May 15, 1956 C. D. CUPP 2,745,401

HEAD BAND FOR MASKS, ETC

Filed May 7, 1951

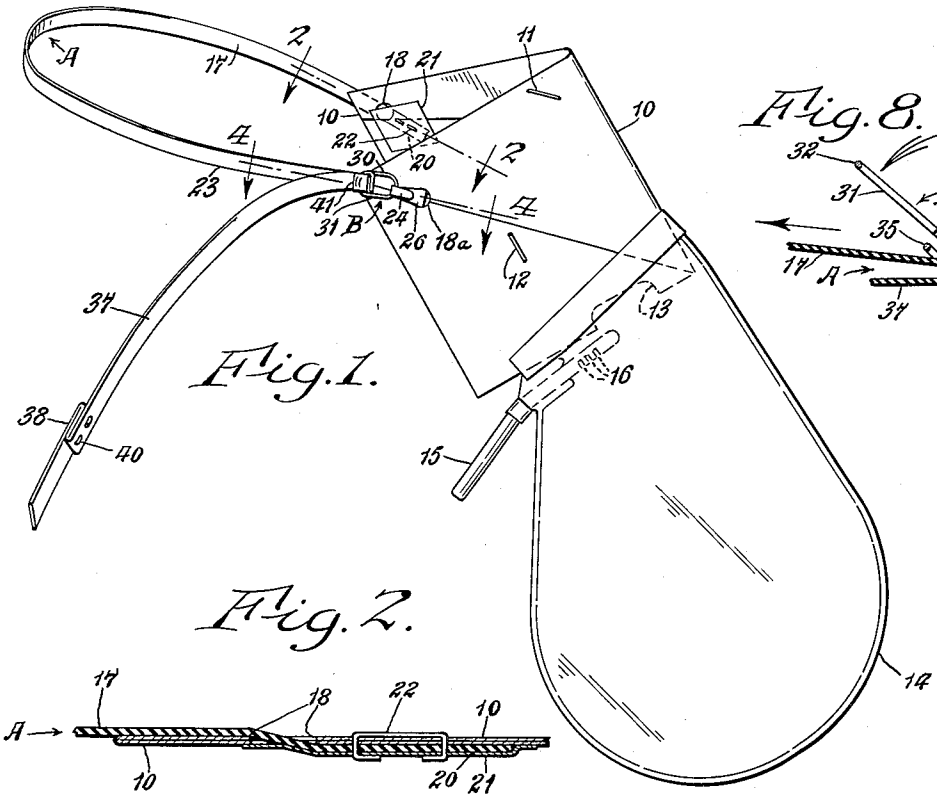


Fig. 1.

Fig. 8.

Fig. 2.

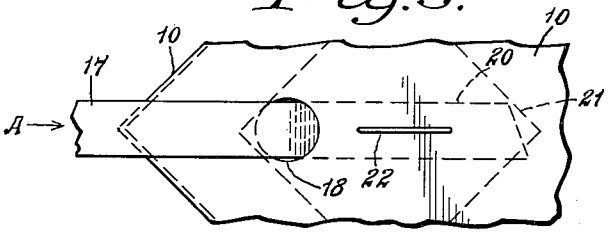


Fig. 3.

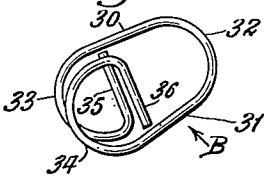


Fig. 6.

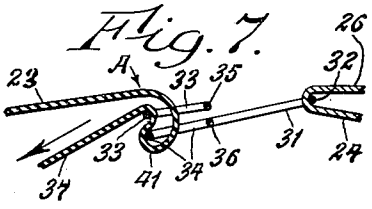


Fig. 7.

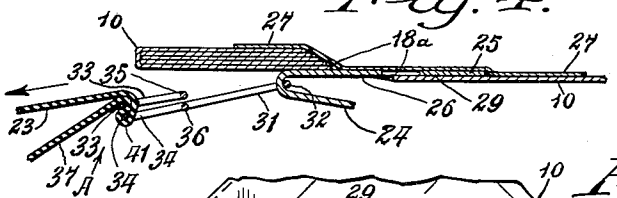


Fig. 4.

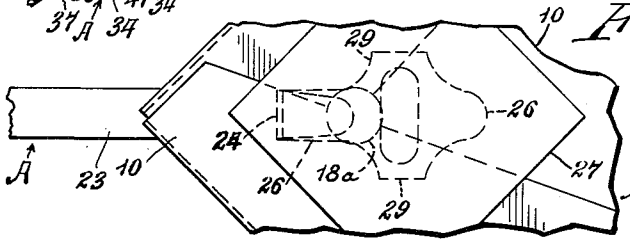


Fig. 5.

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HEAD BAND FOR MASKS, ETC.

