Innovation, Sciences et Développement économique Canada
Office de la Propriété Intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

CA 2720574 C 2019/04/02

(11)(21) 2 720 574

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2010/11/01

(41) Mise à la disp. pub./Open to Public Insp.: 2012/05/01

(45) Date de délivrance/Issue Date: 2019/04/02

(51) Cl.Int./Int.Cl. *B63C 9/15* (2006.01),
B63C 9/19 (2006.01)

(72) Inventeurs/Inventors:
HENUSET, YVES MICHEL, CA;
BOUCHARD, STEPHANE, CA

(73) Propriétaire/Owner:
BB-C TECHNOLOGIES INC., CA

(74) Agent: TESSIER, LOUIS

(54) Titre : DISPOSITIF DE SURVIE AQUATIQUE ELECTRONIQUE
(54) Title: ELECTRONIC AQUATIC SURVIVAL DEVICE

(57) Abrégé/Abstract:
An aquatic survival device wearable by an intended user, the aquatic survival device comprising: a substantially U-shaped body wearable around the neck of the intended user and defining a gap leading into a recess configured to receive the neck; an inflatable bladder contained in a deflated state in the body; a cartridge containing a pressurized fluid; an inflation control element operatively coupled to the cartridge and the inflatable bladder for controlling inflation of the bladder, the inflation control element being configurable between a closed configuration wherein the pressurized fluid is maintained in the cartridge and prevented from reaching the inflatable bladder, and an open configuration wherein the cartridge and the inflatable bladder are in fluid communication with each other to allow inflation of the bladder with the pressurized fluid. The body is configured and sized to allow inflation of the bladder upon the inflation control element reaching the open configuration.

ABSTRACT

An aquatic survival device wearable by an intended user, the aquatic survival device comprising: a substantially U-shaped body wearable around the neck of the intended user and defining a gap leading into a recess configured to receive the neck; an inflatable bladder contained in a deflated state in the body; a cartridge containing a pressurized fluid; an inflation control element operatively coupled to the cartridge and the inflatable bladder for controlling inflation of the bladder, the inflation control element being configurable between a closed configuration wherein the pressurized fluid is maintained in the cartridge and prevented from reaching the inflatable bladder, and an open configuration wherein the cartridge and the inflatable bladder are in fluid communication with each other to allow inflation of the bladder with the pressurized fluid. The body is configured and sized to allow inflation of the bladder upon the inflation control element reaching the open configuration.

TITLE OF THE INVENTION

ELECTRONIC AQUATIC SURVIVAL DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention's target is to save lifes. According to worldwide statistics, a little less than half a million people die by drowning every year, mostly at sea. If there are numerous types of life preservers and jacket, such equipments are not designed for swimmers. Most inflatable life jackets are not built to self-inflate when the wearer is unconscious, except for those that have water detection cell mechanisms that go on when they touch water. This invention compensate for the missing link between standard approved life jackets and other types of floating devices that requires consciousness to be triggered. No similar device was found in previous patents searches. In that sense, the described invention is innovative and unique.

2. Description of Prior Art

Several U.S patents are directly related to life preserving devices. Bissig, in his U.S. Patent No. 4,563,156 describes a rescue apparatus that is worn at the neck. Its U-shaped collar encircling a person's neck, as it is written, is similar in shape to the invention. However, his apparatus is not design for swimmers as it is a rescue device and it does not operate automatically in case of unconsciousness. Furthermore, people have to withdraw a housing prior to its use, preventing any other usage of the collar. Since it is a rescue equipment, it is to be used consciously only once. Thus, it is not suitable for swimmers in pools or at the beach. The mechanism of the apparatus described by Bissig needs a reaction between water and a disk-like support-elements, placed on edge. When this latter become soft and buckle, it no longer prevent the activation of a valve that releases a gas that inflates the floating element. This may take time, especially if the water is cold. When a person is under stress or panic, the time factor is critical. Our invention allows the deployment of the floating elements within 5 – 6 seconds after the wearer has triggered the gas-release mechanism, the triggering action can be both done manually or automatically, depending upon wearer's conditions.

Miller discloses in his U.S. Patent No. 6,767,267 an apparatus to be worn as a necklace for small child, when submerge in water, leaving the child's head above water. In this apparatus, the inflatable balloons are inflated automatically as soon as the child touches water. A chemical reaction between water and solid compounds provokes wall gas chamber to collapse, generating enough carbon dioxide gas to inflate the balloons. Such device takes a too long time to operate and is not suitable for swimming since the reaction in water is automatic. Again, this type of collar is not designed for swimmers.

The only similarity between Miller's invention and this one is the body location where the apparatus is to be worn.

The life preserver of the encapsulated type disclosed by Moran in his U.S. Patent No. 4,297,758 is also worn at the neck and at the waist. His invention allows the protection of inflatable cell or cells that are comprised into a housing where panels are used as solid protector. The inflatable cell or cells are so called encapsulated, because they are confined thereinto. Moran does not mention the presence of any type of electronic controller or even mechanical trigger. The mechanism of inflation is not mentioned although it is stated that cylinder, presumably filled with compressed gas, may be present within the invention. Nothing is disclosed regarding the overall inflation mechanism or principle otherwise that it can be inflated, manually. The invention disclosed herein could be considered also as an encapsulated type, but, its mechanism and operational principals are totally differents.

In U.S. Patent no. 6,776,678 Courtney discloses a collar to improve life jacket performance. The invention described in Courtney's patent relates to an added collar, integrated or attached, to a standard life jacket. The purpose of this invention is to help support of a wearer's head by holding the latter in the axis of rotation. This said cephalo-cervical support has been designed to improve the efficacy of all personal flotation device (PFD). The described collar is preferably made with soft inner fabric for comfort. Our invention differs from that concept in various ways. First, our invention is not intented to add to a standard PDF, although nothing prevents from using it in addition to a PDF. Second, our invention is complete as a safety device and serves only if needed, in case of an emergency. People can swim with our invention without realizing that they are wearing it. Third, our invention is an electronic device, Courtney's isn't.

Bazant discloses a life preserver that is described as a PFD fitted to be worn at the neck in his U.S. Patent No. 7,249,988. In his patent, no claim concerns the presence of bottle of compressed gas or low boiling point liquid to inflate inflatable what is defined as bladder, or mechanisms to inflate bladders. There is no electronic content in his invention and is not worn as a collar that contain the inflatable element or elements.

