped between the outer ends of the inner tubes 3. One of said first flanges 31' at one outer end is removable and releasably attached to the inner tube 3. When said removable first flange 31' is removed from the inner tube 3 the inner tube 3 can be moved in axial direction out of the outer tube 2.

- 35 The removable first flanges 31' comprise two separate circular flange sections 311' which together form the circular flange 31' when the flange sections 311' are connected to the flange 31 of the

adjacent hose 1. The inner tube 3 is provided with a stepped portion 312' at its outer end which prevents axial movement of the removable flange 31' from the inner tube 3 towards the respective flange 31 of the adjacent inner tube 3 to which it is attached.

- 5 The inner tube 3 is further provided with second flanges 32, 32' attached to and extending around the inner tube 3 near the outer end thereof. The outer tube 2 is provided with third flanges 23 at the outer end. The second flanges 32, 32' are connected to the third flanges 23 by means of bolts and nuts. One of the second flanges 32' is also removable and releasably attached to the inner tube 3, such that when said removable second flange 32' is removed from the inner tube 3 the inner tube 3
10 can be moved in axial direction out of the outer tube 2.

The removable second flanges 32' comprises two or more separate circular flange sections 321' which together form the circular flange 32' when the flange sections 321' are connected. The inner tube 3 is provided with retainer rings 322' which prevents axial movement of the removable flange
15 32' of the outer tube 2 towards the respective flange 23 to which it is attached as well as towards the outer end of the inner tube 3. The dimensions of the tubes 2, 3 are chosen such, that there is a space between the second flange 32' (or second flange 32) and the third flange 23, such that the tension with which the outer tube 2 is attached to the inner tube 3 can be adjusted.

- 20 The outer diameter of the inner tube 3 is smaller than the inner diameter of the outer tube 2, such that there is space between the inner tube 3 and the outer tube 2, which allows for an early detection of leaks, as well as easy removal and insertion of the inner tube 3. Also the outer diameter of the retainer rings 312', 322' is smaller than or equal to the inner diameter of the outer tube 2, such that the inner tube 3 with the retainer rings 312', 322' can be moved in and out of the
25 outer tube in axial direction.

The invention has thus been described by means of preferred embodiments. It is to be understood, however, that this disclosure is merely illustrative. Various details of the structure and function were presented, but changes made therein, to the full extent extended by the general meaning of the
30 terms in which the appended claims are expressed, are understood to be within the principle of the present invention. The description and drawings shall be used to interpret the claims. The claims should not be interpreted as meaning that the extent of the protection sought is to be understood as that defined by the strict, literal meaning of the wording used in the claims, the description and drawings being employed only for the purpose of resolving an ambiguity found in the claims. For
35 the purpose of determining the extent of protection sought by the claims, due account shall be taken of any element which is equivalent to an element specified therein. An element is to be

considered equivalent to an element specified in the claims at least if said element performs substantially the same function in substantially the same way to yield substantially the same result as the element specified in the claims.