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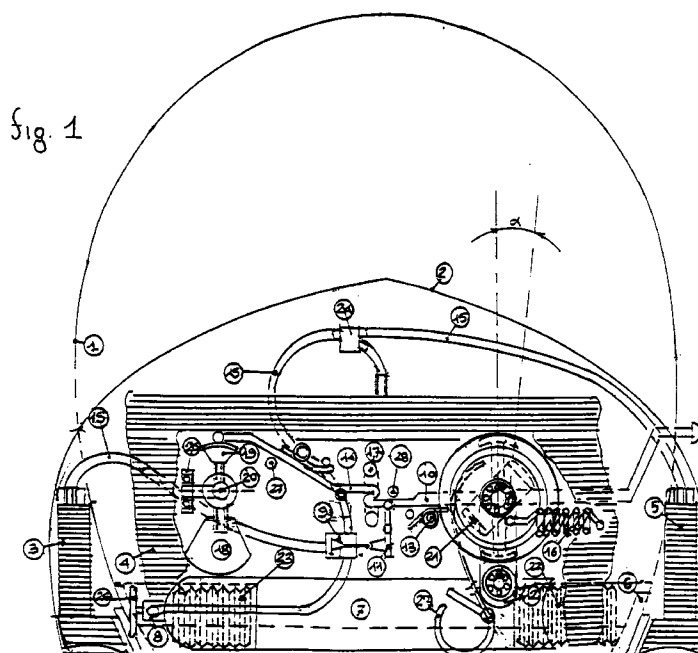
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(54) **Pneumatic safety device for crash helmets**

(57) A safety device (2) for crash helmets (1) directly adaptable to conventional crash helmets or encompassed in newly manufactured helmets, characterized by pneumatically expandable appendages (3,4,5,22,23) triggered by inertial sensors (20,28). This invention is

particularly suitable for preventing irregular movements, compression and rotation of the neck caused by accident trauma.



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## Description

The present invention relates to a safety device for crash helmets for the purpose of preventing irregular movements, compression and rotation of the neck caused by accident trauma.

Accidents involving motorcyclists often cause the motorcyclists to sustain serious injuries. Among the most serious of these injuries are violent impacts to the spinal column and irregular movements, compression and rotation of the neck, which motorcyclists involved in road accidents often sustain. Conventional crash helmets are designed to prevent or reduce head injuries, but they do not protect motorcyclists against impacts to the spinal column or irregular movements, compression and rotation of the neck.

The present invention concerns a safety device for crash helmets for the purpose of preventing irregular movements, compression and rotation of the neck caused by accident trauma.

The present invention further concerns a safety device that can be integrated into already existing crash helmets or directly inserted into newly manufactured crash helmets.

The present invention seeks to provide a pneumatic safety device for crash helmets for the purpose of preventing irregular movements, compression and rotation of the neck caused by accident trauma. This device can be integrated into already existing crash helmets by means of a hook or directly inserted into newly manufactured crash helmets.

In accordance with the invention, the device is a streamlined structure having expandable, pneumatic appendages firmly attached to the external surface of a helmet and in perfect symmetry with the helmet's longitudinal axis. Means for activating the expandable, pneumatic appendages are hinged to a support at the base of the helmet. A compressed gas cylinder, initiated by inertial sensors, is attached to a main valve that instantly allows for expansion of the appendages. The valve thereafter allows the air to flow out of the appendages in order to empty them completely.

Because of the particular form, when the appendages are completely expanded, as well as pressing on the shoulders of the person wearing the helmet, they prevent compression of the neck by completely blocking the rotation of the head. Two of the appendages expand under the chin and contribute to improve safety of the system.

The device comprises two main inertial sensors. One of the sensors has an oscillating mass and is highly sensitive to inclinations and violent accelerations. The other sensor has a centrifugal mass and is activated by a cord that is sensitive to abrupt, sharp movements and links the device to a part of the motor vehicle.

The activation of the expansion of the protective appendages starts when the motorcyclist assumes an abnormal position or a violent acceleration. The sen-

sors detect the abnormal movements and activate expansion of the appendages. To avoid an undesirable activation of the appendages when the helmet is not in use, the activation of the two highly sensitive inertial sensors is inhibited by a manually operated safety device.

The integration of the device with crash helmets makes the helmets safer than conventional helmets and more suitable to reduce the severity of traumas caused by the violent impacts of the spinal column and irregular movements, compression and rotation of the neck, which motorcyclists involved in road accidents often undergo.

The invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a posterior plan view of a helmet equipped with a safety device with a particular view of the inertial sensors, constructed in accordance with a preferred embodiment of the invention; and

Figure 2 is a lateral plan view of the device of Figure 1.

