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Wilson et al.

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(54) **TEAR-OFF OPTICAL STACK HAVING PERIPHERAL SEAL MOUNT**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 09/449,318, filed on Nov. 24, 1999, now Pat. No. 6,388,813.

(51) **Int. Cl.**⁷ **A61F 9/00**

(52) **U.S. Cl.** **2/15; 2/424; 2/434**

(58) **Field of Search** **2/9, 15, 424, 432, 2/434; 351/44, 47; 359/359, 630, 631**

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(57) **ABSTRACT**

An optical stack of laminated removable lens for affixing to a face shield is disclosed. The stack includes a plurality of superposed removable lens adhesively affixed to one another, wherein each of the removable lens is held to each successive lens with a clear uninterrupted adhesive layer interposed between each lens. Each of the lens has a removal tab portion on one end which does not have any adhesive layer on either side thereof. This allows the wearer of the face shield to quickly grasp the removal tab portion for removing the top lens and exposing a clean lens directly underneath. The bottom-most removable lens of the stack has a band of adhesive formed around the periphery thereof for attachment of the stack to the face shield. The band of adhesive forms a seal which eliminates any moisture from the interface between the bottom-most lens and the shield.

11 Claims, 3 Drawing Sheets

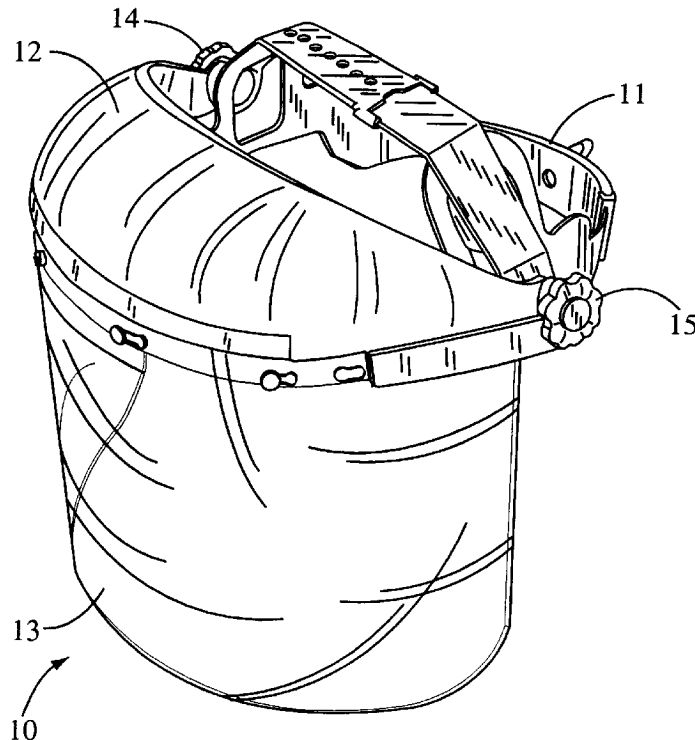


EXHIBIT
Ex. 1004

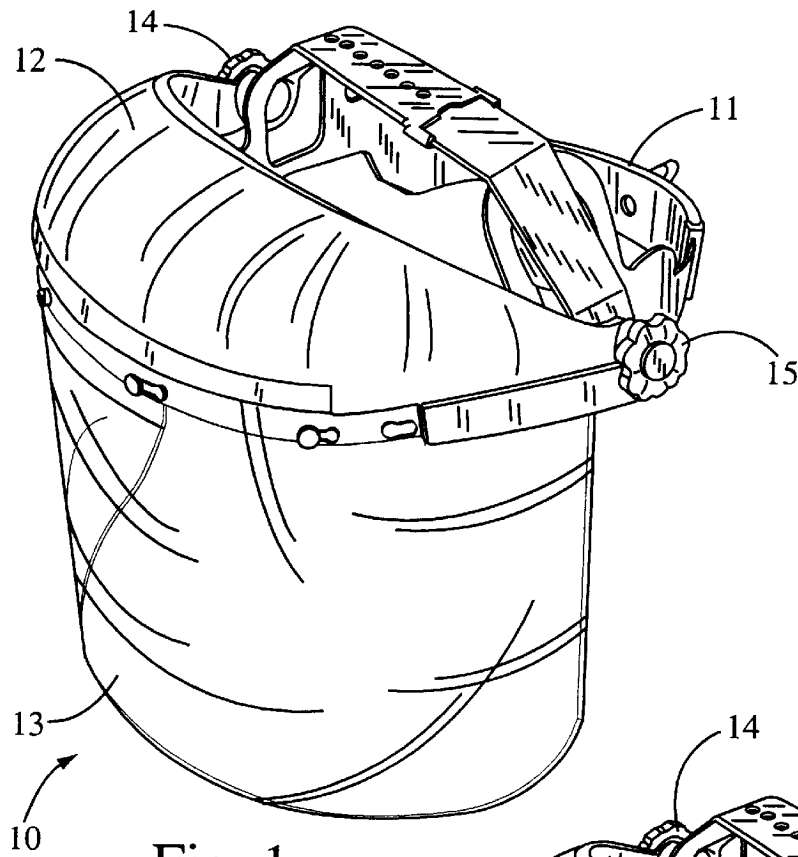


Fig. 1

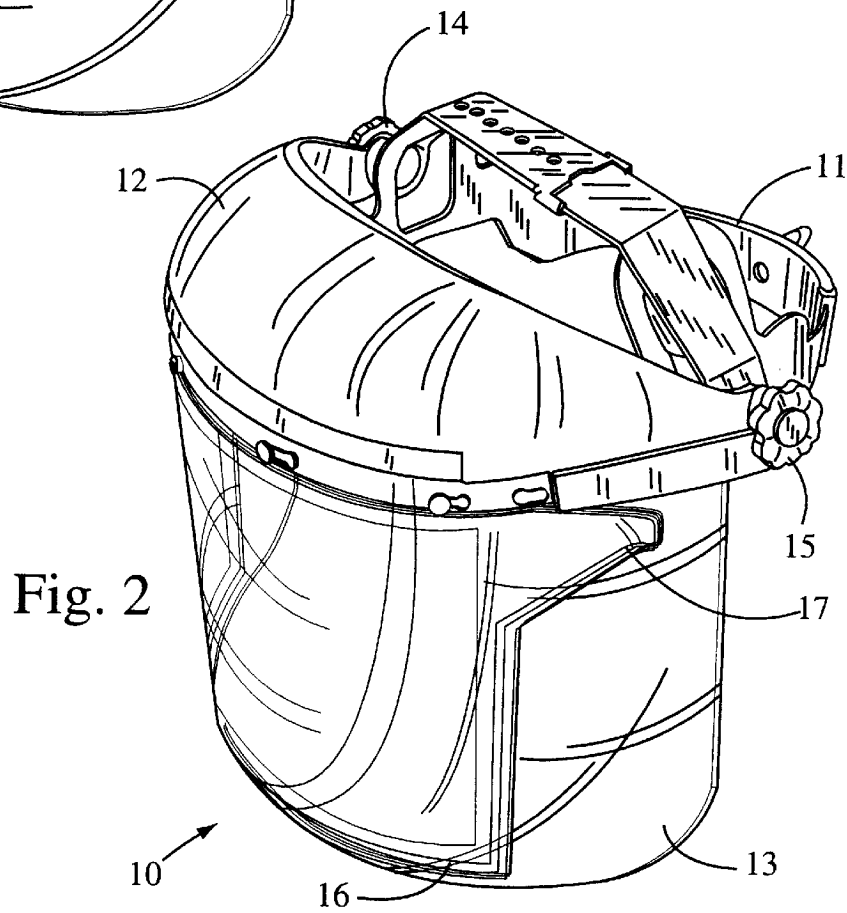
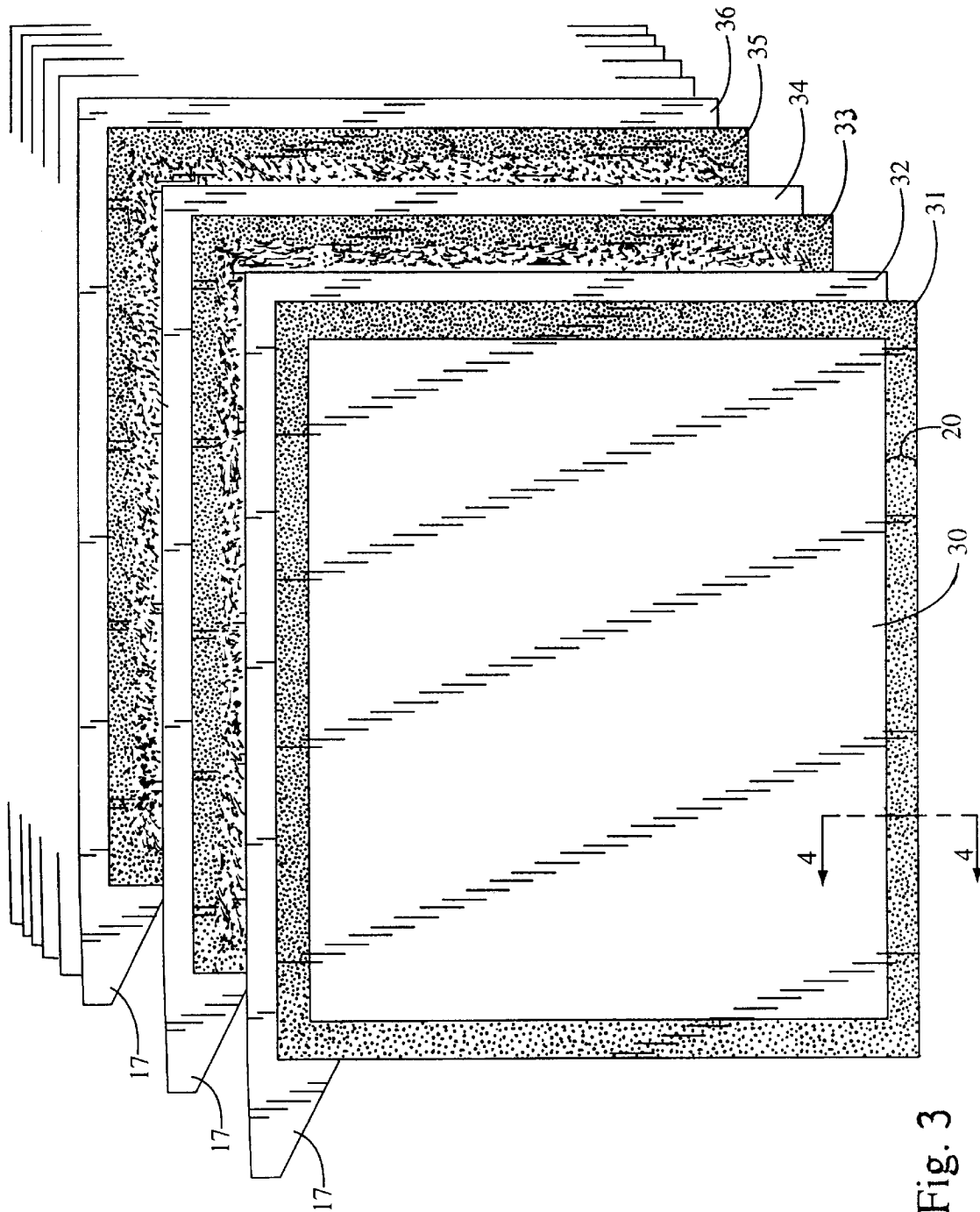


