May 14, 1946. J. F. DAUSTER 2,400,077

HEAD HARNESS

Filed Jan. 7, 1941 2 Sheets-Sheet 1

Fig. 1.

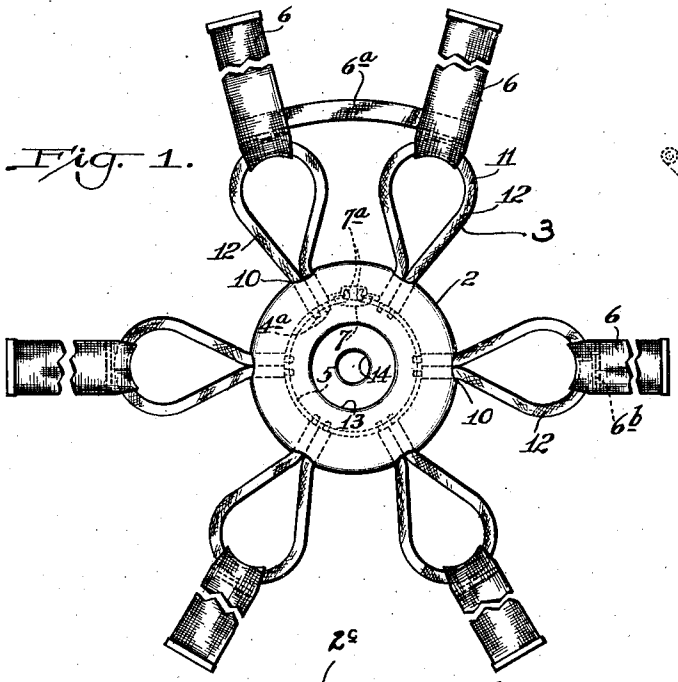


Fig. 8.

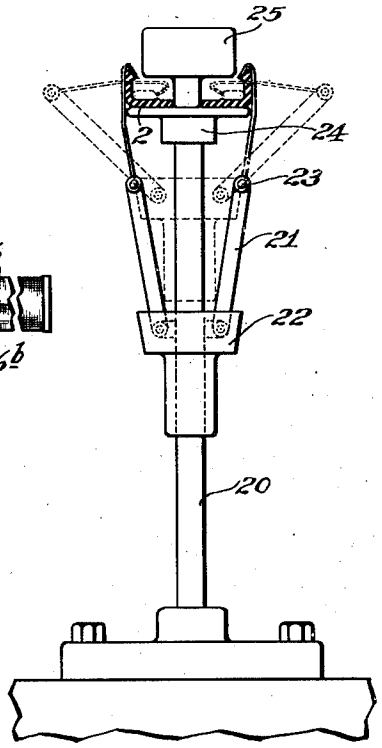


Fig. 2.

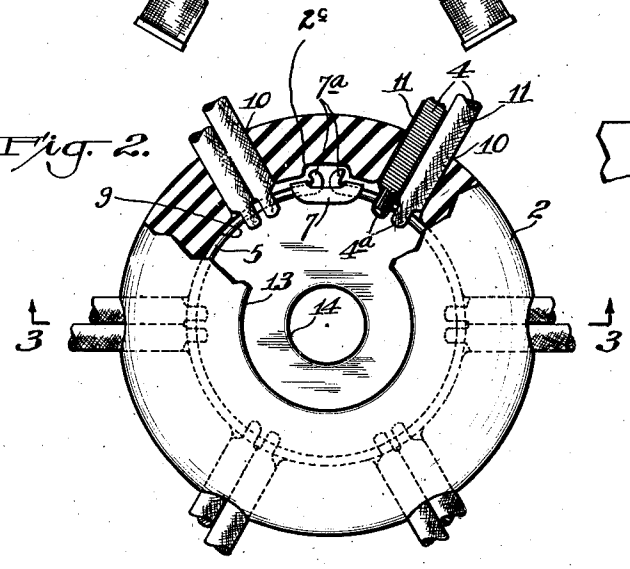


Fig. 7.