U.S. Patent No. 3,988,795 held by Robertson, describes a PDF of rectangular shape with a circular neck opening. Again, the neck is exploited to hold a survival device, although the attach system is totally different from our invention. Nothing is said in his patent about inflatable cell, cells, element or elements.

Jones, in his U.S. Patent No. 3,931,657 discloses a life vest that has similarities with previous patent. In his invention, there is an inflatable bladder whose purpose is to improve the buoyancy of the PDF. He also mentions the use of a collar within.

Finally, a life jacket developed by Higginbotham et al in U.S. Patent No. 7,169,001 discloses a PDF model that appears as a buoyancy device equiped with lateral under arm buoyancy areas to hold the wearer more upright and normally higher above the level of

water when in use. Our invention bears under arm holders as well, but they are not used to improve flotation but rather to improve the overall support of the device when worn.

SUMMARY OF THE INVENTION

The present invention relates to an electronic survival aquatic device whose purpose is to safe life, by preventing people from drowning. This invention discloses herein appears as a collar made of polymer with two under arm straps. The said collar is made of two main parts, an inner collar and an outer protective cover. Both parts form a hollow necklace within which electronic components, bottles, perforation mechanism, beacons, flotation elements and triggers are in. Flotation element are folded inside the collar. Although this latter can provide enough flotation support, as a function of wearer's weight, it is preferable to at least double the flotation units. Hence, if one unit fails to open or become damages once opened, a second unit can allow the flotation of the wearer.

This invention is made to improve security in water, especially for swimmers at beaches or at swimming pools, fishermen and for children living nearby water pools. When the device will be approved by worldwide approvals or standards, it might equiped boats and ships, aircrafts and airplanes. The invention is easy to use. Although it is intented to operate with batteries, it could be triggered manually if the wearer is conscious. With batteries, this invention can be operated manually or automatically, with or without consciousness. This is what makes this invention innovative.

The electronic aquatic survival device has two emergency buttons. One that is battery operated, and one, or the same button, that can be manually operated. This latter is designed to secured the use of the collar even if there is no battery or batteries, or if a battery failure has occured. However, when such circumstance occurs, the activation of the device is only possible when the wearer is in a conscious state, since it is an electronic device. In a state of unconsciousness, at least one floating unit shall be fed by a sufficiently charged battery. This is why bicolor LED equip the collar, to warn the wearer that if one ore more batteries become too low to operate the device, it is no recommanded to use it.

In a conscious mode, a swimmer who wears the collar around his neck may swim with it freely. However, once it is putted ON, a depth gauge, a thermometer, a biocaptor and an electronic clock are working. For example, if a swimmer goes too deep and/or for too long underwater, a pre-programed algorith sets on an integrated-to-collar alarm that warns him to change his situation, otherwise, after a pre-determined time period, the perforation mechanisms will be triggered and the flotation elements will be inflated. The integrated underwater time period, as a function of depth, is such that a maximum time underwater is allowed. Even if this maximum is relative, and depends upon numerous factors such as health condition, weight and age, this invention is preferably programed for a 60-second time period underwater, after that, the flotation units will go on. If water temperature is below a minimum value, preferably 15 degrees celcius, the floating bags are automatically inflated once the device touches water. This feature helps to compensate hypothermia conditions.

Biocaptors are there to monitor heart beats. If pre-programed abnormal heart beat values are detected, as such when panic in water occurs, the flotation elements are automatically inflated.

The invention is built to open only once, although it is possible to recondition it afterward. When it is used, meaning, flotation bags inflated, batteries serve to feed one, two or more beacons. The invention bears at least two LEDs that start to light and/or pulse as soon as the floating bags are inflated. This optical beacon lasts several days with standard CR2 batteries. However, other battery types may be considered. Collar equiped with RF or GPS beacon emit signals for several hours with same or other batteries.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a general view of the invention, as it appears when the inflatable bags are not deployed. The electronic aquatic survival device is worn as a collar, or necklace, mainly composed of an inner shell, or framework (2) that holds all inside components showed in FIG.2, and an outer shell (1) that protects the inflatable bags. The collar is securely fixed to wearer's body through a flexible and comfortable neoprene strap (6) ajustable with a velcro type attach (5) insertable through a ring (18). The neoprene strap may support, depending upon invention model type, a biocaptor (19). Two string-shaped straps (4) to be ajusted at under arms through a small squeezing mechanism (non shown) serve as complementary support. From outside, the emergency button (7) and bicolor LED indicating battery charge level (3) can be seen.

FIG.2 is an exploded view of the inside components of the invention. All components are shown in double; the bag (13) is also doubled, as it is built with three layers of polymer, weld altogether, hence making two separate inflatable compartments. Each compartment can be inflated through a slit (14) that is sealed over the inner shell or framework (2). The electronic components are fixed to a PCB (11), namely, submersible alarm, thermometer, depth gauge, optic beacon (LED) and other sub-circuits to increase battery voltage and receive biocaptor signals (not shown). The RF or GPS beacon (17) is located at the back of the collar and is electrically connected to the PCB. This latter is fixed to the inner shell or framework (2). A bottle (10), that contains the gas or the low boiling point liquid is attached to the PCB. At bottle's head is the perforation mechanism (9) mainly composed of a housing on which there is a hammer with a piercing head, a damper, springs, lever and selenoïd (all not shown in FIG. 2). Bags are protected against all inner components by the addition of a small plastic shell (8). PCB is held securely over framework through an adaptor (12) that also prevents water leak inside the collar. Emergency button (7) is seen from inside. This latter can be activated both electrically or manually.

FIG. 3 represents an overall view of the invention worn at a wearer's neck. This figure illustrates an exemple of an adult wearing the collar. The size of the collar as compared to the size of a human body is relative, although the figure shows how small the invention is in contrast with standard PFDs.

FIG. 4 illustrates two differents upper views of the invention, before (15) and after use or deployment of the bags. Once activated, manually or automatically, the outer shell (1) is ejected or opened by the inflation of the bags. These latters can be folded in various manners, winded or snaked, as long as the inflation time is within a reasonable time period, preferably between 5 to 10 seconds. The inflated bags surround wearer's neck except where the velcro-type attach is. Mass of inflating media such as compressed gas is calculated as a function of wearer's weight, as so indicated on each model of collar. Wearer selects model of collar to use according to his weight.

