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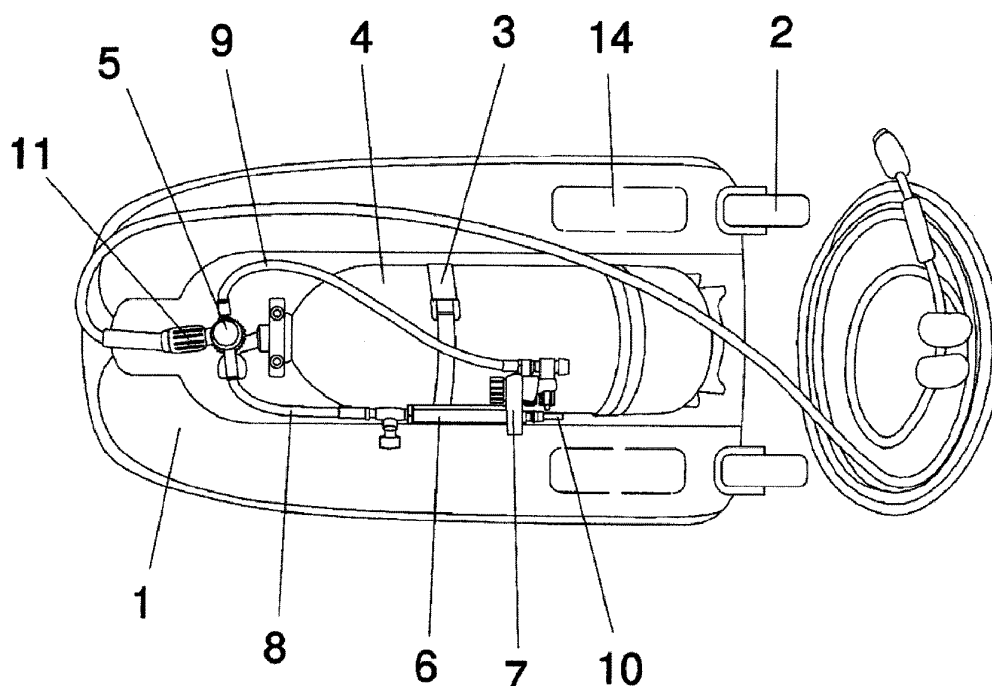
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(54) **SELF-CONTAINED DIVING SYSTEM HAVING AN AUTOMATIC ALARM**

(57) The invention relates to a diving system for several persons in which, without using any type of motors and being self-contained, the cylinder used is attached to a mobile float which is pulled along by the users by means of air-carrying hoses of an adjustable size, which are floating and flexible and fitted with rotary terminals,

the components thereof including an automatic underwater alarm actuated by the compressed air from the actual cylinder and having a quick-release pin which releases the belt from the user without interrupting the flow of air.

Figure 1



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Description

[0001] The present invention relates to a self-contained diving system with an automatic alarm which is so simple and safe that it can be used by persons of any constitution, including children, the elderly and the disabled; using it, several divers are able to simultaneously breathe the air which is supplied to them by a cylinder of compressed air which is attached to a mobile float, which means that the users do not have to carry its weight or volume. The air reaches them, after being regulated, through hoses fitted with high security rotary connections which facilitate their use and avoid the risk associated with the practice of this sport because apart from serving to feed air to the divers, they also act as depth limiting elements and constitute the only equipment among all the equipment of prior art used for diving which, without using motors of any type and using hoses for supplying air, meaning that the divers do not carry the cylinders on their backs, benefits from the characteristic of being self-contained, since it does not require any external assistance for its use, having an automatic submarine alarm actuated by the air in the cylinder itself, which alerts to the divers when the cylinder pressure drops and when they must prepare to terminate their dive.

[0002] The mobile float, which can easily be transported by land since it has removable wheels and which has the compressed air cylinder attached to it, performs various functions because, apart from being pulled along by the water without effort thanks to its aerohydrodynamic shape, it serves as a lifeboat, if required, and it is possible to store, both inside of it and on the fastenings it is provided with on its outside, objects for personal use and any accessory of a suitable size which is required to be transported during diving. This avoids having to carry them on one's body and constantly hauling them around, as is the case in diving with the traditional equipment. When the first air carried in the cylinder is regulated, this is when the aforementioned automatic underwater alarm is connected, this alarm being entirely novel in any diving equipment or system, which has among its components a long range underwater bell which actuates when the air pressure in the cylinder drops to the preset pressure, and which operates using only the pneumatic energy supplied to it by the compressed air from the cylinder itself, which is used for diving, thus avoiding the need for batteries of any type and resulting in almost no maintenance.

[0003] Putting on the equipment is also very simple since no harnesses of any type have to be worn, merely a belt with a buckle fastening fitted with a device that is used to fasten the hose, adjust its exit angle and its length between the belt and the adjuster which the user has on his/her mouth, enabling the belt to be adjusted immediately to any size and to the height of the person and replacing the classic couplings of a predetermined size. The belt also incorporates the weights which are used to practice diving, enabling the whole unit to be detached

if necessary by means of the same aforementioned totally novel, simple and multifunctional device, enabling the same to be dispensed with by a simple tug without the divers losing their air supply at any time.

[0004] All these components are those available to us in a self-contained diving system with an automatic alarm that is so simple and safe to use that it opens up to a large number of people the possibility of venturing into the underwater world where previously the conventional equipment created an insurmountable barrier for them and prevented them in most cases from experiencing the unique sensations provided by independent diving, breathing the compressed air adjusted to the same pressure as that of the user.

BACKGROUND OF THE INVENTION

[0005] There are references to the first diving system known by the name of "apnea", dating back more than 4,500 years, when man immersed himself in the sea holding his breath to catch food, fishing sponges, corals, mothers of pearl, etc., the achievement of military feats and the recovery of treasure and valuable objects. Transparent products were then used to create an air chamber between the eye and the water which enabled him to see the sea bottom more clearly and he began using a snorkel. Currently this method of diving is known by the name of "diving with goggles and a snorkel" or to go snorkelling.

[0006] The bell diving system appeared between the 16th and 17th centuries. This involved introducing an underwater receptacle which maintained the air within at the same pressure as the device, enabling the diver to enter it to breathe and move short distances. Since it was used for a number of years it was improved by supplying air to it from the surface through wax and oil impregnated hoses.

[0007] At the beginning of the 19th century, and based on the same system as the bell, the open diving helmet was invented which, improved and patented in 1837, serves as a model for all the diving helmets that are still used today and which are known by the name of the "traditional diving system or system with diving helmet".

[0008] The first "diving system with pure oxygen" was patented in 1878. It had a closed circuit with a breathing bag, oxygen cylinder and a cartridge containing the carbon dioxide purifying element, this being the precursor to the equipment used by today's combat divers.