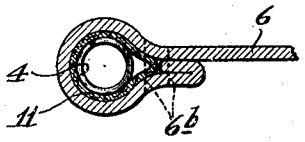
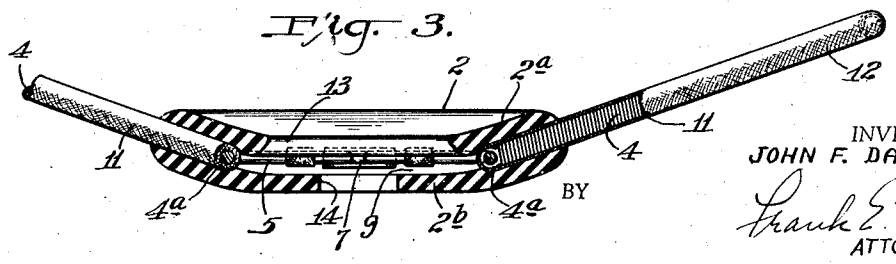


Fig. 3.



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Fig. 4.

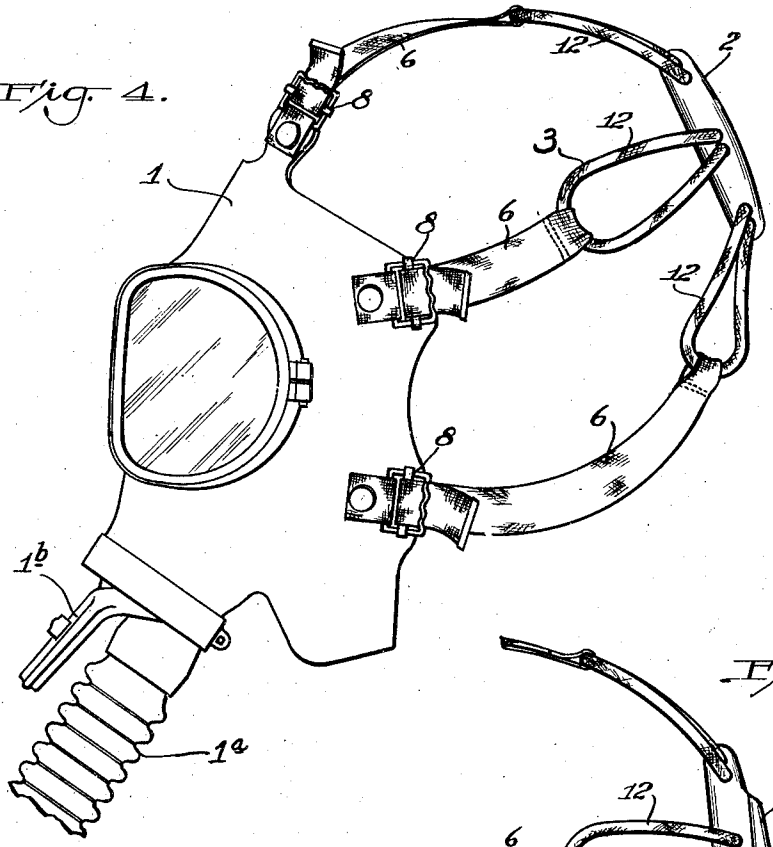


Fig. 9.

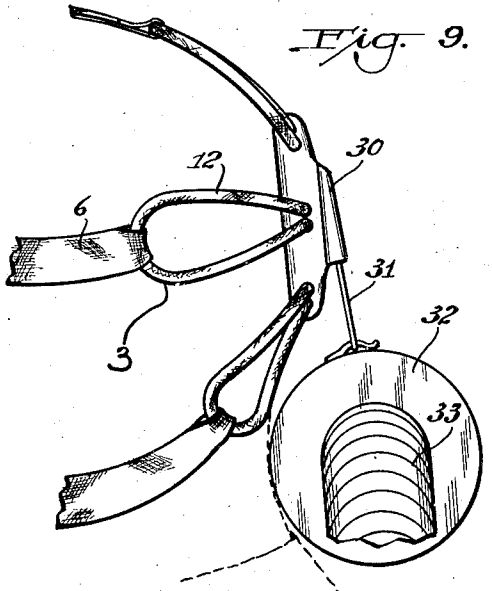


Fig. 5.

