Jan. 23, 1951 W. THOMAS 2,539,284

GOGGLES

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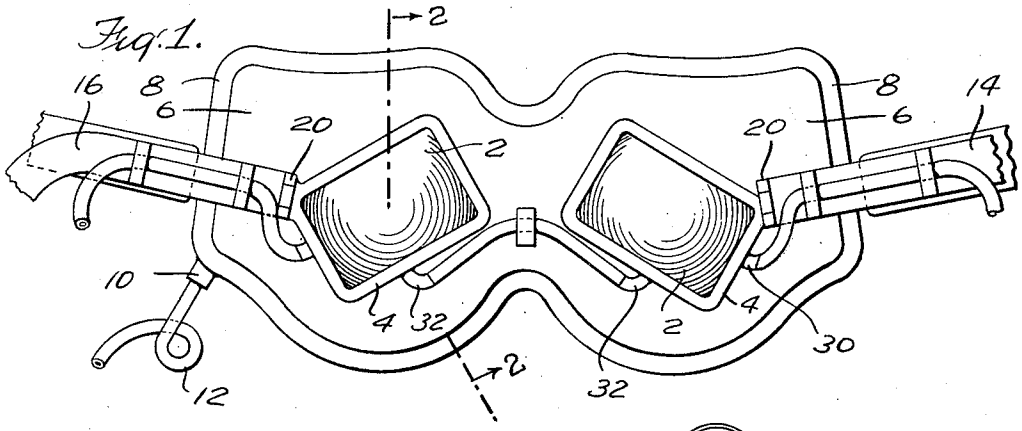
Fig. 1.



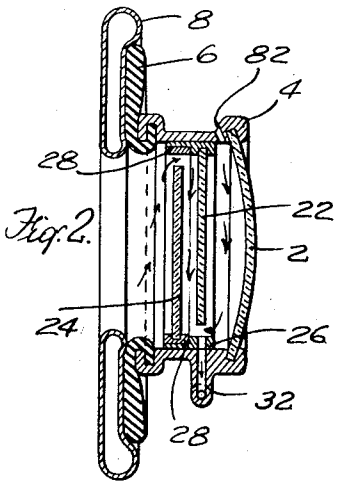
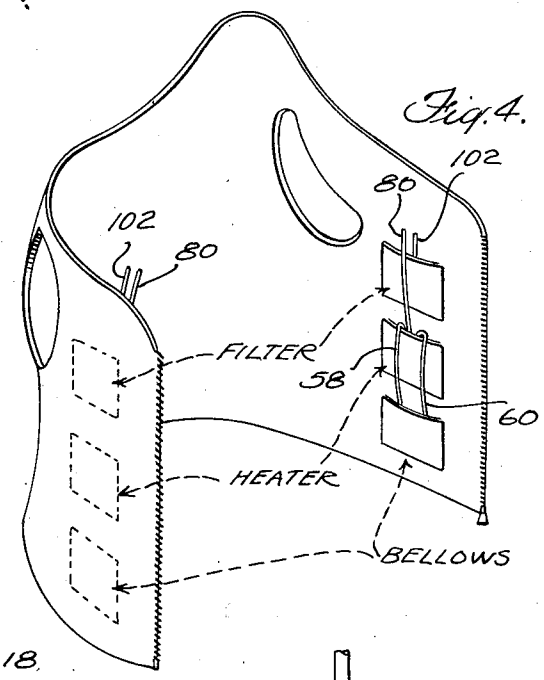


Fig. 2.

Fig. 4.



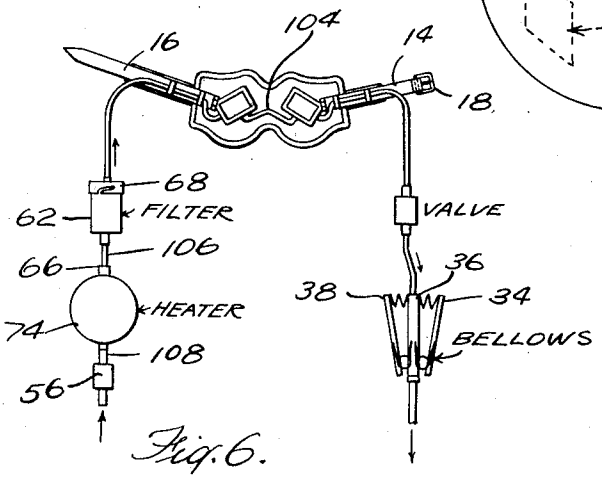


Fig. 6.