[0009] In the 1940s the first diving equipment with a self-contained helmet became known by the name of the "scuba system", which is the system that uses one or more compressed air cylinders which the diver carries on his back and are attached by means of fastenings, and finally also fastened to hydrostatic vests, and, by means of automatic regulators, supply air at the same ambient pressure as that of the user at any time. From that time until the present date a wide range of apparatuses and accessories with the most sophisticated and advanced technology have come onto the market, facil-

itating the practice of diving both in the professional field and as a sporting activity. However, all these advances, such as mixtures of gases which enable the diver to descend to great depths, mini control consoles, wrist computers, special clothing with which divers can dive into waters with extreme temperatures while connected to the latest high-tech communication equipment and much more, have not brought changes to the basic characteristics of the system which from the beginning has been used to dive with a self-contained helmet.

[0010] To dive with the "scuba system", the user must carry, in addition to the diving goggles, the fins and the snorkel, the compressed air cylinder/s which are attached to the body by means of a coupling or hydrostatic vest, and which, with a weight normally of between 12 and 20 kg each, make it impossible in some cases to be able to move around with them when they are out of the water without external assistance. If the inconvenience of also wearing a belt with weights, an emergency adjuster, control devices, a knife, etc., is added to this, the result is a feeling of discomfort which takes a lot of effort to overcome. And although all this equipment is balanced in terms of weight, at the time the diver submerges, having to constantly move his volume and the equipment comprising it underwater is quite complicated and very often puts people who are not in good physical shape off from practising the sport, and of course it could not conceivably be used by children, the elderly or disabled persons.

[0011] There is other equipment which uses industrial compressed air cylinders or cylinders which are used for diving and which are installed on a boat and supply air to the divers via hoses. Used only by diving centres that give initiation courses in some countries, this equipment is designed for diving at a maximum depth of six to seven metres and always accompanied by a monitor.

[0012] There are devices for "diving practice" available which the connoisseurs call diving toys. These consist basically of a compressor which operates on batteries, similar or the same as those used as spare parts to inflate the tyres of cars in the event of a puncture. They are generally moved by plugging them into the lighter, and then installed on a boat or on a float they supply air to the user via a hose. There are also models which use petrol engines. Their complicated operating system, the risk of inhaling toxic gases, the constant noise they make whilst in operation and the malfunctions they continually suffered because their moving components, batteries and motors are exposed to a saline environment, coupled with their poor performance, as it was only possible to lower the equipment a few metres in depth, have led to their practical disappearance from the market.

[0013] The "hookah system", which was born almost at the same time as the scuba, and uses the same regulators as it, is the system which is generally used by the professionals who carry out underwater work. It consists of motor compressors which, when installed on a quay, jetty or boat, supply air via hoses to the divers, the con-

stant presence of expert personnel being necessary, by law, to control the handling of the equipment externally. This, combined with the noise and the pollution generated when internal combustion engines are used, and, in particular, the limitation of its movement capacity, has meant that this diving system is not used by those who dive for leisure, tourism or sport.

[0014] To avoid some of the disadvantages of this type of equipment, the holder of the present invention, Probox Mallorca S.L., developed new equipment constituting the object of the utility model U200802561, the general features of which are as follows: the cylinders are attached to or installed inside a mobile float, the air supply hoses serve as depth limiters an emergency automatic filling device is present. However, experience has shown that it is possible to generally improve the characteristics of the diving equipment constituting the object of this utility model, particularly in terms of the introduction of new safety devices, the method of fastening to the body of the user and the hose connections; consequently, new diving equipment has been designed which is self-contained and does not require external assistance for its use and which creates a system the features, combined with other innovations and which we will describe later, constitute the object of the present invention.

[0015] In the field of underwater warning devices there are different versions, almost all of which carry electric batteries for their operation. However, in addition to their high cost, their delicate mechanism means that they must be constantly maintained. Because of their recognised usefulness we shall mention the so-called diving computers with air management, which indicate to us basically what we are going to consume and how much air is left, and can be used to program alarms which sound in a wristwatch actuated by waves, informing us of the depression times and water temperature; they can also be used as compasses, etc. Recommended for use in major dives, they serve no practical purpose for diving of the low depth tourist type. In any case, these alarms, which sound similar to those produced by certain wristwatches, are intended for individual use because of the short range, one or two metres approximately, and are not used in group diving, it being necessary in this circumstance for the monitor to control the dive making use of a long-range pneumatic underwater bell which acts manually at random to call the diving students. To avoid these disadvantages the owner of the present invention also designed a new automatic underwater alarm constituting the object of utility model U201000223, the principal advantages of which are that, when actuated, it only operates on the compressed air from its own diving cylinder (it does not therefore require batteries of any kind), and it is activated automatically. However, experience has shown that it is possible to improve the characteristics of this alarm generally, especially in regard to the operating time control device and shape of the pushbuttons actuating its pneumatic bell, in a similar manner to that used by instructors to send long-range messages to

their students.

[0016] When the elements comprising these two utility models are combined and improved, this gives rise to the "self-contained diving system with an automatic alarm", the first to be designed for diving, avoiding the need for the divers to carry the cylinder directly on their back, it uses hoses for the air supply and dispenses with motors of any kind. It is self-contained in that it is able to be moved by being pulled along at will by the divers themselves, without requiring any external assistance, and has an automatic underwater alarm. It has a quick-release weight system, as a significant added novelty, which enables the user to release himself from the weight belt without losing the air supply at any time, and is so safe, so simple to maintain and easy to use, that it is suitable for use by persons of any physical constitution, including children, the elderly and disabled persons, and constitutes the object of the present invention.

DESCRIPTION OF THE INVENTION

[0017] The invention relates to a "self-contained diving system with an automatic alarm", comprising various elements, a great many of them designed exclusively for it, which, when properly interconnected, combine to produce a unit suitable for diving which enables this sport to be enjoyed more easily, comfortably and safely than any such state of the art systems. It can be used by any kind of person and is suitable for those who, because of their constitution and build, would find it difficult to go diving with conventional diving equipment.

[0018] We may divide the elements comprising the equipment of the "self-contained diving system with an automatic alarm" into three differentiated parts: 1 - Those which are attached to the mobile float the aerohydrodynamic shape of which facilitates its movement through the water. 2 - Those which carry the flexible floating air supply hoses and which also act as depth limiters, and 3 - Those which are incorporated in the belt worn by the users.