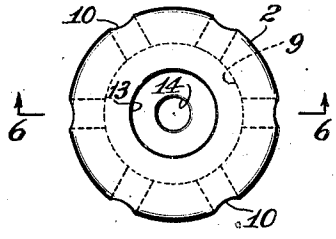
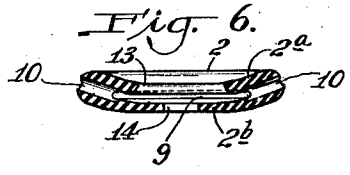


Fig. 6.



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Patented May 14, 1946

2,400,077

UNITED STATES PATENT OFFICE

2,400,077

HEAD HARNESS

John F. Dauster, Wilkinsburg, Pa.

Application January 7, 1941, Serial No. 373,390

7 Claims. (Cl. 128—140)

This invention relates to a head harness for positioning and supporting a facepiece or mask onto a wearer, and more particularly, to an improved head pad and engageable means having head straps attached to form a complete head harness operative to supply proper and effective support.

The head harness, or more specifically the head pad, its head strap engageable means and attachment to head straps, is an improvement of the general type of harness disclosed in U. S. Patent 1,942,442 issued to A. V. Motsinger. In the head harness of this patent, a single tension member is employed to form a plurality of connected looped members and to each of which a head strap is attached. The looped members are provided by arranging the single tension member about a head pad and by means of rivets secure the tension member in position onto the pad.

It is an object of this invention to provide a head harness of the general type considered and which is comfortable in wearing, inexpensive to manufacture, adaptable for adjustment and ready repair, if necessary, and simple in construction.

It is another object of this invention to provide a head harness having a moldable head pad which comfortably supports a facepiece, which is adaptable to receive means to connect the facepiece to the head pad, which properly spaces the means about itself and which is of such a construction that it can be made in an inexpensive manner.

It is a further and more specific object of this invention to provide a means engageable with the improved construction of head pad which provides a means of connection of head straps to the head pad.

Other objects of this invention will become apparent from a description of what I now consider to be a preferred embodiment of my invention and which is illustrated in the drawings in which

Fig. 1 is an elevational view of a complete head harness incorporating the preferred embodiment;

Fig. 2 is a view of the head pad and assembly thereto with a part of the head pad broken away for the purpose of illustrating the assembly;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a side elevational view of a complete facepiece and head harness assembly which includes the preferred embodiment;

Fig. 5 is a plan view of my improved head pad;

Fig. 6 is a sectional view taken along line 6—6 of Fig. 5;

Fig. 7 is a detail sectional view illustrating the assembly of a head strap;

Fig. 8 is a diagrammatic view of a jig apparatus for assembling head straps to the head pad; and

Fig. 9 is a modification of the head pad in which a means is provided integral with the pad for supporting an air purifying canister directly thereonto.

In a harness of the type contemplated, a head pad 2 is provided to engage the rear and upper portion of the head and is preferably made to conform to the shape of this portion of the head and consequently its inner surface is made concave such as illustrated in Figs. 3 and 4. This pad forms the means for supporting straps 3 that are connected to a facepiece 1, Fig. 4, in a manner to properly position the facepiece onto a wearer to effect a fluid seal completely around the facepiece with a wearer. It is to be observed that the purpose of the apparatus is to provide respirable air and protection in a contaminated atmosphere. In order to continue an effective seal a tension means should be incorporated in the head straps and as described in the patent, heretofore mentioned, this tension means was a separate element and served the purpose also of supporting straps from the pad. A tension means found suitable is a small size coil spring of sufficient length and very flexible, and the successive coils are positioned to abut each other and provide sufficient, but yet not too strong and uncomfortable, tension for holding the facepiece in position. This spring member is covered with a fabric material for the purpose of protecting the head of the wearer as well as providing some protection for the spring. While the head strap 3 in this instance is composed of a connecting strap 6 and a tension member 4, it might well be a single member connected directly to the pad by a means receivable by my novel pad. However, it is a part of this invention to provide an inexpensive assembly or construction to the head pad of a plurality of individual tension members of small coil spring material and each of which is arranged to receive a head strap and by cooperation with the head pad is positioned in a definite relation to engageable means on a facepiece.

