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(54) Title: DOUBLE HOSE DEVICE

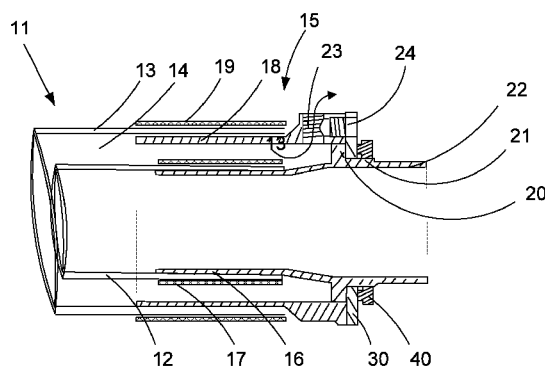


Fig. 1

(57) Abstract: Device for a double hose structure (11) with an inner main hose (12) and an outer cover hose (13) defining an annular space (14) intended to give the hose buoyancy in water, and where at least one end is provided with a coupling member (15) forming a mount for the main hose (12) and the cover hose (13) and which at a free end merges into a threaded portion (22) for connecting the hose assembly (11) to an auxiliary connection. The coupling member (15) comprises an inner coupling sleeve (16) which is tightly connected to one end of the main hose (12) and an outer coupling sleeve (18) which is tightly connected to the cover hose (13), the inner (16) and outer coupling sleeves (18) being mutually connected to form a liquid tight termination of the annulus (14) by means of a ring-shaped plate (30). The ring-shaped plate (30) is attached with a number of screws (25) through holes (29) only to the outer sleeve (18), the ring-shaped plate (30) being forced against a shoulder (20) of the inner coupling sleeve (16) by a ring nut (40) with internal threads that match external threads (21) on the inner sleeve (16).



## Double hose device

The present invention relates to a device for a hose of the kind specified in the preamble of claim 1.

## Background

5 For transfer of pumpable media at sea, such as for bunkering to platforms from supply ships or transfer of sludge from a platform to a supply ship, hoses that can float on water are used. For this purpose it is known to attach float elements on conventional hoses or to attach the tubular sheaths of foamed material to the hoses. Both of these hose assemblies provide buoyancy, but do not contribute to increase safety. Besides, these  
10 hose designs are not convenient and wear resistant.

In connection with the increased emphasis on the problems of pollution by emissions a need for safety beyond upgrade the dimensions of hoses has arisen.

Double hoses where the outer hose (cover hose) has been dedicated to capture leakage from the inner hose (main hose) have been suggested. Such safety hoses have provided  
15 the opportunity of designing hoses that float in water. But the main object of increasing safety has prevented creation of a satisfactory floating hose. For example, U.S. Patent 6,085,796 (Riga, 2000) discloses a composite safety hose constituting an inner and an outer hose, which has been designed for hydraulic systems with low transportation capacity. The design of the end connections has not been satisfactory.

20 Double hoses with foam material in the outer annulus, a.o. to form thermal insulation, are also well known. Such a structure is described in US Patent No. 6,349,976 (Mentor Subsea, 2002), but this has not been suitable as floating hose.

Other known hose systems are described in Norwegian Patents Nos. 328 496 and 329 261. In the latter an inner and an outer hose employing a coupling element forming  
25 attachment for the main hose and cover hose is used, the free end of which is connected to a coupling element for connection to an external connection,  
said coupling element comprising an inner sleeve into which the end of the main hose is inserted for attachment, the inner sleeve being provided with threads at its free end for connection to a pipe system. The coupling element furthermore includes an outer sleeve  
30 attached to the cover hose and a connecting element for releasable connection of the

inner sleeve to the outer sleeve. Finally, the system of the mentioned patent includes a one-way valve allowing the emptying of the cover hose to the main hose.

The system has been shown to work excellent in use but attaching the connecting element to the inner sleeve by means of screws has proven difficult. The problem is thermal expansion during welding. The inner sleeve has an ring-shaped extension comprising screw holes. This ring is typically welded onto the inner sleeve as part of the manufacturing process. The welding causes a thermal expansion which causes an inaccurate and often unsatisfactory positioning of the screw holes.

### **Object**

The main object is to provide a double hose assembly with performance properties at least equivalent to the properties of the hose described in Norwegian patent no. 329261 and wherein said disadvantage in connecting inner and outer coupling parts is avoided.

