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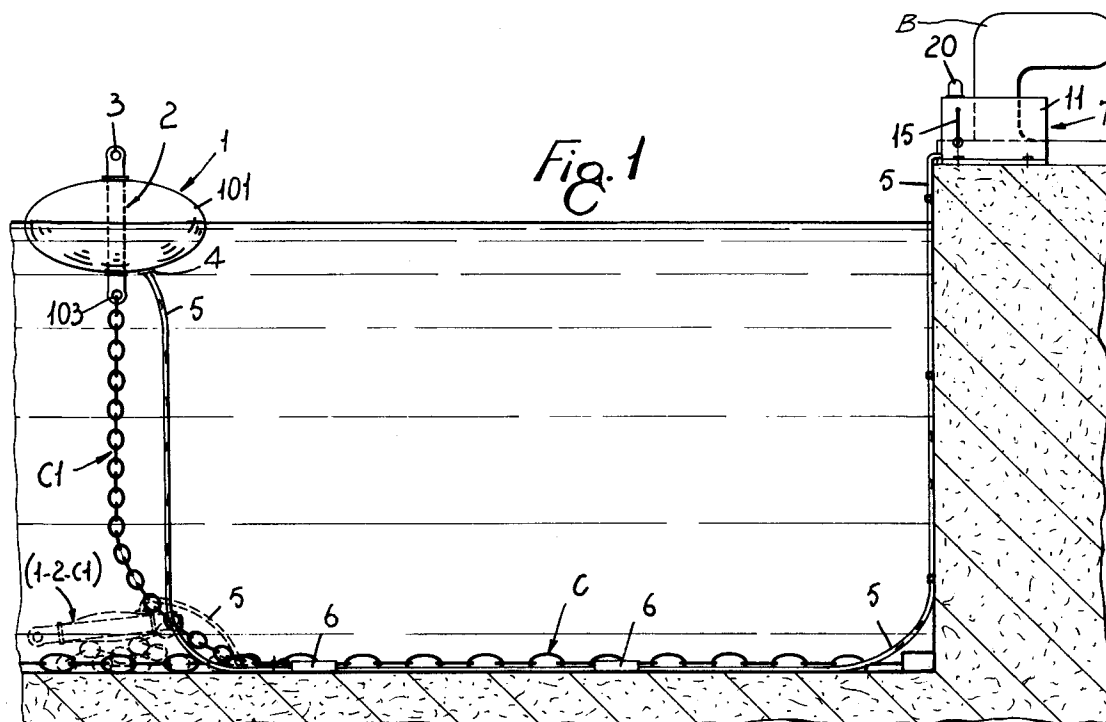
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(54) **Device for mooring a watercraft.**

(57) The branch (C1) of the submerged mooring means is connected to a buoy (1) of the inflatable and deflatable type, connected in turn through at least one small flexible hose (5) to a power pack (7) arranged on the edge of the wharf or pier at the mooring area and provided with means of any suitable type whereby the condition of said buoy (1) can

be modified so that when said buoy (1) is deflated it rests on the bottom of the harbor together with said mooring branch (C1), while when said buoy (1) is inflated it rises up to the surface and carries therewith said mooring branch (C1) to which one can moor a watercraft in a rapid and simplified manner and with no risk of fouling.

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A watercraft is usually moored to a wharf or a pier by fastening said watercraft both to suitable mooring bitts and to at least one submerged or underwater member, consisting of either an anchor or, often, a displaceable branch of a cable, chain or any other suitable means which is anchored to the bottom of the mooring area. When a craft arrives at the mooring area, said branch of the submerged chain must be picked up and raised by means of an anchor or a harpoon to fasten the mooring cable or cables thereto. This operation is somewhat difficult and time-consuming and, above all, it fouls the craft and the operator's hands disgustingly due to organic and inorganic sediments adhering to the submerged mooring chain.

The invention aims to overcome this disadvantage by virtue of the following solution. Fastened to the branch of the submerged mooring chain is any suitable means the specific gravity of which can be modified at a distance, e.g. an inflatable and deflatable buoy. Said buoy is connected by a flexible hose to an inflating/deflating power pack arranged at the mooring means in each mooring area ashore. By activating said power pack, e.g. by a remote-control device, air can be admitted into the buoy so that it will be inflated and will rise to quickly carry the submerged mooring point up to the surface whereby one can moor thereto quickly, easily and with no fouling. On the contrary, when said buoy is deflated, it will be drawn to the bottom by the mooring chain which resumes its rest condition.