Fig. 2



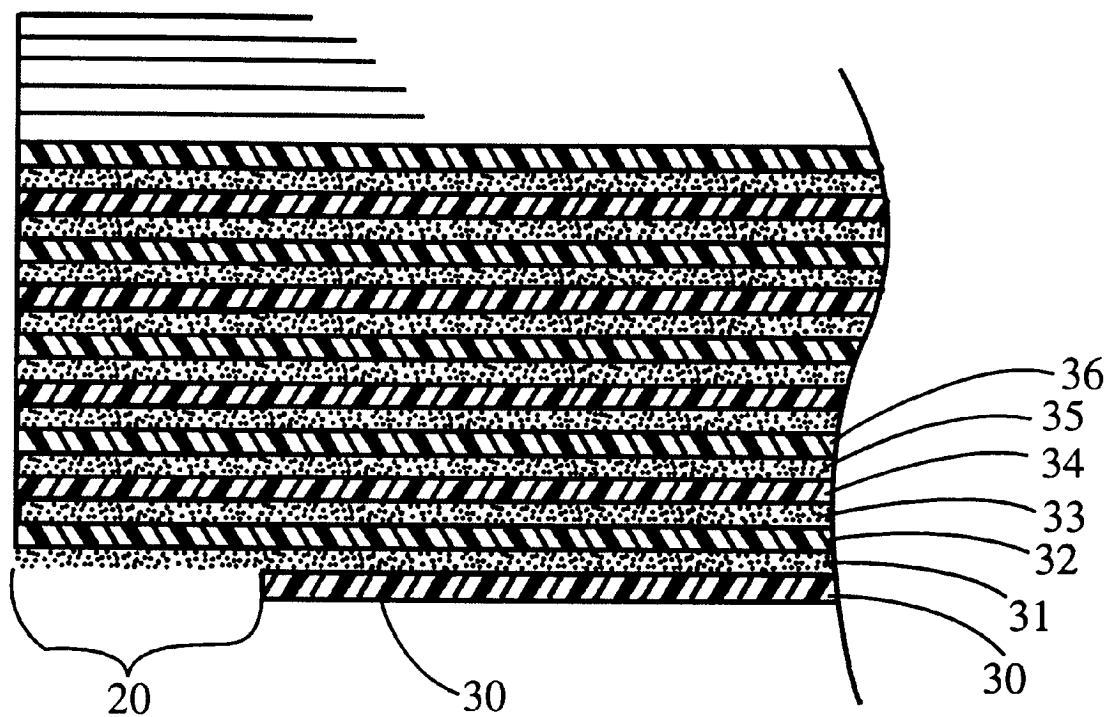


Fig. 4

TEAR-OFF OPTICAL STACK HAVING PERIPHERAL SEAL MOUNT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Ser. No. 09/449,318, now U.S. Pat. No. 6,388,813 entitled OPTICAL STACK OF LAMINATED REMOVABLE LENSES FOR FACE SHIELDS, WINDOWS AND DISPLAY filed Nov. 24, 1999, the entire contents of which are incorporated by reference herein.

STATEMENT RE: FEDERALLY SPONSORED RESEARCH/DEVELOPMENT

(Not Applicable)

BACKGROUND OF THE INVENTION

The present invention generally relates to the field of eye protectors or face shields having a lens cover plate, and in particular to peripheral seal mounts for a tear-off stack of laminated removable lens covers adhered to face shields and the like.

It is common practice to wear face shields in environments where injury of the eyes or face may occur from contamination. For example, face shields are worn by physicians working in the operating room. They are sometimes worn by those playing games where injury to the eyes may occur. For example, in the game of Paint Ball contestants employ weapons that fire at one another pellets or balls of paint as ammunition. When a ball of paint strikes a participant, it becomes readily apparent that they have been hit by a "tell-tale" blotch of paint. Obviously, it is desirable for contestants to wear some form of protection over their face and eyes.

