April 14, 1970 Y. LE MASSON ET AL 3,505,677

DIVING CASQUE

Filed Dec. 21, 1967 3 Sheets-Sheet 1

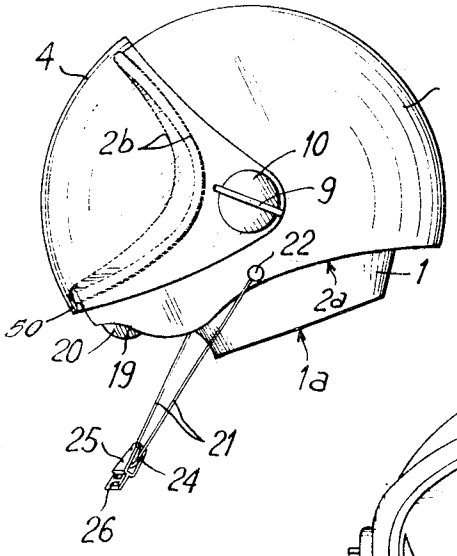


Fig.1

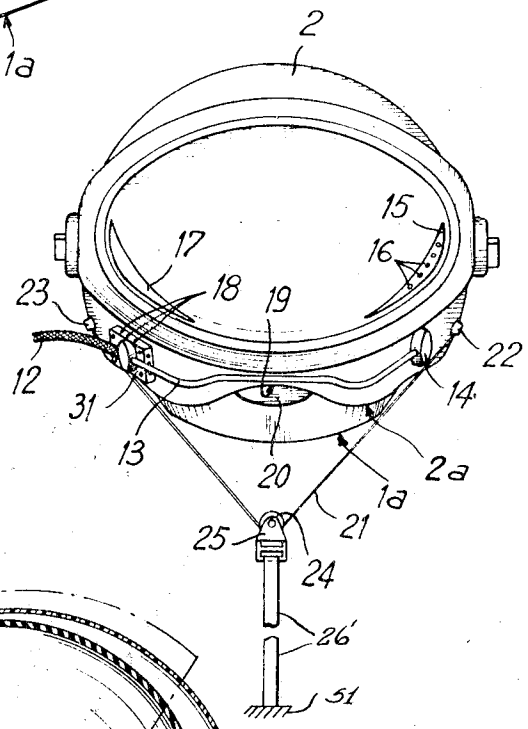


Fig.2

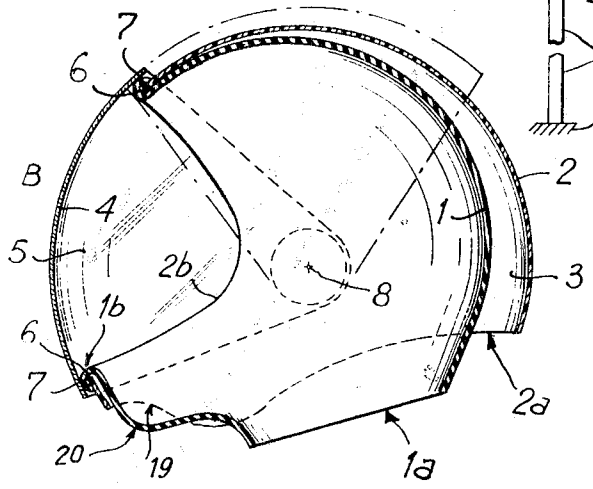
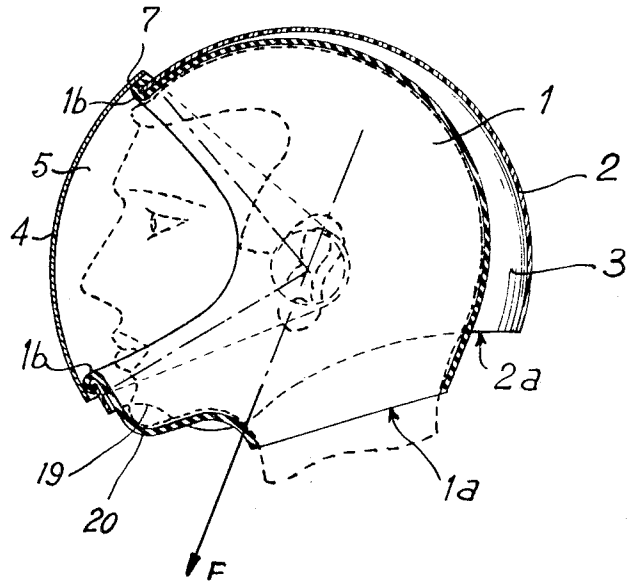


