Sept. 18, 1956 P. D. AMUNDSEN 2,763,006

FACE SHIELD

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Fig. 1

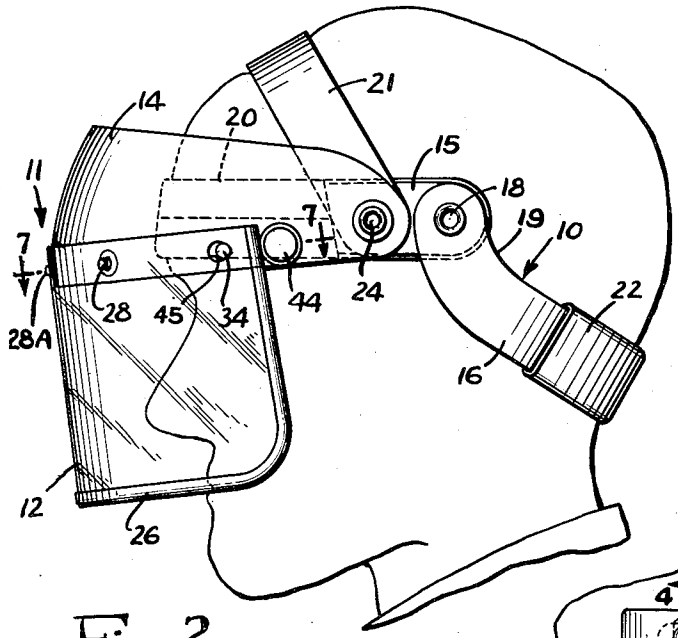

Fig. 4

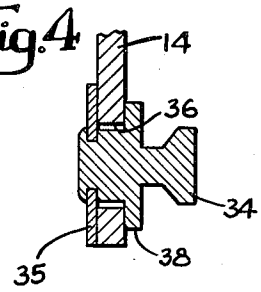

Fig. 3

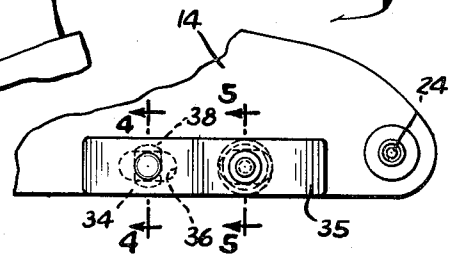

Fig. 2

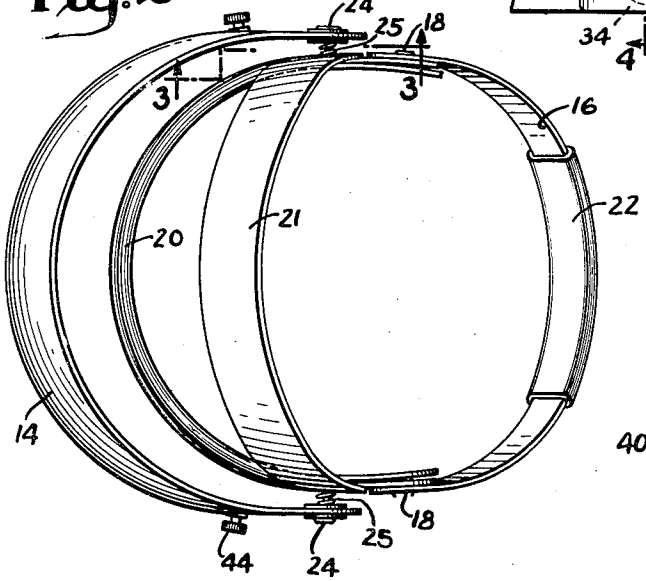

Fig. 5

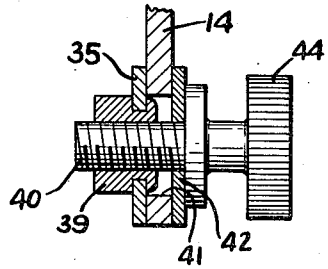

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Fig. 6

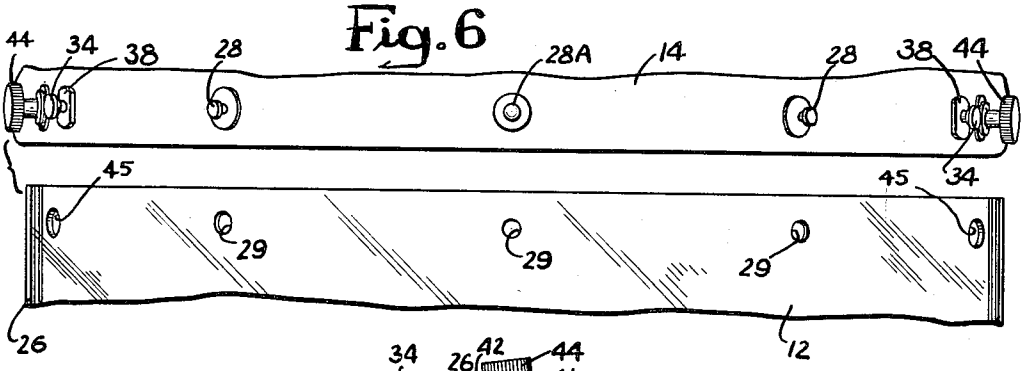
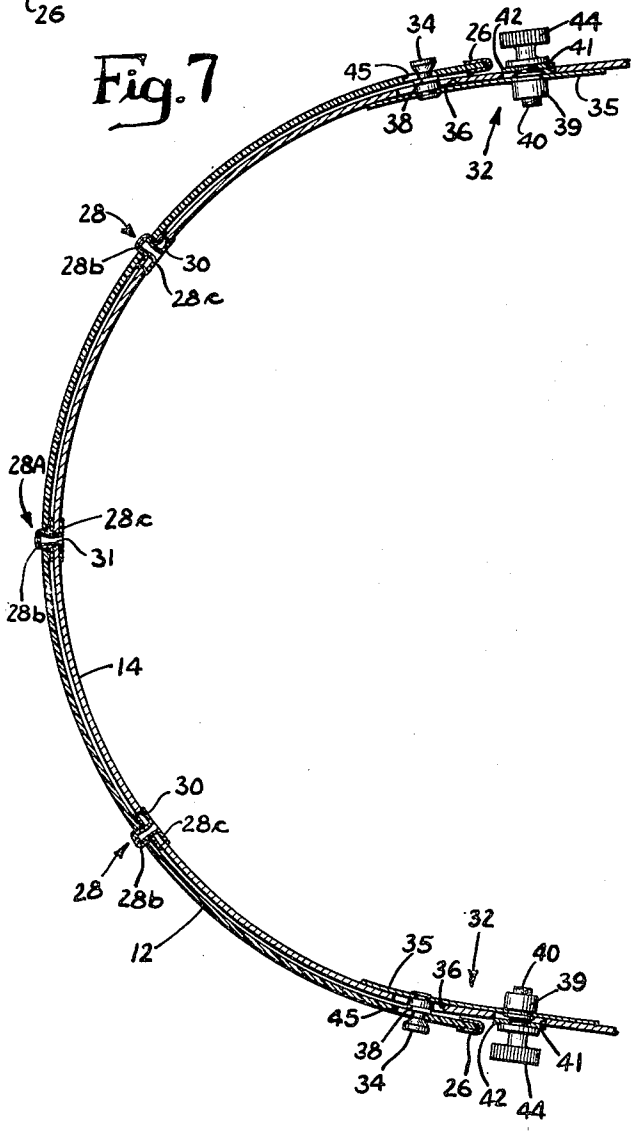


Fig. 7



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2,763,006

FACE SHIELD

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4 Claims. (Cl. 2—8)

The present invention relates in general to protective devices for shielding a wearer from flying fragments and particles, splashing chemicals, intense heat, and the like. More particularly, the invention relates to transparent shield devices of the type worn on the head of the user and having a curved plastic window member for protecting his face and eyes.

The general aim of the invention is to provide, in such a shield device having a head piece, improvements in means for removably mounting a replaceable, flexible window member on an arcuate support member carried by the head piece, such that the window is held curved around the user's face.

In a more specific aspect, it is an object of the invention to provide for the removable attachment of the flexible window member to the curved support member in a manner permitting of automatic compensation for misalinement or mismatch of originally registering fastening means as occasioned by dimensional changes in the members due to the influence of temperature, humidity, and the like, without sacrificing rigidity in the attachment or the convenience with which it is effected.

Another object of the invention is to provide, in a curved shield device, fastening means which are engageable with a flexible window member and circumferentially shiftable to tension the window member in compensating for a dimensional mismatch with the curved support member to which the window is to be attached.