In the embodiment illustrated and referring to Figs. 1 to 4 inclusive, each tension member 4 is of coil spring material of an appropriate size and each of these members has its ends formed in the shape of a loop 4a to receive a retainer or spider member 5 which is made of more rigid wire-like material. Each of these members is enclosed by a sheath 11 of appropriate material

which affords sufficient protection to a wearer and to the member enclosed. This sheath is extended beyond the ends of the coil spring member and is brought back on to the member so that the retainer 5 passes through this extra length as well as that portion which actually covers the looped portion of the coil spring, Fig. 2. This is for the purpose of giving added strength to the attachment of the fabric material to the retainer and is illustrated in Fig. 2. The retainer 5 has its ends 7*a* turned back slightly upon itself to form an engagement with a lock or clip 7 which is merely a flat piece of metal bent to resemble the shape of the retainer material and having an opening to receive the ends of the retainer. When the tension members 4 are assembled on to the retainer, by attaching each engageable end 4*a* to the retainer, looped members 12 are formed and to these the straps 6 of suitable material are attached. The ends 7*a* of the retainer are then brought into abutting relation and the lock member positioned thereon to hold the ends in this closed position. While this assembly of a retainer ring and the attached head straps forms a harness and could be utilized to support a facepiece, an important part of this invention is providing a head pad which receives the assembly and properly positions the extending straps about the pad when the harness is connected to the fastener of the facepiece and serves to cushion the harness against the head of a means. The pad 2, Figs. 5 and 6, is preferably made of molded material such as rubber or any other material which is suitable for this purpose, and it is made in such a manner as to have a central cavity 9 to accommodate the retainer ring 5. The pad is represented as being of circular shape, but this is not indispensable in its use and any other shape can be used and accomplish the advantages of my construction. Also, lateral openings 10 are formed in the pad and about the periphery of the pad to accommodate the head straps in accordance with the prescribed method of properly positioning head straps to a facepiece in fluid sealing position. In constructing the head pad, Figs. 5 and 6, the lip 2*a* defining an entering opening 13 through which the retainer ring is passed is made sufficiently thin and of appropriate material so as to be yieldable and expansible, without distortion or permanent set changing the original size of the opening, sufficient to allow the retainer ring of larger size to be passed therethrough. Obviously, this opening 13 must be made smaller in size than the size of the retainer ring and have sufficient body to hold the ring within the pad in its normal state and position and yet be adequately yieldable to avoid incurring any permanent set when the stretch is made to insert the ring into the cavity. Another important function of this yieldable lip 2*a* is that in the molding of this piece, it is possible by this function of stretching without permanently setting the material to provide a core piece, which is to define the central cavity 9 and the lateral openings 10, to be formed in a single piece and after the molding operation is completed and the material is sufficiently set, the core piece can be removed by merely stretching the material of the lip 2*a* and passing the piece out through the opening 13. The making of such a core piece is within the scope of knowledge of one skilled in the art when confronted with the conditions to be met.