Fig.3

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MARCEL PRAVAZ,
Inventors
by Stephen A. Frazhaus
Atty

Fig. 4



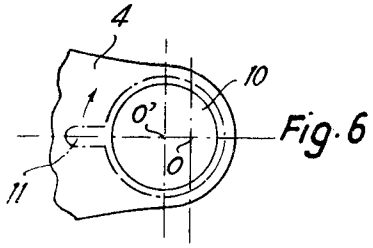


Fig. 6

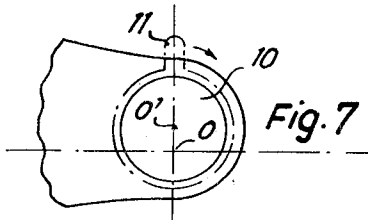


Fig. 7

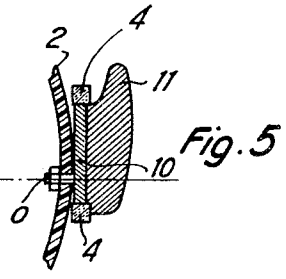


Fig. 5

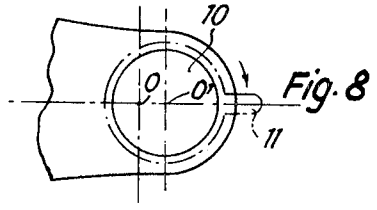


Fig. 8

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Fig. 9

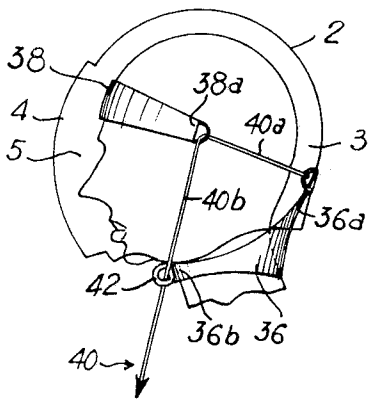


Fig. 10

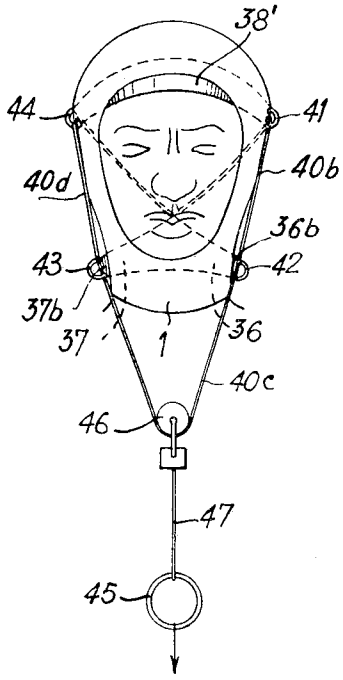


Fig. 11

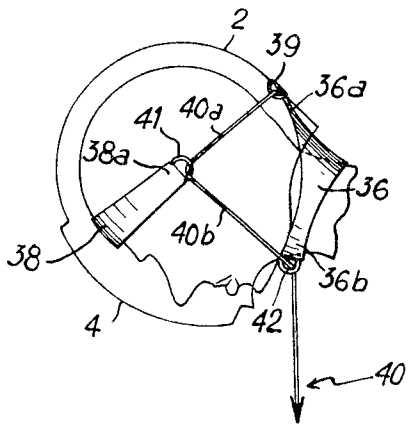
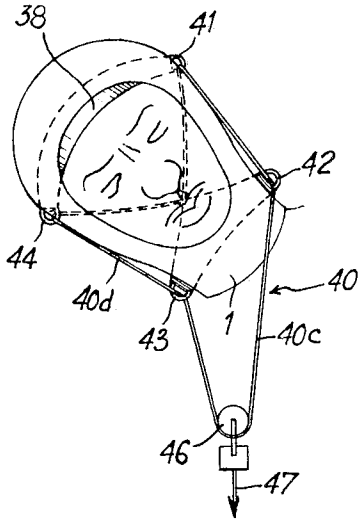


Fig. 12



United States Patent Office 3,505,677
Patented Apr. 14, 1970

3,505,677

DIVING CASQUE

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Filed Dec. 21, 1967, Ser. No. 692,579
Claims priority, application France, Dec. 26, 1966, 88,818
Int. Cl. B63c
U.S. Cl. 2—2.1 17 Claims

ABSTRACT OF THE DISCLOSURE

A diving casque comprising an elastic and head-fitting inner hood and a rigid protective outer helmet with a floodable space therebetween. The hood and the helmet are provided with facial openings and are connected together round the said openings. A glass is pivotally mounted on the helmet. Control means are provided for translating the glass when in front of said facial openings. The hood and the helmet are provided with neck openings and the neck opening edge of the helmet is formed with a chin notch through which can extend a corresponding chin protuberance formed in the hood. The casque is provided with a cap comprising frontal band for drawing the front backwards and neck bands for pinching the hood on the cheeks.

The invention relates to a diving casque.

Diving casques made either of a voluminous and heavy rigid helmet or of a light mask together with a breathing device are well-known in the art.

The rigid helmet is used for keeping the head dry and for allowing the diver to have a normal nasal breathing. The helmet is fixed with respect to the diver's shoulders and is water-tightly connected to the diver's suit. Its internal dead volume is great since the neck opening must be larger than the width of the head and since the head must be easily movable inside the helmet. This dead volume makes the casque very buoyant and it necessary to furnish the diver with a great ballast. Thus the normal position of the diver within the water is vertical, his helmet being buoyant and his feet ballasted.

