

[54] **INFLATABLE CERVICAL COLLAR FOR PREVENTION OF HEAD AND NECK INJURY**

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[22] Filed: **Dec. 23, 1971**

[21] Appl. No.: **211,600**

[52] U.S. Cl.... **128/132, 128/DIG. 20, 128/DIG. 23, 128/75**

[51] Int. Cl..... **A61h 1/02**

[58] Field of Search..... **128/75, 132, DIG. 20, 128/DIG. 23; 2/3, 6, DIG. 3**

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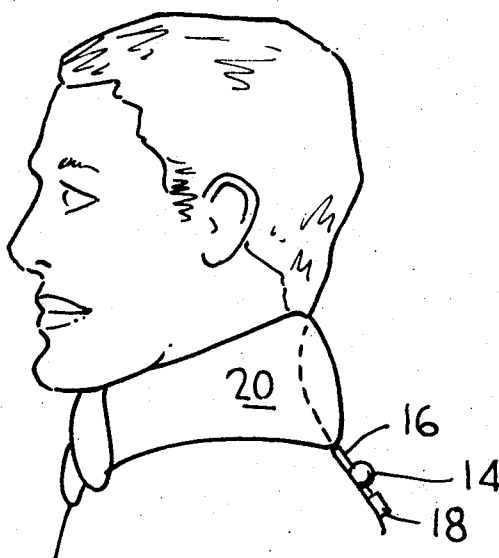