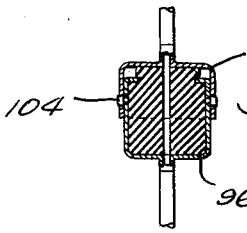


Fig. 5.

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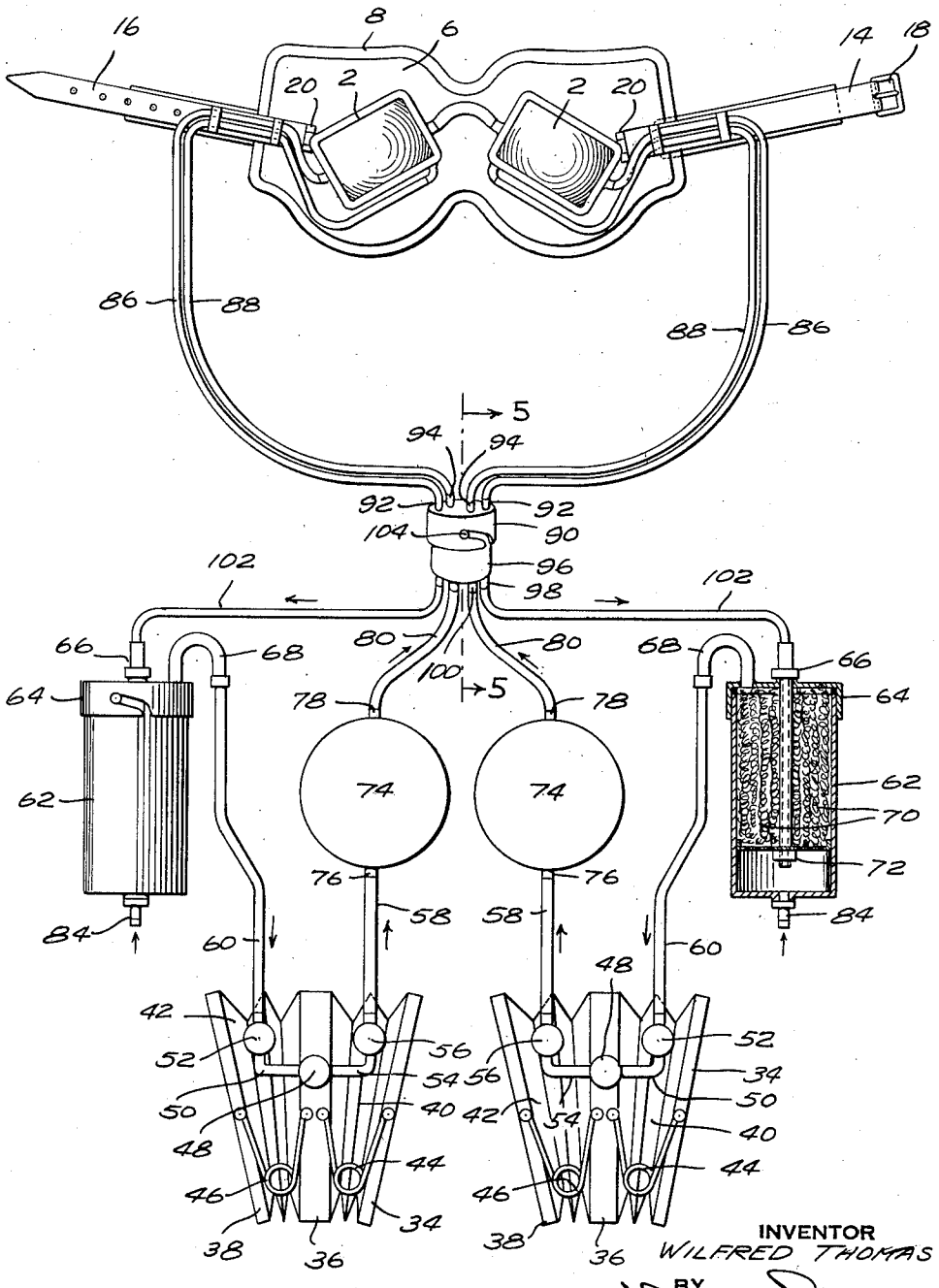
Fig. 3.



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Patented Jan. 23, 1951

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UNITED STATES PATENT OFFICE

2,539,284

GOGGLES

Wilfred Thomas, Albany, N. Y.