Besides, the diver's head being not in a fixed position with respect to the helmet, the helmet must be provided with a plurality of glasses for allowing the diver a wide range of vision.

On the contrary a diver's mask is light, independent from the diver's suit, substantially not buoyant and is fixed with respect to the diver's head, but it is not protective and must be combined with a buccal breathing device.

A diver's casque also is known wherein a glass is fixed on a facial opening in an elastic hood and wherein the hood is covered with a protective helmet. Such a casque which is disclosed in the French Patent No. 1,472,124 offers some drawbacks. Thus the glass is liable to swing with respect to the diver's face and the helmet increases the buoyancy of the casque; further it may happen that the elastic hood exposed to the pressure of the breathing gas swells with the helmet.

A general object of the present invention is to provide an improved casque combining the advantages of the rigid helmet and of the elastic hood and excluding the drawbacks of the same, namely a light and protective casque of a very small buoyancy which keeps the head dry and which may be independent from the diver's suit.

A further object of the invention also is to provide a casque having a movable glass mounted thereupon.

Basically the casque according to the invention comprises an elastic and head-fitting inner hood and a rigid and protective outer helmet with a floodable space therebetween, said hood having a neck opening and a facial opening and said helmet having a neck opening and a facial opening, said hood and said helmet being water-tightly connected round their facial openings and a glass mounted on the helmet being arrangeable in front of said facial openings in a water-tight connection with the casque.

In a preferred embodiment, the glass is pivotally carried on the helmet for being displaceable from a working position in front of the said facial openings to a remote position wherein said openings substantially are free and vice versa.

Further operating means are provided for translating the glass with respect to the casque when the glass lies in front of said facial openings, either for the water-tight connection of the glass with the casque or for the retraction of the glass into its remote position.