Additional objects and advantages will become apparent as the following description proceeds, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a side elevation of a transparent shield device embodying the features of the present invention and shown in place on a user's head;

Fig. 2 is a plan view of the shield device shown in Fig. 1;

Fig. 3 is a fragmentary detail view taken substantially along the line 3—3 in Fig. 2;

Figs. 4 and 5 are enlarged detail views, in section, taken substantially along the lines 4—4 and 5—5, respectively, in Fig. 3;

Fig. 6 is a fragmentary, exploded front elevation of the shield device, particularly illustrating the coacting means for fastening a flexible window member onto a curved support member; and

Fig. 7 is a sectional view taken substantially along the line 7—7 in Fig. 1.

While the invention has been shown and is described in some detail with reference to a particular embodiment thereof, there is no intention that it thus be limited to such detail. On the contrary, it is intended here to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention as defined by the appended claims.

Referring now to the exemplary embodiment of the invention here shown, a transparent shield device is illustrated as worn on the head of a user (Fig. 1). The device has as its principal components a head band **10** and a visor **11** which includes a replaceable, flexible, and transparent window member **12** curved to fit and attached at its upper edge to an arcuate support member or crown **14** carried by the head band **10**.

The head band **10** may take any one of a variety of forms; in the present instance it comprises a front portion **15** and a rear portion **16** hinged together as by eyelets **18** to facilitate the placement and removal of the device on the user's head. For purposes of increased comfort to the user and to assist in preventing accidental dislodgment of the device, the rear portion **16** is fashioned to rest against the base of the user's head just above the nape of his neck. To this end, the rear portion **16** is curved downwardly as at **19**. If desired, a sweat band **20** of soft leather or the like may be provided about the front head band portion **15**.

While the head band **10** alone is sufficient to support the device, its comfort to the wearer may be enhanced by an additional band or strap **21** secured to the front portion **15** in front of the eyelets **18** and extending upwardly and forwardly therefrom so as to rest on the front part of the crown of the user's head. This serves to relieve his brow of a good part of the weight of the device.

The rear portion **16** preferably includes adjustably overlapping sections (not visible) disposed beneath a slidable sleeve **22**, thereby permitting the head band to be adjusted in size but cushioning the adjusting means from contact with the user's head.

The visor **11** is preferably swingable to a position in which the window member **12** is substantially horizontal, thus permitting the user to remove the window **12** from a position in front of his face without taking the band **10** from his head. For this purpose, the crown member **14** is attached to the front head band portion **15** in spaced relation thereto by pivot studs **24** and is frictionally biased by springs **25**. The support or crown member **14** is generally arcuate in shape, following the front portion **15** between the pivot studs **24** and rising to a considerable height to afford protection for the user's forehead. Preferably, such crown member is made of the same material as the head band **10**, such for example as vulcanized fiber which is light and strong.

The transparent window member **12**, when positioned in front of the user's face, as shown, provides complete protection of the face and eyes from flying objects, splashing chemicals, heat, and the like, yet permits good visibility. It is preferably formed of readily available plastic material which possesses many advantages over glass, for example, in that it is light, flexible, and shatterproof. The window member may be bordered on its lower and side edges with a crimped, soft metal channel **26** which not only keeps the edges from becoming nicked of frayed, but also permits the plastic sheet forming the window to be preset to some degree of curvature. For the most part, however, it is the attachment of the window member **12** to the arcuate crown member **14** which shapes and holds the flexible plastic sheet in curved relation around the user's face.

While the plastic material of which the window member **12** is formed is advantageous in most aspects, it is relatively soft and liable to become scratched or otherwise marred so as to impair visibility therethrough, thus requiring replacement from time to time. It has been found that after the crown member **14** of the visor **11** has been in use for some length of time, it is subject to dimensional changes. This is most noticeable as a peripheral elongation or shrinkage depending upon the conditions under which the shield device has been used. For example, when the shield is used in a humid atmosphere such as encountered during plating or liquid chemical operations, the window supporting member absorbs mois-

ture and has a tendency to elongate. If it has been used in operations where heat is encountered, such as furnace work or forging operations, the window-carrying member has a tendency to shrink. Thus, it frequently happens that when a replacement window member is obtained, the elements of the fastening means employed to join it with the support member will not fit.

In accordance with the present invention, the removable attachment of the plastic window member **12** to be curved support member **14** is effected by an improved organization which not only snugly holds the window member **12** smoothly curved to conform to the support member **14**, but compensates for any such dimensional misalinements. As shown, a series of circumferentially spaced, forwardly projecting headed studs **28** are fastened to the lower edge of the support member **14**, all but one of which, stud **28A**, are floatably mounted for relative transverse shifting. In this instance, three such studs are provided, the center one **28A** anchored fast to the support member **14**.