FIG. 5 shows an example of a swimmer wearing the invention after deployment of the floating bags. The swimmer has his head always above water level, regardless his original posture when the deployment of the bags has occured, and regardless the mode of activation of the device, manually or automatically. The device provides a flotation posture for several days. Optical beacon is built to last several days as well while the RF or GPS beacon may last several hours. Both beacon start to operate once the bags are inflated.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is now explained in more details with descriptions of preferred applications.

The herein disclosed invention, defined as an electronic aquatic survival device, or EASD, is a collar fit to be worn at the neck of human beings essentially, in order to save their life in water in case of danger, hence preventing drowning by making wearer to float above water level.

The collar is made of an inner shell, or framework (2) that represents the main part of it. All other components, including the PCB (11), are fixed upon the framework. This latter is preferably made of plastic, but can be made of metal such as aluminum, or made of composite such as carbon fibers, as long as rigidity and corrosion resistance in sea water are met. Preferably, the plastic from which the framework is made is choosen among those that are easy to mold by injection molding. The overall shape of the collar fits the shape of a human neck, preferably a U-shape or a horse shoe shape, but other forms or shapes can be considered, as long as they do not provoque discomfort or other inconvenients such as oversized dimensions or sharp edges that might cut skin or floating bag. For ajustment and comfort, the collar is preferably equiped with a neoprene inner strap (6) that can be ajusted to wearer's neck dimension through the use of an attach (5) preferably made with a velcro type band that passes through a metallic or plastic ring (18). Other types of attach may be considered such as snap buttons, especially convenient for toddlers, zippers, clips or hooks, as examples, as long as they are safe or ergonomic application, corrosion resistant and practical, and made of various materials such as fabric, metal, plastic, polymer, composite or combinaisons of these latters.

The outside shape of the framework is smooth and constructed such a way that it can receive the neoprene collar so that both component are securely fixed to one an other.

Many fashions of fixation are possible, preferably, the neoprene collar is snapped or anchored over the inner wall of the framework, as long as the fixation does not hinder the access to battery compartment and/ or the access to the ON/OFF switch. Since biocaptors (19) are built for skin contact to work properly, at least one of them is incorporated within the neoprene collar. The biocaptor or biocaptors, when present, are connected to the main PCB (11) or a separate one especially designed to interpret signals sent from the biocaptor and connected to the main one (11). The width, thickness, color and flexibility coefficient and number of the neoprene band vary according to size of the framework and model. Preferably, the width of the neoprene band equals the width of the framework in order to guarantee comfort and skin-contact surface. When two or more neoprene bands are placed together, they are preferably saw, or glued or assembled otherwise, as long as the fixing mode does not deteriorate itself in normal water-contact conditions.

Port entries for battery or batteries compartment or compartments, for ON/OFF switches, for depth gauges, for thermometers and for under water alarms shall not allow water leaks. Otherwise, short-circuits may occur. The use of gaskets, bands, strings or other sealing media, is preferred to seal-tight all port entries. Considering ergonomic factors, it is preferable that a battery charge level indicator is present, and easy to see by the wearer of a person nearby the wearer. In our invention, two bicolor LEDs (3) are place on the front sides of the framework. Sealed as well, they indicate through color light the level of charge of the corresponding circuit. Such LED can be of any type and placed anywhere on the framework.

The inside of the framework is constructed, preferably molded, to receive emergency buttons (7), the RF or GPS transmitter (17) and all other parts illustrated in FIG.2 (8) to (12). These parts are assembled altogether to make a whole, as a preferable array that reduces overall dimensions of this latter. The perforation assembly (9) is designed to empty the content of the bottle (10), designated as the inflating media of the bag (13). In our invention, the perforation of the head's membrane of the bottle is performed by an assembly of components that is composed of a hammer equiped with a piercing point and a damper, springs, lever and solenoïd. The operating mechanism is described in details in the next section. The perforation assembly is fixed with the bottle to the inner side of the framework, with the hammer and springs in a slam-acceleration position. It is the retractable shaft of the solenoïd that prevents the hammer to swing toward the bottle head.

The perforation assembly and bottle altogether are fixed to the PCB, on the opposide side of the electronic components. PCB is pre-assembled with all electronic components, including the alarm, the depth gauge and thermometer, plus, the voltage elevation sub-circuit that feeds the solenoïd. Protective cap (8) and fitting adaptor (12) complete the overall assembly. All parts are fixed to a specific internal area of the framework. This area can be located anywhere on framework, preferably at 45 degrees on the horizontal plane. Once the PCB is connected to the mounted emergency button (7) and RF or GPS emitter (17), bags can be fixed over the whole assembly. In order to be seal-tight, the bags, made of flexible but resistant polymer material, preferably TPU, are heat welded or glued all around, hence, three layers making two bags as the preferred mode of assembly.

The portion of the polymer material that is heat welded, high frequency welded or otherwise welded, shall secure the assembly from leaks. Thus, one, two or three lines of welding or glue is preferred. The bags are fixed over the specific internal area of the framework through openings (14) that fit area's geometry and dimension. Bags are sealed on arcas with glue, heat welding, high frequency welding or any other type of fixing process, as long as this latter does not allow any leak of the inflating media between framework and outer surface of the specific area. For the same reason, the PCB is sealed by the adaptor from the other side. Hence. the inflating media is trapped in the bag after inflation.

Volume restriction imposed to the device involves that overall collar dimensions must be as low as possible. For that reason, bag or bags are folded withing the collar prior to put its protective outer shell (1) in place. Folding patterns are numerous, the snake-shaped form being preferred. The addition of tiny breakable clips made of soft material may be placed over folded bag, helping hence the final assembly of the device. Once folded and stable, the bag needs its final protection against damages. This is provided by the outer shell. This latter is simply fixed over the inner shell, or framework, by sliding and clamping outer shell edges over inner shell edged. This preferred mode of fixation can also be substituted by several other assembly configurations, such as mechanical anchorage, pressed-fit string, or any othewise locking mechanism, as long as the bondary between both shells arc water sealed and the separation between both shells is allowed when inflatable bag or bags push toward the outer shell. This equilibrium between the forces of tightness and mechanical resistance at the bondary is critical. If the tendendy goes toward the tightness, the separation between the shells is jeopardized. In the reverse. water leak may occur. This equilibrium is secured in our invention. One way to improve watertightness is to place a strip of sealing tape over the bondary, although it is not the preferred alternative.

