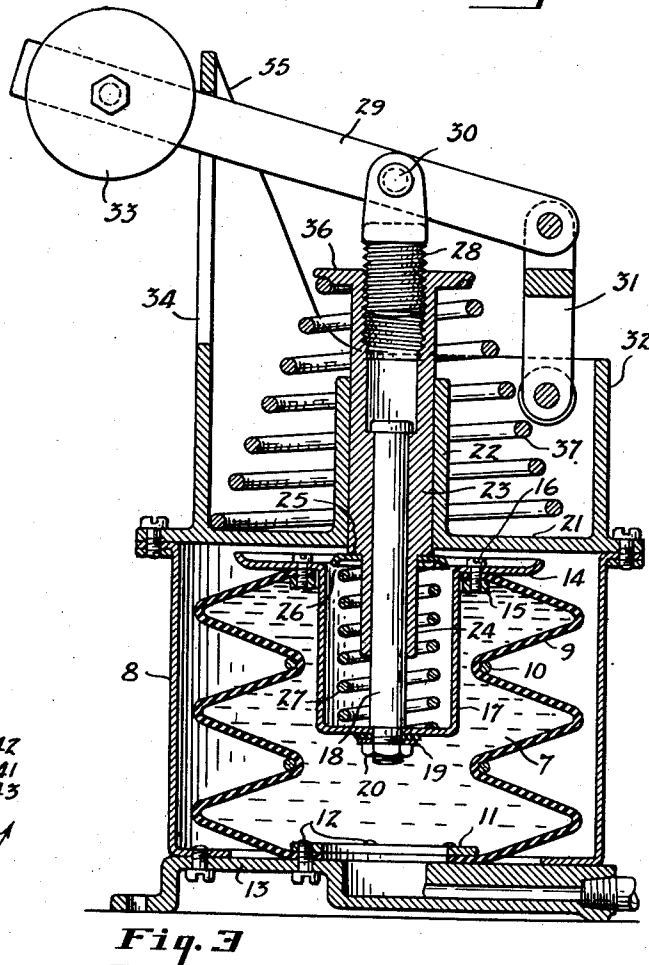
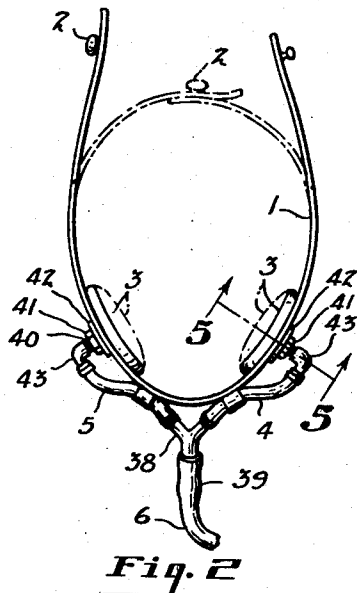
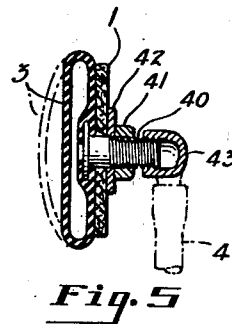
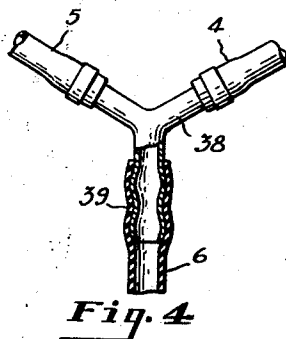
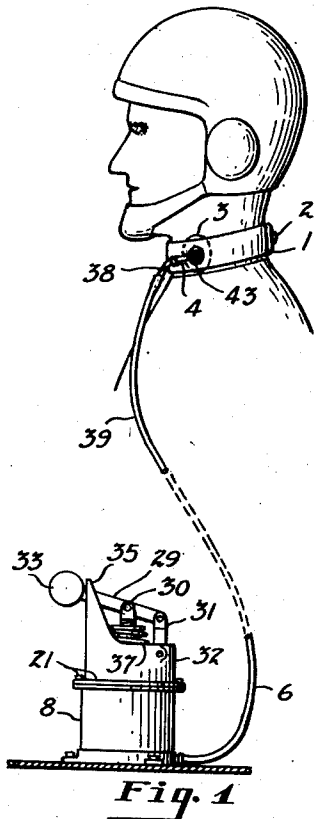