The top edge of the window member **12** is provided with a corresponding series of openings **29** which are just slightly smaller than the heads of the studs **28** and **28A**, and owing to the flexibility of the plastic sheet material, permit the window member to be snapped over the heads and onto the studs, as best shown in Fig. 7. The openings **29** are spaced so that under normal conditions they would register with and fit over the studs **28** and **28A** when the shiftable ones are centered in their limits of travel. However, with elongation or shrinkage of either the window member or support member, such exact registry does not usually prevail over long periods of time.

For the floating fastening of the studs **28**, each is made up of a cap **28*b*** and a skirt **28*c*** having central outwardly projecting and nesting portions together with radially extending flanges. The caps **28*b*** and skirts **28*c*** are adapted for interengagement, with the flange portions thereof disposed on opposite sides of the supporting member **14** and, as shown, with the projecting portion of skirts **28*c*** extending through relatively large openings **30** formed in the lower edge of the support member **14**. That is, the openings **30** are made of a diameter larger than that of the outwardly projecting portion of the skirts **28*c***, and the flange portions of the two parts **28*b*** and **28*c*** are spaced apart a distance slightly greater than the thickness of the material for the support member **14**. It will thus be seen that the headed studs **28** may shift laterally within the openings **30**.

The center, anchored stud **28A** is constructed similarly to the previously described studs **28**, except that its cap and skirt **28*b*** and **28*c*** have flanges which are snugly crimped against the material of the support member **14** and the projecting portion of the part **28*c*** fits snugly in an opening **31** which is relatively small compared to the openings **30**. The center stud **28A** is thus rigid with the support member **14** and cannot shift as in the case of the studs **28**.

With the fastening arrangement described, the window **12** may be attached to the supporting member **14** by first snapping its center opening **29** over the center stud **28A**. Next, the window **12** is curved around to conform substantially to the curvature of the support member **14**. By lateral shifting of the studs **28** in the openings **30**, they are appropriately positioned to snap into the corresponding openings **29** in the member **12** even though there is considerable relative misalinement of the openings **29** with the corresponding openings **30** and **31**, in a peripheral direction around support member **14**. Because the center stud **28A** is rigid with the support member **14**, the window member **12** is not free to shift relative to the support member as it would be if all of the studs were shiftable. By this arrangement, therefore, provision is made for dimensional misalinement or mismatch of the two fastened parts without sacrificing rigidity of the connection.

As a further assurance, however, that the window **12** is easily attached to or removed from the curved member **14**, special fastenings **32** are provided at one or both ends of the latter for engaging one or both corners of the window **12**, both to hold such corners curved down against the support member **14** and to circumferentially tension the window. As a result, the studs **28** are pulled in their openings **30** to positions where the window **12** bears uniformly against the support member **14**.

In accordance with the invention, means are provided to tension the window member **12** into snug conformity with the support member **14**. As here shown, special fasteners comprise headed projections **34** mounted for circumferential shifting relative to the support member **14**, together with means for locking them in a given setting. The projections **34** are peened into a flexible metal strip **35** (Figs. 3, 4 and 7) which is slidable along the inner surface of the support member **14**, the projections being inserted through a circumferential slot **36** and being slidable therein although locked against axial play by a flange **38**. The neck portion of the projections **34** diverges outwardly to the head portion, in order that window members formed of material of various thicknesses can be readily accommodated and each is urged, by a wedging action, down against the support member **14**.

For locking the projections **34** in any given circumferential setting within the limits of the slots **36**, a nut element **39** is mounted fast on each strip **35** and threadably receives a set screw **40** passed through a slot **41** in the support member (Figs. 3, 5 and 7). At the outer side of the latter, the screw **40** carries a washer **42** which is larger than the slot **41** and is disposed beneath a finger-piece **44** on the screw. When the screw **40** is loosened, the projection **34**, strip **35**, and the screw itself may be shifted within the limits of the slots **36** and **41**; tightening of the screw clamps the support member **14** between the washer **42** and the strip **35** to lock the projection **34** in a given setting.