Once assembled, battery or batteries can be placed inside designated compartment. Thus. the EASD is ready to be activated and worn.

DETAILED DESCRIPTION OF THE INVENTION APPLICATIONS

So far, there is no similar invention found on the market or in patents. The purpose of such invention is to save life by preventing people from drowning. In fact, there is no similar device as the one described herein that is designed for swimmers, particularly, or for people in contact with water under circumstances that life jacket is inappropriate or inconvenient. Fishermen working all day long abroad commercial boats or ships would not wear life jacket form both reasons of commodity and confort. For swimmers, reasons to not wear a life jacket is even more obvious. Life vests or jackets are not designed to allow under water swimming since they provide a floating posture all the time. For that main reason, people at beaches or at swimming pools do not wear life jacket, except maybe for toddlers. Just as helmet protects conveniently and confortably a biker, this invention is designed to do the same for swimmers.

People living nearby pools of water and having children are constantly concerned by their security; they are always anxious that of of their love ones might fall accidentally in water without wearing any PFD. It is obvious that children won't play with a life vest or jacket the entire day. But if they could wear a small electronic survival aquatic device, they will get use to it. Models for children are design such that youngsters are not able to deactivate or remove the invention from their body.

The electronic aquatic survival device (EASD) disclosed herein is a small protective emergency device developed for people in contact or in possible contact with water. It is an electronic device that works with common batteries, preferably CR2 batteries. Without battery or batteries, the device can work manually, meaning that the wearer who wants to activate it shall be in a consciousness state of mind, or that someone nearby him in water who wants to activate it shall be in a conscious state of mind. Otherwise, with sufficiently charged battery or batteries, the device can be activated automatically under water even if the wearer is in a state of unconsciousness. In other words, the EASD works in two separate modes.

Working operation in the conscious-state mode :

The wearer first shall trigger the ON/OFF switch (preferably locaty behind the neoprene inner collar) to see the charge level of the batteries (the device may have more than one flotation cell unit, preferably two). A bicolor LED (3) will light up. Bicolor LED convention is GREEN for good/RED for bad. If the LED goes red, the circuit corresponding battery is to weak to make the device safe enough to be worn, it has to be changed. If the LED does not light up, the battery is either dead or absent from the battery compartment. If the LED goes green, the device is activated and in nominal condition to be worn. To wear the EASD, a person has to put the under arm straps, ajusting them to his body size, then opening the neoprene collar and put the U-shaped device at his neck. Using a velcro type strap fixed to the neoprene collar, the wearer passes the said strap through a ring, preferably a stainless steel half-rounded ring, and fold it back to its corresponding anchorage to a conform position.

When the wearer reaches water, the following electronic components starts to operate and transmit information to the internal pre-programed microprocessor : depth gauge, thermometer, biometric captor and battery charge level cell. Several emergency situations may occur in water. For example, a swimmer might feel no so well and judges that he is not able to swim back to a sound and safe position. He decides to activate his personal EASD by depressing the electric emergency button, preferably located at the top side of the device. In order to avoid accidental or undesired triggering of the perforation mechanism, it is prefable to delay the activation signal. This delay can be programed many ways. Preferably, the wearer has to push several times the emergency button, like 3 to 5 times, or the wearer has to push down the emergency button for several seconds, preferably 2 to 4 seconds. The first described pattern is pre-programed in most models.

The depressed button sends a signal to the microprocessor that triggers the solenoïd. The retractable shaft within the solenoïd is then pulled in (or out); a lever leaned over it is

then freed to tip over its axis pivot and no longer prevents a spring-armed hammer to flip from its base pivot and hit the head of a compressed gas or low boiling liquid bottle. The hammer is equiped with a piercing point and a damper. The potential energy from the spring or springs is instantaneously transformed into kinetic energy used to break the bottle's head membrane and free its content. The damper allows the hammer to come back a little bit from its maximum position, helping the delivery of the inflating media. This latter inflates a sealed inflatable bag that has been previously folded inside the collar. The increasing inflation of the bag creates a pressure that eventually becomes high enough to push a protective outer shell from outside the collar, freeing completely the inflated bag up that reaches its final volumetric dimensions. Hence, the bearer floats with his head above water level. The volumetric dimensions of a bag is determined such that its internal pressure does not exceed twice the atmospheric pressure at NPT conditions nor under half of it, otherwise rupture of the bag may occur or floating conditions may not guarantee that wearer's head be above water level.

If the wearer swims or stay at water surface, the programed algorithm allows this safe situation for as long as there is no position change or the battery or batteries start weakening. If the water temperature is too low, below 15 degrees celcius for example, the thermometer sends a signal to the microprocessor that automatically triggers the perforation mechanism, allowing the inflation of the bag. This property of the invention helps to compensate for hypothermia conditions under which the wearer might has to live. If water temperature is above a comfortable value, for example, above 15 degrees celcius, then, the device works according to normal standard conditions.

In order to be practical and to reach invention's goal, namely, saving people's life in water, more precisely, under water, the total under water immersion time shall be limited to avoid drowning or other negative health hazard cause by near-drowning situations. For that reason, the algorithm is pre-program for under water time periods that depend upon brackets of wearer ages. For example, a maximum under water time set of 60 seconds is pre-program. As an example, a adult wearer in a conscious state cannot stay under water more than 55 seconds if the water depth is lower than 10 cm, as an example of pre-programed depth, otherwise the alarm is triggered by the microprocessor for 5 seconds, as an example of alarm running time, after that, the inflation of the bag or bags goes on. For toddlers or young children, pre-set under water time can be 15 seconds, for example.

