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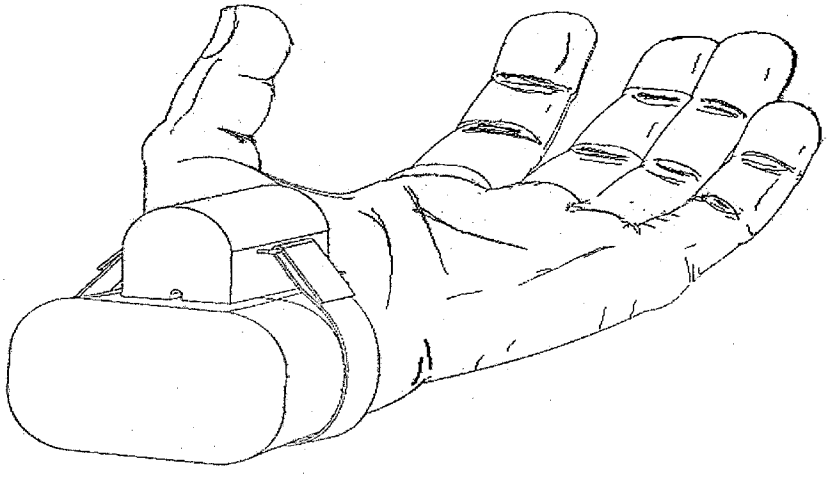
(54) **Title**: VASCULAR PUNCTURE SITE CLOSURE DEVICE



(57) **Abstract**: A vascular puncture site closure device comprises of a compressor / closure block (07) having at least one groove (04). The compressor/ closure block (07) has belt /band (03). The compressor / closure block (07) has two legs (05) and (06). The belt / band (03) is adjustable and sufficiently narrow in area on the supine side in the vicinity of ulnar artery.

TITLE:

"VASCULAR PUNCTURE SITE CLOSURE DEVICE."

FIELD OF INVENTION:

The present invention relates to a device that can be used at any vascular access/puncture site in order to stop bleeding after catheterization or similar invasive medical procedure. In particular, the present invention relates to a device that can be adjustably positioned on the vascular puncture / access site of the patients body part such as arm and/ or leg (hereinafter referred to as limb) where bleeding is to be stopped along with means for effectively maintaining patency of such vessel in the vicinity of the vascular access / puncture site.

BACKGROUND OF THE INVENTION:

After catheterization or similar invasive medical procedure, the blood escape through the puncture / vascular access site needs to be stopped as early as possible. Normally, pressure must be applied on the puncture site or vascular access site of the artery to achieve hemostasis so as to prevent bleeding. Several approaches to apply the necessary pressure on the vascular access site have been followed. One such approach is for a physician or nurse to manually apply pressure to the site of the puncture for an extended period of time. However, this is time consuming and restricts the time of such medical personnel.

Another approach is to use a mechanical device to apply the pressure on the vascular access site. One of the simplest devices for stopping blood escape through the puncture / vascular access site is tourniquet, which is tightened around a limb to stop arterial blood flow to the distal portion of the limb and thereby minimize hemorrhaging from the puncture site.

Several devices have been disclosed in the prior art, which are an improvement over the basic tourniquet , such as by applying pressure to only selected pressure points instead of around the entire circumference of the limb. Examples of such tourniquet-type devices include knob devices, tourniquets devices, elastic bandages and gauze, splint, which are disclosed in the following patents:

U.S. Patent No. 4,798,199 has sought to disclose an arterial wrist support for invasive monitoring of a patient's blood gases during and after surgery. The apparatus is allegedly designed to support a patient's hand, wrist, and at least a portion of the patient's forearm in a relaxed position, which allows for efficient starting of the arterial line and continuous maintenance, observation and cleaning of the arterial site. The apparatus may also be effectively used in the administration of intravenous care. More specifically, the arterial wrist support according to U.S. Patent No. 4,798,199 includes a substantially rigid, lightweight, unitary molded body anatomically shaped to accommodate the contours of a patient's arm and to position the patient's wrist at the proper angle to expose the radial artery for

accurate and efficient handling of the arterial puncture. Wide resilient straps adapted to be releasably secured to the molded body are provided to attach the body to the patient's arm and thus immobilize the patient's wrist. The molded body may also include a foam pad lining located on its upper surface and extending along its length to cushion the patient's hand and wrist and thus provide a soft comfortable support.

US Patent No. 5,601,597 discloses a combination of radial artery occluder and wrist splint to prevent blood flow through a puncture wound or incision following catheterization or similar invasive medical procedure. This device generally includes three main components: a wrist splint that extends along the distal end of the patient's forearm and the back of the wrist and hand; an adjustable pressure strap attached to the splint that extends around the distal end of the forearm; and an adjustable securing strap also attached to the splint that extends around the palm of the patient's hand. The wrist splint is preferably generally trough-shaped so as to cradle the forearm, wrist, and hand around at least approximately half the circumference thereof. Also, the wrist splint preferably includes padding on its inner, concave surface to cushion the forearm. The pressure strap includes a pressure pad that is selectively positioned over the wound in the forearm or wrist to occlude blood flow through only the radial artery while allowing blood flow to the hand through the ulnar artery. During use, the adjustable pressure strap is slowly tightened over the wound

until radial artery blood flow has stopped at the wound. This aids hemostasis in the wound in the radial artery but allows the ulnar artery to deliver enough blood to the hand to ensure tissue viability. In addition, the securing strap is tightened around the palm of the hand to help immobilize the wrist joint.

Both the support of US Patent No. 4798199 and the splint of US Patent No. 5601597 are moulded structures that are preferably comprised of a rigid or semi rigid plastic such as PVC or the like, which preferably have a soft padding on the side that will be in contact with the hand. Therefore, these products are expensive to produce.

US publication number 2004/0039431 A1 has disclosed a splint for a radial artery compression with a reinforcement profile on the bottom surface forming a support structure, such that the splint when placed on a flat surface is supported in one position without wobbling. It has further disclosed use of a compression pad with a compression strap.

EP 2245998 has disclosed a hemostatic device with inflatable balloon. In particular the said hemostatic device includes a flexible band adapted to be wrapped around a patient's limb at a site on the limb where bleeding is to be stopped, a portion for securing the band , a curved plate which is made up of material more rigid than the band and at least a portion of which is curved toward the inner periphery thereof , main balloon which is provided on the inner peripheral side of the curved plate and which inflates when a fluid is introduced

therein, and a pressing member which is provided between the curved plate and the main balloon .

As per the prior art, the pressure is applied to the vascular access site where bleeding is to be stopped in a vertically downward direction. But the hemostatic effect in such pressing direction can become excessive and the possibility of causing occlusion of the artery cannot be ruled out. The said device requires constant monitoring and efficient handling by well trained heath care professionals such as doctors.

DRAWBACKS/ LIMITATIONS IN THE VASCULAR COMPRESSION DEVICES KNOWN IN THE PRIOR ART:

1. The known devices are not economical but expensive;
2. The use of the known devices requires handling and periodic monitoring by the qualified medical practitioners;
3. As per some prior art devices a skilled person such as medical practitioner is required for periodic adjustment and monitoring of the vertical pressure on the vascular puncture site so as to maintain patency of the vessel ;
4. Almost every device available in the market works on the basis of directly applying pressure to the vascular access/ puncture site in vertical direction and the possibility of thrombosis in the vicinity of such puncture site and blockage of the artery or occlusive compression causing hemostasis is very high and cannot be ruled out.