Application October 18, 1945, Serial No. 622,958

2 Claims. (Cl. 2—14)

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This invention relates to goggles such as are used by aviators and others to protect the eyes either against extreme atmospheric temperature conditions or against smoke, dust, or other foreign matter. Goggles of this type usually have a face fitting and air excluding mask for supporting the lens frames or holders in proper sight relation to the eyes. Such an arrangement necessarily creates conditions within the mask that are apt to cause fogging or frosting of the lenses unless some provision be made to prevent such fogging or frosting as, for example, by circulating air through the mask and over the lenses.

Various attempts have been made heretofore to provide non-fogging or non-frosting goggles, particularly for aviators, but many of these prior constructions have either been inconvenient to use, because they require an outside or independent source of circulating air, or they have had attachments which are annoying to the wearer and which sometimes are so located as to interfere with his clear vision.

The present invention aims to provide non-fogging and non-frosting goggles for aviators and the like which are so constructed and arranged that, not only are the goggles comfortable to wear and offer a minimum of interference with the wearer's vision, but the frost and fog preventing circulation of air over the lenses of the goggles requires no special outside connections and is unconsciously brought about by the wearer himself through mechanical means remote from the goggles and operated by normal and unconsciously effected movement of parts of the body, as, for example, in respiration.

The amount of air, if properly conditioned, that must be circulated through the mask and over the lenses of goggles, such as those to which the invention particularly relates, to prevent the deposition and accumulation of moisture on the lenses, is not very great but it is important, as just suggested, that this air be so conditioned as not to contribute to the deposition and accumulation of moisture upon the lenses and that it also be so conditioned as not to cause injury to the eyes. This is particularly true at high altitudes where extremely cold air is encountered and where it is important that the cold air be not so introduced into the circulating system that it will directly impinge upon the eyes.

An object of the present invention is to provide for such treatment of the air which is to be circulated through the mask and over the lenses of the goggles of the present invention that not only will the circulating air be at a comfortable

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temperature but it will be, to a large degree, freed from any moisture which it has brought with it from outside or which it may have picked up in the circulation. To this end the invention contemplates the provision both of means for effecting a heating of the air which is circulated through the goggle mask and also the provision of means for effecting the removal of a large percentage, if not all, of the moisture from the air.

As hereinabove suggested, one of the important features of the invention is the provision of mechanical means for effecting the circulation of air through a goggle mask which can be so located as not to interfere in any way with the wearer's vision or with the normal functioning of his body but which nevertheless can be actuated by those movements of the body which take place unconsciously, as in respiration. To this end the invention contemplates the provision of mechanical air pumping means, such, for example, as a bellows, that can be actuated by the movements of the diaphragm in breathing.

Other objects and important features of the invention to which attention has not hereinabove specifically been directed will appear hereinafter when the following description and claims are considered in connection with the accompanying drawings, in which—

Figure 1 is a front view of the goggles part proper of the present invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a view showing the complete air circulating system with elements thereof shown in section;

Figure 4 shows a vest or inner garment which may be worn by the aviator to support the bellows, hygroscopic filter and air heater of the air conditioning and circulating system in suitable relations to the body, both for actuation of the mechanical circulating means and for effecting the heating of the circulating air through body heat;

Figure 5 is a section on the line 5—5 of the coupling means shown in Figure 3, and

Figure 6 is a view similar to Fig. 3 showing a circulating system comprising a single unit for effecting the circulation over both of the goggle lenses as distinguished from the dual system shown in Figure 3.

In the illustrative embodiment of the invention the lenses 2 of the goggles are shown as mounted in obliquely arranged substantially rectangular lens frames 4 which may be of metal or other suitable material, these frames in turn being sup-

ported, as shown in Figure 2, in a mask 6, preferably of some plastic material of low heat conductivity. Further to protect the face of the wearer from rapid conduction of heat away from the face and also to insure an air-tight fit between the mask and the face there is interposed between the mask 6 and the face an inflatable flexible air cushion 8 of rubber or other suitable plastic which is provided with an inflation nipple 10 having therein the usual pressure retaining valve. The nipple 10 is shown as so located that a comparatively short hose 12 connected thereto can be brought to the mouth of the wearer of the mask after the mask has been placed in position on his face and the cushion 8 inflated by the wearer by blowing through the hose 12.

Straps 14 and 16 provided with a buckle 18 and hinged at 20 on the lens frames 4 provide for securing the goggles in position on the face of the wearer after which inflation of the cushion 8 can be effected to insure the air-tight fit.