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Application May 7, 1951, Serial No. 224,872

4 Claims. (Cl. 128—141)

This invention relates to a head band for a mask or the like, and more particularly to an adjustable, elastic head bank connected at its opposite ends to such a breathing mask as that shown and described in my co-pending patent application, Serial No. 214,584, filed March 8, 1951, now Patent No. 2,655,150, granted October 13, 1953, by Charles D. Cupp, and entitled Breathing Apparatus.

The principal object of the invention is to produce a head band of this character, which may be manufactured at extremely low cost, and, also, is constituted almost entirely of combustible components so as to be easily disposed of in an incinerator after it has become contaminated in use. Other collateral objects of the invention and practical solutions thereof are described in the following specification and are illustrated in the accompanying drawing, wherein:

Fig. 1 is a diminutive side perspective of a breathing mask provided with my improved head band.

Fig. 2 is a fragmentary, substantially horizontal section through the head band and mask, taken by line 2—2 Fig. 1, showing the permanent attachment of the one end of the head band to the mask.

Fig. 3 is a fragmentary, side elevation of that portion of the head band and mask which is shown in Fig. 2, looking from the outside of the mask, i. e., down in Fig. 2.

Fig. 4 is a fragmentary, substantially horizontal section through the head band and mask, taken on line 4—4 Fig. 1, somewhat similar to Fig. 2 but showing the detachable attachment of the head band to the mask.

Fig. 5 is a fragmentary, side elevation of that portion of the head band and mask which is shown in Fig. 4, looking from the inside of the mask, i. e., down in Fig. 4.

Fig. 6 is both an oblique and inclined perspective view of the buckle of the head band.

Fig. 7 is a fragmentary medial longitudinal section through said buckle and associated parts, showing how the length of the head band may be tightened (shortened) while the mask is on the wearer's face and with the head band in its attached position, by merely pulling on the free end of the head band as indicated by the arrow.

Fig. 8 is a fragmentary, medial, longitudinal section through the buckle and associated parts, somewhat similar to Fig. 7 but showing the buckle detached from the mask and swung around back so as to free the head band and allow it to be lengthened by pulling its main body in the direction indicated by the arrow. (The head band can, of course, also be shortened in this position if desired.)

Similar characters of reference indicate like parts in the several figures of the drawing.

Fig. 1 illustrates my improved head band A as applied to the type of breathing mask shown and described in my aforesaid co-pending patent application Serial No. 214,584. This mask, in general, includes the mask **10** proper which is constructed of porous crepe paper held together by staples **11** and **12**, and having an aperture **13** at its lower, forward edge. This aperture communicates with a flexible (but inelastic) rebreather bag **14** that is supplied with oxygen under pressure from an oxygen supply tube **15** from which the oxygen emerges downwardly from its slits **16**.

At the start of the inhalation cycle, the wearer first inhales the contents of the rebreather bag (into which at this time there is a rapid flow of oxygen from oxygen supply tube **15**), and then inhales ambient air which passes inwardly through the pores of the mask **10**. This first fills the lungs with a mixture which is rich in oxygen, and thereafter fills the windpipe with plain air. This utilizes the oxygen to maximum advantage. At this end of the inhalation cycle the fluid pressure in the rebreather bag **14** and in the mask **10** is relatively low, and this results in a rapid flow of oxygen through the oxygen supply tube **15** and into said bag. At the start of the exhalation cycle, the air in the windpipe passes into the rebreather bag **14**, as also does some of the partially utilized oxygen from the upper part of the lungs. The rest of the exhalation consists of almost totally oxygen-depleted, foul air from the bottom of the lungs and this foul air passes out through the pores of the mask **10**. During all of this exhalation cycle the pressure in the rebreather bag is relatively high, and this results in a slowing down of the rate of oxygen flow through the oxygen inlet tube **15**. This flow is, however, sufficiently rapid to ensure a sufficient quantity of oxygen in the rebreather bag before the start of the next inhalation.

The principal feature of the present invention involves the head band A for adjustably and elastically holding the oronasal mask **10** against the face of the wearer. The principal constituent of this head band is an elastic strap **17** which may be constituted of rubber bands covered by and also interwoven with threads or cords of rayon or the like.

The one (left) end of this elastic strap **17** is permanently connected to the mask **10**. This is effected in an inexpensive but sturdy manner whereby tearing of the mask at the point of attachment is minimized. This result is obtained by first perforating the rear, left corner of the mask to form the circular aperture **18**, and then passing the end **20** of the strap **17** inwardly through said aperture and covering this end with a covering patch or plate **21**, preferably of the plastic, adhesive type. The latter also covers the inner face of that portion of the strap which is located in the circular aperture **18**. This prevents said strap from becoming twisted in said aperture. To carry the heavy longitudinal strains to which the strap **17** may become subjected, this aforesaid inner end **20** of the strap **17** is also secured to both the mask **10** itself and also to said covering plate **21** by a staple **22**. If desired, the staple **22**, may be applied first, and its exposed inner ends then covered over by the covering plate **21**.