In assembling the tension members to the pad, it is preferable to provide a further opening 14 in the other side wall 2*b* of the pad for accommodating one method which has been used in assembling the parts. Illustrated in Fig. 8 is a jig apparatus 20 which is nothing more than a plurality of arms 21, having a hinged joint 23 intermediate its ends, that are held together by means of a yoke 22. The apparatus has a central support 24 upon which the pad is positioned and onto which the yoke 22 and its arms are mounted. By raising the yoke to the position illustrated in dotted lines, the fingers are placed about the inner edge of the lip 2*a* which defines the opening 13. A stop or plug 25 is pressed into the opening 14, and engages a surface of the engageable ends of the arms to hold them in place while the yoke member is moved from the position indicated in dotted lines to the position indicated in full to stretch the material of the lip 2*a* sufficiently to form an enlarged opening 13 through which the retainer can be passed in its normal position. While the pad is retained in this position, the retainer and tension members which have been previously placed on to the ring to form the looped members 12 pass through their respective lateral openings 10 and the ring is brought into the internal cavity 9 by actually drawing the looped members through the openings which eventually by proper assembly brings the retainer into its position on the cavity 9 of the pad 2. After the retainer and its tension members have been assembled on to the pad, the engaging ends of the arms of the jig apparatus are released and the lip material restores itself to its normal position and defines the opening 13 of normal size. By this operation, the assembly of the head pad and its attached and arranged engageable tension members 4 are completed and the construction is of such a nature that it provides one which is capable of adjustment and is one which does not get out of proper arrangement because of the nature of the pad construction.

As heretofore mentioned, the straps 3 can each be of single element connected to the support 5 held by the pad which also spaces the straps around the pad to give proper support to a facepiece to which the straps are attached by means of fasteners. Also, while the tension members are described as being connected to the support 5, it could be that some form of suitable material can be used to provide the looped members 12 and some resilient strap material be used connecting the looped members and the facepiece.

After the assembly is completed, straps 6 are connected to each of the members and for some purposes it is advisable to place a transverse strap 6*a* across the two top straps in order to give a better cushioning effect to the harness when placed on the head. This practice has been followed heretofore and it is not intended that it should form a part of this invention. In order to hold the straps in position onto the tension members, each of the straps which are made of fabric or other suitable material has one of its ends brought around the surface of the tension member, as illustrated in Fig. 7, and then folded upon itself. When in this position, the strap material is attached to the material of the tension member by actually stitching or stapling through the material of both such as illustrated in the drawings by dotted lines 6*b*. By stitching through the fabric sheath enclosing the spring members, the straps 6 are held in place. The straps 6 are connected to buckles 8 in attaching the facepiece to a wearer such as illustrated in Fig. 4. This

facepiece, Fig. 4, is one of the commercial designs and is used in contaminated atmospheres wherein it is to be capable of forming a sealing engagement with the face to prevent the infiltration of these atmospheres into the mask or facepiece and breathing by the wearer. An air purifying canister, not illustrated, or other means or source of supply of respirable air is attached to the breathing tube *1a* while exhalation takes place through the exhalation valve *1b*.

Another advantage of the invention is that if desired a means can be provided which is integral with the head pad which is receptive of a connector for supporting directly an air purifying canister. Such a modification is illustrated in Fig. 9 in which the means is merely a projection or extension **30** formed of material integral with the pad and formed while molding the pad and having an opening for receiving and holding a canister bail **31** that is directly attached to an air purifying canister **32**. For some purposes, it is desired that a canister be carried in such a manner rather than being supported from the body by means of a harness. Such an arrangement is specifically described and claimed in a pending application of Brady and Hobson No. 323,580, filed on March 12, 1940. Breathing tubes **33** are connected on each side to the air purifying canisters and connect the canister to the inlet of the facepiece. In connection with this arrangement of providing a support for a canister integral with the pad, the projection **30** may similarly be made integral with a head engaging member which also has head straps integral therewith or molded thereto. Thus the whole assembly is an integral molded mass, preferably of rubber material, having head straps and a canister support means.

It is not intended that the specific means of engaging the tension members to a retainer ring or means of support that is held within a cavity of a pad be limited to the specific means illustrated. As an example, instead of forming looped members at the ends of the tension members, it is possible to provide looped portions in the retainer ring and by shaping the ends *4a* of the tension members to form a hook, a satisfactory engagement is made. It is intended that the term facepiece used herein is to include any protective means employed in connection with the face and where my invention can be used.