As shown in Figure 2, the lenses 2 are curved to correspond substantially to the curvature of the eye. However, to prevent direct radiation from the body to the lenses 2, and vice versa, and direct passage of moisture from the body to the lenses, one or more baffles are preferably interposed between the lenses 2 and the eyes. As shown in Figure 2, two baffles 22 and 24, which may be formed of transparent plastic, are interposed between each lens 2 and the eye, these baffles 22 and 24 being carried in frames 26 and 28, respectively, which may also be of plastic material, the frame 28 being adapted to nest within the frame 26 and the nested frames being adapted to fit within the frame 4 which supports the lenses 2, the frames 26 and 28 being sufficiently elastic to allow the easy insertion and removal of either one or both baffles for cleaning, etc. In some cases no baffle will be needed and in such an event both can be removed.

As shown in Figures 1 and 2, nipples 30 and 32 are provided on each of the lens frames 4 for connection thereto of hose or tubing from the mechanical air circulating means to insure circulation of air over the lenses 2 and through the mask. As shown particularly in Figure 2, the nipple 32 may have two connections to the interior of the lens frame 4, one in front of either one or both baffles 22 and 24 and the other behind these baffles and similarly the nipple 30 may have two similar connections to the frame 4 thus causing the warmer air in the mask to be drawn from the mask from behind the baffles and the cold air to be withdrawn therefrom in front of the baffles, thereby tending to keep the air of different temperatures from mingling and bringing the warmer part of the mixture to the dew point in the lens frame.

As also shown in Figure 2, the baffles 22 and 24 are so mounted in their frames 26 and 28 that they do not entirely fill the frames, the baffle 22 being shown as stopping short of the bottom of the frame 26 and the baffle 24 being shown as stopping short of the top of the frame 28.

As hereinabove suggested, means operated by normal, unconsciously effected movements of parts of the body, such as the diaphragm in breathing, are employed to effect mechanical circulation of the air through the mask and over the lenses and baffles, the illustrated means comprising a bellows mechanism arranged to be located over the abdomen of the aviator or other wearer of the goggles so that the distension and contraction of the abdomen incident to the movements of the diaphragm in breathing will effect the collapsing and permit the expansion of the bellows to insure positive circulation of air through the system now to be described. The bellows shown in Figure 3 is of dual construction and comprises three relatively movable members 34, 36 and 38 hinged together at their lower ends and connected by accordion folds 40 and 42, the bellows being held normally in its open position by springs 44 and 46 located respectively between the members 34 and 36 and the members 36 and 38. The two chambers of the bellows have a common intake 48 through the central member 36 and, as shown in Figure 3, one branch 50 from the intake 48 is provided with a check valve 52 allowing flow of air only into the bellows and the other branch 54 is provided with a check valve 56 allowing for flow of air only out of the bellows. Thus when the bellows is collapsed air is forced up through the tube 58 connected to the check valve 56 and when the bellows is expanded air is drawn down through the tube 60 connected to the check valve 52.

Since one of the purposes of the invention is to prevent the deposition and accumulation of moisture on the lenses 2 or on the baffles 22 and 24, it is important, because of liability to fogging or frosting of the lenses and/or baffles, that the air circulated over them be as free from moisture as possible, so that it may carry away any moisture that may be in the mask or on or near the lenses. To this end, as shown in Figure 3, the air drawn into the bellows is preferably drawn through a hygroscopic filter in a casing 62, which may be of any suitable construction. The illustrative filter comprises a casing 62 screwed into a cap 64 having an intake 66 which extends to the bottom of the casing 62 and an outlet 68 connected to the tube 60. A removable cartridge 70 of suitable hygroscopic material is so located in the casing 62 that air introduced into the bottom of the casing through the inlet tube 66 must pass up through this hygroscopic material by which any moisture in the air is absorbed before it passes out through the outlet 68 at the top of the casing. The cartridge 70 may be retained in proper position in the casing 62 by any suitable means such, for example, as a nut 72 threaded upon the bottom of the intake tube 66.

Since the capacity of the circulating air for picking up moisture will vary with its temperature as well as its dryness and since it is important that air that is not too cold be circulated through the mask in the region of the eyes, provision is preferably made for heating the air in the circuit. In most cases this may be done merely by providing heating means which receives its heat from the body. As shown in Figure 3, the heat exchanger 74, which may comprise a substantially flat chamber having a considerable surface area in comparison to its thickness so that it can be inserted within the pocket of the garment worn by the aviator or other goggle user, has a nipple 76 at one end, to which the tube 58 is connected, and a nipple 78 at its other end to which the tube 80 is connected. By reason of the greater cross sectional dimension of the path of travel of the air through the heat exchanger 74, the movement of the air therethrough will be slowed down considerably, thus permitting it to absorb body heat conducted thereto through the walls of the heat exchanger which are preferably of some good heat conductive material such as copper. If desired, baffles or inner tubes, to insure definite paths of flow

of the air through the heat exchanger 74, may be provided therein.