In order to take into account the time it might take to rise from a certain water depth, the algorithm is pre-programed accordingly. For example, is a wearer swins and goes at a water depth of 1.5 meters, the alarm is triggered after 20 seconds if this depth value does not change. If the wearer changes his position by swimming in an upward motion, the microprocessor interprets this position change as a controlled-situation state, hence, the alarm will stop and more under water swimming time will be allowed up to a maximum value. This latter depends entirely upon the integration of time multiplied by water depth. To be again practical, once the wearer comes back at a water depth of 10 cm or smaller, the chronometer within the microprocessor is reset. This overall functionality of the algorith allows a wearer to swim for as long as it pleases him, as far as the algorithm is pespected. Programed conditions of the algorithm are infinite, as long as the invention

purpose is logically respected. Hence, models of collar can be designed for people practicing aquatic apnea.

Under numerous different circomstances of danger or security uncertainty, the wearer of the invention in a conscious state can always depress the emergency button to provoque the inflation of the bag or bags and float above water level, hence saving his life. In the case where the battery or batteries are empty or defective, for examples, the invention can be activated manually through a manual emergency button. This latter is either located elsewhere on the collar or combined with the electronic button. For example, the wearer pushes down the electronic emergency button until it breaks and pushes the shaft of the solenoid, thus, provoquing the inflation of the bag. An other example of emergency button is a mechanical button placed at angle inside the inner shell of the collar. If needed, the wearer depresses the button to provoque inflation of bag or bags.

Working operation in the unconscious-state mode :

The invention works automatically, as long as its circuitry is in the ON state and the battery or batteries have enough charge to light up the LED in the GREEN state. This automatic mode works then regardless the conscious or unconscious state of the wearer. The unconscious-state can be considered two different manners. First manner, in water, a person in a panic state of mind can be considered as having his judgement lost, as encountered in several books related to diving. This state of mind may conduct to drowning. Second manner examples, a person has lost consciousness or has been hit on the head then fall down in water. In both manners, if the person wears an activated EASD in nominal working condition, the microprocessor, via the electronic components, will take the proper decision depending upon under water condition within which the wearer will go through. For example, in a free vertical, or nearly vertical under water fall, at a water temperature above 15 degrees celcius, the wearer having his head positioned downwardly, the chronometer starts to count under water immersion time as soon as the water depth reaches 10 cm, then, as soon as the water depth reaches 1,5 meters, a maximum of 20 second before the 5-second alarm goes on is set. After the 25-second time period, the bag or bags are immediately inflated after the microprocessor has triggered the compressed gas or low boiling liquid bottle perforation mechanism. Hence, the wearer's body turns upside up and rises above water level, the wearer's life is saved.

WHAT IS CLAIMED IS:

1. An aquatic survival device wearable by an intended user having a neck, shoulders and underarms, the aquatic survival device comprising:

- a substantially U-shaped body wearable around the neck of the intended user and defining a gap leading into a recess configured to receive the neck of the intended user;
- an inflatable bladder contained in a deflated state in the body;
- a cartridge containing a pressurized fluid;
- an inflation control element operatively coupled to the cartridge and the inflatable bladder for controlling inflation of the bladder, the inflation control element being configurable between a closed configuration wherein the pressurized fluid is maintained in the cartridge and prevented from reaching the inflatable bladder, and an open configuration wherein the cartridge and the inflatable bladder are in fluid communication with each other to allow inflation of the bladder with the pressurized fluid;
- wherein the body is configured and sized to allow inflation of the bladder upon the inflation control element reaching the open configuration.

2. The aquatic survival device as defined in claim 1, further comprising an attachment for selectively extending across the gap to secure the body to the neck of the intended user.

3. The aquatic survival device as defined in claim 1 or 2, further comprising straps extending from the body and positionable to encircle the shoulder and underarms of the intended user.

4. The aquatic survival device as defined in any one of claims 1 to 3, wherein the cartridge contains a pressurized gas.

5. The aquatic survival device as defined in any one of claims 1 to 3, wherein the cartridge contains a pressurized liquid having a low boiling point.

6. The aquatic survival device as defined in any one of claims 1 to 5, wherein the bladder is secured to the body.

7. The aquatic survival device as defined in any one of claims 1 to 6, wherein the inflation control element includes a piercing element selectively activatable to pierce the cartridge.

8. The aquatic survival device as defined in claim 7, wherein the piercing element is activatable mechanically.

9. The aquatic survival device as defined in claim 7 or 8, wherein the piercing element is activatable electronically.

10. The aquatic survival device as defined in claim 7, 8 or 9, further comprising a controller operative for controlling selective activation of the inflation control element.

11. The aquatic survival device as defined in claim 10, wherein the controller is operative for automatically activating the inflation control element under predetermined conditions.

12. The aquatic survival device as defined in claim 11, wherein the controller includes an immersion detector and the predetermined condition includes submersion of the controller in water for a predetermined duration.

13. The aquatic survival device as defined in claim 11, wherein the controller includes a depth gauge and the predetermined condition includes submersion of the controller in water at a predetermined depth.

14. The aquatic survival device as defined in claim 11, wherein the controller includes a temperature sensor and the predetermined condition includes submersion of the controller in water below a predetermined temperature.

15. The aquatic survival device as defined in claim 11, wherein the controller includes a heart beat sensor for detecting and processing electrical signals indicative of a heart beat of the intended user and the predetermined condition includes an abnormal heart beat of the intended user.

16. The aquatic survival device as defined in claim 11, wherein the controller is operative for automatically activating the inflation control element only after the predetermined conditions are met for a predetermined duration.

17. The aquatic survival device as defined in claim 16, wherein the controller is operative for issuing an alert while the predetermined conditions are met before termination of the predetermined duration.

18. The aquatic survival device as defined in any one of claims 1 to 17, further comprising cushioning material lining at least part of the recess.