In such environments as the Paint Ball game or the operating room, it is most likely that any face protection lens being worn will become covered with contaminants, which obscures the view. The solution would appear to be to simply clean off the lens. This is not always an option, especially for a physician performing an operation who cannot stop for such cleaning. An example of a recent solution to a similar problem is the use of a multi-ply transparent lens over goggles in order to facilitate rapid removal of dirt or grime in contaminated environments. That is, when the goggles become contaminated, a single layer of the multi-ply transparent lens is removed. The goggles are now clean and when they again become contaminated another layer of the multi-ply transparent lens is removed. This process can be repeated many times, depending upon the number of layers applied to the goggles. An example of this process and the materials used is disclosed in our application Ser. No. 09/449,318 filed Nov. 24, 1999 now U.S. Pat. No. 6,388,813 entitled OPTICAL STACK OF LAMINATED REMOVABLE LENSES FOR FACE SHIELDS, WINDOWS, AND DISPLAYS. The disclosure of which is expressly incorporated herein by reference.

In our above-cited patent, the problem we overcame was caused by reduced visibility as a result of the additive effect of the optical index of refraction for each layer applied. We overcame this problem by eliminating the air space between each successive layer of the multi-ply transparent lens and by inserting an adhesive layer between each lens layer. Thus, we created an adhesively laminated multi-layered clear film adapted to be used on a wearer's goggles, face shield or the like. However, when this same film is used for large area

face protectors other problems arise. For example, when the bottom-most layer is adhered directly to the lens bubbles will appear, which bubbles are not easily removed because of the multi-layers over the bottom-most layer. Moreover, if the adhesive is omitted from the bottom-most layer, then we are back to the original refraction problem of an air gap between the eye-protector lens and the bottom-most layer of the multi-ply transparent lens. In addition, if the adhesive layer is removed from the interface between the bottom-most layer of the multi-ply stack and the lens of the face protector, then there remains the problem with the lens fogging up in the presence of moisture.

Accordingly, there is a need for a multi-ply transparent lens that will not produce bubbles when applied to the face protector's lens and will not reduce visibility due to a fogging up of the lens by moisture seeping into the interface between the bottom-most layer of the removable lens and the lens of the eye protector.

BRIEF SUMMARY OF THE INVENTION

Accordingly, a feature of the present invention is the use of selective areas of adhesive around the periphery of the bottom-most layer of a multi-ply transparent optical lens stack for attachment to a large area face protector. Preferably, the lenses and adhesive layers have an index of refraction between 1.40 and 1.52.

Another feature of the present invention is a method for the removal of a peripheral race around the edges of the bottom-most layer of a multi-ply transparent lens stack, thereby exposing adhesive around the periphery only. The peripheral adhesive area may then be used for affixing the multi-layer transparent lens to the face protector. Thus, the central area of the bottom-most layer of the multi-ply transparent lens remains in place, thereby avoiding the bubble problem. Also, the adhesive on the periphery solves the fogging up problem by sealing out any moisture.

Yet another feature of the present invention is an alternate method of forming the adhesive strip by applying a thin strip of adhesive directly to the bottom-most lens of the optical stack around the periphery thereof.

Still another feature of the present invention is the provision of an optical stack of removable lenses that may be used for windshields of vehicles, windows of all types, or video displays.

These and other features, which will become apparent as the invention is described in detail below, are provided by an optical stack of laminated removable lenses that may be affixed to a face shield. The stack includes a plurality of superposed removable lenses adhesively affixed to one another, wherein each of the removable lenses is held to each successive lens with a clear uninterrupted adhesive layer interposed between each lens. Each of the lens has a removal tab portion on one end which does not have any adhesive layer on either side thereof. This allows the wearer of the face shield to quickly grasp the removal tab portion for removing the top lens and exposing a clean lens directly underneath. The bottom-most removable lens of the stack has a band of adhesive formed around the periphery thereof for attachment of the stack to the face shield. The band of adhesive forms a seal which eliminates any moisture from the interface between the bottom-most lens and the shield.

Still other features and advantages of the present invention will become readily apparent to those skilled in the art from the following detailed description, wherein is shown and described only the preferred embodiment of the invention, simply by way of illustration of the best mode

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