When goggles embodying the present invention are used by aviators, for example, who move from regions of comparatively high atmospheric pressure to regions of comparatively low atmospheric pressure and vice versa, it will be apparent that some provision should be made for equalizing the pressure in the system. To this end each of the goggle frames 4 is preferably provided with a bleed hole 82. Provision is also made for providing make-up air in the system. As herein shown, an intake valve 84 may be provided in the lower end of the casing 62, this valve being constructed to permit flow of air only into the casing and being so located that any air drawn into the system must pass through the hygroscopic filter cartridge 70 before it is driven through the mask and over the lenses.

Various arrangements of the connections between the circulating means comprising the bellows and the mask may be made, the one illustrated in Figure 3 requiring duplicate elements, that is, two air heaters 74, two hygroscopic filters 62 and two bellows. In Figure 6 is shown a circulating system in which only one bellows, one hygroscopic filter and one heater are required.

In the form shown in Figure 3, each lens has an independent circuit, the air from the nipple 30 being drawn out of the system through the flexible tube or hose 86 and the heated and treated air being introduced into the nipple 32 through the flexible tube or hose 88. In order that the head part of the system may be placed upon the head independently of its connection to the body part of the system, a special coupling, such as shown in Figure 5, is provided, this coupling comprising an upper part 90 having two pairs of nipples 92 and 94, connected, respectively, to the tubes or hose 86 and 88, the lower part of the coupling 96 having two pairs of nipples 98 and 100 connected, respectively, to the tube 102 leading to the filter intake 66 and to the tube 80 from the heater 74. It will be seen that a bayonet joint 104 permits the separation of the two parts of the coupling and their reconnection after the head part of the system has been connected to the head and the body part has been placed in the proper position on the body.

In the arrangement shown in Figure 6, which is a much simpler arrangement, the nipple 32 of one lens frame is connected by a hose or tube 104 to the nipple 32 of the other lens frame and the nipple 30 of the first mentioned lens frame is directly connected to the intake valve 52 of the bellows, the nipple 30 of the other lens frame being connected to the discharge 68 of the hygroscopic filter 62. As also shown in Figure 6, the nipple 78 of the heater 74 is connected through a hose 106 to the intake 66 of the hygroscopic filter and the other nipple 76 of the heater 74 is connected through a hose 108 to the discharge valve 56 of the bellows.

From the foregoing description it will be seen that not only does the invention provide improved means for preventing the fogging of the lenses of protective goggles but that, unlike any

devices having similar purposes in the prior art, the goggle protecting device of the present invention is wholly independent of any apparatus outside of the wearer of the goggles and also wholly independent of what the wearer is doing or of his condition at any particular time so long as he is alive and breathing. The invention is therefore particularly useful in the aviation field where "blackout" or other temporary incapacity of the wearer of the goggles would render prior self-contained goggle conditioning means wholly inoperative or where disconnection from an outside supply of conditioning fluid would be equally disastrous.

What is claimed as new is:

1. Non-fogging goggles comprising lenses and frames therefor, a face fitting and external air excluding mask for supporting said lens frames in proper sight relation to the eyes, said lens frames being provided with intake and exhaust ports arranged to direct circulating air over said lenses, and mechanical means connected to said lens frame ports and designed to be arranged, when in use, to be operated by continuously occurring and unconsciously effected movements of parts of the body to cause a positive circulation of air through said lens frames, a plurality of transparent baffles dimensioned and arranged to intercept any direct radiation between the eyes and the lenses being carried by each lens frame between its lens and the eye protected thereby.

2. Non-fogging goggles comprising lenses and frames therefor, a face fitting and external air excluding mask for supporting said lens frames in proper sight relation to the eyes, said lens frames being provided with intake and exhaust ports arranged to direct circulating air over said lenses, and mechanical means connected to said lens frame ports and designed to be arranged, when in use, to be operated by continuously occurring and unconsciously effected movements of parts of the body to cause a positive circulation of air through said lens frames, two transparent baffles between each eye and its appropriate lens being so dimensioned and supported in the respective lens frames that direct radiation between the eye and the lens is prevented and that circulating air passes over one edge of one baffle and over the opposite edge of the other in each frame.

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