Further characteristics of the invention, and the advantages resulting therefrom, will appear from the following description of some preferred embodiments thereof, shown by way of non-limiting examples only, in the Figures of the accompanying two sheets of drawings, in which:

Figure 1 is a side view of the device of the invention;

Figure 2 is a block diagram of the power pack for the control of the buoy for raising and lowering the submerged mooring chain;

Figure 3 shows diagrammatically a simplified modification of the power pack for the control of the buoy.

In Figure 1, letter B indicates a stationary bitt secured to the edge of a pier or wharf and which identifies a mooring area. Said area comprises at least one submerged chain C, or a cable, a rope or any other suitable means, provided with at least one displaceable branch C1 which constitutes the submerged mooring means. according to the invention, the free end of said branch C1 of the chain has connected thereto an inflatable and deflatable buoy 1 provided with a sturdy bracket 2 provided with rings 3-103 at the ends thereof, one of said rings being connected to said branch C1. The

bracket 2 is surrounded by an air bladder of flexible material 101 which constitutes the buoy, which is preferably of toric shape and is vulcanized or anyway fixed suitably to said bracket. The bracket 2 and buoy 1 are associated so that when the buoy is inflated and floating, the ring 3 of the bracket is directed upwards.

Unlike the illustrated embodiment, the buoy may have the configuration of a wheel with a tire, i.e. a central rim which mounts at the periphery thereof an inflatable and deflatable tube held firmly on said rim in any suitable manner, either fixedly or removably. The bracket 2 will be either secured to or integral with said rim, and the whole can be easily conceived and carried out by those skilled in the art.

The air bladder 101 is provided with at least one inflation and deflation point 4 arranged anyway either on said component or on the bracket 2, which may be provided with an internal duct communicating with the interior of said bladder. Said point 4 is connected to at least one hose 5 made of any suitable flexible material resisting to chemical-physical strains, one part of which is as long as the chain branch C1, another part of which is held on the bottom of the mooring area by suitable ballast members 6, and another part of which rises up the side of the wharf or pier so that its opposite end may be connected to a power pack 7 arranged at the bitt B.

According to a simplified embodiment, shown in Figure 3, the power pack 7 may comprise a non-return valve 8 with a manual release 108, a maximum pressure valve 9 which controls the inflation pressure for the buoy, and a union 10 for quick and releasable connection with the delivery of a source of compressed air, e.g. a small electrically-driven, compressor mounted on a carriage, or a bottle of compressed gas, or other pneumatic accumulator, which may be provided on board the craft or may be available ashore to be used in turn by the various users of the mooring area.

When the buoy 1 is deflated, it rests on the bottom of the mooring area, together with the branch C1 of the submerged chain C and hose 5, as shown with broken lines in Figure 1.

When a craft is being moored and is fastened to a bitt B, pressurized air is delivered through the union 10 to the buoy 1, which progressively rises afloat, lifting the terminal C1 therewith. During this step, the safety valve 9 prevents the buoy from being inflated excessively and anomalously. When the buoy emerges out of the water, the ring 3 can be used as an additional point for anchoring the craft.

Conversely, when the craft is to be unmoored, the pushbutton 108 of the stop valve 8 is acted upon to open said valve and deflate the buoy,

which progressively will be sunk together with the terminal C1 to the rest position shown with broken lines in Figure 1.

The power pack 7 may be constructed so as to further simplify the mooring operation, as described herinafter with reference to Figures 1 and 2. A suitable container 11, secured to the ground at the spot intended for connection to the hose 5, made of stainless steel and/or other suitable material and provided with at least one access door which is locked by a safety lock or a padlock, accommodates the following components:

- a small electrically-driven compressor 12;
- at least one electrical accumulator 13;
- a control logic 14 which may comprise, if desired, a remote-control device with an antenna 15 arranged outside of said container 11;
- a four-way offtake 16, the first way being connected to the delivery side of the electrically-driven compressor 12 via a normally-closed solenoid valve 17; the second way communicating with the atmosphere via a normally-closed solenoid valve 18; the third way being connected to the control unit 14; the fourth way being connected to the hose 5.

The control unit 14 may have connected thereto a flash signaling lamp 20 arranged within a suitable housing outside of the container 11.

The power pack constructed as above operates as follows: when the unit 14 receives an activating signal, for example, a radio control signal received by the antenna 15, the compressor 12 is activated and the valve 17 is opened so that pressurized air may get into the buoy. The pressure-switch 19 automatically stops the compressor 12 and closes the solenoid valve 17 when the buoy is inflated at the pressure required for flotation. Conversely, when the unit 14 receives a disactivating signal, it causes the solenoid valve 18 to be opened in timed manner to permit the deflation of the buoy.