A safety device 2 for crash helmets, characterized by a set of pneumatic appendages 3, 4, 5, 22 and 23 securely fastened to the surface of a helmet 1 with hooks 6 in perfect symmetry about a longitudinal dividing line of the helmet 1, is illustrated in Figure 1 and 2. The appendages 3, 4, 5, 22 and 23 are expanded by means of inertial sensors 20 and 28 in accordance with a preferred embodiment of the present invention.

Chin appendages 22 and 23, shoulders appendages 3 and 5, a neck appendage 4, and a cylinder of compressed gas 7 are connected by tubing 15 with a main valve 9 adjoining the tubing 15. The body of the main valve 9 is equipped with a calibrated opening in order to allow the flow of gas to all the protective appendages 3, 4, 5, 22 and 23 when the gas is released from the cylinder.

The centrifugal mass sensor 28, comprised of two masses 21, is sensitive to pulls induced by a cord connected by a hook 27 to the chassis of a motor vehicle. The centrifugal mass sensor 28 activates a spring 16 which, in turn, causes movement of two lever arms 10 and 11, thereby opening the main valve 9.

The oscillation ( $\alpha$ ) of a pole 12 connected to the helmet 1, consequently to the action of one of the two sensors 20 and 28, pushes the lever arms 10 and 11 in such a way as to open the main valve 9. The two sensors 20 and 28, particularly studied to have specific functions have the ability to transmit their amplified forces through the lever arms 10 and 11, operating on the principles of the lever. The valve 9, which is a point of connection between the compressed gas cylinder 7 and the appendages 3, 4, 5, 22 and 23 thereby inhibiting repeated, violent movements of the head.

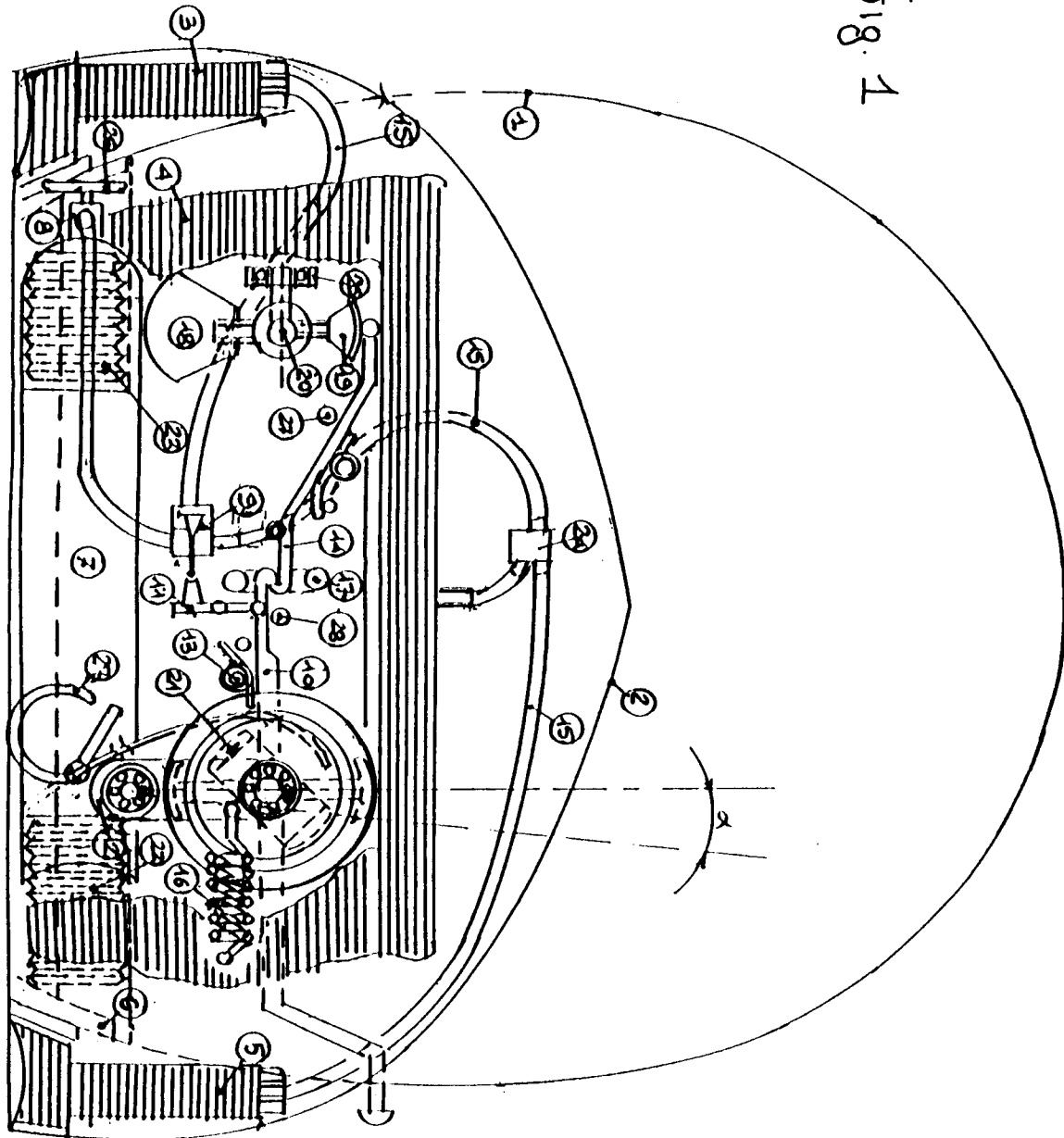
The oscillating mass sensor 20, which is sensitive to dangerous inclinations and violent accelerations is comprised of a rotating part having a ball bearing ring 25 and two diametrically opposed masses 18 and 19 that pivot about a point.