1.- The mobile float, which has fixed or removable wheels to facilitate its movement on land, is preferably brightly coloured and attached to it by means of fastening straps, a compressed air cylinder of the type supplied for diving, and which incorporates a so-called first stage air regulator (which regulates the outlet pressure of the cylinder, which is normally between 200 and 300 bars, reducing it to approximately 8/10 bars above the pressure available to the diver), in which one of the locating threads of one of the low pressure outlets has been modified, enlarging it and rendering it more resistant since it will be used in due course as a drawing point, and furthermore air outlet pressure in this second stage has been established as 2 bars above that used when diving with this scuba system, thus enabling the user to move without difficulty between the surface and a

depth of 20 metres, the second stage regulators permitting this increase without any problem (these regulators are normally carried in the mouth of the diver and adjust the air to the same pressure as the ambient pressure). An automatic air-actuated underwater alarm, totally novel in any diving system or device, is also connected to the first stage diving regulator and comprises, among its components, a long range underwater bell which is connected by means of a flexible coupling to a high pressure outlet of this regulator (which indicates the amount air present in the cylinder at any time), the upper part of the body of the alarm (which incorporates in its interior a spring and a mobile piston which is moved by the surge of the air pressure in the cylinder), and in addition to aforementioned low pressure regulator outlet, and, also by means of a suitable coupling, to a long-range subaquatic bell. Thus, when the pressure of the air in the cylinder is reduced to the preset pressure, the spring it includes starts to decompress and the mobile piston of the alarm is moved, and with it the round and replaceable part connected to it, touching the spherical pushbutton of the bell, causing it to sound for a sufficient, programmed time, which warns the divers automatically to prepare to complete the dive. A high security quick-release connection is threaded onto the first stage regulator and the low pressure outlet which has been reinforced so that it also acts as a drawing point, and to disconnect it is necessary to make two totally opposite rotating movements, apart from having to hold it with one hand, which makes it impossible for the plugged in hose to be disconnected accidentally at any time.

The float is provided with handles not only to facilitate its transport on land but also to enable users in the water to be attached to it if necessary, or simply to rest and to contemplate without effort the surroundings as seen from the surface whilst maintaining sufficient buoyancy for this purpose. It may be compact or hollow, and closed with a tight cover, which in this case means that clothing, keys etc., can be kept inside it, including mobile telephones and other communication tools. It can also be used after diving to keep inside all the components of the equipment inside of it, thus facilitating and simplifying their storage. It also incorporates in its interior, when hollow, some emergency floats which, in the unlikely event of flooding, would keep it afloat. The cover also incorporates rubber seals, safety locks which ensure tightness of the assembly, and on it, or on the upper part of the compact unit, an elastic net is fastened which enables objects such as diving goggles, fins, weights, cameras etc., to be attached to its exterior without having to load the diver with all these elements when not needed, as is the case with the scuba system. It has a well for fitting the mandatory signalling flag mast and all its components are designed to resist the marine environment without issue.

2.- The air hoses which are used are floating hoses so that the part which does not act as a drawing element at all times remains on the surface and is therefore not tangled from the bottom, and are flexible to ensure greater comfort in movements, having incorporated in some sections close to their couplings auxiliary floats and several over-hoses which serve to prevent acute angles from forming, which could affect the air flow. These hoses perform three different functions at the same time: a) they serve to pass the air from the first stage regulator fixed to the compressed air cylinder to the second stage regulator which the divers carry in their mouth; b) they are suitable for pulling through them the mobile float which is always on the surface and the elements connected to it, and finally c) they act as depth limiters since their length can easily be adjusted before each dive, causing the mobile float to brake. They have a maximum length of 8 metres from the point where they are connected to the first stage regulator to a "Y"-shaped branch to which two hoses are connected, each 4 metres long, and which supply air to two divers, since for safety reasons solitary dives are prohibited, this air flowing to the second stage regulators which the divers carry in their mouths. So although, due to their technical characteristics, it would be possible to descend to a depth of more than 30 metres with this new self-contained diving system with an automatic alarm using longer hoses, the depth its users are able to reach is 12 metres, which is the depth indicated in all the decompression tables for diving as the maximum depth that can be reached, and for the time they required without any kind of decompression, including successive dives and dives under any conditions, which means that when using this new diving system there is the added safety of not having to carry out any decompression whatsoever, thus avoiding the risks that it can bring. The hose terminals are of two types, and they are both rotary so that they can absorb the movements that the divers may make when submerged. Some have a quick-release connection, as mentioned above, with added safety, and others are threaded, with the added novelty that the terminal has been designed and developed solely for incorporation in this new invention since it has a seal in the form of a plastic ring, preferably of teflon, which avoids the friction which is generated between the metal section of the part incorporating an O-ring preventing air leaks, and the metal part of the locking nut when the pressure of the compressed air acts on them. Inserting this small seal between the two terminals facilitates the rotations that are produced in the hoses, thus preventing the wear that occurs as a result of metal to metal friction. Thus when the ring-shaped seal is added to it, a simple connection turns out to be an important totally novel, safe and low cost accessory that acts as a drawing point and eliminates

hose kinking resulting from rotation of the divers in all conditions.

As will be readily understood, changing the "Y"-shaped branch to one with several connections means that several divers can use a single unit at the same time, which is very useful when tracking work is being carried out, thus easily allowing air to be supplied to four users simultaneously both due to the rate of air flow supplied by the cylinder and due to the diameter of its pipes, depending on the depth at which they are diving, and even at greater depths.

3.- The belt worn by the drivers, which is very easy to put on and which replaces the classic fastenings and hydrostatic vests currently used with the scuba system, has, among other peculiar characteristics, that of being designed to be used by persons of any height, the same unit suitable both for an obese person weighing over 100 kg, and for a thin child 8 years of age, via simple manual adjustment. It also enables ballast weights to be carried in the belt itself, either in bags or passed directly through its webbing. At its centre, i.e. in the part equidistant from the securing buckles, totally novel multifunctional part is fastened which serves: a) to attach the hose by means of a single pin with a retractable safety head; b) to adjust the hose length between the fastening and the mouth of the diver; c) to adjust the exit angle of the hose from the belt to the general hose, thus avoiding interfering with the diver during the dive; d) it causes the end of the hose itself to act as a coupling for connection to the second stage by replacing those with a predetermined measurement, and finally e) it serves an element for release of the belt as pulling the cord attached to the eyebolt of the pin carrying the part and to the front of the actual belt, causes this pin to eject, releasing the hose, easily enabling the belt, with its ballast weights, to be dispensed of with without the user losing their air supply at any time.

[0019] It is important to point out that this "self-contained diving system with an automatic alarm" is able to operate with compressed air cylinders different from those normally used for diving, such as those used by fire brigades, among other professionals, which are designed to withstand the same pressures as steel cylinders, between 200 and 300 bars and more, but which are much lighter than those cylinders since they are produced from carbon compounds. Since the cylinders in this novel equipment remain on the surface connected to the float, they could technically be used, thereby reducing the weight of the unit as a whole, but the volume of those on the market and their higher price make their use impracticable for the time being. The aluminium cylinders which are normally used for diving in many parts of the world not only have a greater volume than steel cylinders but are ballasted so that they are balanced un-

derneath the water. It would only be possible for the major production plants to eliminate this extra weight and incorporate them in their production processes with large series.

[0020] It must also be pointed out that this "self-contained diving system with an automatic alarm" allows the use of cylinders containing pure oxygen which, when breathed at a pressure greater than atmospheric pressure for a controlled length of time, and under medical supervision, enables the therapeutic method known as oxygenotherapy to be practised. This therapy has a beneficial effect on all types of persons, particularly elderly people and people who are ill.

[0021] And finally must be pointed out that this is the first self-contained diving system which is totally self-contained, without the users having to carry the cylinder on their back, without the use of motors of any type, but rather only the compressed air supplied to the diver from the cylinder that is fixed to its mobile float and uses holes for the supply of air, since the divers are able to move in comfort without requiring external assistance of any type, comprising among its elements an underwater automatic alarm actuated by the air in the cylinder to warn the users when they must complete the dive. For added safety the system has a device which enables the divers to easily release the ballast belt without losing the air supply at any time.

