Oct. 15, 1957 J. J. SWEARINGEN ET AL 2,809,633

ADHESIVE-TYPE OXYGEN MASK

Filed Oct. 21. 1955 2 Sheets-Sheet 1

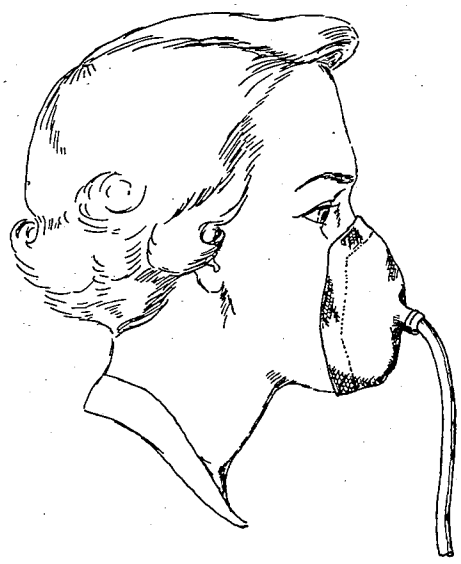

Fig. 1

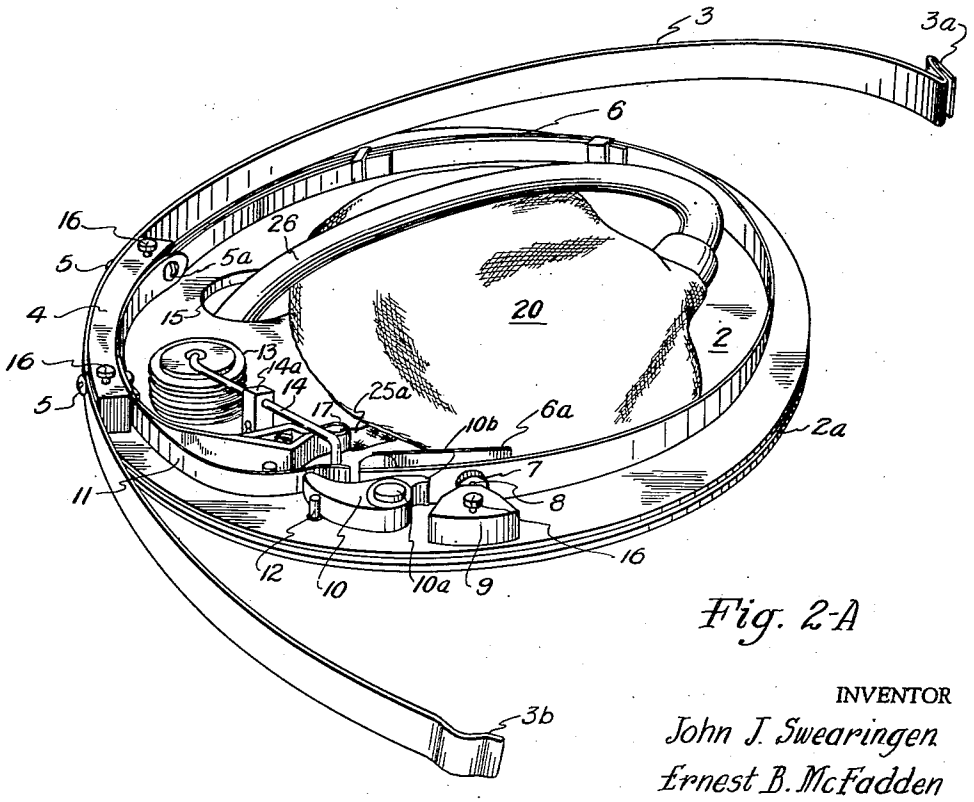

Fig. 2-A

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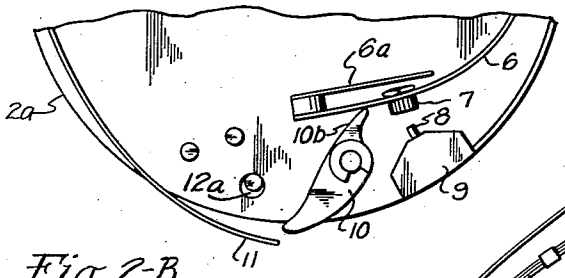