It is to be understood that instead of the accumulator 13 or in addition thereto, current may be supplied from the electrical mains.

Finally, it is to be understood that the above description is referred to preferred embodiments of the invention, which may undergo many changes and modifications, especially of constructional nature. For instance, in order to hasten the deflation of the buoy, the air therein can be sucked by the compressor 12, the latter being suitably pre-conditioned for this purpose. Instead of the compressor 12, there may be provided a small, refillable gas-accumulator provided with a pressure gauge.

Claims

1. A device for mooring a watercraft in a rapid and simplified manner to a wharf or pier provided at each mooring area with at least one movable branch (C1) of a chain (C) or other stationary means on the bottom of said area, characterized in that it comprises at least one inflatable and deflatable buoy (1) - connected to said branch (C1) - said buoy being connected via at least one small flexible hose (5) to a power pack (7) arranged on the edge of the wharf or pier at the mooring area and comprising suitable means for modifying the condition of said buoy so that when deflated the buoy will rest on the bottom of the harbor together with the mooring branch (C1), and when inflated said buoy will rise to the surface and carry the mooring branch therewith so that the craft can be moored thereto in a rapid and simplified manner and without any fouling.
2. A device according to claim 1, characterized in that said buoy (1) is provided with a bracket (2) which is surrounded by an air bladder (101) constituting the inflatable and deflatable part of said buoy and which is provided with free end rings (3-103) one of which is connected to the movable branch (C1) of the submerged mooring chain, whereas the other ring is free for anchoring the craft thereto when the buoy is inflated and emerged.
3. A device according to claim 1, characterized in that said flexible hose 5 which serves to inflate and deflate the buoy (1) can be connected to the air bladder (101) of said buoy either directly at a strengthened and suitably arranged point (4) on said bladder, or indirectly through the anchoring member (2) carrying said bladder and communicating therewith via suitable channels and/or ducts.
4. A device according to claim 1, characterized in that a part of the flexible hose (5) for inflating and deflating the buoy (1) is held fast on the bottom of the mooring area by means of ballast members (6) or other suitable means, and the part thereof that rises up to the edge of the wharf or pier is secured to the embankment thereof of one or more spots by any suitable means.
5. A device according to claim 1, characterized in that the power pack (7) having connected thereto the ashore end portion of the flexible hose for inflating and deflating the buoy (1) comprises: a non-return valve (8) with manual release control (108); a maximum pressure safety valve (9) adjusted at such a value to

