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WINDOW ASSEMBLY

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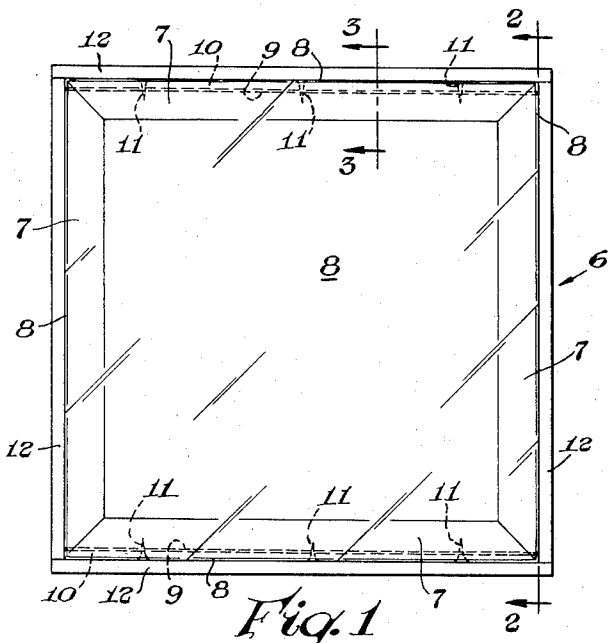


Fig. 1

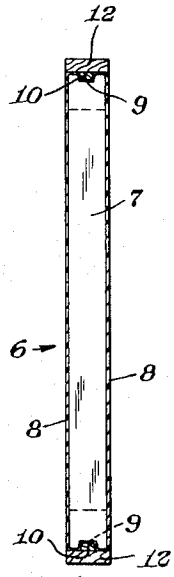


Fig. 2

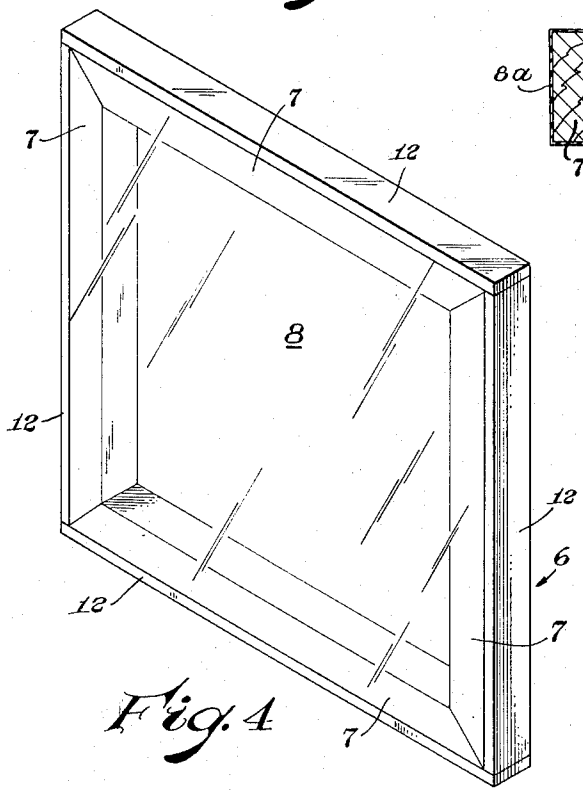


Fig. 4

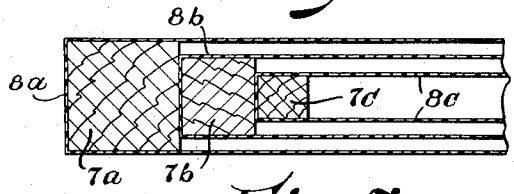


Fig. 5

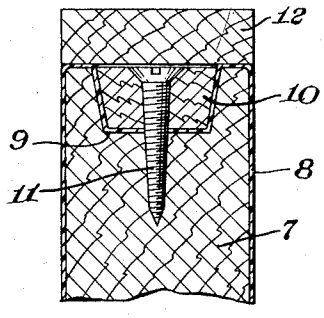


Fig. 3

INVENTORS.
Walter E. Donaldson
Alden W. Hanson

BY

Griswold & Burdick
ATTORNEYS

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WINDOW ASSEMBLY

Walter E. Donaldson and Alden W. Hanson, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich., a corporation of Delaware

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4 Claims. (Cl. 160—179)

This invention relates to an improved window assembly having translucent panes of thermoplastic film and to a method for its manufacture.

Shatterproof windows and window assemblies have been made which utilize translucent (or opaque) films of thermoplastic and other polymeric or resinous materials. However, it frequently is difficult to obtain a suitably firm and taut pane with many films, particularly if they are of a flexible and non-rigid nature. When such films are attached or secured on one or both sides of a frame or sash according to various conventional techniques, they often tend to sag or be loose or sleazy in an unattractive and undesirable manner.