Fig. 2-B

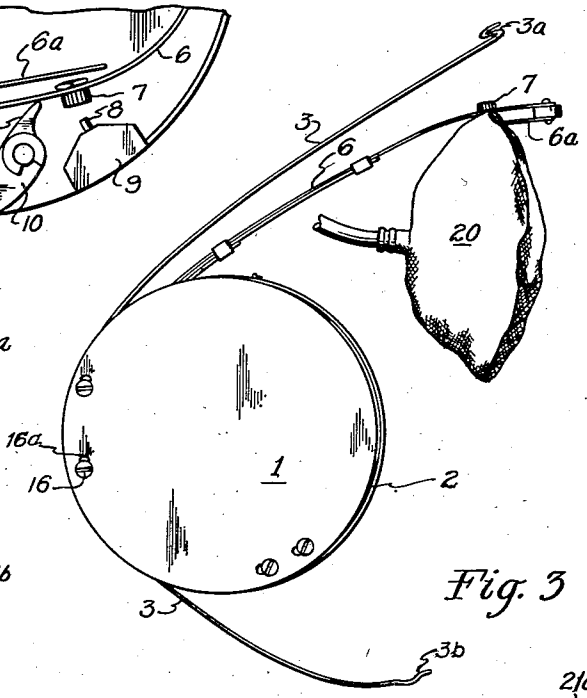

Fig. 3

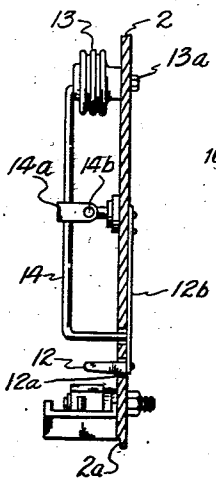

Fig. 4

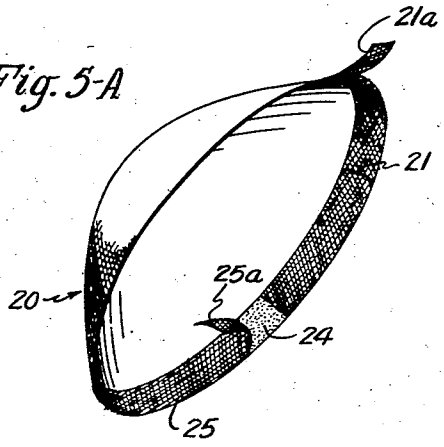

Fig. 5-A

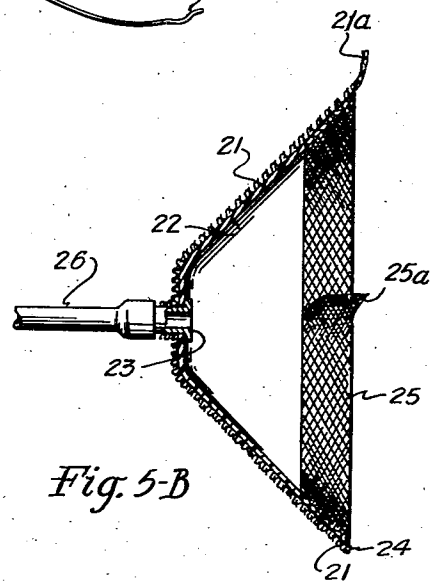

Fig. 5-B

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United States Patent Office

2,809,633

Patented Oct. 15, 1957

2,809,633

ADHESIVE-TYPE OXYGEN MASK

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Application October 21, 1955, Serial No. 542,115

4 Claims. (Cl. 128—146)

This invention relates to breathing apparatus and especially contemplates an oxygen mask assembly in which the mask is automatically presented for use when deviations from specified atmospheric conditions occur.

With the advent of pressurized cabins in commercial aviation consequent to the desire to attain greater speeds and flight altitudes, it has become imperative to devise safety measures and equipment to insure the well being of the passenger in the event of cabin pressure failures.

At altitudes in excess of 10,000 feet, the oxygen content of the air becomes sufficiently low so as to affect the physiological processes of the human body in a detrimental manner as is well known. Therefore, in the event of a pressure failure at high altitudes, it is imperative to quickly make oxygen available to the passengers. Existing emergency oxygen equipment is relatively bulky, expensive and requires a certain amount of instruction for proper use. Moreover, since such apparatus cannot be readily concealed, it presents a somewhat formidable appearance to the average passenger, a condition which is clearly not conducive to relaxation while traveling.

The oxygen apparatus comprising the present invention has therefore been devised to provide a cheap, lightweight disposable mask which is normally contained in a small unobstrusive container adapted to be easily mounted inconspicuously adjacent each passenger. The housing or container includes a mechanism for automatically releasing the mask when a pressure drop of the predetermined magnitude is detected and presenting the mask to the passenger in a manner that is extremely simple and effective. The mask is made of a simple cloth-like, molded rubber or plastic material which can readily be disposed of after use. The maintenance of a mask for each passenger on a plane therefore is extremely economical and practicable.

