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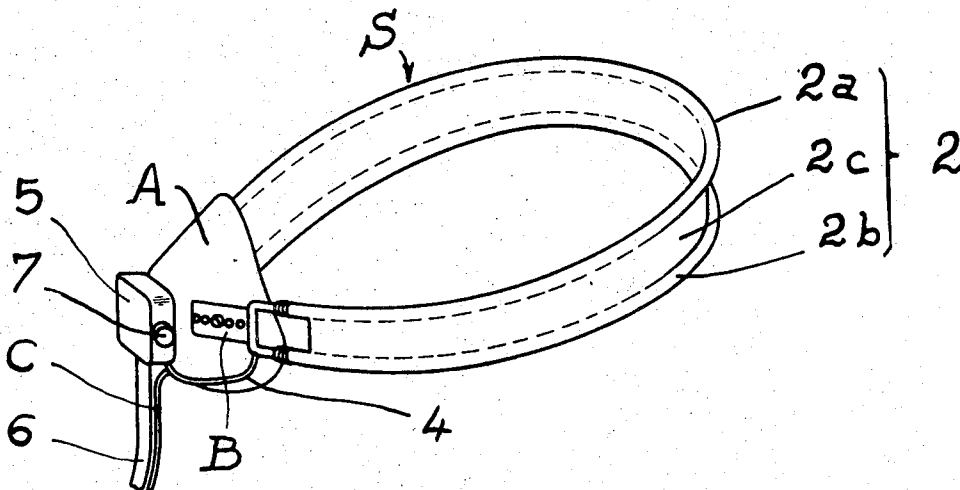
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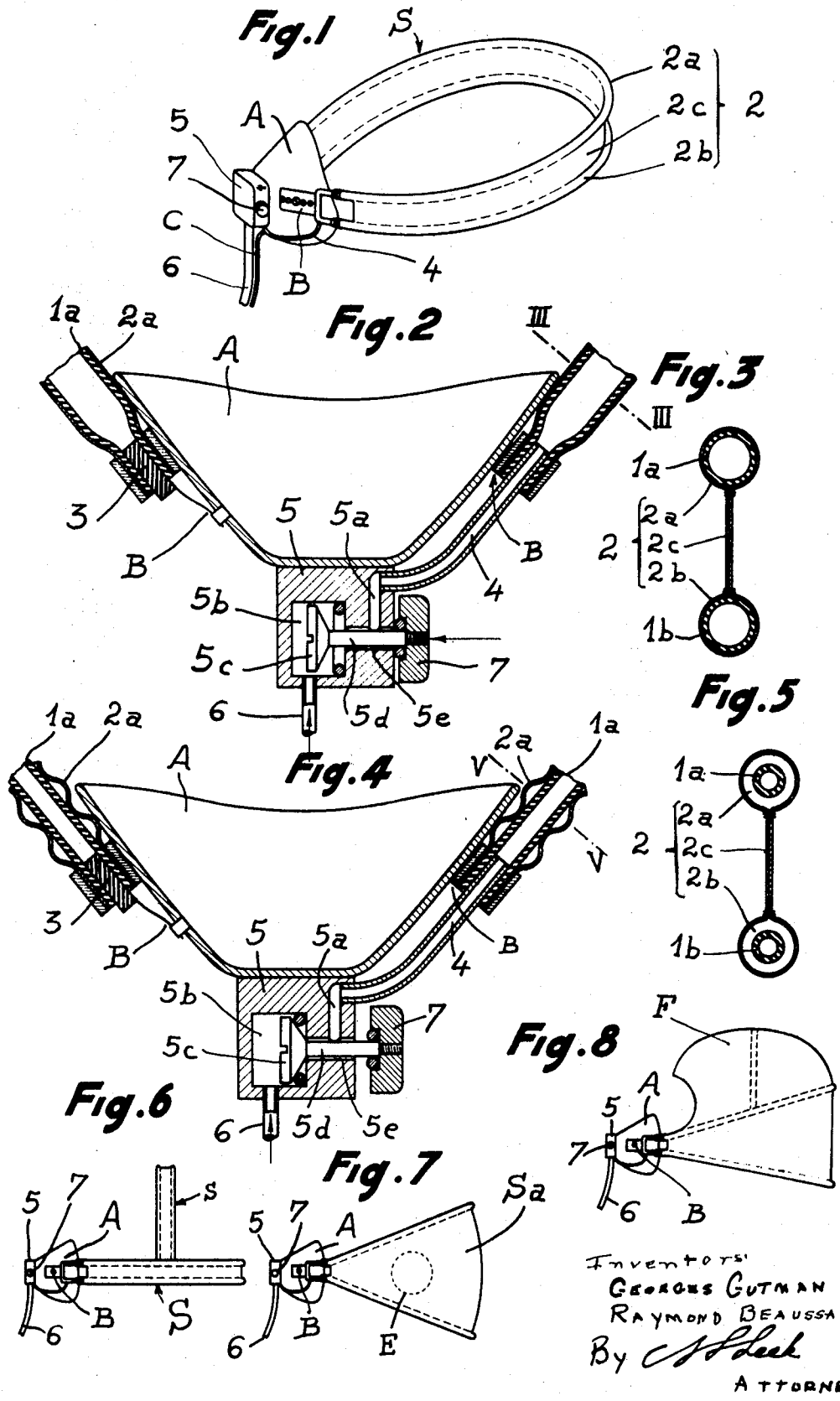
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[54] INFLATABLE HEAD HARNESS FOR RESPIRATOR
DEVICES
6 Claims, 8 Drawing Figs.