For cooperating with the shiftable projections **34** at either end of the support member **14**, holes **45** which are relatively large compared with the heads on the projections **34** are defined in the opposite, upper corners of the window member **12**. Once the window has been snapped onto the studs **28** and **28A** as described above, it is only necessary to loosen the screws **40** and bend the corners of the window down against the support member **14**, shifting the projections **34** as required in order that they are received in the holes **45**, as shown in Fig. 7. Because the holes **45** are relatively large compared with the heads on the projections **34**, and because the latter are shiftable between the wide limits afforded by the slots **36** and **41**, no trouble is experienced in effecting such engagement even though dimensional misalinements due to relative expansion or contraction are the greatest at the extremities of the window **12** and support member **14**. Once the engagement has been effected, the projections **34** may be circumferentially retracted by grasping the finger-pieces **44** and pulling rearwardly on them thus pulling the projections **34** into firm engagement against the rear edges of the holes **45** and tensioning the window **12** to pull it firmly against the support member. At the same time, the outwardly diverging or frusto-conical neck of each of the projections **34** bears against the edge of the holes **45** and "wedges" the corners of the window down firmly against the support member. The screws **40** may then be tightened by turning the finger pieces **44** to thereby lock the strips **35** and projections **34** relative to the support member **14**.

In removing the window member **12**, it is only necessary to loosen the screws **40** and slide the strips **35** and projections **34** forwardly until the corners of the window snap free of the projections. The window may then be

quickly pulled from the studs 28 and 28A so that the support member 14 is ready to receive a new replacement window.

I claim as my invention:

1. A protective device of the character described comprising, a head band, a relatively rigid generally arcuate window carrying member supported on said head band and having an inside surface facing the user's head and an outside surface facing away from the user's head, a flexible window member, and means for attaching said window member along its upper edge to the outside surface of said carrying member so that it depends in front of the user's face, said means including a first fastener for fixing said window member against lateral movement in both directions at one point along its upper edge on the carrying member, and a second fastener adjustable relative to the support and including means by which the window member may be positively drawn in a direction away from said first fastener, for tensioning the window member in snug conformity to the outside surface of said carrying member notwithstanding dimensional misalignment thereof, and for holding the members together.

2. In a transparent shield device, the combination of a relatively rigid arcuate support member adapted to be worn above the user's brow, a flexible plastic window member, and means for holding the window member on the outside of the support member so that it depends in curved relation in front of the user's face, said means including a headed stud anchored on said support member, said window member having an opening along the upper edge to snap over said headed stud, said support member having first and second spaced circumferential slots defined therein at one end thereof, and a fastener at said one end of said support member including a headed projection insertable through said first circumferential slot, a flexible strip slidable along the inner surface of said support member and mounting said projection such that the latter is shiftable circumferentially in said first slot, a nut element carried by said strip, a screw element threaded in said nut element and extending through said second circumferential slot to releasably lock said strip relative to said support member, said window member also having an opening formed in one upper corner thereof whereby said projection may be shifted forwardly, inserted through said latter opening, retracted in a direction away from said headed stud and locked to tension said window member in curved conformity to the outside of said support member notwithstanding dimensional misalignments of said members.

3. A protective device of the character described comprising, in combination, a head band adapted to fit on the head of a user and including a relatively rigid crown member curved to extend around his brow, a flexible, replaceable window member, a plurality of headed studs

removably securing said window on the outside of said crown member, all of said studs except one being floatably mounted in spaced relation for lateral shifting on said crown member and the remaining stud being anchored fast to said crown member, said window member having a plurality of openings formed in spaced relation and adapted to fit over said headed studs, misalignment of said studs and openings or dimensional differences between said members being compensated for by movement of said shiftable studs, but the members being held fast and located against relative lateral movement in both directions at one point by said one fast stud, certain of said floatably mounted studs being adjustable relative to the support and including means by which the window may be positively drawn in a direction away from said one fast stud, for tensioning the window into curved conformity to the outside of said crown member, and for holding the window in place on said crown member.

4. A protective device of the character described comprising, in combination, a head band adapted to fit on the head of a user and including a relatively rigid crown member curved to extend around his brow, a flexible, replaceable window member, a plurality of headed studs removably securing said window on the outside of said crown member, all of said studs except one being floatably mounted in spaced relation for lateral shifting on said crown member and the remaining stud being anchored fast to said crown member, said window member having a plurality of openings formed in spaced relation and adapted to fit over said headed studs, misalignment of said studs and openings or dimensional differences between said members being compensated for by movement of said shiftable studs, but the members being held fast and located against relative lateral movement in both directions at one point by said one fast stud, certain of said floatably mounted studs having conical neck portions diverging towards the headed portions thereof, said certain of said studs being adjustable relative to the support and including means by which the window may be drawn in a direction away from said one fast stud, for tensioning the window into curved conformity to the outside of said crown member, the conical neck portions thereof wedging the window firmly against said crown member.

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