It is also a teaching of the invention to have the opening of the helmet bounded by an helmet edge provided with a notch in the part thereof corresponding to the chin for reasons which will be explained below.

Another object of the invention is to provide the casque with a cap securing a right position of the hood and of the helmet with respect to the diver's head, whatever be the position of the head.

According to the invention, said cap consists in the combination of: a first neck band attached to a lower rear portion of the helmet, said first neck band passing between the helmet and the hood on a side of the neck and having a free fore end; a second neck band attached to a lower rear portion of the helmet, said second neck band passing between the helmet and the hood on the other side of the neck and having a free fore end; a frontal band having a free end between said helmet and said hood on each side of the hood; tensioning means attached to the rear portion of the helmet and passing through said free ends of the neck and frontal bands and connecting means movable between said fore ends of the said neck bands for connecting said tensioning means to drawing means.

These and other objects and advantages will become apparent as the details of the invention are further disclosed.

Referring to the drawings:

FIG. 1 is a perspective side view of a casque according to the invention;

FIG. 2 is a front view of the casque;

FIGS. 3 and 4 are vertical sections of the casque;

FIG. 5 is a schematic section of a part of the casque showing mounting means of the glass on the helmet;

FIGS. 6 to 8 are diagrammatic drawings illustrating, sequentially, the operation of the glass;

FIG. 9 is a side view of a casque provided with a cap according to the invention;

FIG. 10 is a front view of the casque of the FIG. 9;

FIG. 11 is a side view of the casque of the FIG. 9 illustrating how functions the cap when the head is bent forwards;

FIG. 12 is a front view of the casque of the FIG. 9 illustrating how functions the cap when the head is bent sidewards.

The casque substantially is made of an inner hood **1** fixed within an outer helmet **2**, with a floodable space **3** therebetween.

The hood **1** is form-fitting and is made of a material having the required degree of flexibility. Of the various substances useful therefor, unicellular rubber, f.i. neoprene, is used preferably. This use of the neoprene or the like is well known in the art, as disclosed f.i. in the U.S. Patents 2,749,551 and 2,981,954.

The protective helmet **2** is made of a material resistant enough for carrying the glass as explained below and for sheltering the head from small impacts or more. Suitable materials for making the same f.i. are aluinium or other light metal and light synthetic materials such as plastic materials, f.i. of the kind used for airman's helmet. The casque preferably is obtained by molding.

The hood is provided with a neck edge **1***a* which limits the neck opening through which the diver passes his head into the hood; this edge is either self water-tight or watertightly connectable to the diver's suit; it may be prolonged downwards up to the shoulders.

The helmet also is provided with a neck edge **2***a* which limits a neck opening wider and preferably upper than the neck opening of the hood; it is prefered to have the edge **2***a* located between the edge **1***a* and the position of the ears.

According to a specific feature of the invention, the edge **2***a* is provided with a notch **19** in the part thereof which corresponds to the chin. This notch allows the nose to pass when the casque is put on or put off, and the neck opening of the helmet should be wider if the edge **2***a* is not notched which would result in an helmet of a greater volume, an undesirable consequence. Moreover the notch **19** cooperates with a corresponding protuberance in the hood for maintaining a right position of the hood in the helmet as it will be shown below.

The space **3** formed between the inner hood and the outer helmet is open downwardly to be flooded when the diver is underwater; thus this space does not give buoyancy to the casque according to another feature of the invention.

Further the water which fills the space **3** when the diver is under water prevents a swelling of the hood within the helmet.

Of course the invention is not limited to any means for making the space **3** floodable and the same may be obtained by openings in the helmet wall for instance.

The hood and the helmet are provided with facial edges **1***b* and **2***b* respectively which define facial openings through which the diver can look and breath.