[0022] To supplement the description, and to facilitate a clearer understanding of the features of the invention, drawings are attached to this specification and on the basis of these figures the features and operation of the "self-contained diving system with an automatic alarm", constituting the object of the invention, will be more easily understood.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Figure 1. View of the float from below, and of the elements that are connected to it and form part of the invention.

Figure 2. View of the top part of the float and of the components that are in the upper part of the Equipment.

Figure 3. Detailed drawing of the air-actuated automatic underwater alarm.

Figure 4. Hoses with their different connections and accessories.

Figure 5. Detailed drawing of the novel threaded connections which serve as a drawing point and which prevent kinking of the hoses.

Figure 6 and Figure 7. Components of the belt for fastening to divers in two positions: normal (Figure 6) and when the hose is released from the belt (Figure 7).

Figure 8. Detail of the elements comprising the novel multifunctional part which attaches the hose, adjusts

both its length and exit angle and serves to enable the belt to be dispensed with if necessary.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] On examining the figures mentioned we see that in order to use the equipment comprising the novel self-contained diving system, the first thing we have to do is secure the diving cylinder (4) by means of its straps (3) to the float (1), by attaching it by its handles (12) and transporting it on its removable wheels (2) as far as the water, when we use it from the shore, or else take it on board a boat, if we want to, and place it in the water from the boat.

[0025] Once afloat we will place in the well (17) the mandatory diving flag, pay out the hoses (19), (24) and (24T), which will already have connected the quick-release safety couplings (11) threaded to the first stage regulator (5), and which are fixed to the ends of the hoses (21). We will then proceed to fasten the threaded rotary connections (23) to the "Y" branch (22), which keep the auxiliary floats just below the surface (20), thus avoiding sharp angles at the drawing points, the over-hoses (25). We will open the general cylinder stop cock, when the alarm (6) will be activated automatically, and this air will be fed to the second stage (32) to diving regulators carried by the divers in their mouths via the reinforced low pressure outlet of the first stage regulator (5) and via the hoses and their connections.

[0026] The users will adjust the length of the hoses (24T) to their measurement, the hoses replacing the conventional hoses with a predetermined length, from their fastening on the novel multifunctional part (29) to their connection to the second stage regulator (32) by simply removing the pin (30) which attaches it, and refastening it when they are adjusted to the desired measurement. This also provides the hoses at this point with an angle of exit (29F) which prevents the divers from becoming tangled in them whilst swimming. They will also adjust the belt (26) to their height by means of the buckles (27). They will place in the belt the weights which they require (28) either directly or inside bags provided for this purpose, and will proceed to connect the connection plugs (18) to the quick-release connection terminals (21) which, when disconnected, prevent the discharge of air. They will check for correct operation of the equipment and proceed to submerge by pulling the mobile float (1) with an aerohydrodynamic shape and the elements connected to it via the flexible and floating connecting hoses (19), (24) and (24T), which is very simple to do. Since the length of the hose (19) is 8 metres, and that of the hoses (24) is 4 metres, the total depth which the divers can reach is 12 metres, which is the maximum they may reach without having to carry out decompression of any kind, and in all conditions. If it is desired to limit the depth to a lower one, we would proceed to place on the hose (19) one or two fastening flanges so that its total length is shortened, making one or more loops if necessary, with-

out stopping the flow of air. If, on the other hand, in the case of an emergency or necessity, it is desired to descend to a greater depth, several hoses (19) would be connected by joining terminals (18) and (21) of the different hoses together, since depth of up to 30 metres, or even more, could easily be reached because of the technical characteristics of the equipment and its components.

[0027] When the air pressure in the cylinder (4), which is attached with straps (3) to the mobile float (1), reaches the body of the warning device (6A), it presses the spring (6E) as far as its stop, and when it drops to a preset pressure this spring begins to decompress, thus triggering the air-actuated automatic underwater alarm (6), which moves, in the interior of its body (6A), the piston (6B), which has O-rings (6C) and which is connected by means of (6D) to the interchangeable contact plate of different diameters (6F), which is the part which, when the pressure drops, touches the spherical pushbutton (1), causing the underwater bell (7) to sound. The air in the cylinder passes through the high pressure hose (8) to the connection of the body of the warning device (6A) and through the low pressure hose (9) to the bell (7), the contact plate (6F) determining the sounding time, which plate touches the spherical pushbutton (10) and can be replaced by others with different diameters for the purpose of adjusting the operating times of the bell (7).

[0028] The hoses (19), (24) and (24T), apart from their high security connections of the type (11) and (21), have other different connections which are threaded and totally novel (23), and which are fastened by means of (23F) to the "Y"-branch (22), which distributes the air to ensure that the divers are able to breathe normally. These connections consist of a locking sleeve (23B) which fastens the hose by locking it to the tip of (23E), a lock nut (23C) and the novel seal, preferably teflon (23D), which, when placed between the body of the part with the O-ring (23E) and the nut (23C), enables a simple connection to be converted to a high-security drawing point that is totally novel and easily absorbs the hose kinks that are produced when the divers turn under the water, thus at the same time preventing the metal to metal friction and intensified wear to which this gives rise when all the elements are subject to the pressure from the compressed air. The part (23F) is a threaded body which enables the connection (23) to be used instead of the quick-release connection (11), and which will replace it if it can also be threaded to the first stage regulator (5). Although we would take a little more time to connect it, it has the advantage of being much more economical. If we wanted to connect two hoses together at a given time by means of threaded connections (12), we could do this using the double-threaded connection (23G).

[0029] In the event of an emergency the divers can release the belt (26), with all its accessories, including the weights (28), by simply pulling on the cord (31), which causes the pin (30) to eject from the totally novel multifunctional part (29), thus releasing the adjustable hose

(24T), then proceeding to unhook the buckles (27) to release the belt, with weights, without the divers at any time losing the air supply which reaches them via the second stage regulator (32).

5 **[0030]** The multifunctional part (29) which is fastened, together with the base (29A), to the belt (26), and which prevents the body of the part (29B) from having any lateral movement relative to the base of the belt (26), also performs other functions, for, apart from attaching to the hose (24T), it also serves to adjust it, to cause it to have a preestablished exit angle (29F), thus preventing it from interfering with the divers when they are moving, and finally it is also used as an element for releasing the belt, as already described.

10 **[0031]** For the tools to be stored or used during the dive, use can be made both of the tight compartment which carries the float (1), fitted with emergency floats (14), opening its cover (13) to release the locks (15) and place them inside, and the elastic netting (16), or, when they are to be transported below the water, tying them to a cable of the desired length fastened to the handles (12).

15 **[0032]** Once the dive is completed, and once ashore or on board the boat, all the elements incorporated in the unit designed for two divers may be stowed away in the mobile float (1), thus facilitating their storage.