The development of such device therefore provides a safety standard on the basis of which emergency equipment can be prescribed for commercial aviation by regulatory agencies such as the CAB.

It is therefore an object of this invention to provide an oxygen mask and presentation device which is automatic in operation, economical and sufficiently compact to make practicable its adaptation to commercial airline use.

A further object is to provide an oxygen mask having securing means which adapts it to be secured to the face of the user with a minimum of skill and effort.

An additional object of this invention is to provide an oxygen mask which possesses radial symmetry so as to conform to the contour of the users' faces and obviates the need of observing physical congruence when applying.

A still further object of this invention is to provide an oxygen mask assembly, in which the mask is normally safely concealed in an inconspicuous receptacle and in which means are provided for automatically releasing the container and presenting the mask for application to the user when a pressure drop in the surrounding atmosphere is detected.

Another object of this invention is to provide a low-

cost, disposable oxygen mask having adhesive-like securing means, and in which the means for protecting the adhesive surface is automatically removed upon presentation of the mask.

Other uses and advantages of the invention will become apparent upon reference to the specification and drawings.

Fig. 1 is a pictorial representation of the oxygen mask in accordance with the present invention in use and applied to the face of the user;

Fig. 2A is an isometric view of the interior of the mask-container showing the mask presentation mechanism in cocked position;

Fig. 2B is a view of a portion of the mechanism shown in Fig. 2A illustrating the position of the operative elements at the start of release;

Fig. 3 represents the mechanism of Fig. 2A showing the position of the operative elements when fully released, the mask being in its final position of presentation;

Fig. 4 is a partial sectional view of a portion of the release mechanism, and

Figs. 5A and 5B are detailed views of the oxygen mask construction in accordance with the invention.

The mask

The construction of the mask portion of the apparatus is detailed in Figs. 5A and 5B. The mask **20** may be made of elastic cloth, thin rubber, or plastic and is preferably formed in the shape of a frustum of a right circular cone. It has been determined that a cone-like body having a large diameter of about 4½", a small diameter of approximately 1¾" and a height of approximately 1¼" allows perfect and comfortable fitting of different facial contours of both children and adults when applied over the nose and mouth. The cone-like shape described results in the mask possessing radial symmetry and eliminates the need for aligning the mask with the face before applying.

As shown in Fig. 5B, a portion of the inner surface of the fabric cone **21** is provided with a thin rubber or pliable plastic lining **22** which is suitably cemented to the fabric body. When the cone portion is fabricated out of thin rubber or other plastic material it is preferably made in varying thicknesses, the base of the cone being made thin and flexible so as to be adaptable to the contours of persons' faces, the upper portion of the cone being of greater thickness to provide sufficient body to the cone. The center of the cone is provided with an orifice in which a hollow grommet **23** is secured. The grommet provides an anchor for the end of an air hose **26** connected to the oxygen supply line in the plane. The remaining peripheral surface on the inside face of the cone is coated with a tacky adhesive-like material **24** such as "Elastoplast." A protective cover strip **25** is applied over the tacky portion as is conventional. As is apparent in Figs. 5A and 5B, a tab **21***a* is formed integral with the cone, and a separate peeling tab **25***a* is provided on the protecting cover for a purpose to be described.

Since failure of the pressurizing apparatus in a plane is often incidental to failure of other power equipment, either the mask body **21**, or the liner **22** may be impregnated or otherwise treated to exhibit fluorescent properties. For example, the use of a substance such as "Col-o-vin" as the lining material **22** not only provides the necessary degree of flexibility but is sufficiently fluorescent to enable the mask to be manipulated in the dark.

Container and release mechanism

As indicated in Fig. 3, the oxygen container assembly according to the present invention comprises a relatively flat disc-shaped housing having an upper cover plate **1**, a base plate **2**, and a removable cylindrical closure **3**.

The base plate includes studs **16** (Fig. 2A) which fit into bayonet-type slots **16***a* (Fig. 3) in the cover plate to secure the cover to the base. The housing contains the previously described oxygen mask together with a portion of the oxygen supply hose and the automatic pressure responsive release mechanism which automatically opens the closure **3** and projects the mask for immediate use according to the position shown in Fig. 3.