The helmet is water-tightly connected to the hood round in the region of the facial openings and a glass **4** is mounted on the helmet so as to be watertightly disposable in front of the facial opening of the helmet. Thus there is between the glass and the diver's face a space **5**, the so-called "dead space," which is substantially water-tight and fed with a breathing gas as explained below.

The connection between the hood and the helmet round their facial openings can be achieved by putting the facial edge **2***b* in a channel formed in the hood, f.i. a channel **6** obtained by folding outwards and rearwards the facial edge portion **7** of the hood as shown. Preferably the hood is adhesively connected to the helmet round the facial edges **1***b* and **2***b*.

In another embodiment of the casque according to the invention, there is no folding of the hood facial edge portion and the edge **1***b* is glued inside the facial edge portion of the helmet.

The glass **4** is pivotally mounted on the helmet to be movable from a working position where it lies in front of the facial openings, as shown in FIGS. 3 and 4, to a remote upper position where it makes the facial openings substantially free, as shown by the chain-dotted line in the FIG. 3.

According to a specific feature of the invention, operating means are provided for making the glass translatable towards and away from the casque so as to be pressed on the casque, to insure water-tightness in the said working position, or to be slightly spaced from the casque, to facilitate swinging the glass into its upper position.

In the described embodiment, the operating means comprise an eccentric **10** on each side of the glass, the glass **4** being pivotally mounted on the eccentrics **10** and the eccentrics **10** being pivotally mounted on the corresponding sides of the helmet **2**.

In FIGS. 5 to 8, **0'** is the theoretical axis of rotation of the glass **4** on the eccentrics **10**; and **0** is the theoretical axis of rotation of the eccentrics on the helmet **2**. FIGS. 6 to 8 show that the glass **4** is translated backwards by a distance equal to twice the distance between the axes **0** and **0'** when the eccentrics **10** are turned clockwise about 180°. Thus, the glass may be pivoted from its release (FIG. 4: chain-dotted line) position to its working position (FIG. 4, full line) while the eccentric is in the position of FIG. 6. Upon rotation of eccentric **10** through the position of FIG. 7 to that of FIG. 8, the glass **4** will be translated backwards to seat in sealing engagement against the edges **16**. Eccentrics **10** may be provided with handles **11** to simplify their handling.

The water-tightness of the contact between the glass and the casque when in its working position is obtained by the pressure of the glass on the folded edge **1***b* of the hood, as shown in FIG. 4. Optionally sealing material may be interposed between the glass and the casque round the facial openings when the hood is not folded outwards; a sealing ring **50** may be glued to the helmet round the facial edge **2***b* for example.

The glass **4** may be entirely transparent or may comprise non-transparent portions, for instance a metallic frame portion as shown.

Preferably the glass is curved for giving the diver the greatest range of vision with the least dead space. The central part of the glass may be flat. A glass having a radius of curvature of about 50 mm. is very convenient in use, due to the relative positions of the glass and of the diver's eyes.

According to another feature of the invention, the hood is provided with a chin protuberance **20** which projects through the chin notch **19** formed in the neck edge **2***a* of the helmet, thus preventing the helmet from bending downwards with respect to the hood.

It is to be noted that the diver at will can introduce his hands between the hood and the helmet for compressing his nose when needed, since the fixation of the hood to the helmet is limited to the periphery of the facial openings.

For preventing an upwards movement of the helmet with respect to the hood when the diver is under water, holding means for drawing the helmet downwards with respect to the hood are provided. In the embodiment shown in FIGS. 1 to 4, the holding means include a string **21** the ends on which are connected to pins **22** and **23** on the sides of the helmet and connecting means, such a wheel **24** with a stirrup **25**, movable along the said string for connecting the string either to a weight (not shown) or to the diver's suit, f.i. through an elastic link **26'** (FIG. 2) having an end attached in opening **26** (FIG. 1) to the stirrup **25** and the other end attached to the belt of the diver's suit as schematically shown at **51**.

Due to the movability of the connecting means along the string, the diver is not inhibited by the drawing means when he turns his head.

Breathing means for feeding the dead space **5** with breathing gas and for removing the gas after breathing will be described now.