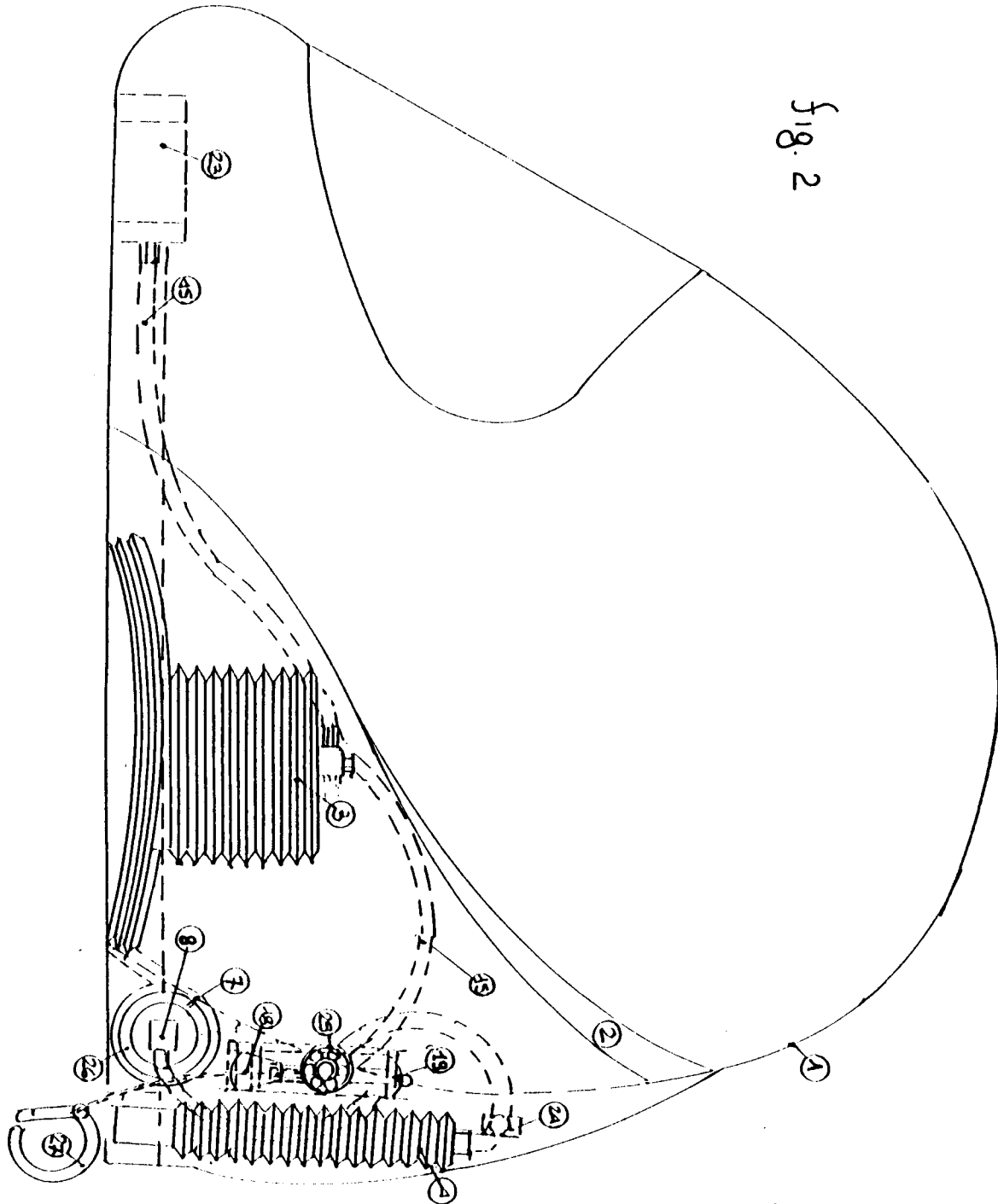
The closing of a valve 26 located at the junction of the tubing 15 and the cylinder of compressed gas 7, or the insertion of a blocking device 17, inhibits the release of the lever arms 10 and 11 put into action by the spring 16.