20 **[0033]** The entire set of parts described, constituting the object of the invention, comprise the components of this "self-contained diving system with an automatic alarm", enabling several people to dive at the same time, which means that it is the simplest, most comfortable, safest and easiest system to use from among all those of the present state of the art, thereby providing the opportunity for people of any constitution to dive with compressed air, including children, the elderly and disabled persons, as already indicated above.

Claims

- 40
1. A self-contained diving system with an automatic alarm, **characterised in that**, being self-contained, it incorporates the compressed air cylinder separated from the users and attached to a mobile float (1) provided with emergency floats (14), the entire unit being pulled by the divers by means of hoses of adjustable size fitted with rotary terminals, with the air, the discharge pressure of which has increased by 2 bars above the usual pressure, flowing from the reinforced low pressure outlet of the first stage regulator (5) to the second stage regulators (32) which are attached to the belts (26) incorporating a multifunctional part (29) with a release pin (30) which clamps the hose, and wherein an automatic underwater alarm (6) actuated by the compressed air in the cylinder is also connected to the first stage regulator, with replaceable contact plates of different diameters (6F) and a spherical bell pushbutton (10).
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2. The self-contained diving system with an automatic alarm according to Claim 1, **characterised in that** its threaded rotary connection (23) has a plastic ring (23D) between the threaded lock nut and the connection plate with an O-ring.