The hose system should be easy and inexpensive to produce, easy and inexpensive to use, hereunder easy to assemble and disassemble, easy to coil up after use and it should be leak-proof.

### **The present invention**

The above mentioned objects are achieved through the hose system of the present invention as defined by claim 1.

Preferred embodiments appear from the dependent claims.

Further details of the invention are apparent from the example description.

Figure 1 shows the end of a double ("compound") hose.

Figure 1 shows the end of an assembled, double-hose 11 designed in accordance with the present invention. The main element is an inner main hose 12 which may be adapted to transfer fuel oil, sludge, or other pumpable mass between two units that are separated at sea so that the hose must be scheduled on a water surface.

The main hose 12 is surrounded by a cover hose 13, which has a diameter sufficiently large that there is an annular space 14 between the main hose and cover long hoses. The space 14 will be filled with air to provide buoyancy in water, so that the hose 11 will remain floating on the water. However, it can also be filled with another gas, or wholly or

partly with a foam material. To maintain the distance between the main hose 12 and the cover hose 13 may, spacers may in an alternative embodiment be included, for example in the form of a tubular wave profile in the space 14.

For connecting the main hose 12 and the cover hose 13 is at each end or at any splicing  
5 joint, a coupling member 15 which in this case is composed as described below, is arranged.

The main hose 12 is adapted to be connected to an end portion of an inner coupling sleeve 16 and can be further secured thereto by means of an inner clamping sleeve 17 which surrounds the main hose. The inner coupling sleeve 16 furthermore comprises an  
10 annular shoulder 20 and at least one threaded portion 21, 22. Figure 1 shows a first threaded portion 21 having external threads of a dimension and to the right another threaded portion 22 having external threads of dimension smaller than the first threaded portion 21. The significance of these is explained later.

The cover hose 13 is adapted to be attached to an end portion of an outer coupling  
15 sleeve 18 and can be further secured thereto by means of an outer clamping sleeve 19. The outer coupling sleeve has a threaded open passage 23 suitable to receive a pressure sensor (not shown) mounted radially relative to the coupling sleeve 18. A sealing screw 24 is shown in an axial passage from the open passage 23. The significance of this is the fact that the user can choose whether an optional pressure sensor is to be mounted  
20 axially or radially relative to the outer coupling sleeve 18.

Figure 1 also shows a ring-shaped cover plate 30 affixed to the outer coupling sleeve 18 in a manner that is further explained below, and a ring nut having internal threads corresponding to the threads in the first threaded portion 21 of the inner coupling sleeve.

25 Figure 2a shows in principle the same as Figure 1 with the exception of the elements mentioned in the following. In Figure 2a the hoses 12 and 13 are not shown and thus neither the inner and outer clamping sleeves 17 and 19. In addition, inner coupling sleeve 16 is shown having a knurled outer surface in the area adapted to receive a main hose. A further element which is different in Figure 2a compared to Figure 1, is that the entire  
30 assembly is rotated so that fastening screws 25 and set screws 26 are located in the cut surface, whereas the passage for the pressure sensor is out of the cut surface.

Figure 2b shows a detail (circled) of figure 2a enlarged, comprising a fastening screw 25, a set screw 26 and two O-rings, an outer O-ring 27 and an inner O-ring 28. It is worth noting, and it is a significant difference compared to the hose system described in Norwegian patent no. 329261; that the ring-shaped cover plate is fastened with fastening screws 25 only to the outer coupling sleeve 18 and is fluid-tight against this by means of outer O-ring 27. The set screws 26 are attached in non-penetrating threaded holes in the cover plate 30 and their sole purpose is to prevent relative rotation between the inner coupling sleeve 16 and the external coupling sleeve 18. These set screws thus fits into bores in the inner coupling sleeve 16 and more specifically in the annular shoulder 20 thereof.

Figures 3a and 3b show the ring-shaped cover plate 30 from the front, respectively from the side, with set screws 26, holes 29 for fastening screws and an orifice 31 for optional axial mounting of the pressure sensor, confer the explanation given with reference to Figure 1 regarding this.