In the shown embodiment, breathing means comprise a gas regulator assembly **31** mounted on the helmet and fed with breathing gas through a feeding line **12**, a gas helmet inlet **14** mounted on the helmet and fed from the assembly **31** through connecting gas line **13**, a gas distributor **15** with a plurality of distributing holes **16** mounted within the helmet for introducing the breathing gas under pressure into the dead space **5** and a gas outlet **17** mounted within the helmet and communicating with the assembly **31** for expelling outside the gas through holes **18**. Line **12** is connected to a gas cylinder (not shown) as usual.

The gas regulator assembly for a diving breathing system is well known in the art and need no more description. The feature of the invention is to have the breathing system mounted on the helmet to be preferably

removable at will. The hood is provided with the required passages for the introduction and for the expelling of the gas into and from the dead space **5**. When the facial edge **1***b* of the hood is entirely contained within the helmet, it is possible to have all the breathing system fixed on the helmet in front of the facial edge of the hood, thus avoiding any perforation in the hood for the passage of the gas.

FIGS. 9 to 12 schematically show an embodiment of the casque according to the invention wherein it is provided with a cap which is a feature of the invention.

The casque now comprises an inner hood and an outer helmet as above, with a cap therebetween as explained below; for convenience, the hood is not shown in FIGS. 9 and 11 whereas the helmet is not shown in FIGS. 10 and 12.

The cap comprises two neck bands **36** and **37** forming an open collar and a frontal band **38**.

Neck band **36** is attached to the helmet by its rear end **36***a*, either directly or by a link, the fixation being made in the lower rear portion of the helmet. The other end **36***b* of the band **36** is a free end which is located on the side and on the front of the neck, the said band passing outside the hood along the neck. It is the same with the other neck band **37** which is on the other side of the hood. The neck bands **36** and **37** may be independent one from another or may be two portions of a single collar of which the rear part is fixed to the helmet at **39** as shown. In the drawings, the said collar is raised backwards.

An end **38***a* of the frontal band **38** is on the left side of the hood and the other end **38***b* of the band is on the right side of the hood. The frontal band preferably is fixed to the hood at **38'** (FIG. 10) in the frontal portion thereof with the band ends **38***a* and **38***b* projecting outside the hood into the space **3**, preferably in the regions of the ears; f.i. the central part of the frontal band is made up of a material similar to the material of the hood and is blended with the hood.

Tensioning means which act on the bands is a string **40** or the like which is attached to the lower back portion of the helmet, f.i. at **39**, and which passes through rings fixed to the free ends of the bands, namely through the ring **41** at the band end **38***a*, the ring **42** at the band end **36***b*, the ring **43** at the band end **37***b* and the ring **44** at the band end **38***b* successively, to be again attached to the lower back portion of the helmet, f.i. at **39**.

Perforations in the band ends may be used instead of rings for the passage of the string **40**; any other passing means may be used provided that the cooperation of the tensioning means with the bands is that pointed out below.

String **40** or the like is drawn downwards by drawing means connected to the string by connected means movable along the string between the ends **36***b* and **37***b*. Drawing means f.i. comprise a weight **45** connected to the string portion **40***c* by a strap **47** attached to a wheel and stirrup assembly **46** movable along the said portion of the string.

The weight **45** may be connected to the diver's suit or equipment, for instance by a string passing between the diver's legs and attached at the back part of the diver's suit.

In the FIG. 11, the head is assumed to be in a position where it would be liable to impact the glass: the string **40** by its portions **40***a* and **40***c* then draws the diver's head backwards thus preventing such impact.

In the FIG. 12 where the diver is bent sidewards, the portion **40***b* of the string **40** applies on the adjacent face of the hood a pressure which prevents a swelling of the hood in that part thereof which is the more inclined to swell.

When the diver is bent on the other side, it is the string portion **40***d* which applies the convenient pressure on the hood.

Thus the cap according to the invention is effective for drawing the front backwards and for pinching the hood on the diver's cheeks.