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Figure 1

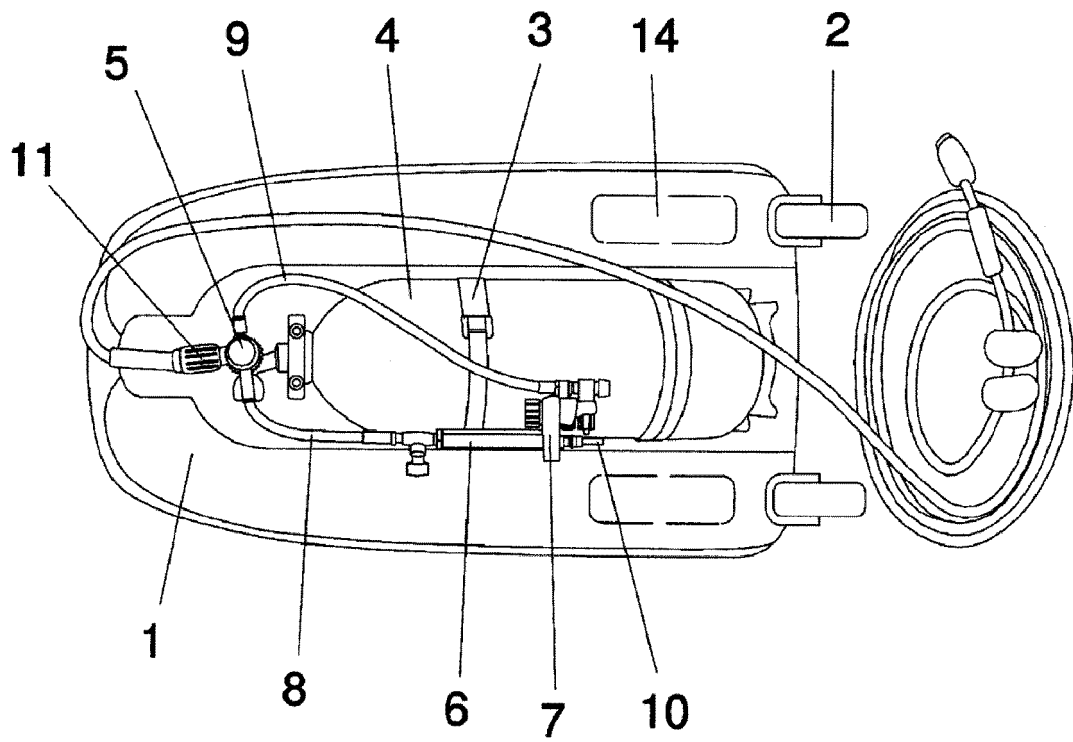


Figure 2

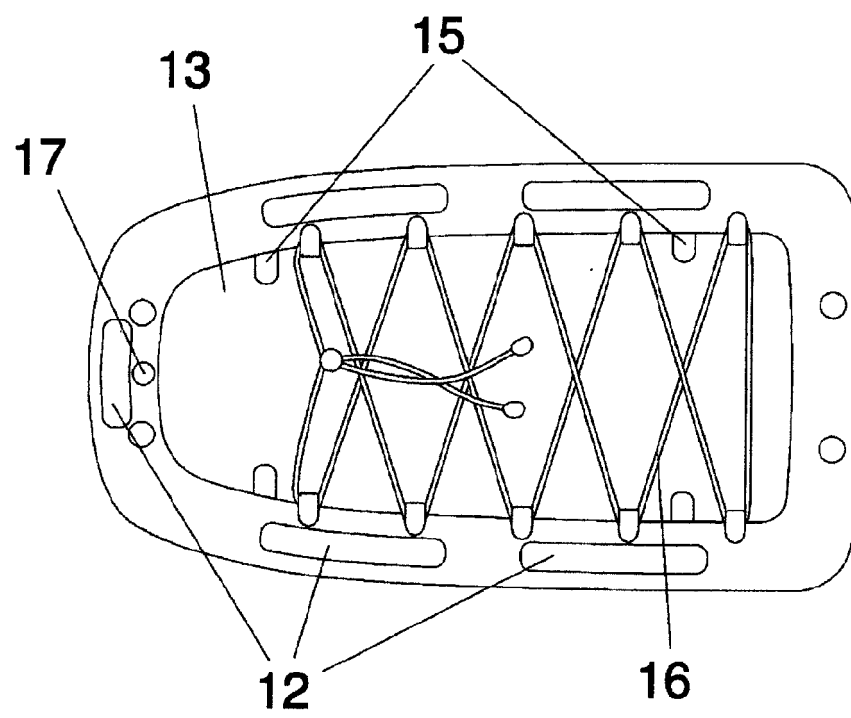


Figure 3

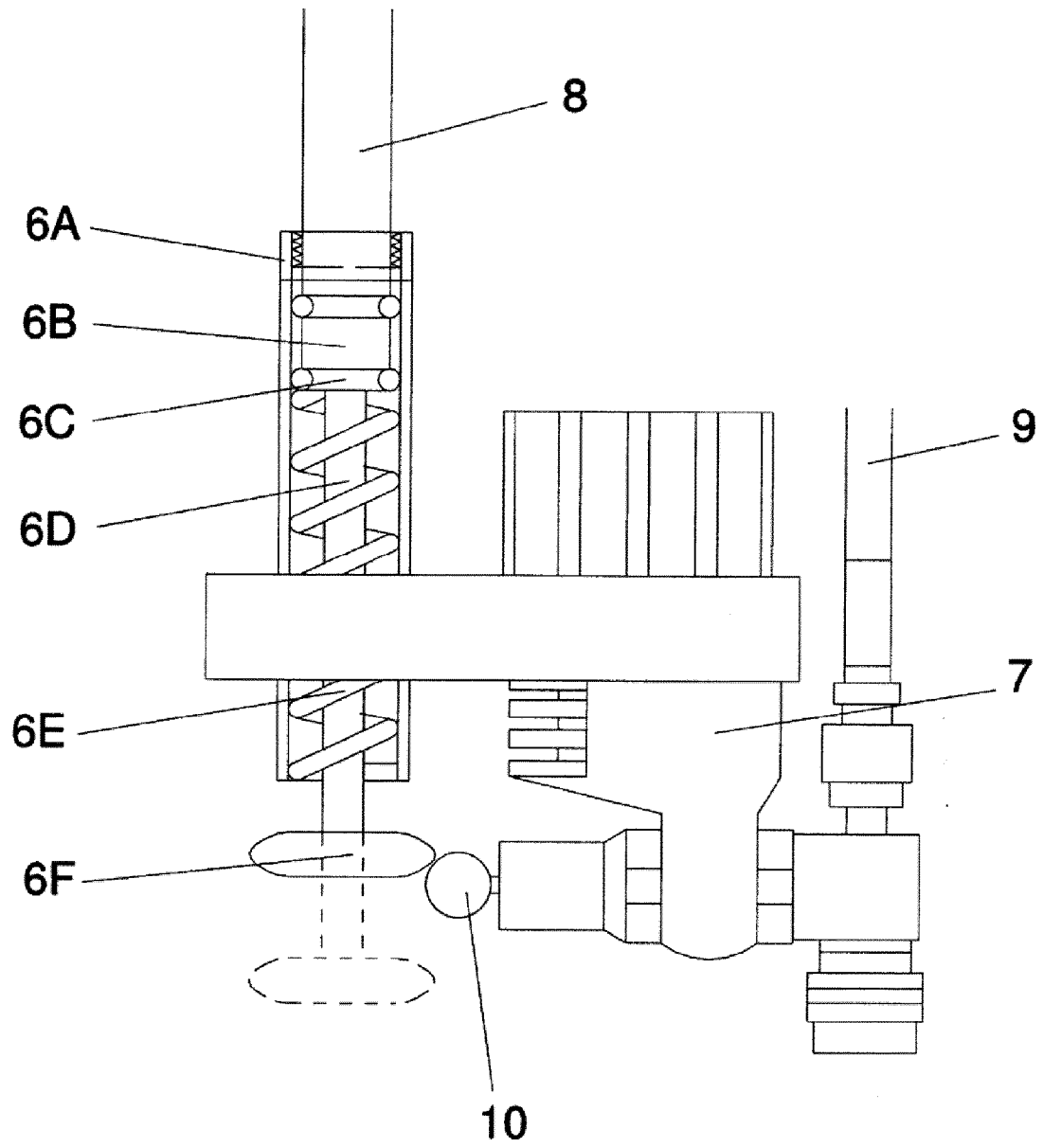


Figure 4

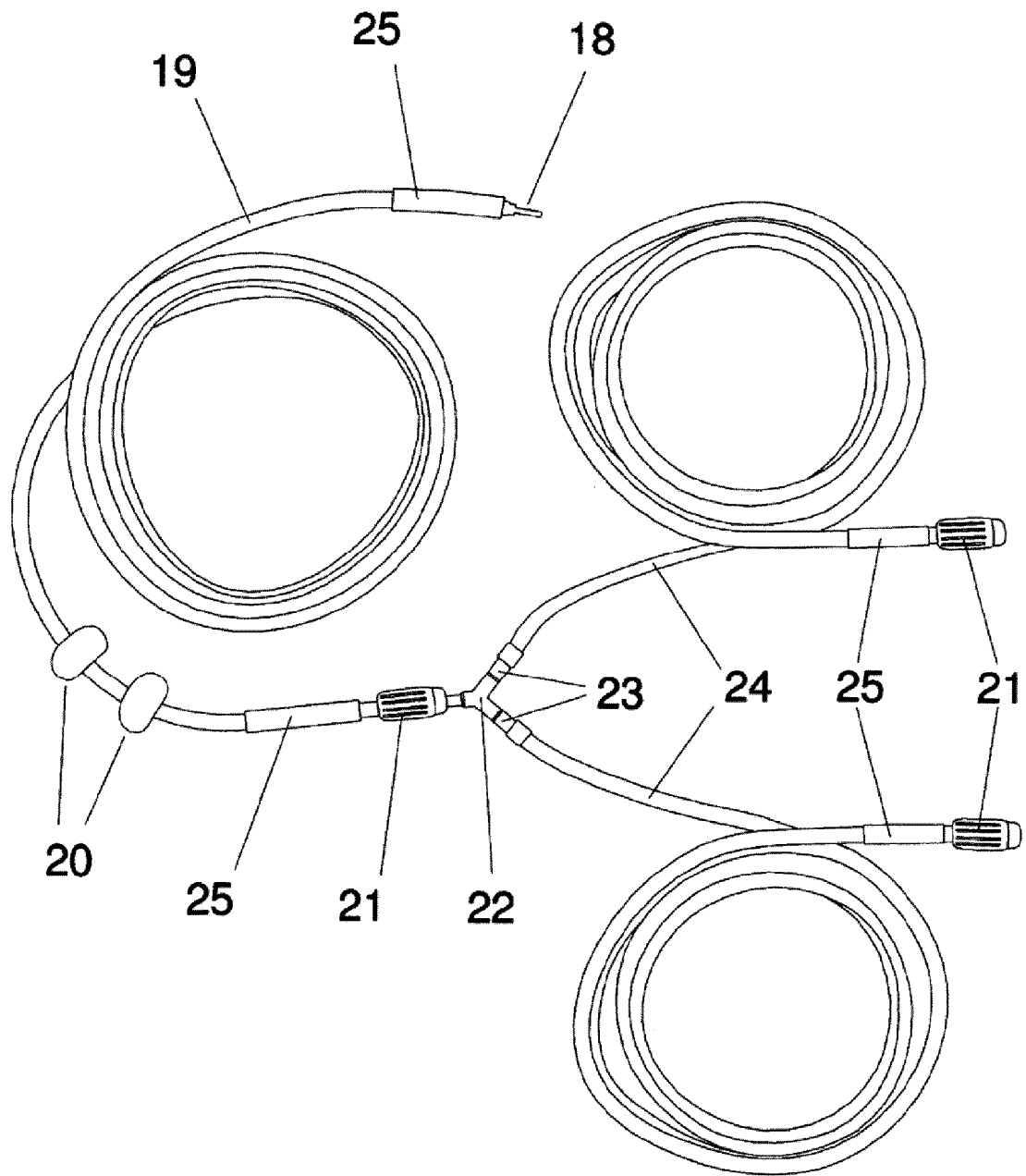


Figure 5

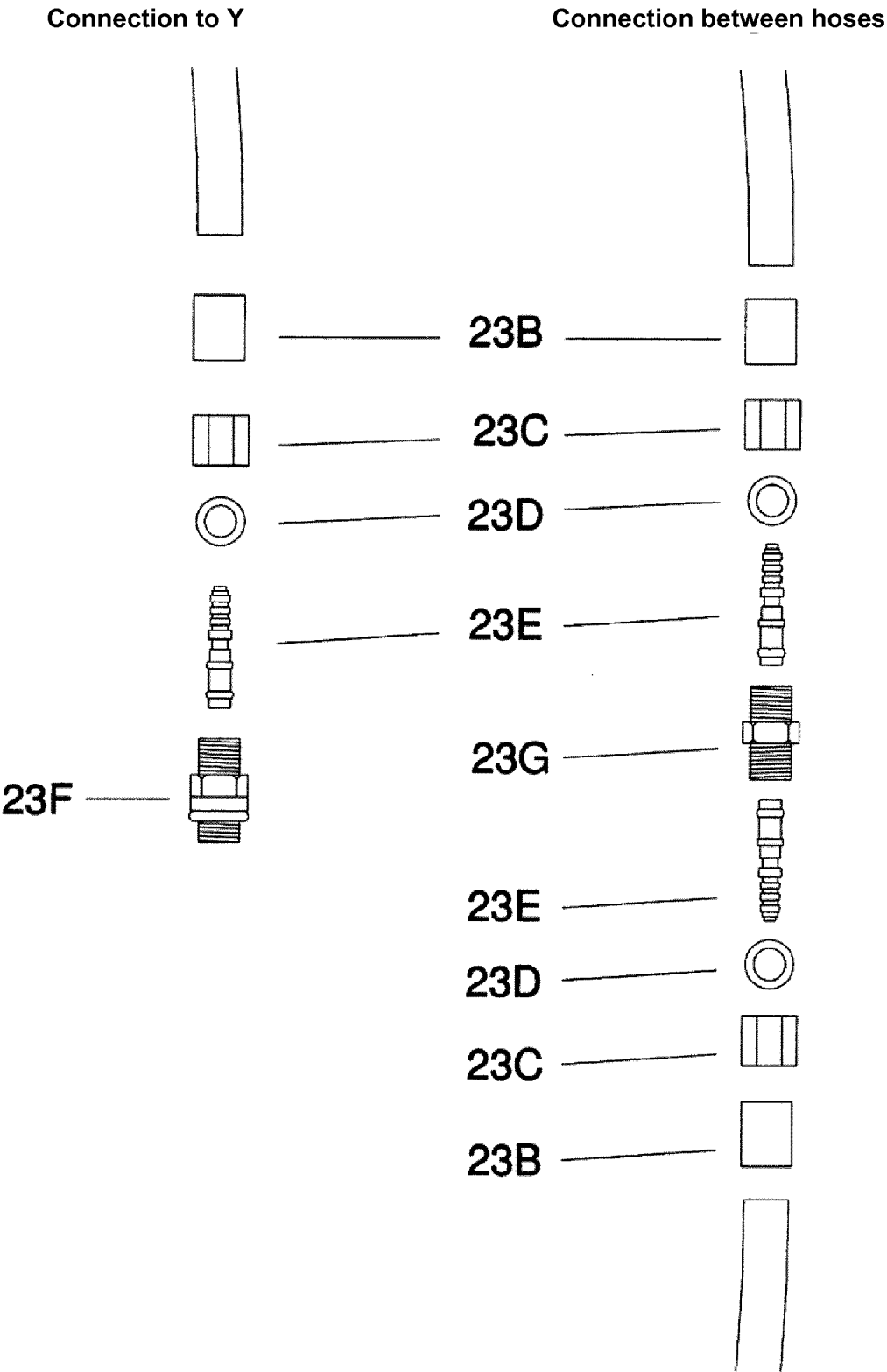


Figure 6

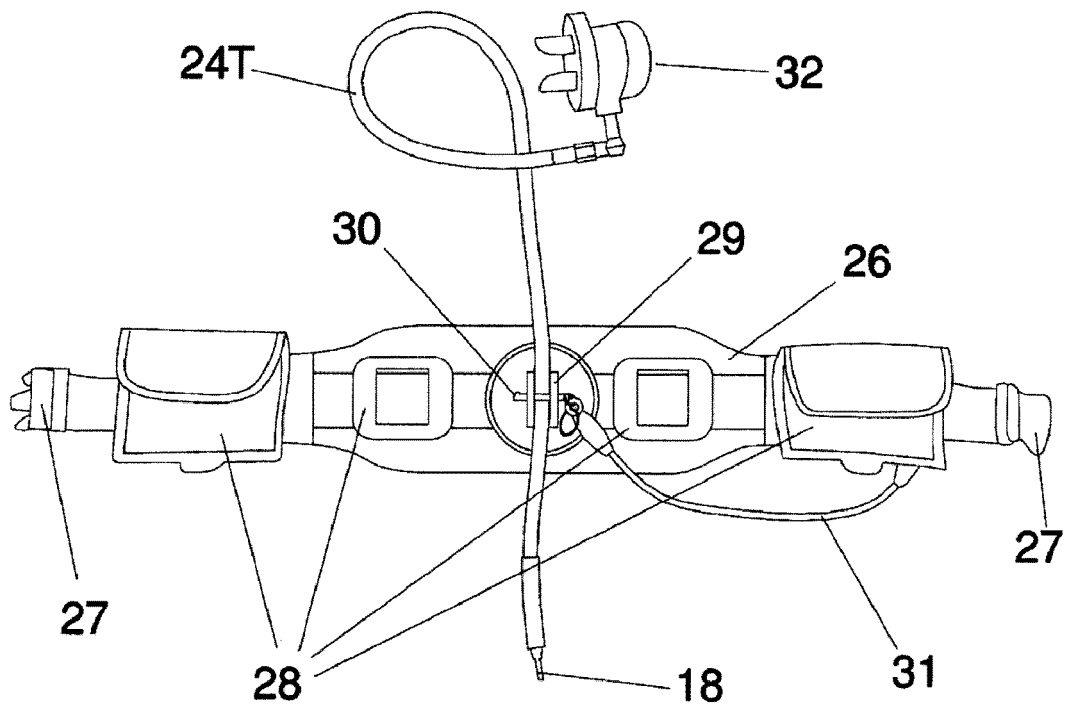


Figure 7

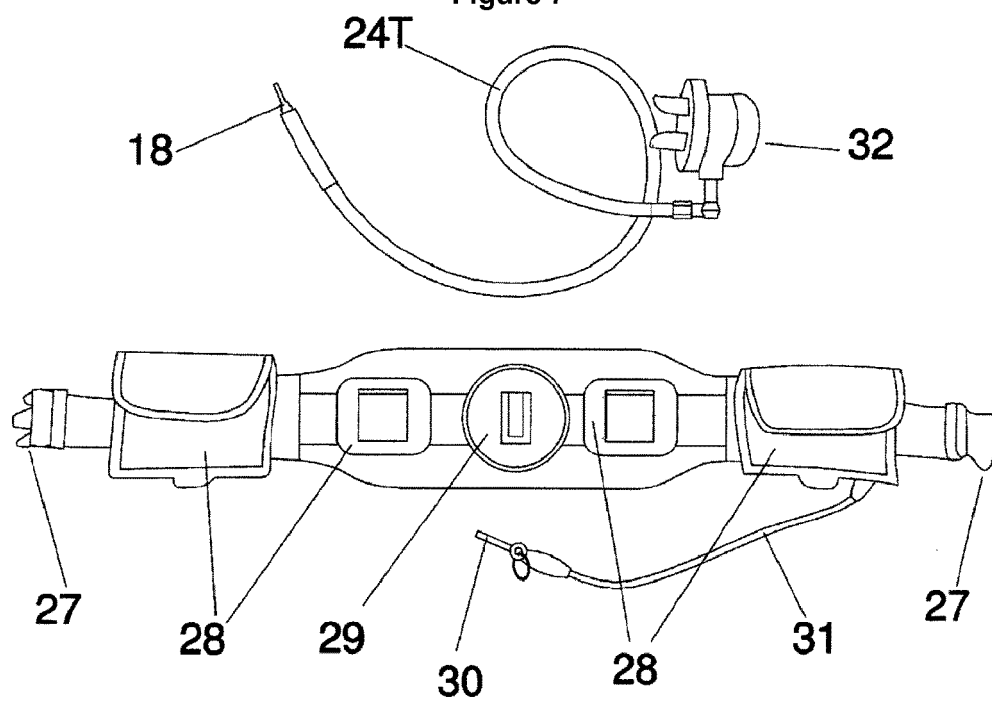
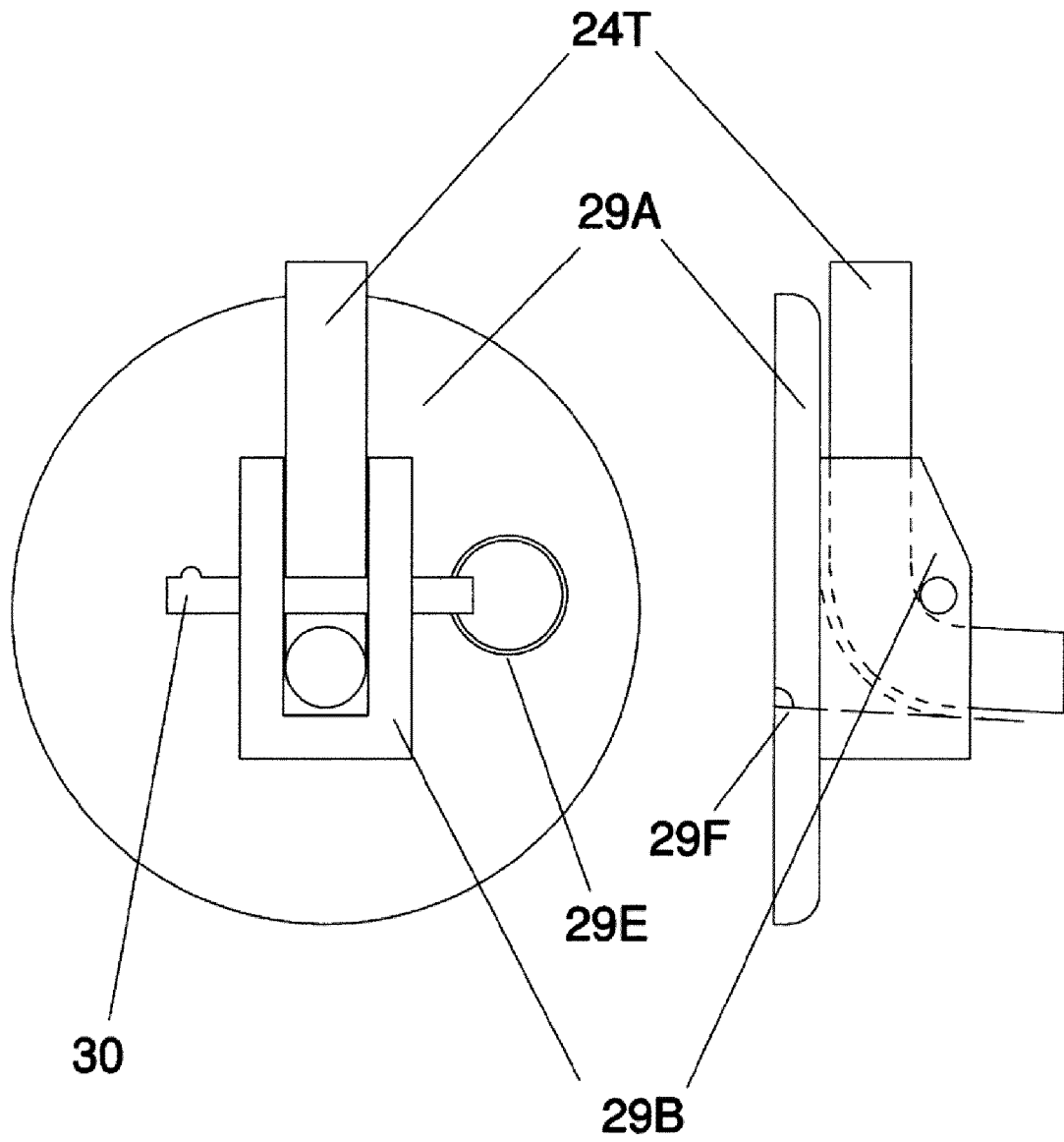


Figure 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2013/000059

A. CLASSIFICATION OF SUBJECT MATTER

B63C11/20 (2006.01)

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)

B63C, F16L

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

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