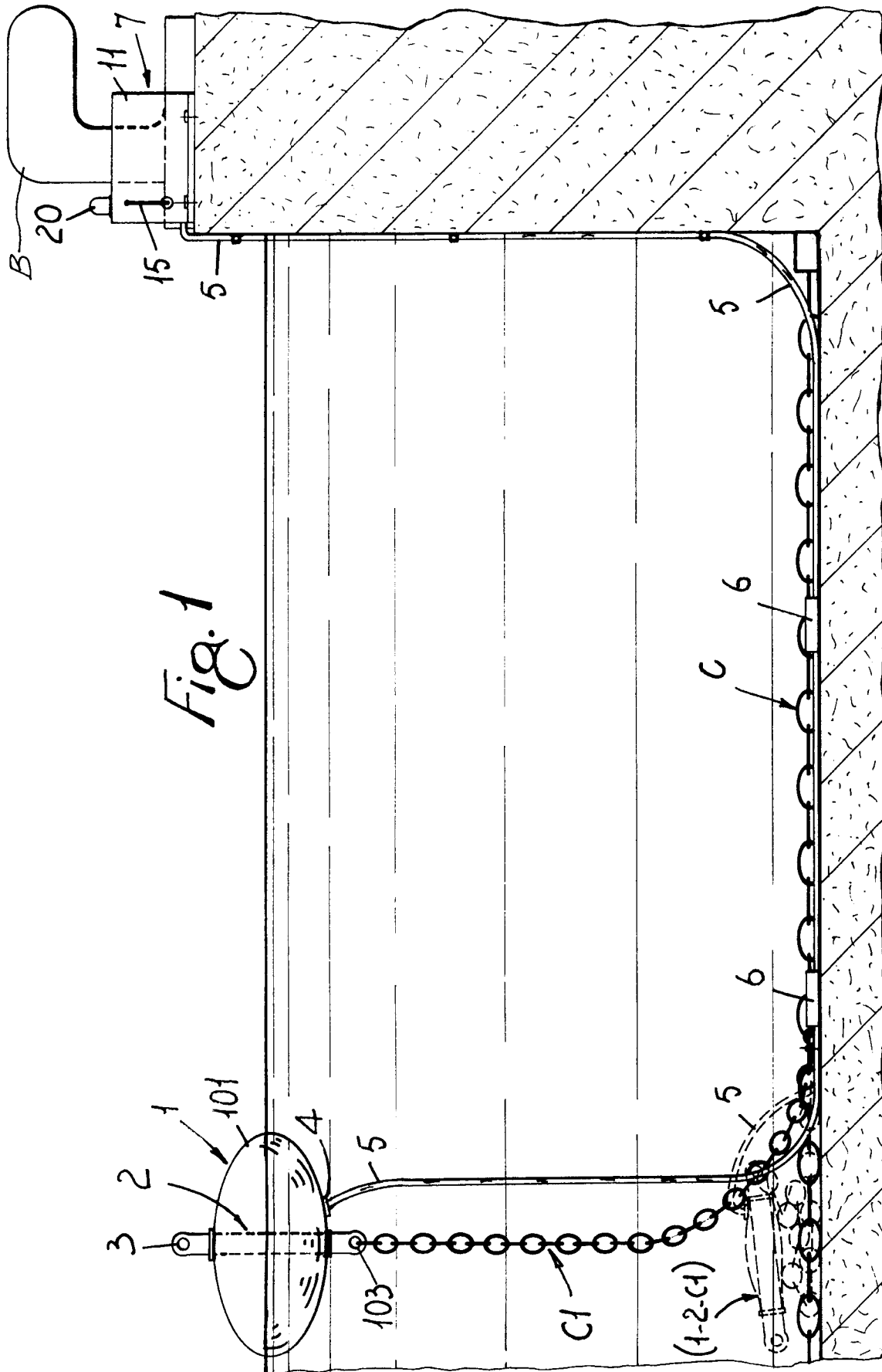
maintain the inflation pressure in the buoy at a pre-established value; a union (10) for quick, releasable and simplified connection to any suitable source of pressure pressurized air available either at the mooring area or on the craft. 5