The interior of the housing, with the coverplate **1** removed is more clearly illustrated as shown in Fig. 2A. The presentation mechanism is shown in its normal cocked position ready to be triggered by a pressure change. The cylindrical closure **3** is shown in open position for purposes of clarity. It is to be understood that such closure is normally banded around the base plate to form an annular protective wall for the interior mechanism.

Referring to Fig. 2A there is shown a peripheral anchoring block **4** which is rigidly secured or may be formed integral with the base plate **2**. The closure member **3** comprises a thin band of spring-like material, the ends of which are suitably upset as indicated at **3***a* and **3***b* to provide a friction joint. The end portion **3***b* is adapted to snugly fit within the pocket portion defined by the end **3***a* when the closure **3** is wrapped snugly around the periphery of the housing. The base plate **2** is suitably machined to provide an annular shoulder or ledge **2***a* extending peripherally around the circumference of the base plate. The coverplate **1** is similarly shaped, and it will be apparent that such shoulder portions provide a seat for snugly accommodating the closure member **3**.

The center portion of the closure **3** is secured to the anchoring block **4** by means of suitable fasteners **5** in a manner such that the closure will assume the approximate position indicated in Fig. 2A, when it is released as will be described.

A triple-leaf volute spring mask presentation member **6** is rigidly fastened to the inner surface of the anchoring block by means of fasteners **5***a*. The presentation member **6** when untensioned extends approximately tangentially outwardly from the housing as indicated in Fig. 3. The end of the presentation member is provided with an offset ledge **6***a* to which the oxygen mask is partially secured by means of a light adhesive or other readily disconnectable securing means. The previously described tab **21***a* on the mask shown in Figs. 5A and 5B provides a convenient mounting means for such purpose. The mask **20** occupies the interior of the housing and is normally folded to lie on the base plate **2** as shown in Fig. 2A. The presentation member **6** is further provided with a catch **7** (Figs. 2A and 3) in the form of an abutment having a recess (not shown) adapted to seat over a restraining pin **8**. The pin **8** forms part of a boss **9** secured to the base plate. When the presentation member **6** is retracted within the housing as shown in Fig. 2A, it assumes the volute form shown, and is firmly retained in the housing by the engagement between the catch **7** and restraining pin **8**.

A trigger finger **10** is provided in order to release the presentation member **6**. The trigger finger is shown in Fig. 2A as being pivotally mounted on the base plate **2** by means of a pin **10***a*. One end of the trigger is provided with a nose **10***b* adapted to engage against a surface of the presentation member **6**. The other end of the trigger finger **10** is engaged by a trigger spring **11**. For convenience, the trigger spring may be in the form of a leaf spring, one end of which is fastened to the anchoring block **4**. The spring is shown in a tensioned condition bearing against the end of the trigger finger **10**. When the apparatus is in the cocked position illustrated in Fig. 2A, the trigger finger **10** is held against the force exerted by spring **11** by means of a sear **12**. The sear **12** extends through an opening **12***a* formed in the base plate and is resiliently connected to the bottom surface of the base plate by a suitable leaf spring **12***b* as indicated in Fig. 4.

It will be apparent from Fig. 4 that the sear **12** is in this manner mounted for lateral movement in a direction transverse to the base plate **2** and the trigger finger **10**.

The pressure sensing means comprises a conventional aneroid element **13** which is fastened to the base plate **2** by means of a fastener **13**a (Fig. 4). An operating crank **14** is mounted on a rocker **14***a* which is pivotally mounted on the base plate **2** by a pintle **14***b*. One end of the operating crank **14** is disposed in alignment with the aneroid element, while the remote end of the crank extends downwardly through an opening in the base plate as is more clearly shown in Fig. 4 and abuts the sear leaf spring **12***b*. It will be apparent from such described construction that expansion and contraction of the aneroid **13** will be reflected as a rocking movement of the crank **14** about the pintle **14***b* with consequent displacing of the sear **12**.

An anchorage which conveniently may take the form of a conventional alligator clip **17** is suitably fastened to the base plate as shown in Fig. 2A. The tab **25***a* on the adhesive protective cover referred to in connection with Figs. 5A and 5B is held by the alligator clip when the mask is positioned within the housing. An opening **15** in the base plate provides access for the oxygen supply tube which extends outwardly of the housing where it is coupled to the oxygen supply system of the plane or vehicle in which the device is mounted.