The foregoing description is for purposes of illustration only and is not intended to limit the scope of protection accorded this invention. The scope of protection is to be measured by the following claims, which should be interpreted as broadly as the inventive contribution permits.

### Claims

1. A safety device for crash helmets comprising more than one pneumatically expandable appendage attached to a crash helmet having an external surface, a base and a longitudinal dividing line, wherein the appendages are attached to the helmet in perfect simmetry to the longitudinal dividing line of the helmet. 20 25
2. A device as claimed in Claim 1, further comprising:
  - a) two appendages directed toward the shoulders of a person wearing the helmet; 30
  - b) two appendages directed toward the chin of a person wearing the helmet; and
  - c) one appendage directed toward the neck of a person wearing the helmet. 35
3. A device as claimed in Claim 1, further comprising:
  - a) a cylinder of compressed gas;
  - b) a main valve for controlling the expulsion of gas from the cylinder; and 40
  - c) tubing connecting the appendages to the cylinder and the valve.
4. A device as claimed in Claim 3, wherein the valve allows the deflation of the appendages as soon as full expansion has occurred. 45
5. A device as claimed in Claim 1, wherein one or more sensors is integrated into the device to activate the expansion of the appendages. 50
6. A device as claimed in Claim 5, wherein one of the sensors comprises an oscillating mass that is particularly sensitive to inclinations and accelerations. 55
7. A device as claimed in Claim 5, wherein one of the sensors comprises a centrifugal mass that is sensitive to the pulling of a cord that links the safety device to a part of a motor vehicle on which a person wearing the helmet is riding.
8. A device as claimed in Claim 1, wherein a release system deactivates the expansion of the appendages. 5
9. A device as claimed in Claim 1, wherein the device may be attached to the helmet during manufacture of the helmet. 10
10. A device as claimed in Claim 1, wherein the device may be attached to an existing helmet by means of one or more hooks. 15







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# EUROPEAN SEARCH REPORT

Application Number  
EP 97 12 2848

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                          |                                                  |                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                                                                            | Relevant to claim                                | CLASSIFICATION OF THE APPLICATION (Int.Cl.6)    |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WO 94 26136 A (ENTROPY RACING, INC.)<br>* page 11, line 12 - page 16, line 7 *<br>* page 18, line 1 - page 19, line 13 *<br>* figures 13-28,32-34 *                                                      | 1-10                                             | A42B3/04                                        |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FR 2 719 747 A (PHILIPPE STREIFF<br>MOTORSPORT S.A.R.L.)<br>* page 5, line 11 - page 6, line 3 *<br>* page 7, line 17 - line 29 *<br>* page 8, line 1 - line 32 *<br>* claims 1,3,5,14-19; figures 5,6 * | 1-10                                             |                                                 |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 5 133 084 A (R. L. MARTIN)<br>* column 2, line 30 - column 4, line 38 *<br>* figures *                                                                                                                | 1,3,5,10                                         |                                                 |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DE 89 11 519 U (N. PREUSS)<br>* page 7, last paragraph - page 10 *<br>* figures *                                                                                                                        | 1,3,5,10                                         |                                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WO 96 36249 A (AIRBAG PROTECTION SYSTEMS<br>LTD.)<br>* abstract; figures 1-3 *<br>* page 3, line 32 - page 4, line 21 *                                                                                  | 1,3,5,9,<br>10                                   | TECHNICAL FIELDS<br>SEARCHED (Int.Cl.6)<br>A42B |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DE 44 16 847 A (TEMIC BAYERN-CHEMIE AIRBAG<br>GMBH)<br>* the whole document *                                                                                                                            | 1,3,5,9                                          |                                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FR 2 646 592 A (SMITHS INDUSTRIES PUBLIC<br>LIMITED)                                                                                                                                                     | 1                                                |                                                 |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                          |                                                  |                                                 |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                          | Date of completion of the search<br>8 April 1998 | Examiner<br>Bourseau, A-M                       |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                                          |                                                  |                                                 |

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