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C. A. COAKWELL, JR
BLACKOUT-PREVENTING DEVICE

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INVENTOR
Charles A. Coakwell Jr.
BY *Frank S. Greene*
ATTORNEY

UNITED STATES PATENT OFFICE

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BLACKOUT-PREVENTING DEVICE

Charles A. Coakwell, Jr., Cleveland, Ohio

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7 Claims. (Cl. 128—1)

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This invention relates to a device for preventing the effect commonly referred to as "black-out," which is caused by sudden change in direction of movement of an airplane traveling at high speed.

In maneuvering fast fighting planes during the course of an air battle, sharp banks and turns at high speed are often necessary to escape the fire of enemy craft. But such turns are highly dangerous because sudden changes in the direction of movement of the pilot's body may so accelerate the flow of blood through the veins leading from the head as to drain the blood from the pilot's brain to an extent such that the optic nerves are affected and the pilot becomes temporarily blind. The apparent increase in the weight of a body carried by a plane due to its inertia during recovery of the plane from a diving maneuver is commonly referred to as an increase of *g* and the present invention provides means automatically operative upon an increase of *g* for impeding the flow of blood from the pilot's brain to prevent blacking out.

The present invention has for its object to provide acceleration responsive means for retarding the venous flow of blood from the head during sharp turns so as to increase the pilot's resistance to blacking-out.

A further object of the present invention is to provide a pressure-applying device which is automatically controlled by turning movements of the plane such that there is an increase in the thrust of the pilot's body against the seat due to inertia.

With the above and other objects in view, the invention may be said to comprise the devices illustrated in the accompanying drawing, hereinafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention pertains.

Reference should be had to the accompanying drawings forming a part of this specification, in which:

Figure 1 shows the device of the present invention attached to the pilot's neck;

Fig. 2 is a plan view of the collar which carries the pressure-applying pads;

Fig. 3 is a sectional view showing the automatic pressure-applying means;

Fig. 4 is a detail view showing the breakable connection between the fluid pressure supply tube and collar; and

Fig. 5 is a section taken on the line indicated at 5—5 in Fig. 2.

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The device of the present invention is a device for applying pressure to portions of a pilot's neck while sharp turns are being made, so as to temporarily restrict the flow of blood from the head and prevent blacking-out.

The device of the present invention includes a suitable support for the pressure-applying device which may be in the form of a collar 1 adapted to be secured on the pilot's neck by means of a suitable quick detachable fastener 2. The collar 1 carries one or more inflatable pads 3 which are so positioned that they are adapted to apply pressure to veins carrying blood from the head. Fluid under pressure is supplied to pads 3 through tubes 4 and 5, which branch from a main pressure-supply tube 6. The fluid employed for inflating the pads 3 is preferably a liquid supplied from a reservoir 7 to which the tube 6 is connected.

The reservoir 7 is in the form of a tubular bellows mounted within a housing 8 which is fixed to a portion of the plane such as the pilot's seat, or the floor of the cockpit. The bellows 7 has a collapsible tubular wall 9 which may be formed of rubberized fabric and which has spaced restricted portions which are stiffened by spaced hoops 10. The lower end of the wall 9 is secured by means of a clamping ring 11 and bolts 12 to the base 13 of the housing 8. The bellows has an upper movable head 14 to which the upper end of the flexible wall 9 is attached by means of a clamping ring 15 and bolts 16. The head 14 has a central cup-shaped portion 17 which projects into the bellows 7. A rod 18 is rigidly attached to the bottom of the cup-shaped portion 17, the rod 18 having a reduced lower end 19 which extends through the bottom of the cup-shaped portion 17 and which is threaded to receive a clamping nut 20.