5. It is almost impossible to maintain patency of the artery/ vein due to the application of vertical pressure directly on the vascular access/ puncture site.

SUMMARY AND OBJECTS OF THE INVENTION:

It is one of the objects of the present invention to provide an interventional cardiology product, which can produce effective hemostatic effect as well as maintain patency of the vascular access /puncture site.

The present invention provides a device for effectively stopping the bleeding at the vascular puncture / access site of the patient. The said device includes a closure block/ compressor (07) that can be positioned/ placed around the body part such as limb and/ or arm and further secured or tied by belt/band/ strip member (03). The said closure member such as compressor /closure block (07) has a belt/band/ strip member (03) and clip (04). The said closure member/ compressor has a groove (04) along the full length of the said closure block / compressor (07) on at least one side of the said block (07) such that it can be wrapped around the limb at the puncture site where bleeding is to be stopped. The said groove (04) can accommodate/ cover the vascular access / puncture site where bleeding is to be stopped. The two legs (05) and (06) of the said closure block (07) forming such groove (04) are used to apply requisite pressure in the area adjacent to the vascular access site.

It is another object of the present invention to provide simple and easy to handle vascular puncture/access site closure device with a view to carry out hemostasis for restricting the blood escape from the punctured vein/ artery.

It is one of the objects of the present invention to provide a vascular puncture site closure device, which is easy to handle by any of the health professional in the ward *inter alia* doctors, nurses, and paramedical staff.

A further object of the present invention is to provide a vascular puncture site closure device having means to maintain patency of the punctured artery/vein during its use.

A further object of the present invention is to provide a vascular puncture / access site closure device, which can be used to stop bleeding / escape of blood from the site within short span of time.

A further object of the present invention is to compressor/ closure block with a narrow belt / band (03) on supine side.

The object of the present invention is to provide a vascular puncture site closure device comprising a compressor / closure block (07) having at least one groove (04) and two legs namely first leg (05) and second leg (06), and adjustable belt / band (03) connected to the compressor / closure block (07). The belt / band (03) is sufficiently narrow in area on the supine side in the vicinity of ulnar artery.

Additional features and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following detailed description of the embodiments of the present invention exemplifying the best mode and working of invention at present.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a front perspective view of an artery compression device.

FIG. 2 is a partial exploded component view of a radial artery compression device.

FIG. 3 is a bottom view of a compression block of the artery compression device of FIG. 1.

Fig 4 is the perspective view of the compression block having groove of the present invention.

Fig. 5 is perspective view of the different shapes of the groove of the compression block.

FIG. 6 to 8 (c) illustrates various shapes and dimensions of the device.

DESCRIPTION:

There was no motivation to a person skilled in the art to use any vascular puncture site closure comprising of a compressor/ closure block (07) having groove (04) formed between the legs (05) and (06) that are almost parallel to each other (as shown in FIG. 1 to 6) and/ or a belt (03) by applying effective vertical pressure directly on the legs (05) and (06) having groove (04) in between so as to vertically compress the area adjacent to the vascular puncture site and the vascular puncture/ access site without causing occlusive compression of the vascular lumen. Thus, it facilitates applying vertical pressure on the vascular access/ puncture site so as to stop bleeding and causing hemostasis while maintaining patency of the vessel including the vascular access /puncture site. The said vascular access / puncture site may be provided on artery such as but not limited to the radial artery of the limb.

The features of the vascular access/ puncture site closure device of the present invention are shown in various figures accompanying the description viz. FIG. 1 to FIG.

As per one of the embodiments of the present invention, the vascular puncture site closure device comprises of the said compressor/ closure block (07) having a groove (04).

DESCRIPTION:

There was no motivation to a person skilled in the art to use any vascular puncture site closure comprising of a compressor/ closure block (07) having groove (04) formed between the legs (05) and (06) that are almost parallel to each other (as shown in FIG. 1 to 6) and/ or a belt (03) by applying effective vertical pressure directly on the legs (05) and (06) having groove (04) in between so as to vertically compress the area adjacent to the vascular puncture site and the vascular puncture/ access site without causing occlusive compression of the vascular lumen. Thus, it facilitates applying vertical pressure on the vascular access/ puncture site so as to stop bleeding and causing hemostasis while maintaining patency of the vessel including the vascular access /puncture site. The said vascular access / puncture site may be provided on artery such as but not limited to the radial artery of the limb.

The features of the vascular access/ puncture site closure device of the present invention are shown in various figures accompanying the provisional specification viz. FIG. 1 to FIG. 5 and accompanying complete specification viz. FIG. 6 to 8 (c).

As per one of the embodiments of the present invention, the vascular puncture site closure device comprises of the said compressor/ closure block (07) having a groove (04).

As per another embodiment of the present invention the compressor/ closure block (07) is directly or indirectly connected to or attached with strap/ band/ belt (03). The said connection is through the connectors such as connecting clips (02) as shown in the Figure 01.

As per one of the embodiment of the present invention the belt/ band (03) and the compressor/ closure block (07) are directly molded together.

As per one of the embodiments of the invention the compressor / closure block (07) has an adjustable belt / band (03). The said band/ belt (03) is sufficiently narrow in area on the supine side in the vicinity of ulnar artery.

As per the present invention, the compressor / closure block (07) has a top surface (01), and bottom surface (05) and (06) and groove (04) on at least one and the same side of the said closure block (07). The top surface (01) may be flat or may have an angular surface. The said groove (04) is formed such that first leg (05) and second leg (06) are spaced apart by the said groove (04), wherein the said groove (04) extends longitudinally/ linearly from one end to the other along the full length of the said compressor/ closure block (07). The said legs (05) and (06) have almost equal height and forms base of the closure block (07). The said legs / base (05) and (06) assists to hold/place the closure block (07) on the body part in an adjustably balanced position. The length of the said closure block (07) can be adjusted as per the requirement.

As per one of the parts embodiment of the present invention, the said grove (04) forms the two legs /sections (05) and (06). The said legs (05) and (06) may have asymmetrical or symmetrical dimensions. The possibility of the said legs (05) and (06) having slightly or totally different dimensions is not ruled out. The said legs (05) and (06) are defined in a manner to maintain the shape of the groove (04).

The following table merely illustrates the various dimensions of the said compression /closure block (07) and does not limit the same. The modicaitons and variations if the dimensions of the closure block (07) can be done without deviating from the scope of the present invention.

Sr. No.	Length (10 mm to 40mm)	Height (10 mm to 20 mm)	Width (10mm to 25)
1.	30	18	18
2.	40	18	18
3.	25	18	18
4.	20	18	18
5.	40	20	25
6.	15	10	10
7.	19	15	15

The length, height and width of the compression /closure block (7) is selected as per the requirement and few illustration are as given above.

The following table illustrates the various dimensions of the said groove (04) of the closure block (07) without limiting the same. The modifications and variations if the dimensions of the closure block (07) can be without deviating from the scope of the present invention.