Operation

The release mechanism is normally in cocked position within the housing as shown in Fig. 2A. The mask **20** is neatly and compactly folded so as to be within the receptacle as shown in Fig. 2A. The hose portion **26** extends out through the opening **15** in the base plate **2**. With the flexible closure **3** and the cover plate **1** in place, the entire assembly has a relatively flat cylindrical appearance as indicated by the receptacle portion of the assembly shown in Fig. 3. The unit may therefore be conveniently mounted on a portion of the seat occupied by the passenger or on the bulkhead adjacent the seat. In any event the unit occupies very little room and is quite inconspicuous. The outwardly extending hose may be connected to the oxygen supply main of the plane or vehicle.

The tab **21***a* forming part of the cone portion of the mask **20** is suitably fastened to the ledge **6***a* on the presentation member **6**. The tab may be adhesively joined to the ledge or may be otherwise tacked on so as to be readily removable therefrom. Alternately a spring clip fastener or any suitable securing means may be employed The tab forming part of the protective cover for the adhesive surface **21** is engaged to be gripped by the jaws of the alligator clip **17**.

The aneroid member **13** will tend to contract toward the base plate upon increase of the ambient or atmospheric pressure and to expand away therefrom when the atmospheric pressure decreases. The connecting arm **14** is cooperatively related with the aneroid **13** and the sear **12** as described. Hence, when the aneroid member is extended a predetermined amount consequent to a pressure drop as would be occasioned by a failure in the pressurizing system of the plane or vehicle or a voluntary dumping of pressure due to smoke or toxic gases, the pivoting of the member **14** will retract the sear pin and undog the restrained end of the trigger finger. The trigger will then be abruptly rotated by the trigger spring **11** and the nose portion **10***b* will force the catch **7** from engagement with the restraining pin **8**. The position assumed by the trigger finger **10**, and the end of the presentation member **6** is diagrammatically illustrated in Fig. 2B which shows catch **7** just after it is disengaged from the pin **8**. Since the presentation member **6** is no longer constrained its unsecured end will fly outwardly, disengaging the frictionally held ends of the closure **3**a and the mechanism will assume the position illustrated in Fig. 3. It will be apparent, that in such final position of presentment, the mask **20** is ex-

tended in a position most appropriate to removal by the user. As the mask 20 is jerked outwardly from the container by the spring action of the presentation member 6 the peeling tab 25*a* will be firmly held in the alligator clip and hence, the protective covering 25 will be automatically stripped, exposing the tacky or adhesive surface 24. The mask is thus rendered ready for use. The user merely removes the mask from the presentation member and applies it to his face in the manner indicated in Fig. 1. The adhesive surface provides an efficient anchoring means and seal, while the flexible construction and shape of the mask as described adapts it to various facial contours.

While an exemplary embodiment of the principles underlying the present invention has been shown and described it will be apparent that the invention is susceptible of many construction variations. The mask as described is constructed of elasticized gauze to which a rubber lining is applied. It is entirely feasible, however, to form the mask out of a molded rubber or pliable plastic composition. Moreover, the rubber lining may be applied to the fabric body by spraying, dipping, or other conventional methods. It is therefore not intended to limit the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a respiratory apparatus, the combination of a mask adapted to be applied to the face of a user, said mask having conduit means adapted to be connected to an oxygen supply source and means for readily securing the mask to the user's face, a normally closed container having a mask storage area for receiving said mask, an extensible mask presentation member mounted in normally retracted position within said container, means on said presentation member for detachably mounting said mask

and means responsive to a predetermined change in the ambient atmospheric pressure for releasing said mask presentation member to extended mask-available position.

2. The invention of claim 1 in which said mask securing means comprises an adhesion surface provided on a marginal portion of said mask, a strippable protective strip normally covering said adhesion surface, and means responsive to the extension movement of said mask presentation member for stripping said protective strip and exposing said adhesion surface.

3. The invention of claim 1 in which said extensible mask presentation member comprises a spring, and said release means comprises means for restraining said spring in its normally retracted position within said container, trigger means for disengaging said restraining means and pressure responsive means for releasing said trigger means.

4. The invention of claim 1 in which said container comprises a base plate and a cover plate spaced therefrom, an annular resilient closure strip banded around the peripheral portions of said plates, disconnectable means normally securing said closure member to said container, and said mask presentation means comprises a volute spring normally coiled within the space defined by said plate and closure member and adapted, when released, to disengage said closure member from said plates.

References Cited in the file of this patent

UNITED STATES PATENTS

1,575,206	Howe	Mar. 2, 1926
1,699,937	Yablick	Jan. 22, 1929
2,371,965	Lehmberg	Mar. 20, 1945
2,625,155	Engelder	Jan. 13, 1953