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[51] Int. Cl. A62b 18/08
[50] Field of Search..... 128/146.7,
142.4

ABSTRACT: An inflatable head harness to rapidly fit and carry a face mask. The harness has two inflatable elastic tubes closed at one end and opened at the other end. A sheath of limited yieldability encircles the tubes and acts to restrain their expansion when inflated. When in the inflated state, the harness is placed over the head of a user and then deflated to fit the user's head. A valve is connected to the opened ends of the tubes to control the inflation and deflation of the harness by exposing the opened ends to a fluid source or ambient air, respectively.





INFLATABLE HEAD HARNESS FOR RESPIRATOR DEVICES

This application is a continuation of application Ser. No. 646,678 filed June 16, 1967, now abandoned.

This invention relates to head harnesses or helmets for the purpose of wearing any apparatus such as a respiratory mask, and the invention is accordingly concerned with the design and development of a harness of the type referred-to whereby any apparatus to be worn or carried by the user can very easily and quickly be fitted in position with only one hand and can also be removed with one hand with equal ease and rapidity.

The novel head harness has a wide range of potential applications which are too numerous to be listed here. In order to define the problem which has been investigated by the present Applicant, and the solution of which forms the basis of this invention, consideration will therefore be given only to one application which is given solely by way of example. This application is concerned with emergency respiratory masks employed by aircraft pilots; masks of this type must essentially be put into immediate service in the event of sudden failure of the pressurization system, for example as a result of a failure of the cockpit wall.

Should such an accident occur, the emergency respiratory mask with which the pilot of the aircraft is equipped must not only be within his immediate reach but must also permit of reliable and convenient fitting with only one hand and in the shortest possible time.

In order to achieve this result, the automatic harness according to the invention is characterized in that it comprises a holding means which constitutes at least one loop, the two ends of said loop being fastened to the apparatus to be carried by means of said harness, said holding means being normally flexible and having the distinctive property of permitting extension up to a predetermined limit and of becoming restrained in its flexibility as soon as it reaches said limit so as to acquire at that moment both a degree of stiffness and a length such that said holding means can then be readily and freely engaged over the user's head, the extension of said holding means being produced by an external force controlled by the user and preferably with only one hand, namely the hand in which the harness is held together with the apparatus to be fitted in position.

In a preferred embodiment which is not given in any limiting sense, the novel automatic head harness is of the pneumatic type and the holding means which forms the essential part thereof is characterized in that it consists of at least one fastening strap comprising at least one closed elastic tube housed within a sheath which affords limited extensibility in order to ensure that any elongation as well as any transverse expansion of the elastic tube beyond a predetermined limit is accordingly prevented and that, when said limit is attained, the assembly consisting of tube, sheath and apparatus to be carried is consequently endowed both with a degree of rigidity and with dimensions which permit of easy handling of said assembly (after the fashion of a rigid hoop) or in other words which permit of correct engagement and positioning on the user's head; the extension as well as the expansion of said elastic tube being produced by a supply of compressed air which is controlled by a distributor, said distributor being adapted to put said elastic tube into communication either continuously with the surrounding atmosphere or temporarily with a source of fluid under pressure, depending on the user's requirements.