The cap is made of material used for known headbands and able to endure the marine environment. For instance the bands are made of rubber and the string made of nylon, or the like.

What is claimed is:

1. A diving casque comprising an elastic and head fitting inner hood adapted to be worn by the diver directly over the head to keep the head dry;

a rigid protective outer helmet, said helmet being spaced from said hood, the space between said hood and helmet being floodable;

said helmet and said hood being formed with aligned facial openings;

connecting means interconnecting said helmet and said hood in the region of said facial openings;

a glass carried on the helmet and movable between a working position covering the facial openings of the hood and the helmet and a release position leaving said openings substantially free;

and operating means carried on the helmet, said operating means permitting moving the glass between its release position and its working position and movably securing the glass to the helmet, and securing the glass with sealing pressure around the facial opening of the hood when the glass is in working position.

2. A diving casque as claimed in claim **1**, wherein the operating means interconnect the glass and helmet by a pivotal and translatory connection to permit translating the glass in front of said facial opening for varying distance between the glass and said opening and for effecting said sealing pressure, as well as for swinging of the glass away from the opening.

3. A diving casque as claimed in claim **2**, wherein said operating means comprises a pair of eccentrics, one at each side of the glass, and rotatably mounting the glass thereon; said eccentrics being, in turn, rotatably mounted on opposite sides of the helmet.

4. A diving casque as claimed in claim **1**, wherein the helmet has a lower front edge, said lower front edge being formed with a thin notch.

5. A diving casque as claimed in claim **4**, wherein the hood is provided with a protuberance adapted to receive the chin of the diver, said protuberance extending through said notch.

6. A diving casque as claimed in claim **1**, wherein the connecting means for the hood and the helmet are an adhesive, adhesively connecting the helmet to the hood around the facial openings.

7. A diving casque as claimed in claim **1**, wherein the connecting means for the hood and the helmet includes a channel edge formed in the hood around the facial opening therein; and an edge formed at the helmet in the region of the facial opening and received in said channel edge of said hood.

8. A diving casque as claimed in claim **1**, including a sealing strip surrounding said facial openings and interposed between the glass and the helmet.

9. A diving casque as claimed in claim **1**, wherein the helmet is provided with means for drawing the helmet in a downwardly direction, when worn by a driver.

10. A diving casque as claimed in claim **1** and further comprising a cap which consists in the combination of: a first neck band attached to a lower rear portion of the helmet, said first neck band passing beneath the helmet on a side of the neck and having a free fore end; a second neck band attached to a lower rear portion of the helmet, said second neck band passing beneath the helmet on the other side of the neck and having a free fore end; a frontal band having a free end beneath said helmet on each side of the hood; tensioning means attached to the rear portion of the helmet and passing through said free ends of the neck and frontal bands and connecting means mov-

able between said fore ends of the said neck bands; means drawing said cap in a downward direction, said connecting means connecting said tensioning means to drawing means.

11. A diving casque as claimed in claim **9** wherein said drawing means comprises a string attached to the helmet and connecting means movable along said string for connecting the string with tensioning means.

12. A diving casque as claimed in claim **11** wherein said tensioning means comprise an elastic link between said connecting means and a fixed point.

13. A diving casque as claimed in claim **10** and wherein said frontal band is fixed to the hood.

14. A diving casque as claimed in claim **10** and wherein said neck bands are two portions of a single collar raised backwards and of which the rear part is attached to the helmet.

15. A diving casque as claimed in claim **10** and wherein said tensioning means comprise a string attached to the rear lower part of the helmet and passing through the free end of the first neck band, a free end of the said frontal band, the said free end of the second neck band and the other free end of the said frontal band successively.

16. A diving casque as claimed in claim **15** and wherein said free ends of the bands are provided with rings through which passes the said string.

17. A diving casque as claimed in claim **15** and wherein said drawing means comprises a weight and a wheel and stirrup assembly connecting said weight to said string.

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