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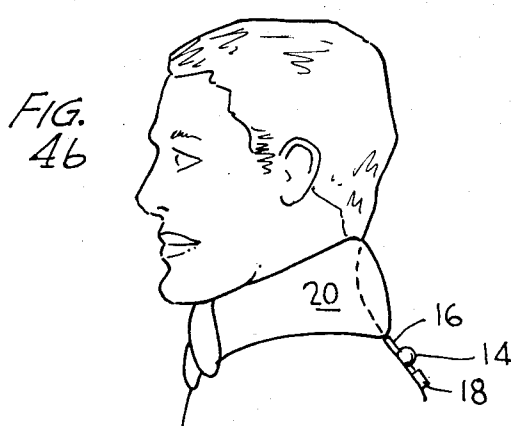
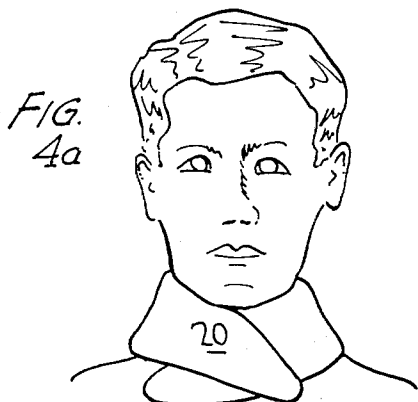
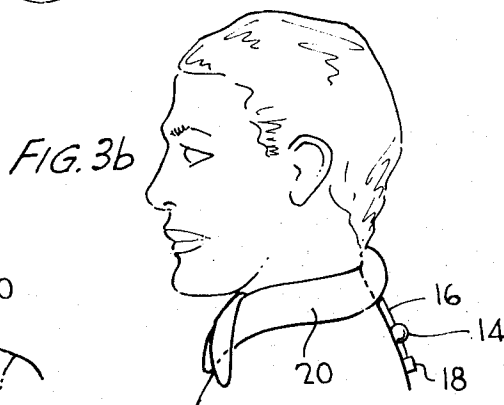
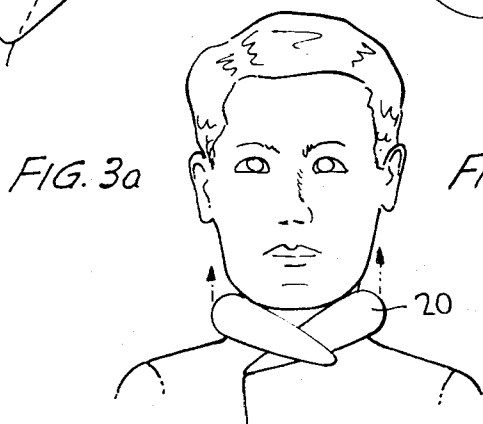
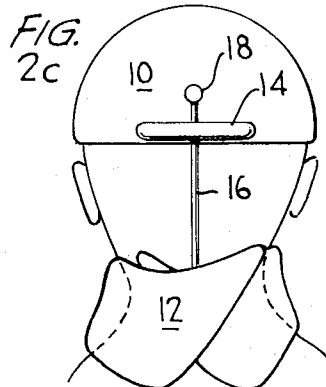
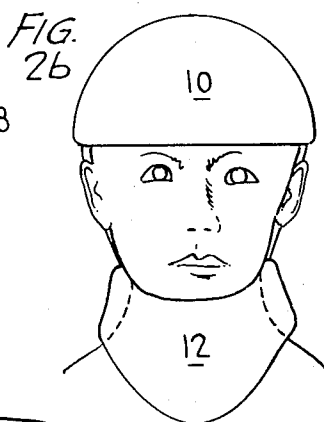
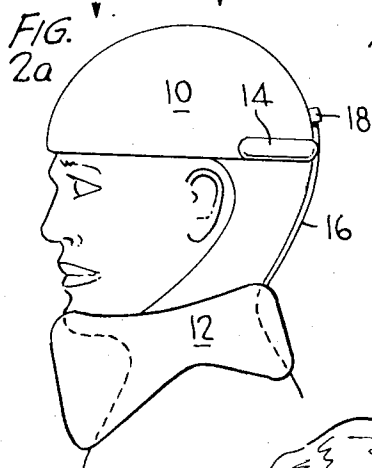
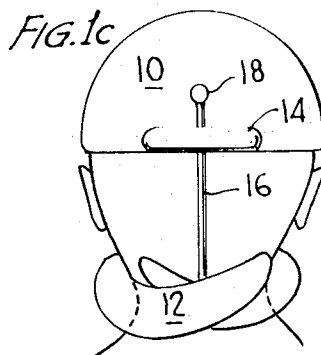
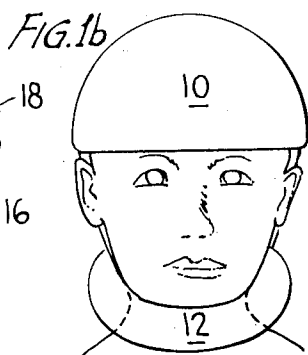
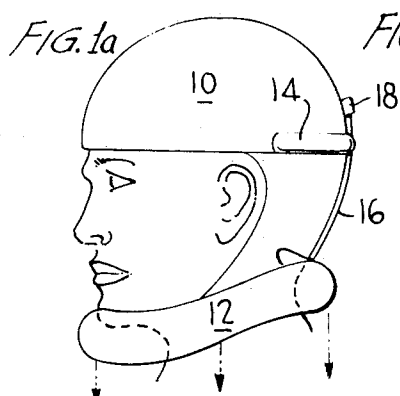
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[57] **ABSTRACT**