It will be apparent that the compression of the bellows 7 by downward movement of the head 14 will apply pressure to the liquid within the bellows and the tube 6, forcing liquid into the inflatable pads 3 so as to exert pressure against the neck of the pilot. Pressure exerted upon the veins which conduct blood from the head impedes the flow of blood and lessens the tendency of the blood to drain from the head upon sudden change in direction of movement. It is desirable that this pressure be applied during turning movements and it is obvious that such application of pressure may be effected manually if desired. However, in view of the fact that such manual application of pressure might not be convenient for the pilot, it is preferred to provide automatic means responsive to turning

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movements of the airplane for applying pressure to the liquid.

As herein illustrated, the rod 18 is actuated automatically by a device mounted upon the housing 8. The housing 8 has an upper head portion 21 provided with a central boss 22 in which a sleeve 23 is slidably mounted. The sleeve 23 slidably receives the upper end of the rod 18 and is provided with a reduced lower end portion 24 providing a shoulder 25, which provides a seat for a washer 26. A spring 27 mounted in the cup-shaped portion 17 of the bellows head surrounds the rod 18 and reduced portion 24 of the sleeve 23 and bears against the underside of the washer 26. The upper end of the sleeve 19 is internally threaded to receive an adjustable threaded extension 28.

A lever 29 is connected intermediate its ends by pivot pin 30 to the adjustable extension 28 and has one end pivotally connected to the upper end of a link 31 which is pivoted at its lower end to a tubular wall 32 extending upwardly from the head 21 of the housing 8. The opposite end of the lever 29 carries a weight 33 which may be adjustably mounted upon the lever. The lever 29 is guided for vertical movement in a slot 34 which receives the end of the lever to which the weight is attached and which is formed in an integral extension 35 of the wall 32. The sleeve 23 is provided with a flange 36 above the boss 22 and a conical coil spring 37 is interposed between the flange 36 and the head 21 of the housing.

The spring 37 serves to normally support the lever 29 and weight 33 in elevated position so as to relieve the pressure on the lower spring 27 interposed between the bellows and the sleeve 23 so that normally the liquid within the reservoir 7, tubes 4, 5, and 6, and pads 3 is not subjected to compression. The spring 27 need not be completely released but the pressure normally exerted by the spring 27 should not be sufficient to over-balance the pressure head due to the height of the pads above the reservoir 7, since the pads 3 should not normally exert pressure upon the pilot's neck. Whenever the plane is turned in such manner that blood tends to drain from the pilot's head due to its inertia, the change in the direction of movement of the weight 33 will cause the weight to exert a pressure toward the bellows 7 in excess of the pressure due to gravity. This increased pressure exerted by the weight tends to cause the lever 29 to swing about its pivot toward the bellows 7 and, if the turn is made while traveling at high speed, the movement of the weight will compress the spring 37 and apply pressure to the bellows 7 through the spring 27.

The extent of movement of the lever 29 is limited by the slot 34, so that after a predetermined movement of the weight toward the bellows 7, the lever 29 comes into engagement with the bottom of the slot 34 and there is no further compression of the springs 27 and 37. The amount of pressure applied to the liquid in the bellows 7 is thus limited to a substantially predetermined amount, namely, the pressure exerted upon the spring 27 when the lever 29 is held in engagement with the bottom of the slot 34.

The range of movement of the lever 29 and the maximum pressure upon the spring 27 may be adjusted by adjusting the threaded extension 28 in the upper end of the sleeve 23, an upward adjustment of the extension increasing the amount of pressure applied when the lever 29 is held in its lowermost position.

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By the means above described, the pressure exerted by the inflatable pads 3 is automatically applied during turning movements of the plane which tend to cause black-outs and the amount of pressure so exerted is automatically limited so that choking or other undesirable effects are not caused by the actuation of the pressure devices.

In order to permit the pilot to quickly disengage the pressure-applying device in the event that it becomes necessary for the pilot to bail out, the fastener 2 which holds the collar in place on the pilot's neck is preferably of a type such that it can be quickly and easily released by hand. As an additional safety measure, the tube 6 may be provided with a breakable connection with a fitting 38 which connects the tube 6 to the tubes 4 and 5. This connection may be in the form of a frictional slip coupling 39 between the rubber tubing and the fitting 38.