Sr. No.	Length (equal to the length of the compression/ closure block) (10 mm to 40mm)	Depth (0.1mm to 5 mm)	Width /Diameter (0.1mm to 5)
1.	30	2	2
2.	30	2.5	2.5
3.	40	3	2
4.	25	2.5	2
5.	40	2	2.5
6.	23	1	1.5
7.	25	1	1

The depth of the groove is in the range 0.1 mm to 5 mm and the diameter/ width of the groove is about 0.1.mm to 5 mm as per the requirement.

As per the present invention, the base / legs (05) and (06) have equal / similar dimensions *inter alia* height when measured from the centre of the groove (04). Both the legs (05) and (06) have skin contacting surfaces (05) (a) and (06) (a).

More particularly, both the legs (05) and (06) are like two raised opposite side walls extruded in same direction to form and define the

said groove (04). The groove (04), and the said legs/ walls (05) and (06) run along the length on the surface of the compressor/ closure block (7), preferably the linear groove is in the middle area of the said compressor/ closure block.

As per one of the preferred embodiments of the present invention, the skin contacting surface of the said legs (05) (a) and (06) (a) may be plane. As per one of the embodiment of the present invention, the skin contacting surface of the said legs may have angular, semi cylindrical, or convex base.

As per one of the preferred embodiment of the present invention, the groove (04) has a concave, semicircular, angular biangular shape as shown in Figures. As per one of the preferred embodiment of the present invention the groove (04) is a semicircular shape depression/dent as shown in Figures. As per one of the preferred embodiment of the present invention the groove (04) is a curved shape depression/dent. As per the present invention, the said groove (04) of the compressor / closure block (07) has semicircle or concave circumference. As per the present invention, the said groove (04) of the compressor / closure block (07) has tunnel shape. As per yet another aspect of the present invention, the said groove (04) may have rectangular shape circumference, wherein two parallel edges (5) and (6) of almost equal / different height are perpendicular to the third innermost edge of the said groove (04).

As per one of the preferred embodiment of the present invention, the groove (04) is longitudinal / linear/ straight.

The groove (04) accommodates the vascular puncture / access site along with the adjacent portion of the artery such that the non occlusive compression is present during hemostasis.

The said groove (04) provides a tunnel/ channel like cavity that runs the length of the said compressor/ closure block (07) on the surface of at least one side that can be used to accommodate/cover the punctured access site of the radial artery during hemostasis. The said groove (04) may have at least three sided shape e.g. ∏ shape.

The dimensions of the said legs (05) and (06) may be almost symmetrical or asymmetrical and that can be adjusted as per the requirement.

As per another embodiment of the present invention, the compressor/ closure block (04) as described hereinabove can be connected to or molded with at least one securing means such as strap (03) or band (03) or belt (03) by means of connectors (02) such as buckle (02). The compressor/ closure block (07) is connected to the strap or band (03) through buckle / connectors (02).

As per one of the embodiments of the present invention, the compressor / closure block (07) can be integrated /molded directly with the band/ strap /belt member (3).

The block (07) may be molded separately, as a separate unit.

As per one of the preferred embodiment of the present invention, the compressor /compression block (07) is made up of non rigid material. The said non rigid material includes composite polymer, plastic or polystyrene or silicon material or the like. The said closure block (07) may be made up of a relatively softer, resilient, bio compatible material.

As one of the preferred embodiment of the present invention the compressor / closure block (04) is made up of silicon material.

As per another embodiment of the present invention the compressor/ closure block (07) is made up of rigid material such as but not limited to any metal, plastic or polystyrene.

The said block may be made up of material such as plastic, silicon reinforced polymer composite. The hardness/ softness can be adjusted as per requirement. A clear or about transparent material may be used to allow the personnel to view the puncture cite through the block (07).

As per one of the preferred embodiments of the present invention the strap / belt /band may be made up of rigid or non rigid material. As per another embodiment of the present invention the strap/ band assist in securing / maintaining the closure block (07) snugly wrapped around the limb in the preferred position with increased stability for requisite period of time.

As per one of the embodiment of the present invention the strap/ band is made up of Plastic Velcro material.

As per one of the preferred embodiments of the present invention, the band/ belt (03) is such that it is adjustably narrow at supine side.

As per the present invention the buckle may be made up of any suitable material such as but not limited to SS 316 material.

As per the preferred embodiment of the present invention the said closure block (07) having legs (05) and (06) forming groove (04) when placed / kept appropriately on the vascular access cite of the artery such as radial artery during post catheterization repair work, it - (a) provides sufficient space/room/cavity to accommodate/ cover the artery under sufficient pressure by means of a groove (04) ; (b) provides means to apply optimum pressure / compression below the legs (5) and (6) in the area adjacent to the vascular access site of the patient, and the groove (04) thus spontaneously helps to accommodate the corresponding portion of the said radial artery there under along with the vascular access/ puncture site within the cavity / groove (04).

As per the present invention the said groove (04) covers the vascular access/ puncture site along with the said vascular puncture/ access site and helps to maintain patency of the said artery at the puncture site. As per the present invention the said two legs (5) and (6) and the groove (04) provides requisite vertical pressure / compression in a

balanced manner to accomplish non occlusive hemostasis within shorter period of time and maintain patency of the said artery including the vascular access / puncture site.

Although the preferred embodiments have been described, it should be understood that various changes, substitution and alterations can be made without departing from the scope of the invention.

WORKING OF THE INVENTION:

The compression block (07) is moved into position over the artery having puncture site, wherein the skin contacting surfaces of the first leg (05) and second leg (06) are placed such that the groove (04) between the said legs (05) and (06) directly covers the portion of the punctured artery having sheath therein.

Post catheterization use of the device of the present invention involves the following:

1. Partially pulling out the sheath from the punctured vessel;
2. Placing the closure block (07) on the said sheath of step (1), which is partially inside the punctured vessel and partially outside the vessel;
3. Adjustably positioning the said groove (04) on the limb portion with the punctured vessel having sheath as described in step (2) above such that the puncture site along with the vascular puncture site is accommodated in the linear groove (04), As per one of the embodiments of the present invention the vascular puncture site is

accommodated in the middle portion of the linear groove (04). As per another embodiment of the present invention, the positioning of the groove (04) of the compressor /closure block (07) is directed to cover the actual puncture site on the vessel, which may be a bit proximal to the puncture site on skin.

4. Manually applying reasonable pressure on the compressor/ closure block (07) positioned as per step (3) above, and pulling out the sheath completely from the puncture/ access site;
5. Strapping the closure block (07) snugly around the limb.

After removing the sheath, the said block (07) is snugly positioned on the puncture /access site in such a manner that the groove (04) covers the adjacent portion of access/ puncture site of the radial artery. Before removing the sheath, the said closure block (07) is adjustably pressed/ compressed manually on the puncture / access site of the artery. Instead of holding the closure block (07), optionally, the strap portion (03) is then pulled through buckle/ slot (02) to tighten the band member (03) around the limb (arm/leg) until the skin contacting surface (05) & (06) exerts an optimum /sufficient amount of pressure on the limb surface adjacent to the puncture site and the groove (04) accommodates the portion of the radial artery along with the vascular access/puncture site under vertical pressure such that it maintains the patency of the said artery under the closure block (07) and at the same time the said closure block (07) stops bleeding from the access/ puncture site by causing hemostasis.