Figures 4a and 4b show the ring nut 40 from the front, respectively from the side. They show recesses 41 suited to cooperate with tools adapted to tighten the ring nut to the threaded portion 21 of the inner coupling sleeve, thereby securely and fluid-tight attaching the inner coupling sleeve to the outer coupling sleeve, assisted by O-ring 28. This method for mutual connection of the coupling sleeves is significantly better than using screws also into the inner coupling piece, both in terms of precision and quickness in assembly and disassembly. It is also absolutely leak-proof.

For assembly of the hose construction of the present invention, an outer coupling sleeve 18 including outer clamping sleeve 19 is attached to the end of a cover hose 13. The ring-shaped cover plate 30 is not attached at this point. Corresponding coupling sleeve 18 with clamping sleeve 19 is normally attached to other end of the cover hose. A main hose 12 with approximately the same length as cover hose 13 is equipped with an inner coupling sleeve 16 and corresponding inner clamping sleeve 17, preferably at both ends of the main hose 12.

The main hose then is pulled through the cover hose with a suitable tool, such as cord or chain until threaded portion 21 projects from the free end of the outer coupling sleeve 18. Thereafter, the ring-shaped cover plate 30 is guided over the free threaded portions

22 and 21 and screwed to the end of the outer coupling sleeve 18 , with sealing O-rings 27 28 disposed therebetween. Finally, the ring nut 40 is guided over the threaded portion 22 and screwed into the threaded portion 21. Simultaneously, it is ensured, if required, by slightly rotating inner coupling sleeve in relation to the external coupling sleeve that set screws 26 hits adapted holes or recesses in the projecting shoulder 20 of the inner coupling sleeve. Thereby relative rotation between inner and outer coupling sleeve is made impossible. The ring nut tightened so that there is tight engagement between the ring nut 40, ring-shaped cover plate 30 and the shoulder 20. Thereby a fluid tight connection between the cavity 14 and the surroundings is ensured, provided that any passages 23 are sealed by sensor elements (not shown) or sealing screw 24 .

This coupling is much easier to assemble sufficiently tight than a plate through which axial screws are used into outer as well as inner coupling sleeve. The threaded portion 22 at the free end of the inner sleeve 16 is intended for connection to auxiliary equipment. In principle, the same threaded portion may be used also for the ring nut 40, but this would require far more turns to tighten the ring nut, and there may be undesired interactions between the ring nut and the auxiliary device, possibly with the consequence that the coupling over time does not remain liquid tight.

Among optional, not mandatory, features of the present invention, it should be noted that the screw heads 25 should be bevelled with a bevel corresponding to a bevel in the holes 29 so that the tops of the screw heads 25 lie flush with the ring-shaped plate 30. The number of fastening screws can vary, but it is preferred with at least four fastening screws, and more preferably at least 6.

Furthermore, in connection with the coupling member 15 there may be a valve for discharging the cover hose into the main hose 12.

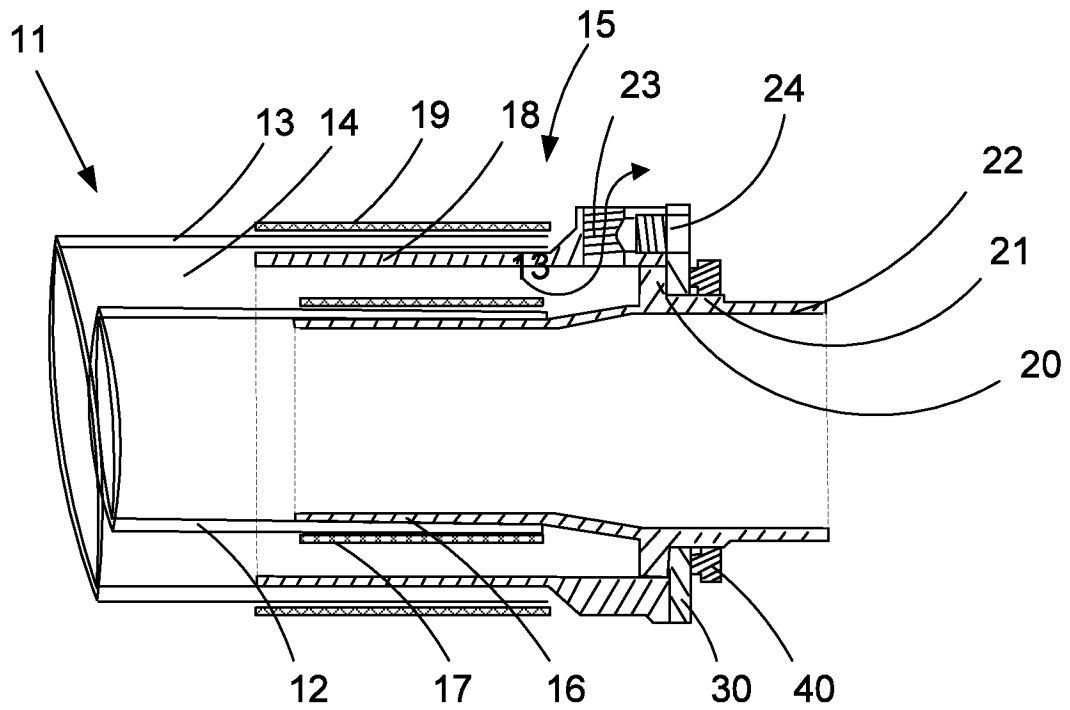
In connection with the coupling member 15 a valve for evacuation of air from the cover hose is normally arranged.