EPODOC, INVENES, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	ES 1039590U U (PROBOX MALLORCA S L) 01/01/1999, the whole document.	1,2
Y	ES 1074222U U (PROBOX MALLORCA S L) 01/04/2011, the whole document.	1,2
A	US 4986267 A (DOSS STEPHEN F) 22/01/1991, column 5, lines 42 - 58; figures.	1
A	WO 9710991 A1 (TAE LMAN THOMAS R) 27/03/1997, figure 4.	1
A	EP 0341085 A1 (SNUBA INT) 08/11/1989, figures.	1
A	US 2003189337 A1 (PALMER ROBERT) 09/10/2003, description; figures.	2

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document but published on or after the international filing date	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"O" document referring to an oral disclosure use, exhibition, or other means.	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search
18/06/2013

Date of mailing of the international search report
(24/06/2013)

Name and mailing address of the ISA/

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Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2013/000059

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
EP0341085 A1	08.11.1989	JPH0314784 A JPH0755676B B2 AU3178489 A AU623638B B2 US4919631 A US4919631 B1	23.01.1991 14.06.1995 09.11.1989 21.05.1992 24.04.1990 25.11.1997
----- WO9710991 A1	----- 27.03.1997	----- NONE	-----
----- US4986267 A	----- 22.01.1991	----- NONE	-----
----- US2003189337 A1	----- 09.10.2003	----- US6746056 B2 US6705647 B1	----- 08.06.2004 16.03.2004
----- ES1039590U U	----- 01.01.1999	----- ES1039590Y Y	----- 01.06.1999
----- ES1074222U U	----- 01.04.2011	----- ES1074222Y Y	----- 30.06.2011
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