If the closure block member (07) is made from clear/ transparent material such as plastic, silicon reinforced polymer composite, it is possible to see and determine the area covered by the said groove (04) of the radial artery along with the vascular access site and that the bleeding has stopped.

The invention has been described in sufficient details, and by reference to the preferred embodiments thereof. It will be apparent that modifications and variations are possible without deviating from the scope of the invention discussed / implied in the body of the specification including drawings. For example, if desired the band member (03) and the block (07) may be unitarily formed in a molding operation.

ADVANTAGES:

1. It has a very simple design.
2. It is an economical and cost effective device.
3. It is simple to handle.
4. It is convenient to position the medical device at the vascular puncture site.
5. It facilitates hemostasis in minimum possible time to restrain bleeding post catheterization procedure.
6. It can be used to restrain bleeding post catheterization without compromising radial blood flow.
7. It does not affect the ulnar blood flow.

8. It facilitates non occlusive or minimal occlusive compression to achieve hemostasis;
9. It is convenient to monitor access site.
10. It ensures patient safety.
11. It is ready to use device.
12. The groove (04) helps to maintain the patency of the said artery having vascular access site during hemostatis.
13. It is easy to handle even by Para medical staff.
14. It provides means for obtaining non occlusive compression during hemostasis.
15. It provides closure block (07) having legs (05) & (06) for adjustment of sufficient pressure in the area adjacent to the vascular puncture / access site of the artery/vein, and linear groove (07) along the middle length of the closure block (07) as means to maintain patency of the said vascular access site during hemostasis. Thus, the problem of occlusive compression of the vascular access/ puncture site has been effectively solved by the present invention.

We Claim:

1. A vascular puncture site closure device comprising of a compressor / closure block (07) having at least one groove (04).

2. A vascular puncture site closure device of claim 1 having first leg (05) and second leg (06).

3. A vascular puncture site closure device of claim 1, wherein the inner depth, and outer diameter or width of the groove (04) is in the range of (0.1 mm) to (5 mm).

4. A vascular puncture site closure device of claim 1, wherein the compressor/ closure block (07) has belt or band (03).

5. A vascular puncture site closure device of claim 1, wherein the compressor / closure block (07) is made of polymer material.

6. A vascular puncture site closure device of claim 1, wherein the compressor (07) / closure block (07) is made of plastic, silicon or polystyrene.

7. A vascular puncture site closure device of claim 1, wherein the groove (04) has concave shape.

8. A vascular puncture site closure device of claim 1, wherein the groove (04) has semicircular shape.

9. A vascular puncture site closure device of claim 4, wherein the compressor (07) / closure block (07) and belt / band (03) are made of plastic, silicon, polystyrene.

10. A vascular puncture site closure device of claim 4, wherein the belt / band (03) is adjustably narrow on the supine side in the vicinity of ulnar artery.

11. A vascular puncture site closure device according to any of the preceding claims for suppressing post catheterization escape of blood from the vascular access cite or puncture site of the radial artery comprising of compressor (07) or closure block (07) and belt (03) having a groove (04) such that it can provide sufficient pressure on the puncture site without adversely affecting and compromising radial or ulnar blood flow.