## Claims

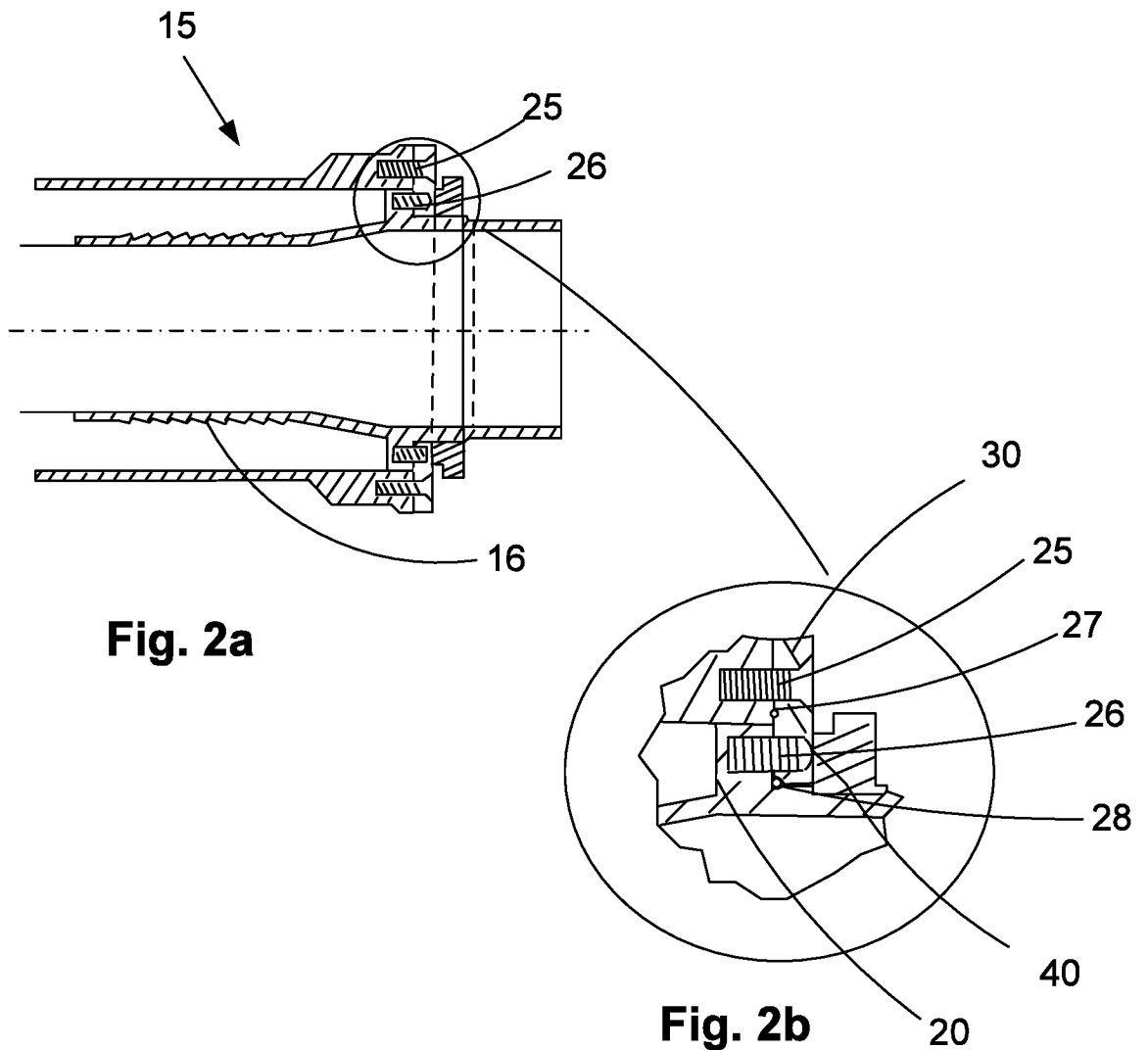
1. Device for a double hose assembly (11) with an inner main hose (12) and an outer cover hose (13) defining an annular space (14) intended to give the hose buoyancy in water, and where at least one end is provided with a coupling member (15) forming a  
5 mount for the main hose (12) and the cover hose (13) and which at a free end merges into a threaded portion (22) for connecting the hose assembly (11) to an auxiliary connection, the coupling member (15) comprising an inner coupling sleeve (16) which is tightly connected to one end of the main hose (12) and an outer coupling sleeve (18) which is tightly connected to the cover hose (13), the inner (16) and outer coupling  
10 sleeves (18) being mutually connected to form a liquid tight termination of the annulus (14) by means of a ring-shaped plate (30), **characterized in** that the ring-shaped plate (30) is attached with a number of screws (25) through holes (29) only to the outer sleeve (18), the ring-shaped plate (30) being forced against a shoulder (20) of the inner coupling sleeve (16) by a ring nut (40) with internal threads that match external threads (21) on  
15 the inner sleeve (16).
2. Device for a double hose assembly (11) according to claim 1, wherein sealing O-rings (27, 28) are arranged between the ring-shaped plate (30) and each of the inner (16) and outer coupling sleeve (18).
3. Device for a double hose assembly (11) according to claim 1, wherein at least one set  
20 screw (26) is provided to prevent relative rotation between the inner (16) and outer sleeve (18).
4. Device for a double hose assembly (11) according to claim 1, wherein the screw heads (25) is bevelled with a bevel corresponding to a bevel in the holes (29) so that the tops of the screw heads (25) are flush with the ring-shaped plate (30).
- 25 5. Device for a double hose assembly (11) according to claim 1, wherein, in regard to the coupling member (15), a valve is arranged for discharging the cover hose into the main hose (12).
6. Device for a double hose assembly (11) according to claim 1, wherein the number of fastening screws (25) is at least 4, preferably at least 6.

