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(72) Inventor: **Franchini, Fabio**  
**Castelnuovo Rangone (Modena) (IT)**

(74) Representative: **Coppi, Cecilia**  
**c/o Studio Internazionale Dott. Coppi,**  
**Via del Cane No. 8**  
**40124 Bologna (IT)**

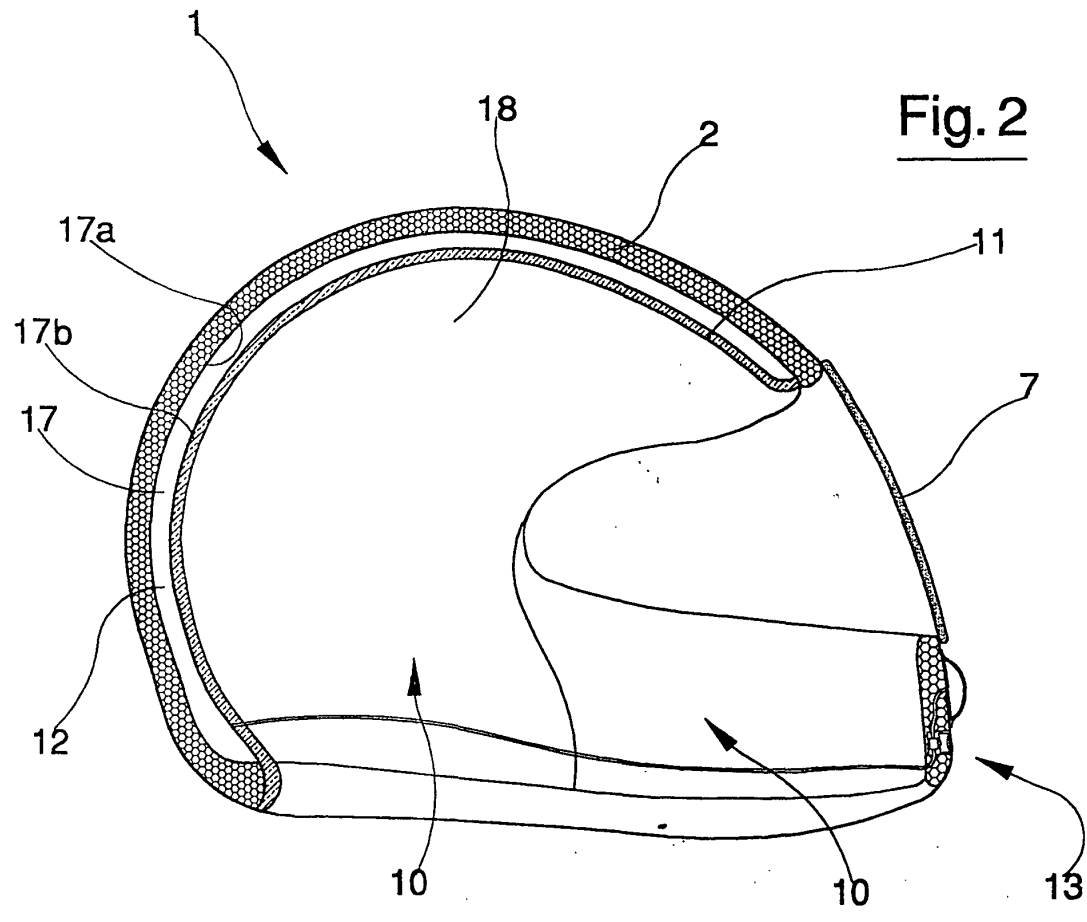
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(71) Applicant: **Franchini, Fabio**  
**Castelnuovo Rangone (Modena) (IT)**

(54) **Protective helmet**

(57) Protective helmet consisting of a hard shell (2) comprising a crown (3) that is essentially hemispherical in shape and two side sections (4a, 4b) extending from the edges of the crown (3). The helmet (1) additionally

comprises at least one expandable liner (11) placed inside the hard shell (2) and forming at least one air-tight chamber (12); and means for inflation and deflation (13) of the chamber or chambers (12) mentioned above.



**Fig. 2**

**EP 1 316 264 A2**

## Description

**[0001]** The invention relates to a protective helmet according to the preamble of claim 1.

**[0002]** It has been shown that the use of protective helmets, and in particular those worn for riding motorised two-wheeled vehicles, whether scooters or powerful motorcycles, can prevent the serious injuries which may result from even minor accidents occurring at low speed.