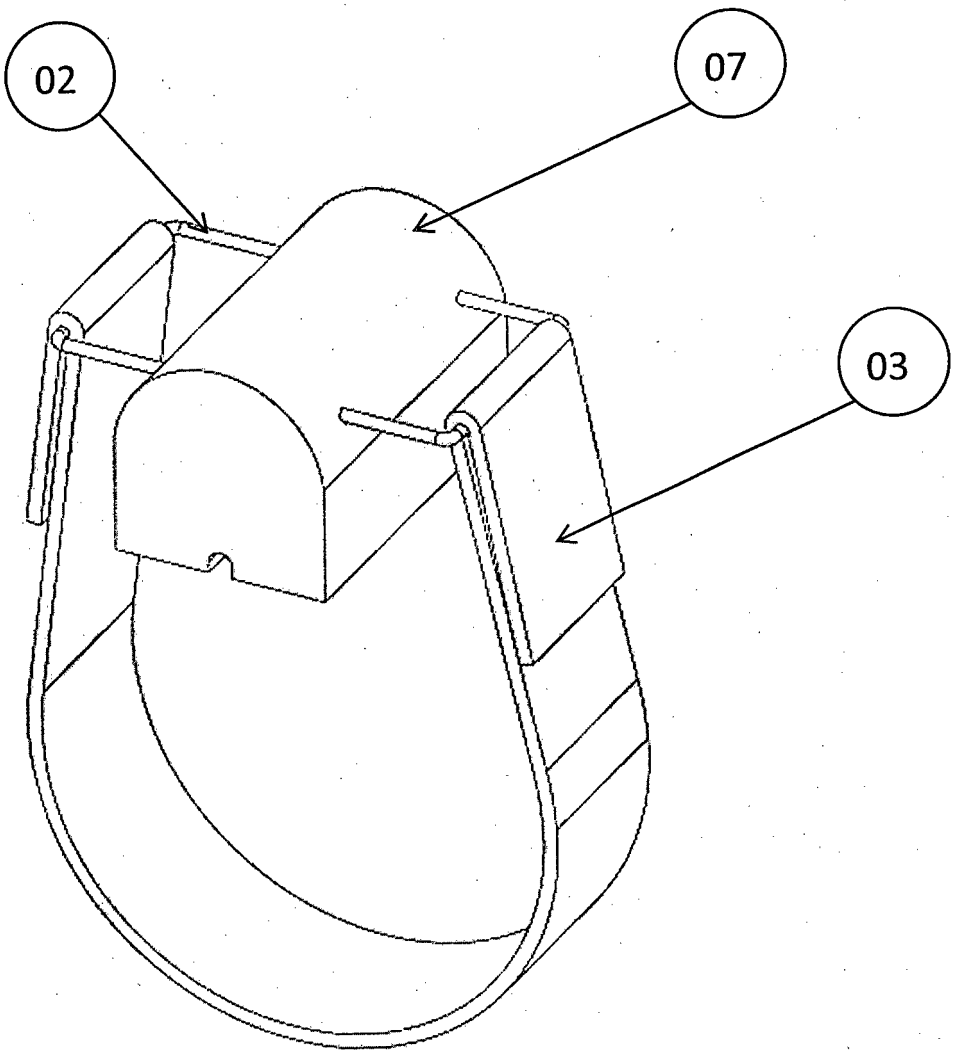


FIG 01

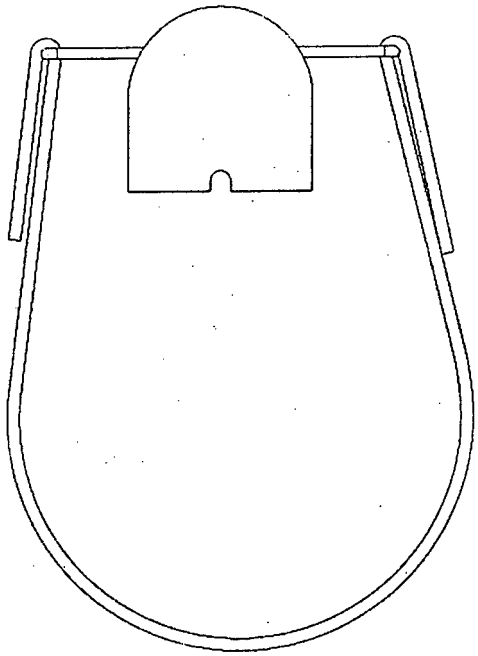


FIG 02

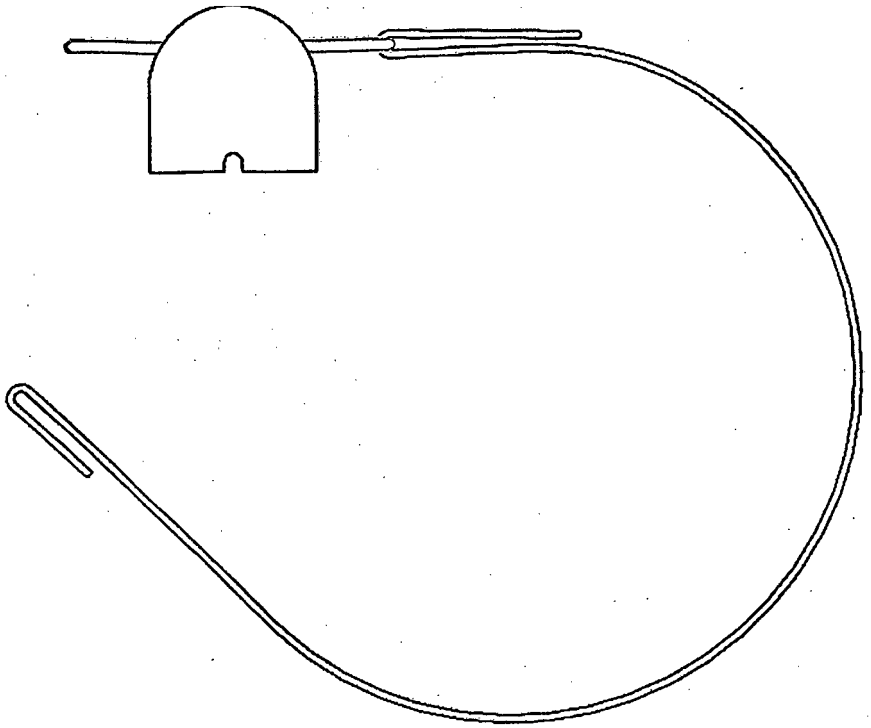


FIG 03

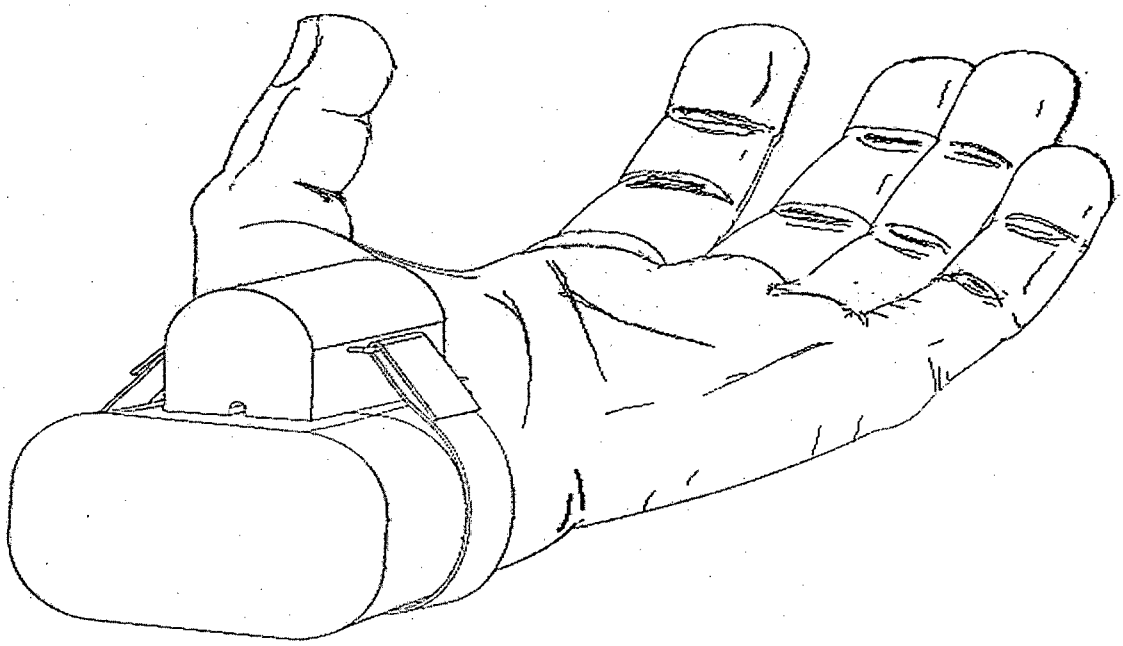


FIG 04

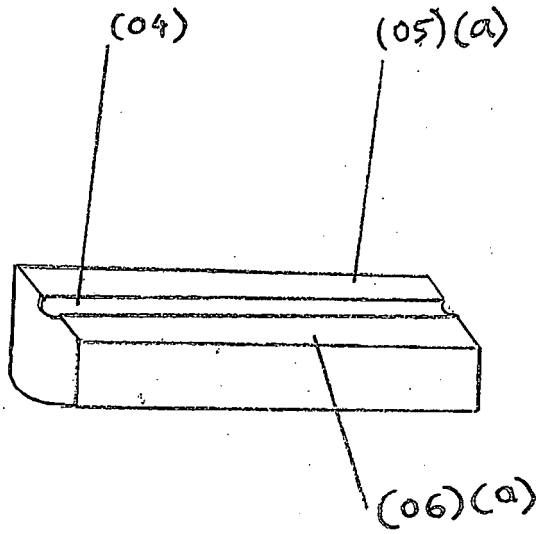


FIG. 5

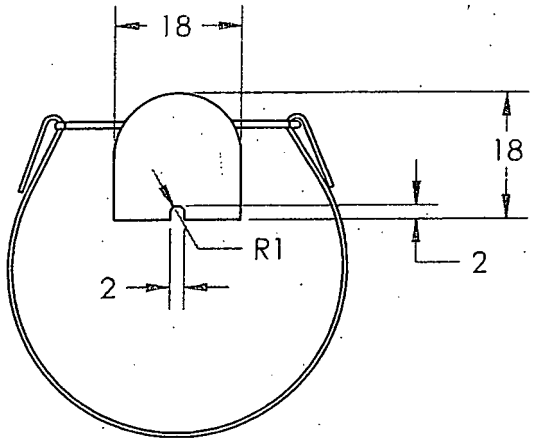


FIG. 6(a)

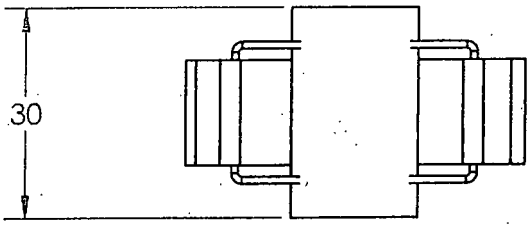


FIG. 6(b)