It is an object of the present invention to provide an improved shatterproof window assembly having panes of a translucent film of a thermoplastic material installed in a more satisfactory manner. It is an additional object to provide such a window having good thermal insulating qualities. Other objects and advantages will be apparent in the following description and specification.

According to the present invention, an improved shatterproof window assembly having a low thermal conductivity is comprised of a sash frame enveloped within an ensheathing tube of a shrinkable thermoplastic film which has been shrunk in place about the ensheathed frame. Such window assemblies may advantageously be manufactured by positioning a sash frame within a tube of a shrinkable thermoplastic film; enveloping the frame with said tube of film; securing the film on the frame; then shrinking the film tightly in place about the ensheathed frame.

Embodiments of window assemblies according to the invention are illustrated in the accompanying drawing, in which like reference numerals refer to like parts, wherein:

Figure 1 is a front elevation of a window assembly;

Figure 2 is a side sectional view taken along 2—2 in Figure 1;

Figure 3 is a magnified sectional view along the line 3—3 in Figure 1, showing the envelopment of the sash with the secured film;

Figure 4 is a perspective view of the window assembly; and

Figure 5 illustrates a modified embodiment of the invention.

The reference numeral 6 generally indicates the embodiment of a window assembly which is illustrated in the first four figures of the drawing. A sash 7 is ensheathed by an enveloping film 8 of a flexible, shrunken thermoplastic film which is shrunk in place to fit tightly about the sash and provide a double pane which is firm, taut, attractive and translucent. The installation of the double film pane is accomplished by inserting the sash 7 within a loosely-fitting accommodating tube of the film 8 in an unshrunken condition. It is preferable to utilize film which has been extruded or manufactured in tubular form. However, if it is desired, the tube of film 8 can be specially fabricated from flat sheets for purposes of the present invention. Advantageously, the edges of the sash 7 are

rounded to avoid cutting or damaging the film 8. The tube of film, which is provided in a sash-accommodating length or after being suitably trimmed, is made to completely envelope the sash 7 by invaginating its opposite edges in mortise grooves 9, rabbeted in opposite ends of the sash, and securing the infolded film which ensheathes the sash with tenon strips or clamping bars 10 which fit in the grooves 9. Wood screws 11 or other suitable fasteners may be employed to hold the clamping bars 10 in the grooves 9. As is apparent, the mortise grooves 9 are provided at the opposite ends of the sash 7 which are inserted parallel to the trimmed or bounding edges of the tube of film 8. After securing the enveloping film about the sash, it is shrunk to fit tightly in place by any suitable shrinking means for the particular film employed. While shrinking the film completes the assembly, protective strips 12 may, if desired, be employed to trim the edges of the fabricated window assembly for added strength and to guard the ensheathing film from unnecessary damage, although such addition is a completely optional matter.

While it is shown to be made from a wooden frame having miter joints and in a generally rectangular form, the sash 7 can be constructed from any desired material in any desired manner and can be made with any desired configuration. Square or rectangular window assemblies may generally be made with less difficulty, although round and other shaped window assemblies may be provided readily in the practice of the present invention. In this connection, the window assembly can be made for function as a fixed, sliding or casement window or as a door or for any other architectural purpose which may be desired. The window assembly may also be provided with muntins (not shown) or other suitable or required types of reinforcement.

The unshrunken circumferential size of the tubular film 8 should be selected to readily accommodate the insertion of the sash 7 within the tube in a loose fitting manner. However, the tube should not be so large in comparison to the sash dimensions as to preclude formation of a tight ensheathment by the film after it is shrunk about the sash. The shrinkage characteristics of the particular film which is employed and the tautness or film tension which is desired in the fabricated assembly will determine the optimum film tube size which should be used for a sash of any given size.

Other techniques for installing the film to envelope the sash may also be employed, including glueing the film over the end of the sash or utilizing other types of batten strips and the like. In many instances the employment of glue or other adhesive to augment the clamping bars in securing the film may provide a superior vapor-proof seal for the assembly. In general, however, assemblies which are fabricated in a manner analagous to that of the illustrated embodiment have suitable characteristics including those which relate to obtaining a thoroughly sealed and vapor-tight inner space between the double film pane.

While various shrinkable thermoplastic films may be employed in the practice of the present invention, it is preferable to use films which are comprised of a copolymer of vinyl chloride and vinylidene chloride and which contain a major proportion of vinylidene chloride polymerized in the copolymer molecule. Films of such a polymeric material are readily available in the desired form and in good quality. They frequently are commonly referred to as saran films. Saran films have highly desirable characteristics and properties for purposes of the present invention. They have good clarity, can be obtained in a weather-resisting form, and have a much lower thermal conductivity than glass, which is conventionally employed in window panes. In addition, saran films have a high tensile strength and are tough and tear-resistant. Polyester films such as those obtainable from

polyesters of ehtylene glycol and terephthalic acid also have many desirable characteristics for purposes of the invention.