19. The aquatic survival device as defined in claim 18, wherein the cushioning material includes neoprene.

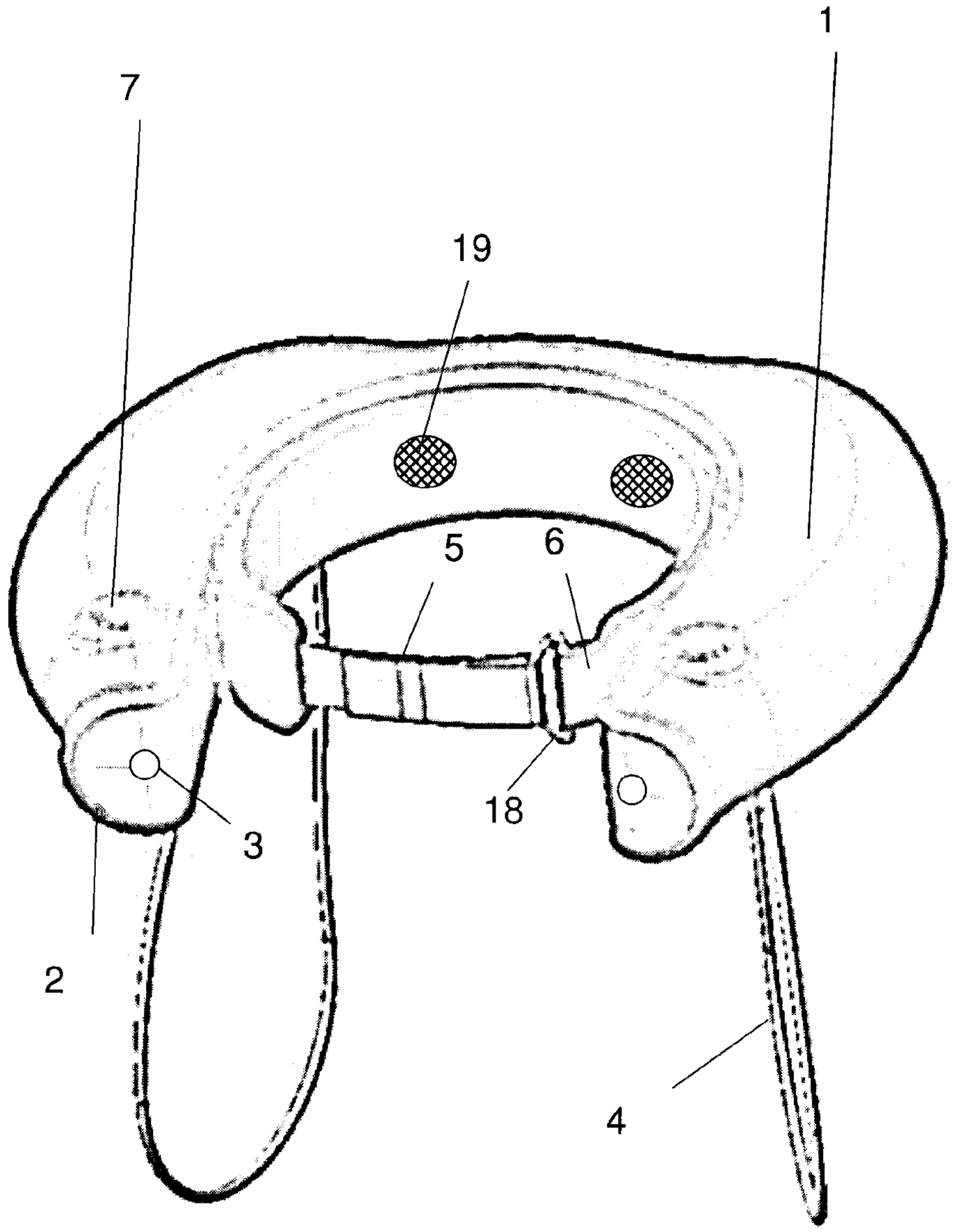

FIG. 1

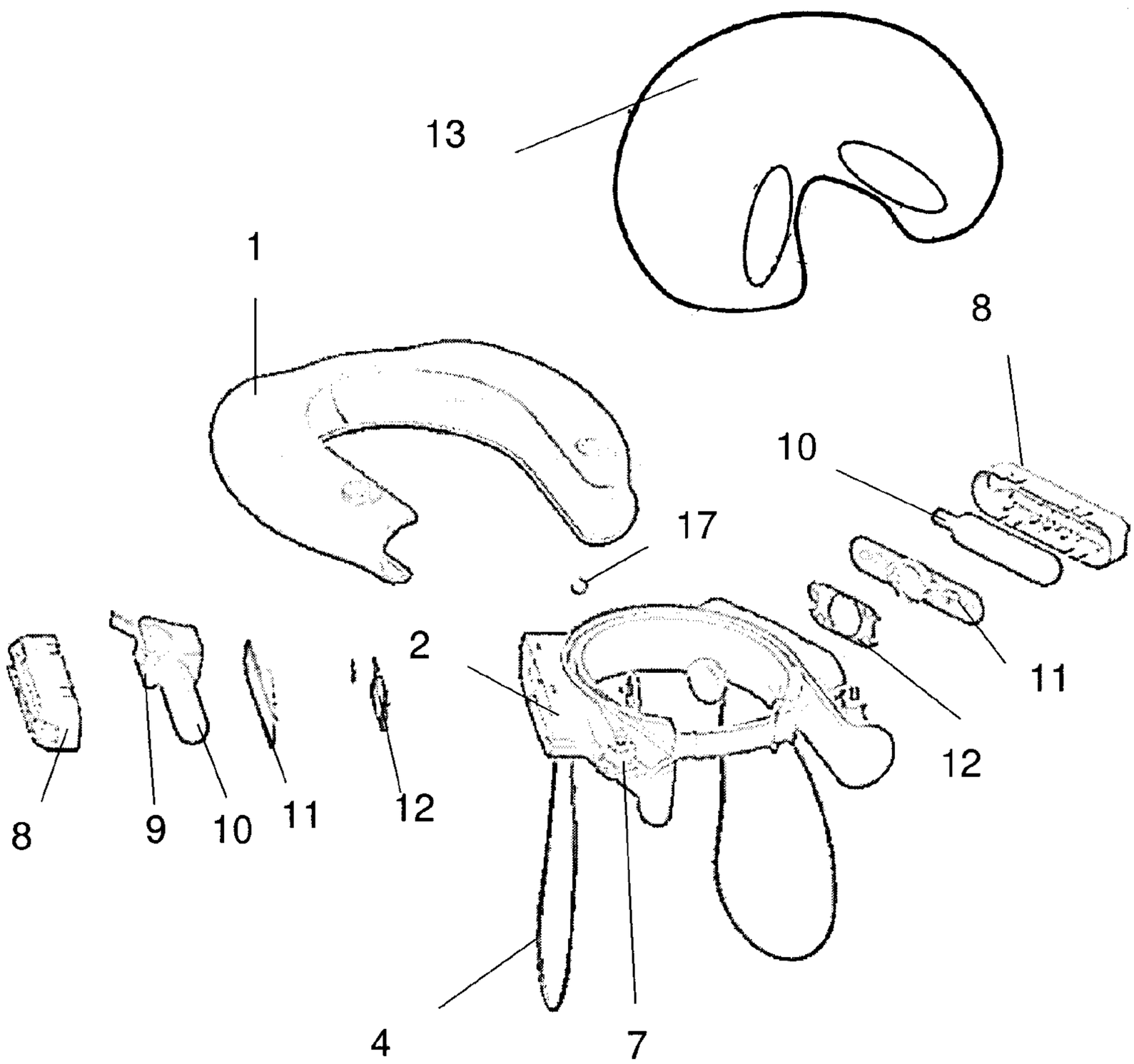

FIG. 2

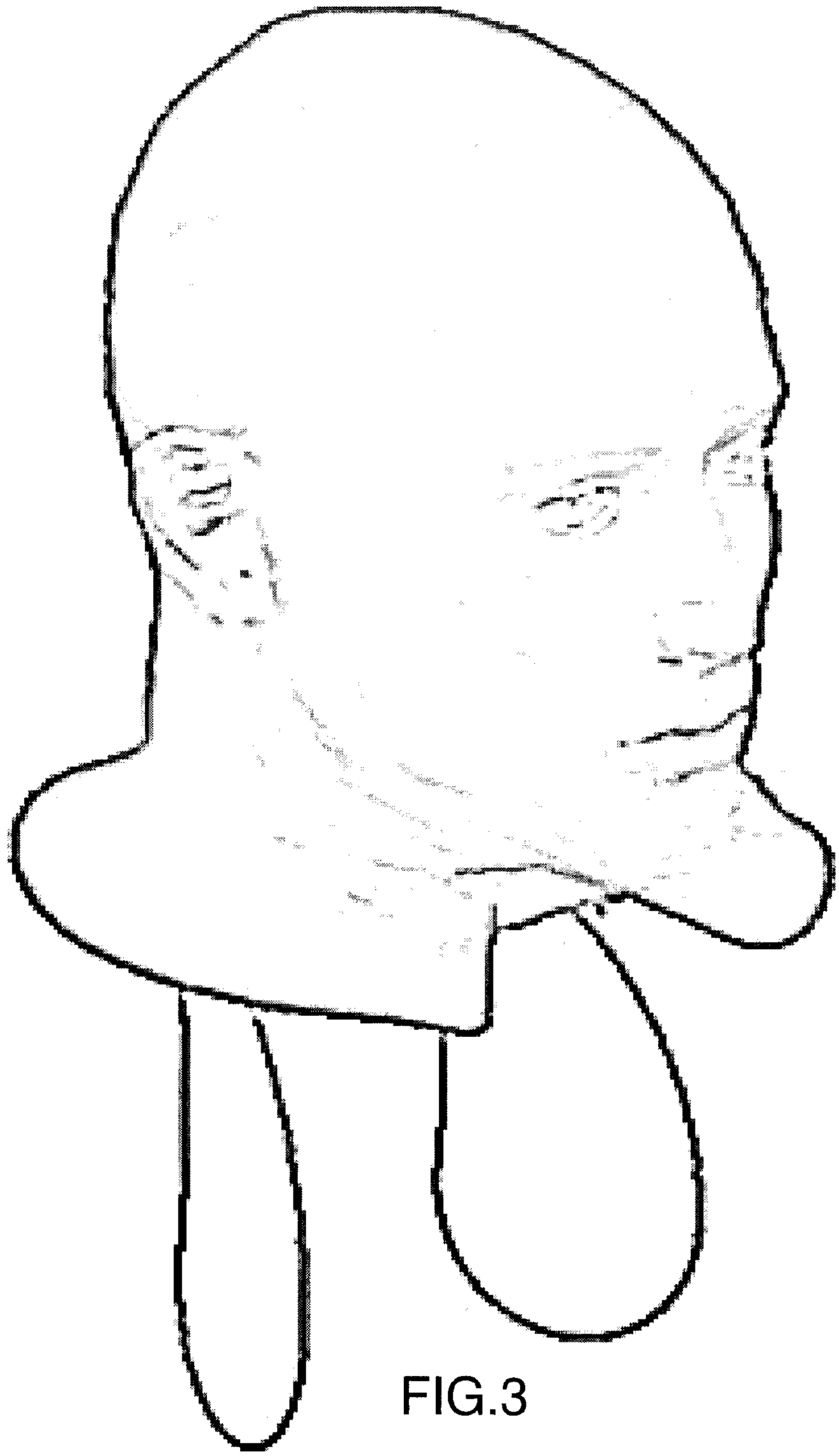