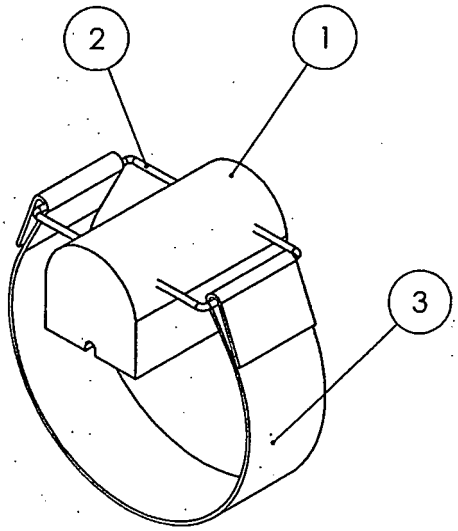


FIG. 6(c)

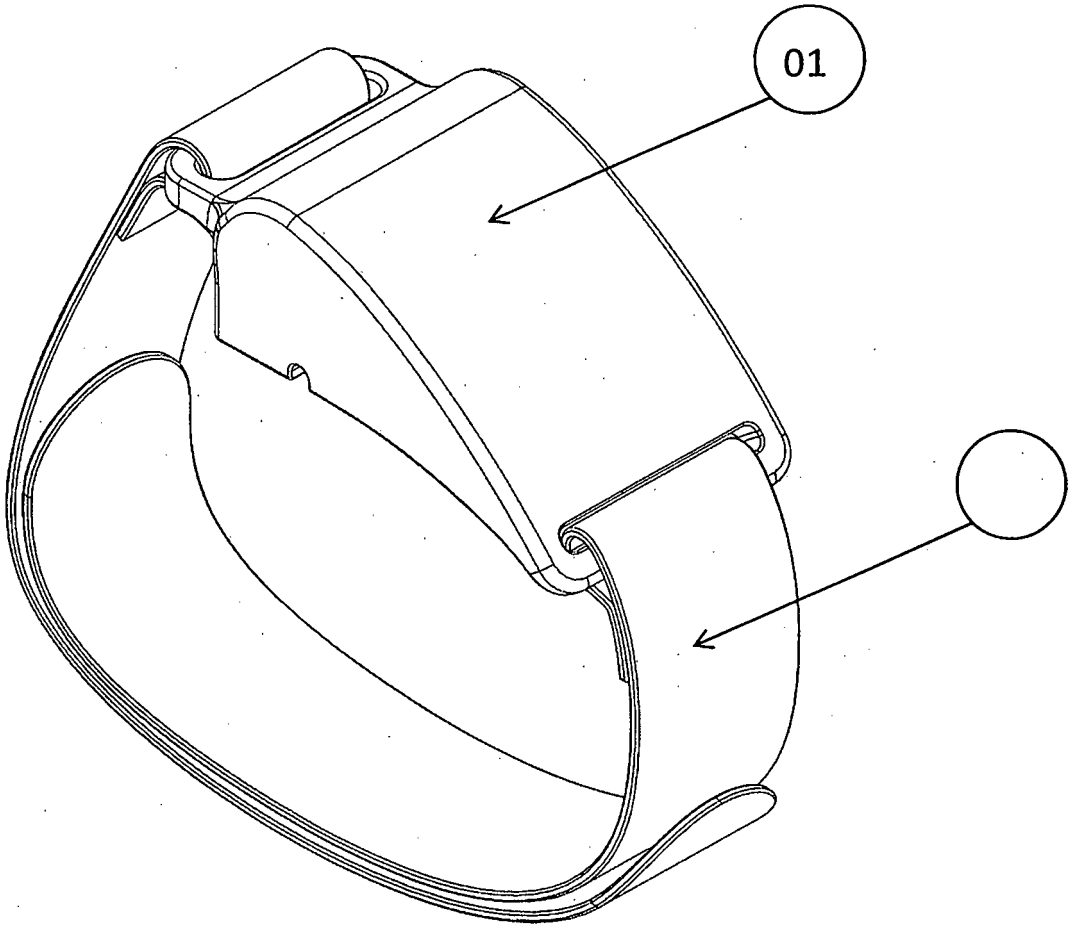


FIG 07

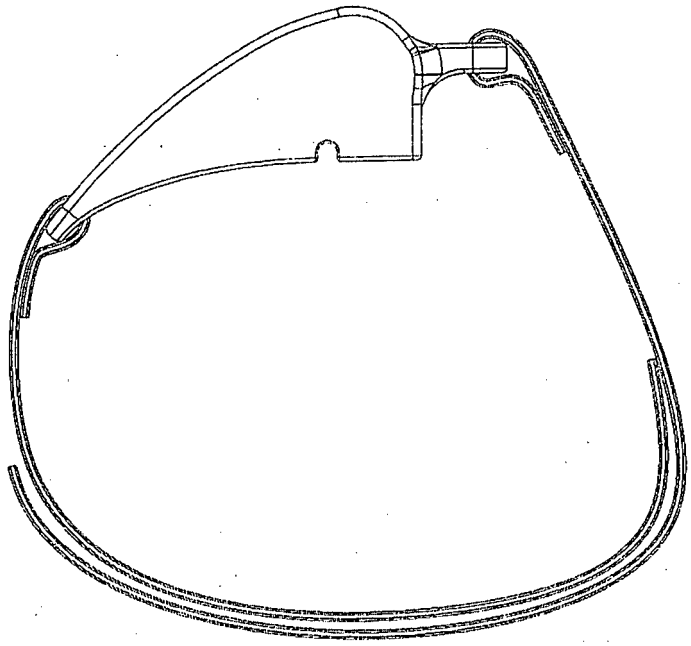


FIG 07(a)

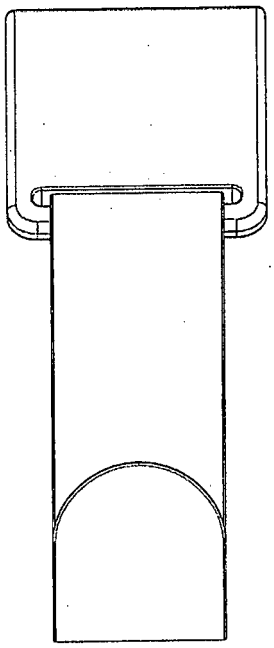


FIG 07(b)

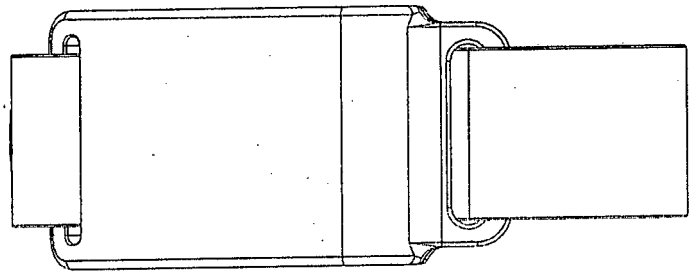


FIG 07(c)