The other end **23** of said strap **17** is both detachably and adjustably connected with the other (right) side of the mask **10**. This is accomplished by the use of a novel buckle B which is longitudinally adjustable, relatively to the strap, and is adapted to be connected to a hook **24** which forms part of the sheet metal or other fastener **25**, the latter being secured to the mask in the following manner: Formed in the right, rear corner of the mask is the circular aperture **18***a*, and through this aperture, in the manufacturing assembly operation, is outwardly passed the reduced neck **26** of the fastener **25**, the front end of said reduced neck **26** terminating in aforesaid hook **24**. The rear, enlarged portion **29** of said fastener **25** lies against the inner face of the mask and is held in place by a securing plate **27**, constructed preferably of a sheet of plastic, adhesive material.

The buckle B is shown in tipped, oblique perspective

in Fig. 6. It is preferably constructed of a single piece of light bar stock, such as wire, and is constituted as follows: The substantially parallel side bars **30** and **31** of said buckle are resiliently connected together at one end by a cross tie **32**. The other ends of said side bars are curvilinearly bent toward each other to form gripping arms **33** and **34**, the latter being resiliently urged slightly away from each other (see Figs. 7 and 8) by the resilient nature of aforesaid cross tie **32**. The termini of said gripping arms **33, 34** are bent sharply inwardly to form guard fingers **35, 36** which are positioned substantially at right angles to the main axis of the buckle B. The purpose of these guard fingers **35, 36** is to prevent the strap **17** from becoming twisted in the buckle, and also to prevent the bights of said strap from moving too far away from the gripping bars **33, 34**.

To prevent the outer or free end **37** of the strap A from accidently being drawn clear through the buckle B, and thereby becoming entirely disengaged therefrom, said free end of said strap is double back twice upon itself (see Fig. 1), so as to form a thickened portion or safety stop **38** and held in this twice doubled back position by a staple **40**, or by any other suitable means.

The operation of this buckle B is as follows: When the person who is to wear the mask **10** first receives it, the double-back portion or safety stop **38** is close to the buckle B. This permits the mask to accommodate the maximum size of head. After the mask has been placed in position on the wearer's face, the free end **37** is pulled in the direction of the arrow of Fig. 7 until the strap has been sufficiently shortened in effective length so as to comfortably but snugly hold the mask in place. The wearer or whoever is fitting the mask, then releases his hold on the free end **37** of the strap, the coupling of the buckle to the strap having been effected automatically as regards any strain on the engaged portion **23** of the strap in the direction indicated by the arrow in Fig. 4. Of course, if the wearer should desire to tighten the strap still tighter, he has merely to pull on the free end **37** of the strap a sufficient distance to effect the desired tightening. The buckle automatically prevents any tendency of the effective portion of the strap to lengthen, i. e., by any force on the portion **23** of the strap as indicated by the arrow in Fig. 4.

If, on the other hand, the "size" of the head band A is too small for the wearer's head, he merely rotates the outer end of the buckle B in a counterclockwise direction (as seen in Fig. 8) a sufficient angular distance (say 130° or more), and then pulls on the effective portion **23** of the strap **17** in the direction indicated by the arrow in Fig. 8. This lengthens the effective length of said strap **17** and hence of the head band A taken as a whole. Of course, no attempt ought to be made to accurately adjust the head band A to any particular person's head by this operation of increasing its head "size." Accurate adjustment is preferably obtained by lengthening, if necessary, the "size" of the head band until it slips easily over the wearer's head, and then decreasing the "size" by pulling on the free end **37** of the strap **17** until the head fit is exactly as desired. An alternative method for increasing the "size" of the head band is, of course, to loosen the bight or loop **41** and then to "thread" the strap in the desired direction through the buckle. But this operation is not as convenient as the one previously described.

I claim:

1. A head band associated with a mask having an aperture, and comprising: a fastener secured to the inner face of said mask and having a reduced neck passing outwardly through said aperture and terminating in a hook; a buckle adapted to engage with said hook; and a strap connected with said buckle.

2. A head band associated with a mask having a circular aperture, and comprising: a fastener secured to the inner face of said mask and having a reduced neck passing outwardly through said aperture and terminating in a hook; and a buckle provided with a strap and adapted to engage with said hook.

3. A head band associated with a mask having a circular aperture, and comprising: a fastener secured to the inner face of said mask and having a reduced neck passing outwardly through said aperture and terminating in a hook; a securing plate secured to the inner face of said mask and covering the inner portions of said fastener; and a buckle provided with a strap and adapted to engage with said hook.

4. A head band associated with a mask and comprising: a strap; and a buckle constituted of a pair of straight side bars connected together at one end by a transverse cross tie; each of said side bars being integrally connected at its other end to a transverse gripping arm, and each of said gripping arms being integrally connected with a transverse guard finger which extends clear across the buckle and is positioned next to its companion guard arm.

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