In this embodiment, the head harness may further be characterized by the following features and combinations:

The fastening strap preferably comprises two elastic tubes disposed in parallel relation at a predetermined distance from each other inside two corresponding cavities of a common sheath;

the elastic tube or each elastic tube is made of rubber or like material;

the sheath which affords limited extensibility is a single-walled or double-walled sleeve made of fabric which is pleated over the elastic tube as long as said tube is not subjected to any elongation stress, the length of said sheath in the unpleated state being such as to correspond to the maximum dimension of the fastening strap while said sheath is subjected to the aforesaid stress;

the distributor is adapted to communicate with one end of the elastic tube or of each elastic tube whilst the other end thereof is closed, said distributor being mounted in proximity to the tube-end with which it communicates (for example on the respiratory mask to which the harness is attached) and comprising a control knob which is normally maintained in a rest position in which the elastic tube or each elastic tube communicates with the surrounding atmosphere.

Further properties and advantages of the invention will become apparent from the following description which relates to one example of construction of the automatic head harness according to the invention, said example being given solely by way of indication and illustrated diagrammatically in the accompanying drawings, in which:

FIG. 1 is a view in perspective of the automatic head harness which is of the pneumatic type in the example shown, said harness being secured to a respiratory facepiece and being shown in the expanded and relatively rigid condition, namely in which it is ready to be placed over a user's head;

FIG. 2 is a partial longitudinal sectional view of the facepiece at the level of one of the two elastic tubes showing the compressed-air distributor and the ends of the harness which is attached to said facepiece, said harness being in the expanded and relatively rigid state;

FIG. 3 is a transverse sectional view taken substantially along the line III-III of FIG. 2;

FIG. 4 is a view which is similar to FIG. 2, the harness being in the rest position;

FIG. 5 is a transverse sectional view taken substantially along the line V-V of FIG. 4;

FIGS. 6, 7 and 8 are profile views of alternative forms of execution of a harness of the pneumatic type.

The pneumatic head harness of FIGS. 1 to 5 is designed for rapid and convenient fitting, wearing and removal of the respiratory facepiece A (or breathing mask) at which the microphone leads terminate and to which said harness is attached consists of a fastening strap S comprising two elastic tubes 1a and 1b which may be fabricated of rubber, for example. Said tubes are placed inside two parallel tubular ducts 2a and 2b which are located at a distance from each other and formed within a common fabric sheath 2, said tubular ducts being joined together by means of a web 2c.

The ends of the sheath 2 are joined to the facepiece A, preferably in an adjustable manner at B.

When the harness is in the rest position (as shown in FIGS. 4 and 5), the elastic tubes have a small cross-sectional area and minimum length. The fabric sheath 2 is then in the pleated state, the assembly consisting of tubes and sheath being thus in the form of a flexible band with relatively small rigidity (which can facilitate storage of standby equipment when so required).

One of the ends of each tube 1a, 1b is sealed off by means of a plug 3 whilst the other end is coupled by means of a rigid tube 4 to the duct 5a of a compressed-gas distributor 5 constituted by a casing in which is formed a chamber 5b. Said chamber is connected by means of a pipe 6 to a compressed-gas source (which is not shown in the drawings and which can be, for example, the oxygen supply of a miniature regulator which is provided on the respiratory mask).

A valve 5c located inside the chamber 5b is integral with a pushrod 5d which passes through a duct 5e outside the casing and terminates in a control knob 7. Said duct 5e has a diameter which is larger than that of the push-rod 5d and thus serves as a connecting passageway into which opens the duct 5a. In FIG. 4, said duct 5a communicates with the atmosphere and, in FIG. 2, (in which the control knob has been depressed by the user), said duct accordingly communicates with the chamber 5b and therefore with the compressed-gas source.

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In the case last mentioned (in reference to FIGS. 2 and 3), the elastic tubes 1a and 1b are on the one hand caused to expand to the maximum diameter which is permitted by the corresponding tubular ducts 2a and 2b of the sheath 2 and, on the other hand, extended to the maximum length which is permitted by said sheath 2. The assembly retains the configuration of a loop which is connected to the facepiece A. However, in the stretched condition, said loop is larger than in the slack condition and is also endowed with a degree of stiffness which permits of easy handling and engagement over the head of the wearer.

When the user considers that the harness is correctly fitted in position, he then releases the distributor control knob 7, in order to allow the compressed air contained in the tubes 1a and 1b to escape to the atmosphere through the passages 4, 5a and 5e as can be clearly seen from FIG. 4. When the control knob 7 is released, it moves from the position illustrated in FIG. 2 to the position illustrated in FIG. 4 as a result of the compressed air passing through tube 6 and pressing against the face of the valve 5c.