FIG.3

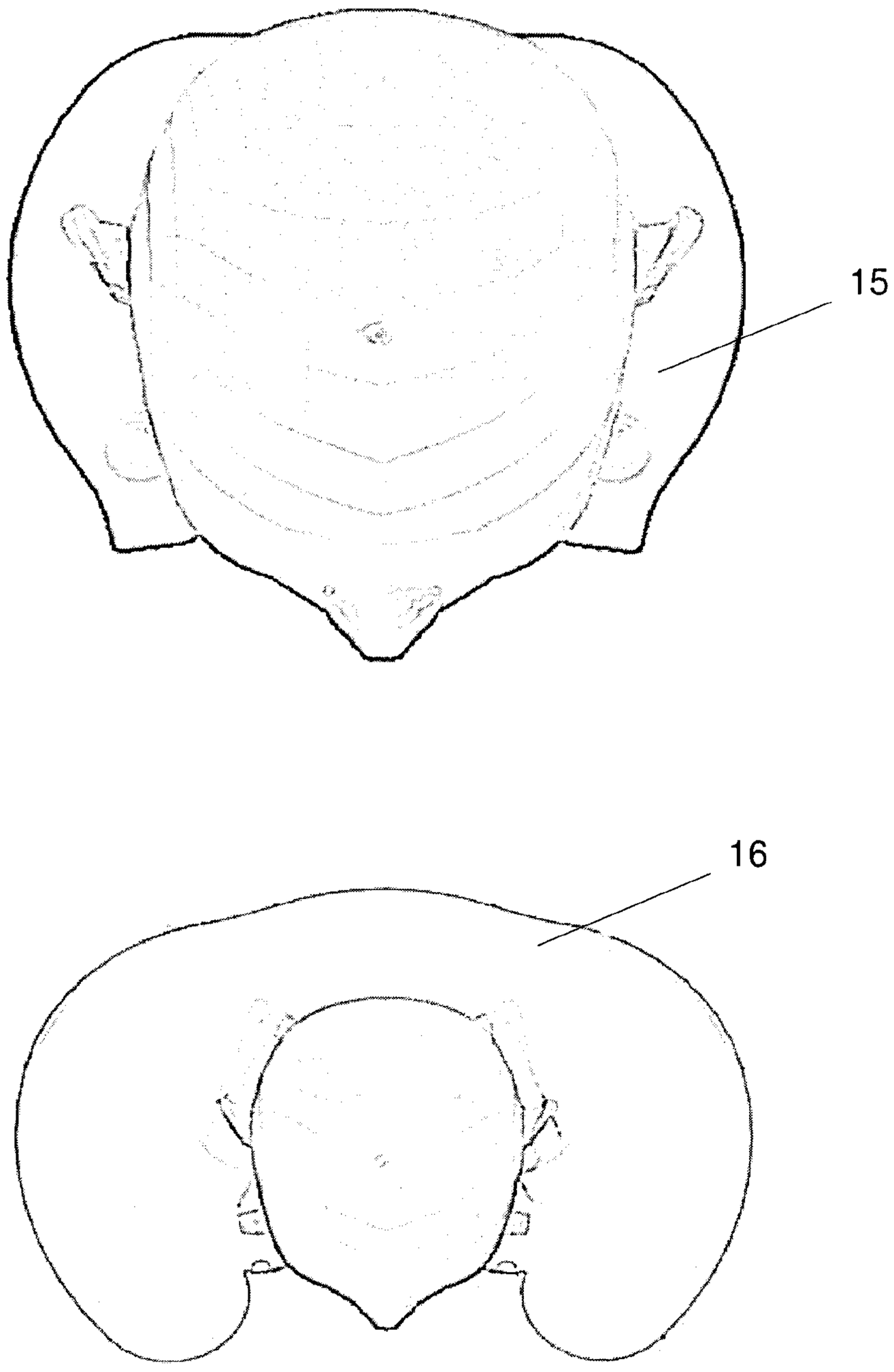

FIG. 4

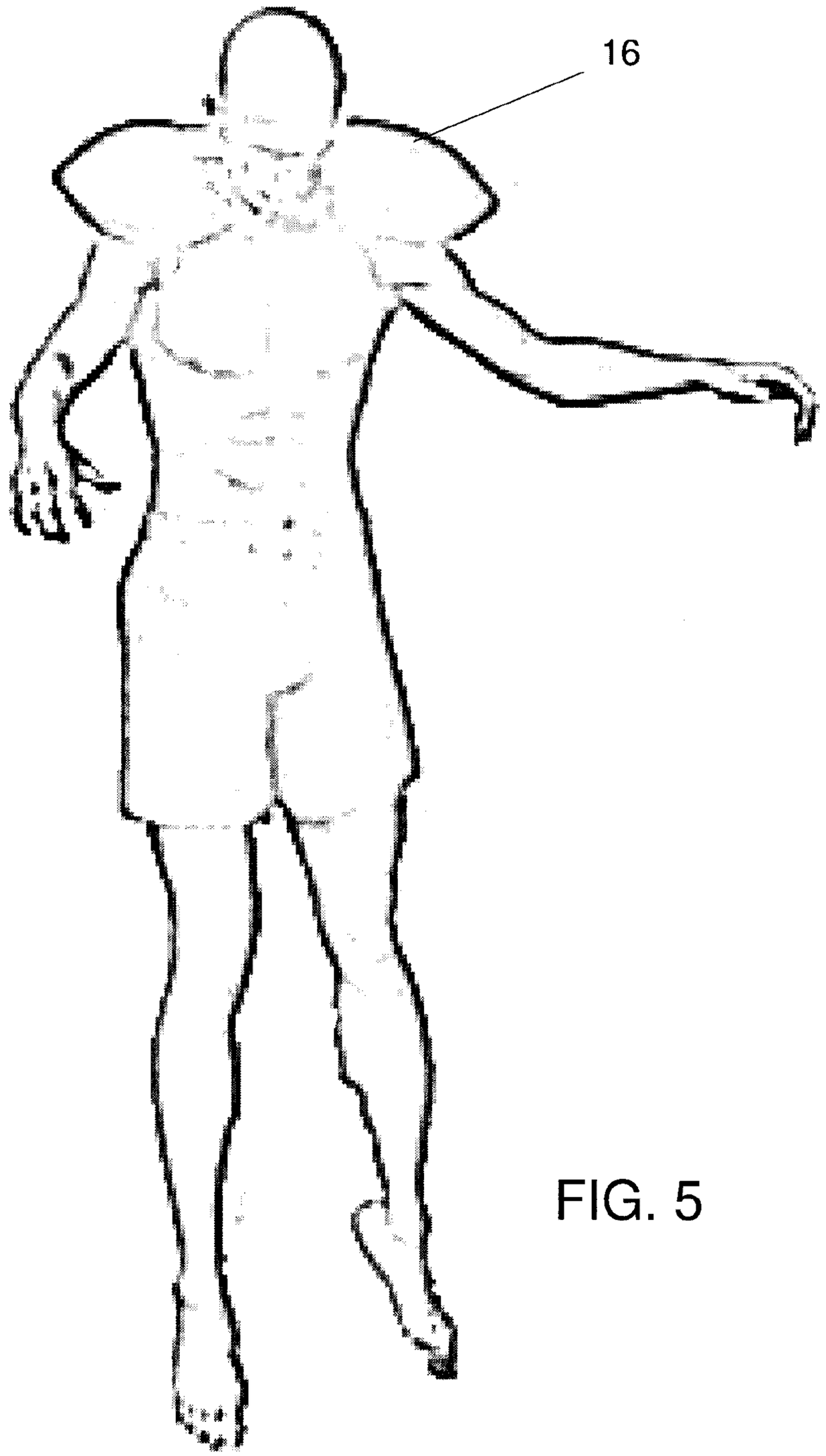

FIG. 5