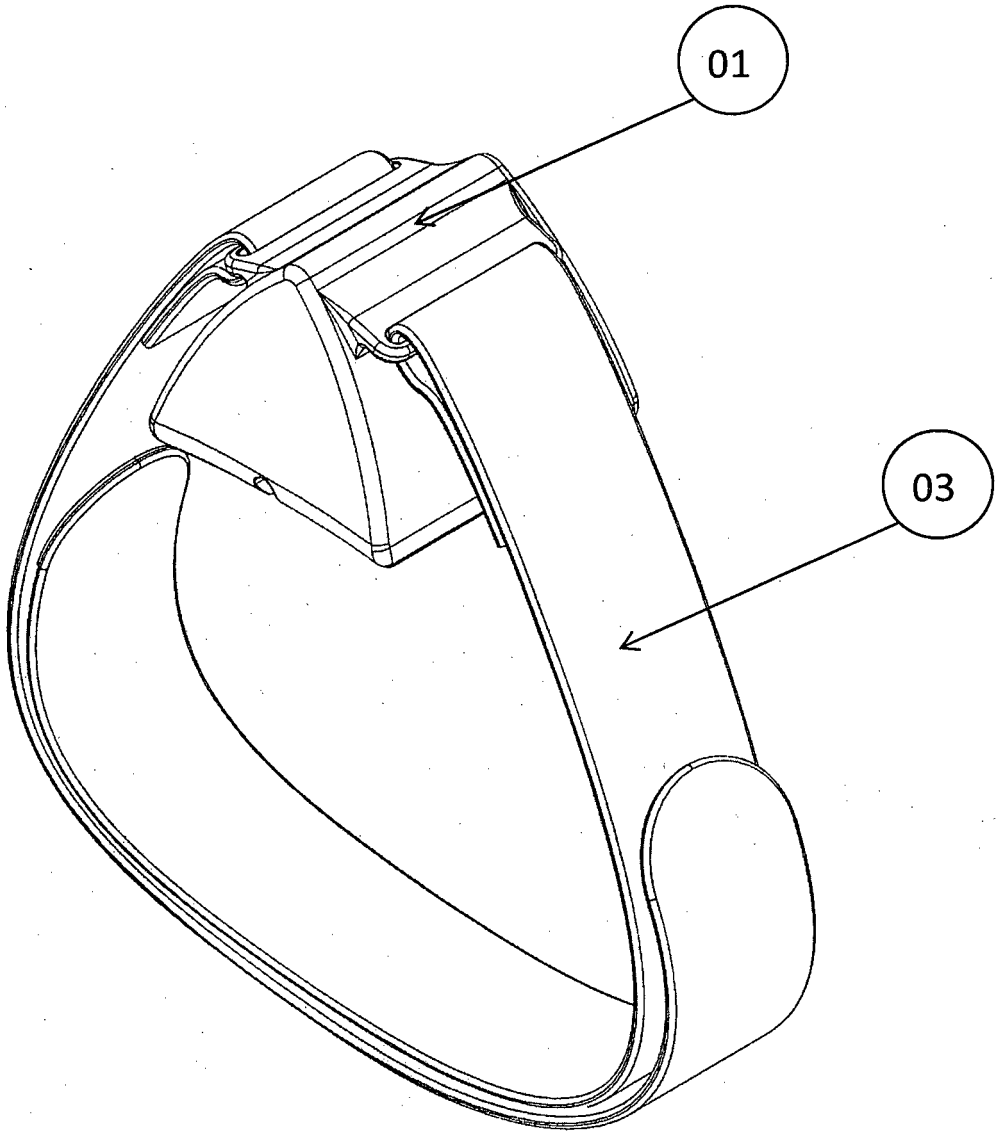


FIG 08

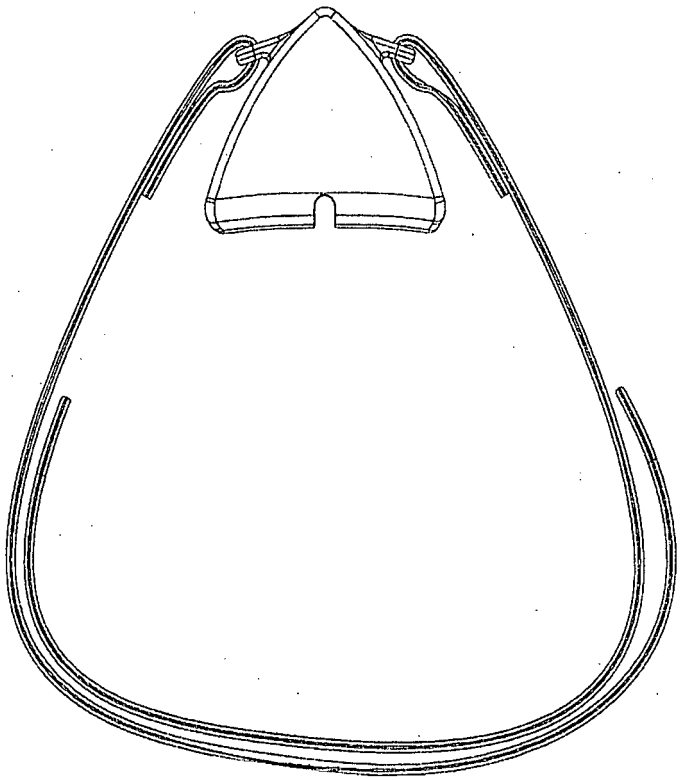


FIG 8(a)

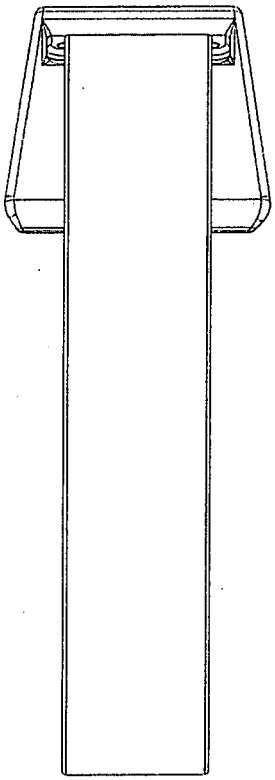


FIG 8(b)

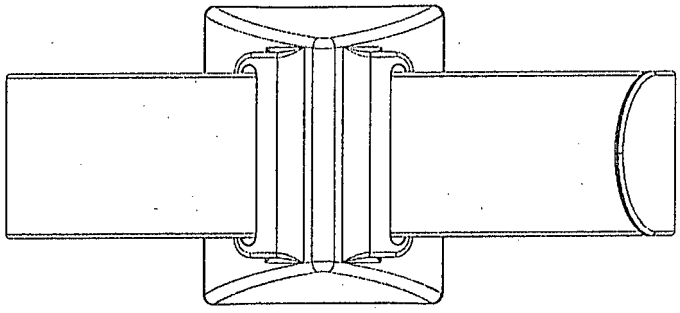


FIG 8 (c)