A novel medical appliance is disclosed comprising an inflatable cervical collar adapted to be disposed about the neck of a wearer who may be an occupant of a motor vehicle, for example. A source of compressed gas is connected to the inflatable collar, and triggering means are associated with the compressed gas source for inflating the collar upon the occurrence of an impact to the vehicle, such as a rear-end collision. When the collar is inflated, rotation of the neck of the wearer relative to the torso is substantially reduced or prevented, thus preventing a whiplash-like head or neck injury.

**5 Claims, 10 Drawing Figures**





## INFLATABLE CERVICAL COLLAR FOR PREVENTION OF HEAD AND NECK INJURY

### BACKGROUND OF THE INVENTION

This invention generally relates to the medical arts and particularly concerns an inflatable medical appliance for the prevention of head and neck injuries of the whiplash-type such as oftentimes occur in automobile accidents.

The number of traffic accidents involving motor vehicles such as automobiles, motorcycles and the like, has been rising in recent years and has reached alarming figures. Associated with this increasing accident rate has been an increase in injuries and fatalities of the occupants of the vehicles involved. And, leading among such injuries, are injuries to the head and neck, particularly as occur in the common rear-end impact type of accident.

Such head and neck injuries are generally the result of two mechanisms. One such mechanism comprises a direct impact to the head and neck. Another such mechanism consists of an acceleration of the head and neck, i.e., a "whiplash" type of action. Each of these mechanisms oftentimes effects cerebral concussions and brain injuries including macroscopic intracranial hemorrhage. Clinical evidence suggests that rotational displacement of the neck, expressed as either rotational velocity or acceleration, is a prime physical mechanism of brain damage in whiplash injuries caused by the impact of rear-end vehicle collisions. In fact, approximately half of the potential for the brain injury during such a collision is directly proportional to the amount of head rotation of the occupant of the vehicle, and it is known that rotational acceleration of the head above certain predetermined limits, such as 1800rads/sec.<sup>2</sup> will probably result in cerebral concussions.

In recognition of the propensity for occurrence of head and neck injuries during vehicular collisions, many safety appliances and the like have been developed in the prior art. For example, the proper use of seat and shoulder belts in a vehicle oftentimes prevents the impact type of head injury upon a vehicular collision. Other prior art approaches to this problem have included the provision of inflatable bags or other such mechanisms which generally act as a barrier or "wall" about the occupant of the vehicle, also to prevent impact-type of head injuries. Little has been done in the prior art, however, to prevent neck and head injuries of the non-impact or "whiplash" variety and specifically to prevent rotational displacement of the neck of an occupant of a vehicle during a vehicular collision.

### SUMMARY OF THE INVENTION

The instant invention proposes to provide a medical appliance which is adapted to be worn by the occupant of a vehicle, which appliance has as its primary objective the reduction of rotational displacement of the neck and head of the wearer during an impact to the vehicle carrying the wearer.

Another objective of the instant invention concerns the provision of a medical appliance which is of an inflatable type, wherein inflation of the appliance is effective automatically upon the occurrence of an impact.

These objects as well as others which will become apparent as the description proceeds are implemented by the instant invention which will be seen to comprise an

inflatable collar which is adapted to be disposed about the neck of a wearer who may be an occupant in a vehicle, for example. The collar means is normally in an uninflated condition, and when the collar means is inflated, it serves to inhibit rotation of the neck relative to the torso of the wearer. As mentioned at the outset, the reduction of rotational displacement of the neck serves to substantially reduce and prevent neck and head injuries to the wearer during an impact to the vehicle.

In a preferred inventive embodiment, the inflatable collar is adapted to be removably attached to an article of apparel, such as a helmet or an upper torso garment, on the body of the wearer. Such attachment serves to facilitate the utilization of the medical appliance, and further assists in the reduction of rotational displacement of the neck.

A source of compressed gas is connected to the inflatable collar for inflating the collar when triggered. In this respect, a triggering device is associated with the compressed gas source for releasing the compressed gas upon the occurrence of an impact to the vehicle within which the wearer is an occupant. In the preferred inventive embodiment, the triggering means serves to detect acceleration of the head and neck of the wearer itself, which acceleration is caused by an impact to the vehicle.

### BRIEF DESCRIPTION OF THE DRAWINGS

The invention itself will be better understood and features and advantages thereof other than as above-discussed will become apparent from the following detailed description of a preferred inventive embodiment, such description making reference to the appended single sheet of drawings, wherein:

FIGS. 1a, 1b, and 1c are perspective illustrations of the side, front and rear, respectively, of a first embodiment of the novel medical appliance of the instant invention in an uninflated condition;

FIGS. 2a, 2b, and 2c are side, front, and rear views, respectively, of the first embodiment of the instant invention depicted in FIGS. 1 in an inflated or operative condition;

FIGS. 3a and 3b are front and side perspective views, respectively, of another embodiment of the instant invention depicted in an uninflated condition; and

FIGS. 4a and 4b are front and side perspective illustrations, respectively, of the second inventive embodiment of FIGS. 3 illustrated in an inflated or operable condition.