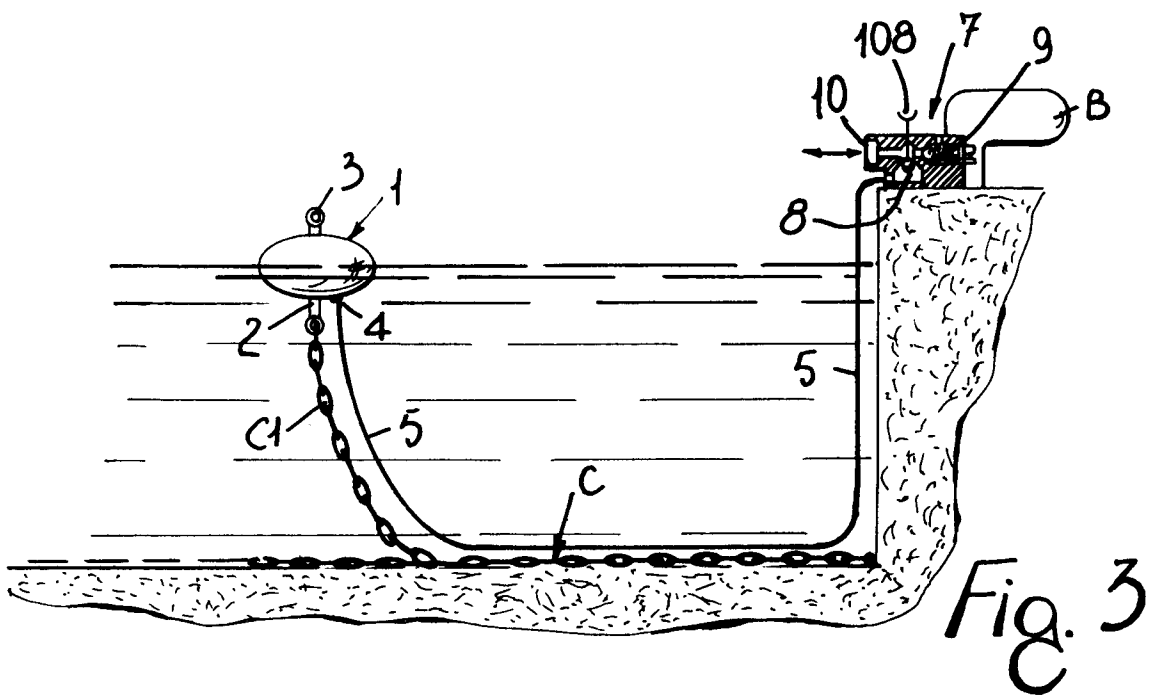
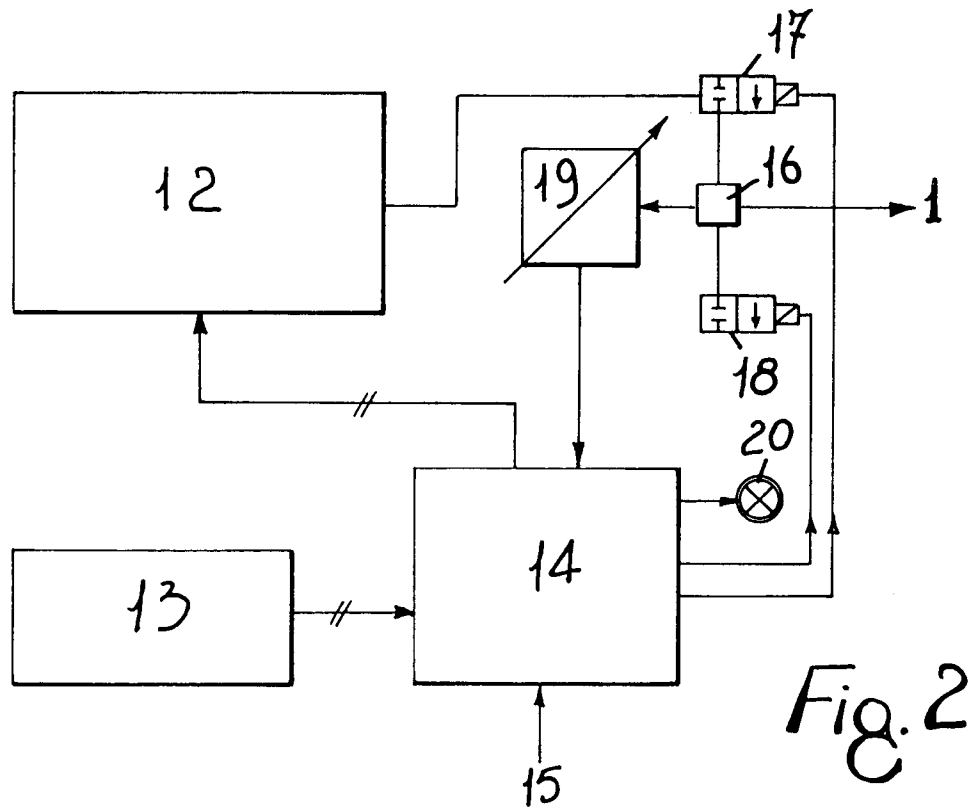
6. A device according to claim 1, characterized in that the power pack (7) having connected thereto the ashore end of the flexible hose for inflating and deflating the buoy (1) comprises a container (11) arranged at the mooring area and accommodating therein: 10
- a small electrically-driven compressor (12); 15
 - at least one electrical accumulator (13) for feeding the electrically-driven compressor and other electrical components;
 - an electronic control logic (14) which can be activated by means of either manual control means and/or remote control means, through a remote-control comprising a suitable radio receiving antenna (15) outside of said container; 20
 - a visual alarm (20) arranged outside of said container, for signalling the activation of the device; 25
 - a group of solenoid valves (17-18) to control the connection of the flexible hose associated with the buoy to the inflation compressor or to the atmosphere for deflation; 30
 - pressure switch (19) for the control of the compressor during the buoy inflation step. 35
7. A device according to claim 6, characterized in that it comprises, instead of the electrically-driven compressor, a small, refillable accumulator of pressurized gas. 40

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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 2254

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-2 814 054 (H. PHILLIPS) * column 1, line 48 - column 2, line 20; figures 1,3 *	1,2,3,5	E02B3/20 B63B22/28
Y	FR-A-2 451 342 (SEA TANK) * page 1, line 33 - page 3, line 8; figures *	1,2,3,5	
A	---	4,6,7	
A	US-A-3 899 990 (C. LECOMTE) * column 2, line 35 - column 3, line 55; figures 1-3 *	1,3,5,7	
A	---		
A	US-A-4 331 097 (S. BELINSKY) * column 2, line 57 - line 64; figure 3 *	1	
A	---		
A	FR-A-2 109 096 (J. LIAUTAUD) -----	-	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E02B B63B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 SEPTEMBER 1991	Examiner KRIEKOUKIS S.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	