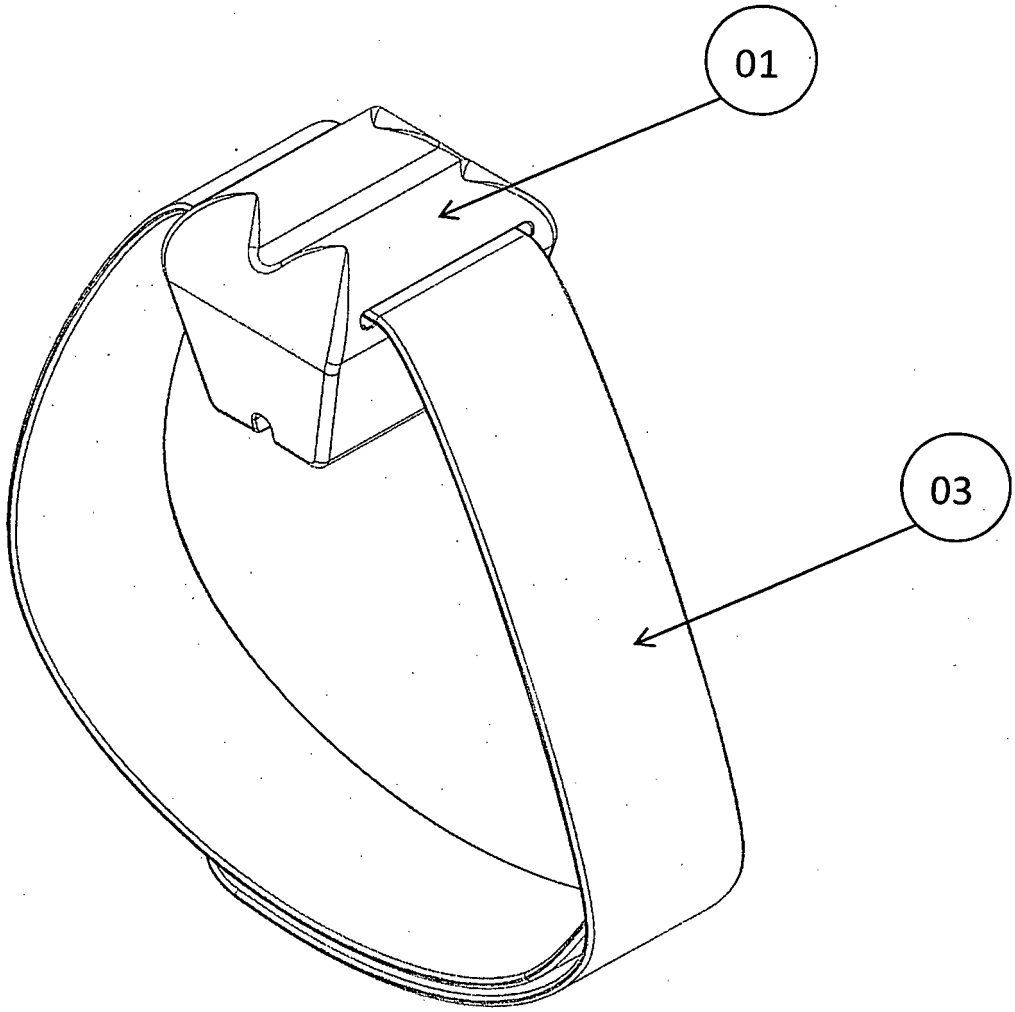


FIG 9

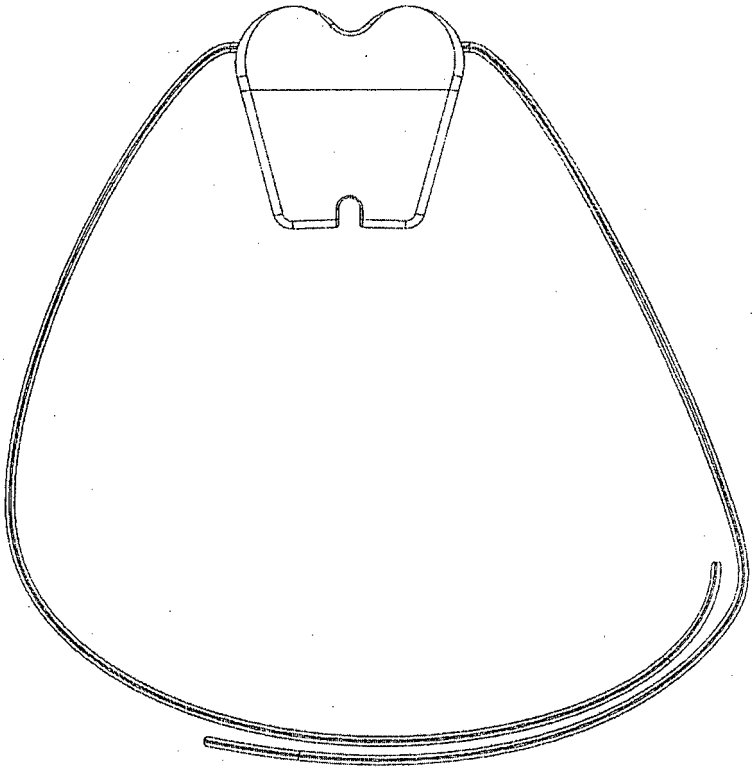


FIG 9(a)

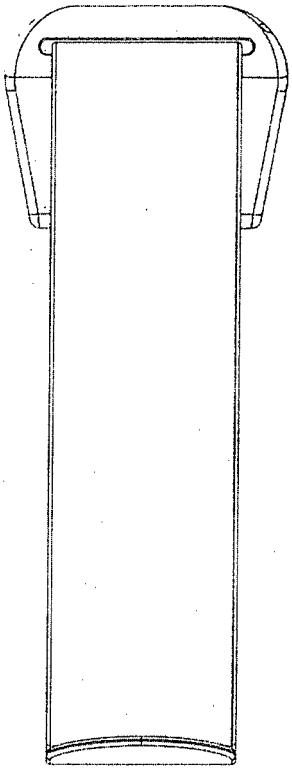


FIG 9(b)

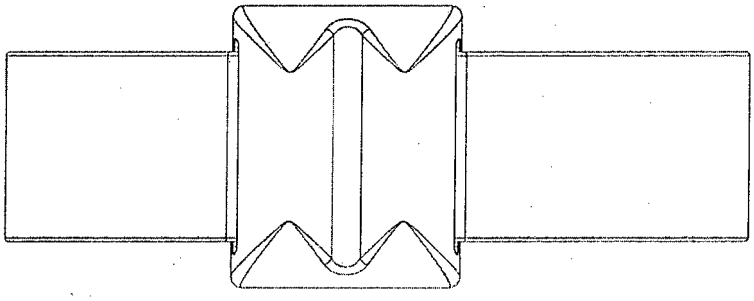


FIG 9 (c)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2013/000423

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/132
ADD.

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)
A61B

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/056280 A1 (SEMLER TECHNOLOGIES INC [US]; BENZ PHILIP [US]; NIEMEYER ROBERT) 20 May 2010 (2010-05-20) paragraphs [0009], [0054], [0058], [0071]	1-11
X	US 4 760 846 A (MERS KELLY WILLIAM C [US] ET AL) 2 August 1988 (1988-08-02) column 1, lines 5-9; figures 1-3 column 3, line 30 - column 4, line 11	1-11
X	US 5 269 803 A (GEARY GREGORY L [US] ET AL) 14 December 1993 (1993-12-14) figures 1-11	1-11
X	GB 291 600 A (ADAM SINGER) 7 June 1928 (1928-06-07) figure 1 page 1, lines 93-100	1-6,8-11

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

☒ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 February 2014	27/02/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Erbel, Stephan

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2013/000423

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010056280 A1	20-05-2010	US 2012053617 A1	01-03-2012
		WO 2010056280 A1	20-05-2010
US 4760846 A	02-08-1988	NONE	
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GB 291600 A	07-06-1928	NONE	