By virtue of the elasticity of the tubes 1a and 1b, the harness then tightens round the wearer's head and thus provides a close fit.

In order to remove the device A together with its harness, the user need only press the control knob 7 once again, with the result that the harness again increases in size and stiffness and can then be removed without the least difficulty.

Only one embodiment of the device according to the invention has been described in the foregoing but a large number of detail modifications can be contemplated.

Thus, in the alternative form which is illustrated in FIG. 6, the fastening strap S is associated with an auxiliary strap or crossband s.

In FIG. 7, the holding means is a strap Sa, and the central portion of said strap (which is intended to be applied against the back of the user's head) is widened and adapted to permit the use of earphones E.

In the alternative form which is shown in FIG. 8, the holding means takes the form of a full helmet F made of fabric, for example.

Without thereby entailing any substantial modifications, the pneumatic head harness could also be controlled (both in extension and in rigidity) by a hydraulic fluid.

The novel head harness could also be designed to operate by means other than the action of a fluid under pressure.

Instead of elastic tubes which are controlled by pneumatic or hydraulic means, consideration could also be given to the use of a cable having a predetermined degree of flexibility and which could be caused to work in compression inside an elastic tube or alternatively inside an elastically extensible sheath fitted inside the limited-stretch sheath. Said cable could be actuated either by hand (by means of a pushrod in the same manner as the shutter release of a photographic camera) or by means of a miniature jack (of the hydraulic or pneumatic type), or by means of an electromagnet, and so forth. These and all other alternative forms which are within the capacity of any one versed in the art also come within the broad purview of this patent.

What we claim is:

1. A head harness in combination with any apparatus to be carried on the head of a user, said harness comprising:

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at least one closed flexible tube for encircling the user's head, enclosed by a sheath of limited yieldability;

a fluid source under pressure communicating with said tube; valve means interposed between said source and said tube to control the flow of fluid to the tube;

outlet means in said valve means normally connecting the tube with ambient air whereby said valve means may close said outlet means and allow the fluid to enter at least one tube to inflate it or may open said outlet means to empty said tube if inflated.

2. In a head harness for rapidly fitting, carrying and removing apparatus of the class of respiratory mask, said harness comprising a holding strap forming a loop, the two ends of which are fastened to said apparatus, said holding strap consists of at least one inflatable closed elastic tube connectable to a fluid source under pressure and enclosed by a sheath of limited yieldability for preventing any elongation of said tube beyond the limited elongation of said sheath, and valve means connected to said tube and connectable to said fluid source to control the flow of fluid to the tube and outlet means in said valve means, said valve means normally connecting the tube with ambient air and movable to a position whereby said valve means closes said outlet means and allows fluid to enter the tube to inflate it and thus increase the length of the loop formed by the strap, the valve means movably returnable to its normal position to empty said tube if inflated and to restore the initial dimension of the loop of the strap.

3. A head harness as claimed in claim 2, wherein the holding strap comprises a plurality of tubes, said tubes communicating with each other, disposed in parallel relation, and enclosed in corresponding cavities of the sheath which is common to all tubes.

4. A head harness as claimed in claim 2, wherein the sheath is a sleeve made of fabric which is pleated over the elastic tube as long as said tube is not inflated and the length of which in the unpleated state corresponds to the maximum dimension of the fastening strap while said elastic tube is in the inflated state.

5. A head harness as claimed in claim 2, wherein the valve means is adapted to communicate with one end of the elastic tube whilst the other end is closed and said valve means which is mounted in proximity to the tube-end with which it communicates is provided with a control knob which, when at rest, is in a position in which the elastic tube communicates with the ambient atmosphere.

6. A head harness and respirator mask combination, said head harness comprising:

a pair of parallel flexible tubes encircling the user's head enclosed by a sheath of limited yieldability, one end of each of said tubes being closed and the other ends being opened;

a fluid source under pressure communicating with the opened ends of said tubes and said respirator mask;

valve means interposed between said fluid source and the opened ends of said tubes to regulate the flow of fluid to the tubes;

outlet means in said valve means normally connecting the opened ends of the tubes with ambient air whereby said valve means may close said outlet means to allow the fluid to enter the tubes to inflate them or may open said outlet means to empty said tubes if inflated.

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