**[0003]** Generally, helmets consist of a hard outer shell designed to fit on the user's head, and which in "full face" helmets also extends across the front, forming a tapered section known as a chin guard. The area between the chin guard and the crown can be optionally closed with a flip-up visor, usually hinged on either side.

**[0004]** The interior of the hard shell is padded with a layer of impact-absorbing material such as polystyrene foam, lined for comfort and hygiene with fabric where it comes into contact with the head and face of the wearer.

**[0005]** As a rule, helmet manufacturers produce outer shells in two or three sizes at most, and then vary the thickness of the internal impact liner to obtain a range of sizes that can fit the majority of purchasers.

**[0006]** It is in fact important for the helmet to fit securely against the head and cheeks of the wearer, to prevent it being knocked off in the event of a collision.

**[0007]** The fit should also be sufficiently snug to prevent the helmet being shifted or partially dislodged by the airflow while in motion, especially when travelling at high speed on motorcycles which afford minimal aerodynamic protection to the driver.

**[0008]** At the same time, and without compromising the above, the helmet should not be so tight that it feels painful or causes headaches after prolonged use.

**[0009]** However, helmets constructed in the conventional manner outlined above have certain drawbacks.

**[0010]** In fact, it can be easily envisaged how, after a certain period of use, the pressure of the head inside the shell tends to permanently compress the impact liner, increasing the freedom of movement of the head within the helmet.

**[0011]** This often prompts users to purchase smaller-sized helmets which, at least during the initial period of use, do not provide adequate comfort.

**[0012]** What is more, the internal conformation of the helmet will not necessarily suit the anatomy of all wearers, and can at times even result in discomfort due to the pressure exerted on certain areas, especially at the front. This is the reason why, for example, helmets produced for the Asian market have a different shape from those produced for Europe: to take into account the different anatomical head shape of oriental populations.

**[0013]** In an attempt to partially get round these difficulties, certain helmets on the market have detachable impact liners which can be replaced with new ones or with paddings of a different thickness. However, such helmets are costly to maintain because the replacement

paddings are expensive and do not, in any case, guarantee a perfect fit for all users.

**[0014]** Within this context, the technical function of the invention described here is the design of a protective helmet that overcomes the above drawbacks.

**[0015]** More specifically, the purpose of the invention is to design a protective helmet that can be perfectly conformed to the anatomical shape of each user.

**[0016]** An additional purpose of the invention is to design a protective helmet whose internal dimensions are not subject to alteration after a certain period of use. The above technical function and purposes are achieved by a protective helmet having the characteristics set out in one or more of the annexed claims.

**[0017]** By way of example not intended as a comprehensive listing, we shall now describe some—though not the only—preferred embodiments of a protective helmet according to this invention, illustrated in the annexed drawings wherein:

- figure 1 shows a perspective view of a helmet constructed according to this invention;
- figure 2 shows a cross-section of one possible embodiment of the helmet of figure 1;
- figure 3 shows a cross-section of a second possible embodiment of the helmet of figure 1.

**[0018]** In the above-mentioned figures, the number label (1) designates a protective helmet constructed according to this invention.

**[0019]** Helmet (1) consists of an outer shell (2) made from a hard, impact-resistant material which comprises at least one essentially hemispherical top section (3), or crown, and two side sections (4a, 4b) extending from the edges of the crown (3). The side sections (4a, 4b) meet at the front and form a single piece with crown (3), thereby defining a front portion (5) with an opening (6) that can be optionally closed with a visor (7), and a rear portion (8).

**[0020]** When helmet (1) is worn, side sections (4a, 4b) afford protection to the area of the ears and the nape of the neck.

**[0021]** In the illustrated embodiments, helmet (1) comprises a tapered element (9) which joins together the ends of side sections (4a, 4b) to form a chin guard.

**[0022]** Preferably, helmet (1) also comprises a number of inserts (10) of deformable material which partially or entirely cover the inner surface of the hard shell (2), to absorb any impacts.

**[0023]** The interior of hard shell (2) contains at least one expandable liner (11) to create an air-tight chamber (12) provided with means for inflation and deflation (13).

**[0024]** Chamber (12) can therefore retain gases such as air, enabling it to go from an inflated state where chamber (12) is filled with pressurised gas, to a deflated state where the internal pressure of the gas is substantially the same as the external air pressure. Preferably, the aforesaid means for inflation and deflation (13) are

situated on the chin guard and consist of a pump (14), for example a diaphragm pump, that is used for inflating chamber (12), as well as some means (140) for connecting the pump (14) to the chamber (12).