### DETAILED DESCRIPTION OF PREFERRED INVENTIVE EMBODIMENTS

Referring now to the drawings and particularly to FIGS. 1 and 2 thereof, a first embodiment of the novel medical appliance of the instant invention is depicted. The medical appliance will be seen to comprise an inflatable collar means 12 constructed of rubberized cloth or similar impervious synthetic material. The inflatable collar means 12 is adapted to be worn about the neck of the wearer and, as seen in FIG. 1c, has overlapping ends which assure a secure fit and guard against undesirable rotation. The inflatable collar means 12 is further adapted to be removably attached to an article of apparel on the body of the wearer and, in this instance, the collar means 12 is illustrated as being re-

3

movably attached to a helmet 10. In fact, collar means 12 functions as the chin strap for helmet 10.

In FIGS. 1, the collar means 12 is depicted in its uninflated condition. When the collar means 12 is inflated, such as depicted in FIGS. 2, the collar means serves to inhibit rotation of the neck of the wearer relative to the torso and, in this respect, it will be seen that the collar means 12 is itself contoured so as to comfortably fit about the neck of the wearer and further about the shoulders. A source of compressed gas, such as cylinder or container 14 disposed on helmet 10, is provided and is connected to the inflatable collar means 12 via a coupling tube 16 so as to controllably inflate the collar. In this respect, the collar is adapted to be inflated upon the occurrence of an impact to the vehicle within which the wearer is an occupant. To this end, a sensing means or means for triggering the compressed gas source 14 is provided as at 18, which sensing means broadly senses the occurrence of an impact.

In the preferred embodiment, sensing means 18 serves to detect acceleration of a body portion of the medical appliance wearer, such as the head or neck, when such acceleration exceeds a predetermined medically safe level. The actual internal construction of the triggering means 18 serves no part of the instant invention, and such triggering means could comprise any of the well-known accelerometer type devices available in the art.

Referring now to FIGS. 3 and 4 of the appended drawings, a second embodiment of the novel medical appliance of the instant invention is shown. Here, the inflatable collar means is designated by reference numeral 20 and is adapted to define a removable and overlapping lapel for an upper torso body garment as shown. The inflatable collar means 20 is connected to an associated source of compressed gas 14 via a connecting or coupling tube 26, which compressed gas is caused to flow into and inflate the collar means 20 upon impact sensed by triggering means 18. The components of this second preferred embodiment of the invention operate in a fashion similar to like elements in the embodiment of FIGS. 1 and 2.

It should be noted that with respect to the embodiment depicted in FIGS. 1 and 2, the collar means, when inflated moves in a downward direction as shown by the arrows in FIG. 1a so as to make contoured contact with the shoulders of the wearer. With the embodiment depicted in FIGS. 3 and 4, the collar means, when inflated, moves upwardly under the chin of the wearer in

4

a direction indicated by the arrows in FIG. 3a.

It should now be apparent that the objects initially set forth at the outset to this specification have been successfully achieved. It further should be appreciated that while preferred inventive embodiments have been illustrated and described herein, modifications will become apparent to those skilled in the art, and the invention may be variously practised within the scope of the appended claims.

Accordingly,

What is claimed is:

1. A medical appliance for reducing rotational displacement of the neck and for preventing head and neck injury of a wearer during an impact to a vehicle carrying the wearer, said appliance comprising, in combination:

an inflatable collar means adapted to be disposed about the neck of the wearer, said collar means, when inflated, inhibiting rotation of the neck relative to the torso;

a source of compressed gas and means communicating said source of compressed gas with said inflatable collar means for inflating the collar means when triggered; and

triggering means adapted to be carried by the wearer and associated with said compressed gas source for triggering said source of compressed gas, said triggering means detecting acceleration of a body portion of the wearer above predetermined limits upon the occurrence of an impact to the vehicle, whereby said collar means is inflated.

2. A medical appliance as defined in claim 1, further including means for removably detaching said inflatable collar means to an article of apparel on the body of the wearer.

3. A medical appliance as defined in claim 2, further including, in combination, a helmet adapted to be disposed on the head of the wearer, said helmet being coupled to said collar means and defining said article of apparel.

4. A medical appliance as defined in claim 2, further including, in combination, a garment adapted to be disposed on the upper torso of the wearer, said garment being coupled to said collar means and defining said article of apparel.

5. A medical appliance as defined in claim 1, wherein said body portion comprises the head of the wearer.

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