7. Device for a double hose assembly (11) according to claim 1, wherein, in regard to the coupling member (15), a valve is arranged for the evacuation of air from the cover hose.
8. Device for a double hose assembly (11) according to claim 1, wherein, in regard to the outer coupling sleeve (18), a threaded radial passage (23) is arranged to permit radial  
5 positioning of a pressure sensor in relation to the hose assembly (11).
9. Device for a double hose assembly (11) according to claim 8, wherein, in connection with the radial passage (23), an axial passage is arranged to permit axial positioning of a pressure sensor in relation to the hose assembly (11).





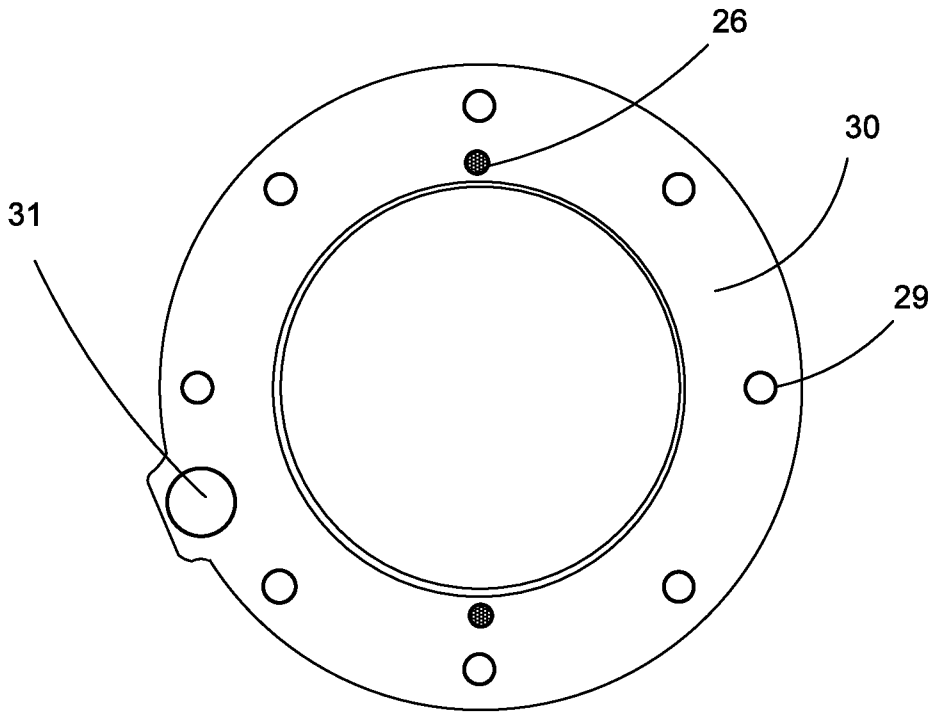
**Fig. 1**



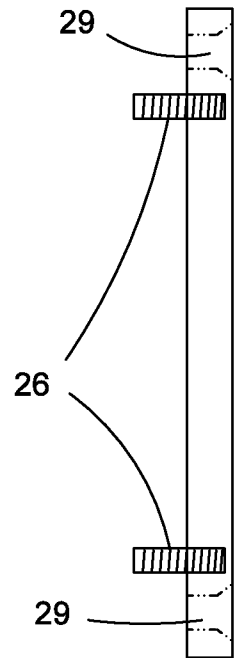
**Fig. 2a**

**Fig. 2b**

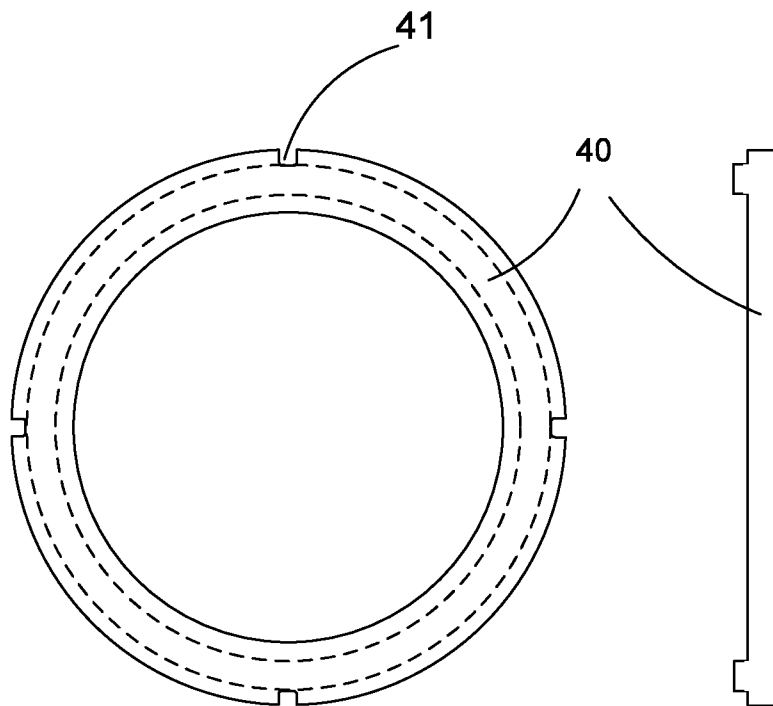
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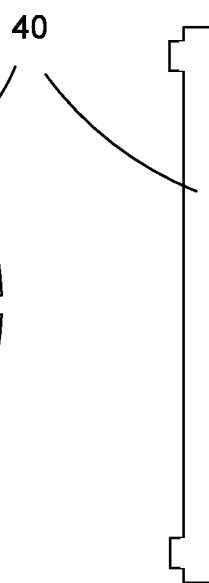
**Fig. 3a**



**Fig. 3b**



**Fig. 4a**



**Fig. 4b**