**[0025]** The aforesaid means (140) for connecting the pump (14) to the chamber (12) can consist, for example, of one or more segments of hose.

**[0026]** The means for inflation and deflation (13) additionally comprise a one-way valve element (15), operationally connected to the aforesaid means (140) for connecting the pump (14) to the chamber (12).

**[0027]** The said one-way valve element (15) permits the inflation of chamber (12) but prevents the air retained inside chamber (12) from coming out.

**[0028]** In order to deflate chamber (12) it is therefore necessary to operate the means (16) for opening the one-way valve element (15), where said means for opening (16) consist, for example, of a button (151) connected to a control device (150), where control device (150) is fitted on the one-way valve element (15).

**[0029]** Alternatively, the means for inflation and deflation (13) can be realised by substituting pump (14) with a tube for blowing air into chamber (12).

**[0030]** According to one possible embodiment illustrated in figure 2, the expandable liner (11) forms an air-tight bag (17) which defines chamber (12), and whose outermost surface (17a) is in direct contact with the hard shell (2) while the inner surface (17b) is in contact with the wearer's head. In this case, the inner surface (17b) is lined with a hypoallergenic fabric (18) to assure the comfort of the user.

**[0031]** Alternatively, according to the embodiment illustrated in figure 3, bag (17) is contained between the hard shell (2) and the inserts (10), which are therefore covered with the above-mentioned fabric material (18).

**[0032]** In both embodiments, bag (17) can entirely cover the interior of the hard shell (2) or, in configurations that are not shown, several bags (17) can be positioned at predefined points, for example at the front and/or the sides and/or the neck area at the back.

**[0033]** Moreover, the various bags (17), each provided with its own means for inflation and deflation (13), can be inflated at different pressures in order to achieve an even more personalised fit of helmet 1.

**[0034]** The use of helmet 1 constructed according to this invention is extremely simple.

**[0035]** With the chamber or chambers (12) not yet inflated, the user puts on the helmet 1 which fits loosely on the head. After donning the helmet, the user operates pump (14) to fill bag (17) with air until its volume causes the inner surface of helmet 1 to adhere snugly to the head and face. Before removing helmet 1 it is sufficient to operate the means (16) for opening the one-way valve element (15), allowing the air contained in bag (17) to come out.

**[0036]** It should first of all be pointed out that the helmet according to this invention assures a perfect custom fit on the wearer's head, affording safety and comfort at

the same time.

**[0037]** In addition, this precise fit is maintained even after prolonged periods of use, i.e. when the helmet is no longer new. Furthermore, the helmet according to this invention allows users to choose the most appropriate configuration for each occasion, for example a very snug "sports" fit for short journeys, or a more comfortable "touring" fit for longer trips. Finally, the helmet is extremely comfortable to put on and remove, because it does not need to be forcefully pulled on or off.

## Claims

1. Protective helmet consisting of a hard shell (2) comprising a crown (3) that is essentially hemispherical in shape and two side sections (4a, 4b) extending from the edges of the crown (3), **characterised in that** it comprises:
  - at least one expandable liner (11) placed inside the hard shell (2) and forming at least one air-tight chamber (12); and
  - means for inflation and deflation (13) of the chamber or chambers (12) mentioned above.
2. Helmet according to claim 1, **characterised in that** the said expandable liner (11) comprises an air-tight bag (17) which defines chamber (12).
3. Helmet according to claim 1, **characterised in that** the means for inflation and deflation (13) comprise:
  - one pump (14), for example a diaphragm pump;
  - means (140) for connecting said pump (14) to the chamber (12),
  - a one-way valve element (15), operationally connected to the said means (140) for connecting the pump (14) to the chamber (12); and
  - means for opening (16) the one-way valve element (15).
4. Helmet according to claim 3, **characterised in that** the means for opening (16) the one-way valve element (15) comprise:
  - one control device (150); and
  - one button (151) connected to the control device (150).
5. Helmet according to claim 2, **characterised in that** said bag (17) has an outer surface (17a) in direct contact with the hard shell (2) and an inner surface (17b) in contact with the wearer's head.
6. Helmet according to claim 2, **characterised in that** it additionally comprises a number of inserts (10) of deformable material positioned inside the hard shell

(2), with the bag (17) housed between the hard shell (2) and these inserts(10).

7. Helmet according to claim 1, **characterised in that** the chamber (12) extends over the entire inner surface of the hard shell (2). 5
8. Helmet according to claim 1, **characterised in that** it comprises a number of chambers (12) situated at pre-established points on the hard shell (2). 10

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**Fig. 3**