Unshrunken saran films may conveniently be shrunk by subjecting the film to treatment with low pressure steam. Thus, a window assembly fabricated with an unshrunken saran film may be completed in an efficient and expedient manner with close control of the shrinking temperature by merely exposing the loosely fitting film secured on the ensheathed sash to low pressure steam, as by directing a stream of low pressure steam across the surface of the film or in other ways as by employing steam chests and the like, which shrinks the film to a tight, enveloping ensheathment about the sash. Controled heat from other sources including hot air zones and the like or the application of other known techniques may also be utilized for purposes of shrinking the film if such means are more desirable or expedient in particular instances.

Window assemblies prepared according to the present invention, having a low thermal conductivity, do not permit the uninhibited passage of heat through the double film pane. This characteristic adapts them for employment as storm windows and in like weather-proofiing or other thermal insulating applications. For example, a window assembly which was prepared according to the foregoing illustration with a saran film having a thickness of about 0.0015 inch and which was spaced in the assembly with a distance of about one and five-eights inches between the ensheathing films was tested and found to have a thermal conductivity of only about 0.615 B. t. u./hr./° F./inch thickness/sq. ft. A similar window having an inner space between the films of about three-quarters of an inch had a thermal conductivity of only about 0.862 B. t. u./hr./° F./inch thickness/sq. ft. Better results can be obtained when the inner space between the films is vapor-tight and if it is filled with an atmosphere of a dry gas such as carbon dioxide. Thus, as a further example, a carbon dioxide filled window assembly with the same double thickness of saran film and having one and five-eights inches of spac ebetween the films was found to have a lower thermal conductivity of only about 0.360 B. t. u./hr./° F./inch thickness/sq. ft. A foot square pane of common, double-strength window glass having a thickness of about one-eighth inch will, for purposes of comparison, conducts about 306 B. t. u./hr. when the involved temperature differential is about 75 Fahrenheit degrees.

Still greater improvement in this regard can be obtained when a multiple window assembly is fabricated after the manner illustrated in Figure 5, showing part of one such assembly in cross section, wherein a plurality of sash frames are sequentially fabricated and placed one inside the other. Thus, as shown, the window assembly may be comprised of a first sash 7C ensheathed in the film 8C which is then positioned within the film 8B about a second sash 7B which in turn is positioned between a third, outer ensheathing film 8A enveloping both the outer frame 7A and the inner assemblies. Any multiple number of separate window assemblies which may be desired for various purposes may be fabricated in such a manner to produce a unitary, highly efficient assembly.

Besides being useful as storm windows or the like or other applications wherein their low heat radiation loss and thermal conductivity may be advantageous, window assemblies in accordance with the present invention may be utilized beneficially for other purposes. They may, by way of illustration, provide emergency or "crash" openings for various enclosures from which it may be desirable to have an available, quick egress port without danger of injury from broken glass or other more permanent obstructions. In addition, they may be attractive and extremely practical replacements for conventional glass windows and doors in order to obviate the danger which is inherent from flying glass particles in case of explosions or other forces which may cause violent glass shattering.

Since certain changes and modifications in the practice of the present invention can be readily entered into without substantially departing from its spirit and scope, it is to be understod that all the foregoing is merely illustrative of certain of the preferred embodiments of the invention and is not to be otherwise construed as limiting or restrictive thereof, expecting as it is set forth and defined in the appended claims.

What is claimed is:

1. A shatterproof and thermal insulating window and like assembly comprised of a sash frame having mortise grooves rabbeted at opposite ends; clamping bars fitting in each of said grooves; a length of tubular saran film ensheathing and enveloping said frame and being invaginated in said grooves at each of its edges and clamped by said clamping bars to secure said film on said frame; said film being shrunk in place about the ensheathed frame to form a taut, tight-fitting and translucent double pane.

2. The window assembly of claim 1 wherein the film is secured in a vapor-proof manner on said frame to provide a vapor-tight inner ensheathed space between the double pane of film.

3. The window assembly of claim 2 wherein the vapor-tight ensheathed space between the double pane of film is filled with an atmosphere of dry gas.

4. A shatterproof and thermal insulating window and like assembly comprised of a sash frame having mortise grooves rabbeted at opposite ends; clamping bars fitting in each of said grooves; a length of tubular shrinkable thermoplastic film ensheathing and enveloping said frame and being invaginated in said grooves at each of its edges and clamped by said said clamping bars to secure said film on said frame; said film being shrunk in place about the ensheathed frame to form a taut, tight-fitting and translucent double pane.

References Cited in the file of this patent

UNITED STATES PATENTS

1,969,453	Churchill	Aug. 7, 1934
2,298,783	Burnett	Oct. 13, 1942
2,708,774	Seelen	May 24, 1955

OTHER REFERENCES

Cry O Vac for Poultry, Dewey & Almy Chem. Co., 15 pages.