Providing a notch *2c* in the pad, Fig. 2 can be used as a substitute for the clip **7** in which the ends of the retainer are held in place by engagement with the surface of the pad defining the notch. The construction of support **5** need not be restricted to that as shown because the pad can be made to accommodate any modified construction and be within the principle disclosed in the embodiment.

While the embodiment illustrated describes what I now consider to be the preferred embodiment of my invention which is an application of the principle involved, I intend that the invention be limited only by the scope of the appended claims.

I claim:

1. A head harness adaptable for use in connection with a facepiece comprising a head pad having a cavity adapted to receive and hold a support, a ring-like support within the cavity, yieldable head strap members attached to the ring-like support and each of the members passing through a lateral opening in the pad connected to the cavity to space each member from the other.

2. A head harness adaptable for use in supporting a facepiece comprising a head pad having a cavity adapted to receive and hold a retainer ring member, a retainer ring member within the cavity, and a plurality of yieldable tension and laterally extending head strap members, each of the members having an end attached to the retainer and extending through a lateral opening in the head pad to space each member about the pad and engageable with a fastening means of the facepiece.

3. A head harness adaptable for use in connection with a facepiece comprising a head pad having an inner cavity to receive a member, an opening in a side wall of the head pad and connected to the inner cavity, a retainer ring member within the cavity, a plurality of yieldable tension means, each of the means having its ends connected to the retainer member to form a strap engageable means and extending laterally through openings in the pad, and each of the formed engageable means having head straps connected thereto and engageable with a fastening means of the facepiece.

4. A head harness adaptable for use in connection with a facepiece comprising a head pad of moldable material having an internal flat-like cavity and an opening thereto in a central portion of a side wall of the pad to enter a retainer ring-like member into the cavity, a retainer ring member within the cavity, the pad having lateral openings connected to the cavity, spring members having their ends shaped to receive the retainer member and each having both of its ends connected thereto to form a looped tension member, and the looped tension members extending through and beyond the lateral openings and being thus positioned in a predetermined relation to position head straps to be connected to each of the members for engaging a fastening means of the facepiece.

5. A head harness adaptable for use in connection with a facepiece comprising a hollow head engaging pad having a central opening, the wall of the pad defining the central opening being sufficiently thin to be expandable for passing a rigid member of a size greater than the size of the opening into the hollow space within the pad, a substantially rigid wire-like member having its ends demountably attached and positioned within the hollow space of the pad, the pad having lateral openings connected to the hollow space of the pad and being spaced around the periphery of the pad in a predetermined manner, spring tension members having closed ends, the wire-like member being passed through each of the closed ends to form looped tension members and each looped member being passed through one of the lateral openings of the pad and a strap attached to each of the looped members engageable with a fastener of the facepiece.

6. An assembly for properly supporting a facepiece on to a wearer comprising a pad engageable with the rear of the head of the wearer and constructed of moldable material and having a hollow central portion and a central opening in one of its wall sections defining the hollow portion, the wall section being such to permit enlargement of the opening without altering the original permanent set of the material and size of the opening, and a head strap means supported within the cavity, said means comprising a spider member having its ends demountably connected

and positioned within the pad, said pad having lateral openings arranged in a predetermined manner around the periphery of the pad, coil spring members of small size to form tension members and having their ends shaped to receive a wire member and each of the members having its ends attached to the spider member to form a loop, each loop being passed through a lateral opening of the pad, and a head strap connected to each of the loops and to engage the facepiece.

7. A head pad adaptable to support a facepiece comprising a flat body of moldable material having a head engaging surface, the body having further an internal cavity to receive a means for supporting head straps, one wall of the body defining the cavity having an opening to receive a head strap support means and this wall being sufficiently yieldable to enlarge the opening by stretching of the material to accommodate the head strap support means and to adequately support the head straps and without incurring any permanent set so that after insertion of the head strap support means the material of the wall returns to its original state and position to define the normal opening provided in the wall.

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