The pads 3 may be attached in any suitable way to the collar 1. As herein shown, each pad is provided with a threaded stem 40 which extends through the collar 1 and the pad is clamped in place by means of a nut 41 and washer 42 on the stem 40. The tubes 4 and 5 may be connected to the stems 40 by means of suitable fittings 43.

It will be apparent that the present invention provides a device of simple construction which operates instantly and automatically whenever the plane is turned sharply in such a manner that the blood is caused by its inertia to flow away from the pilot's head and that the restrictive pressure so applied may be so regulated as to keep it within a safe limit.

It is to be understood that variations and modifications of the specific device herein shown and described for purposes of illustration, may be made without departing from the spirit of the invention.

What I claim is:

1. A device for protecting an airplane pilot against black-outs comprising a support, means for detachably fastening said support to the body of a pilot, an inflatable pressure-applying pad carried by said support and engageable with the pilot's neck to apply pressure to veins in the neck to retard flow of blood from the head, a reservoir for liquid mounted in fixed position on the airplane, a flexible tube connecting said reservoir to said pad, a movable member for applying pressure to the liquid in said reservoir, a movably mounted weight connected to said movable member and adapted to actuate the same in a direction to apply pressure to the liquid upon a turning movement of the airplane, and means for limiting the pressure exerted by said movable member upon the liquid.

2. The combination, comprising constricting means to be worn about a portion of the body of an occupant of an aircraft, a conduit for conducting a fluid medium under pressure to operate said constricting means, acceleration responsive means for regulating the pressure of said fluid medium so as to increase the constricting force applied by said constricting means during recovery of said aircraft from a diving maneuver, and said constricting means arranged to be positioned about the body of the occupant in such a manner as to retard upon such increase in the constricting force thereof the drainage of blood from the brain of the occupant, whereby during the interval of recovery of the aircraft from said diving maneuver the occupant may be protected from loss of consciousness.

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3. The combination with a fluid pressure operated device mounted on an aircraft and means for supplying a fluid medium under pressure to said device, of means for automatically controlling the pressure of said fluid medium comprising a weighted member mounted for limited movement in a path fixed with respect to said craft and disposed transversely of the path in which said craft is propelled, elastic means for exerting a yielding pressure on said weighted member to normally hold said member at one end of its path of movement, said elastic means being yieldable to permit movement of the weighted member under the increased pressure exerted by said weighted member during changes in the direction of movement of the craft that oppose the momentum of the weighted member to said elastic means, and means operated by said weighted member for varying the pressure of the fluid medium supplied to said device.

4. The combination with a fluid pressure operated device mounted on an aircraft and means for supplying a fluid medium under pressure to said device, of means for automatically controlling the pressure of said fluid medium comprising a weighted member mounted for limited movement toward and away from the floor of the craft, a spring exerting pressure upon said weighted member away from said floor sufficient to hold the weight at its limit of movement during normal flight, said spring being yieldable under the increased pressure of said weight during changes in direction of travel of the craft causing acceleration of said weight in a direction toward said floor, and means operated by said weight for varying the pressure of said fluid medium.

5. In a system for preventing unnatural blood distribution within a human body which is subjected to forces set up when said body is accelerated in space, a fluid pressure operated de-

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vice adapted normally to engage loosely a portion of the human body and adapted when actuated to effect a pressure against blood carrying vessels of the body, a conduit connected to said device to supply pressure thereto to actuate the same, inertia means automatically operative in response to said acceleration forces, means operated by said inertia means for effecting transmission of pressure through said conduit to said device when said inertia means is operated in response to acceleration forces and for discontinuing the transmission of pressure to said device upon cessation of said acceleration forces, means for limiting the maximum pressure applied to said fluid pressure operated device, and adjustable means for increasing or decreasing the maximum pressure applied to said fluid pressure operated device.

6. The device defined in claim 2 in which the acceleration responsive means establishes and maintains a pressure in said constricting means that is proportional to the increase in g.

7. The device defined in claim 2 in which means is provided for limiting the pressure applied to said constricting means.

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