

T33104

United States Patent

[11] 3,633,984

[72] Inventors **Leonard E. Smollen**
Winchester;
Ralph I. Larson, Jr., Framingham; Gerald
H. Karr, West Peabody, all of Mass.

[21] Appl. No. **18,586**

[22] Filed **Mar. 11, 1970**

[45] Patented **Jan. 11, 1972**

[73] Assignee **The United States of America as**
represented by the Secretary of the United
States Air Force

[56]

References Cited

UNITED STATES PATENTS

2,450,746	10/1948	Bliss	350/311 X
2,122,178	6/1938	Land	156/99 X
3,290,203	12/1966	Antonson et al.	350/1 UX
3,069,301	12/1962	Buckley et al.	350/1 X
2,446,843	8/1948	Merritt	350/195

Primary Examiner—David Schonberg

Assistant Examiner—Toby H. Kusmer

Attorneys—Harry A. Herbert, Jr. and Arsen Tashjian

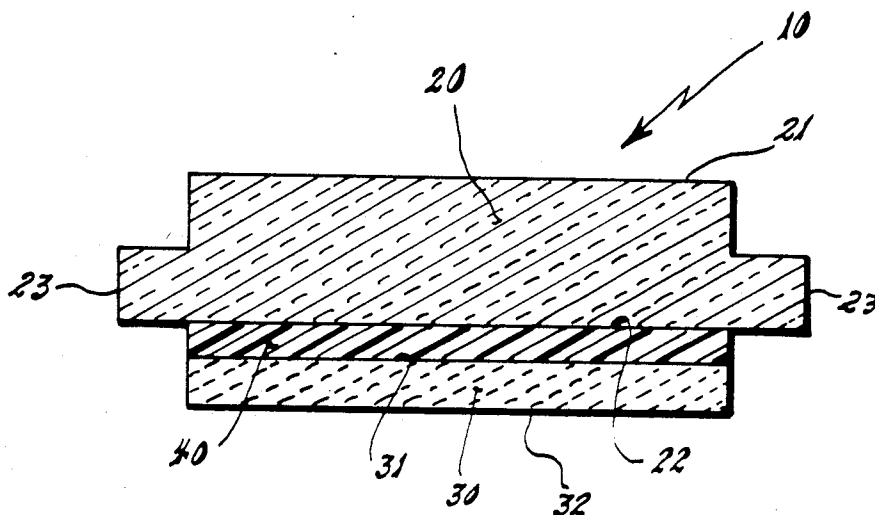
[54] **COMPOSITE, INFRARED TRANSMITTING,**
STRESS-FREE WINDOW
 2 Claims, 1 Drawing Fig.

[52] U.S. Cl. **350/1,**
 156/99, 350/311, 350/318

[51] Int. Cl. **G02b 5/20**

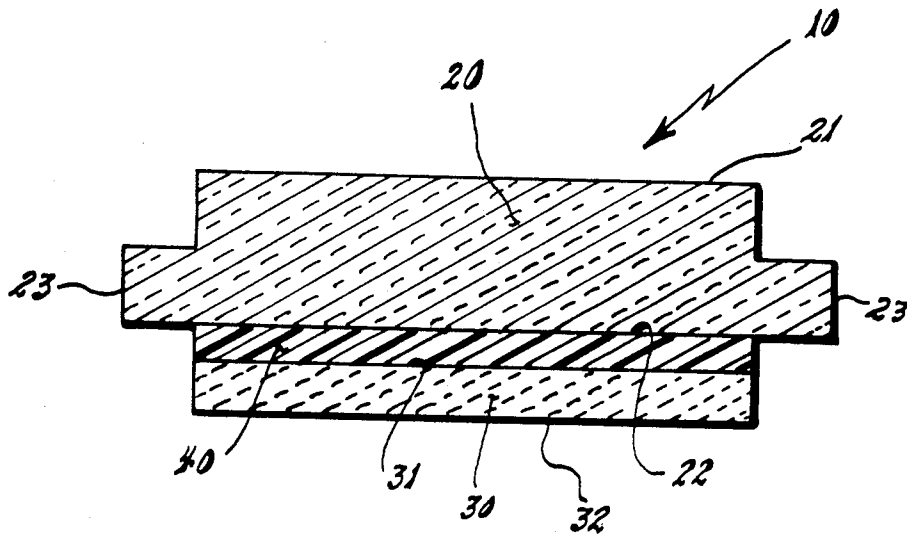
[50] Field of Search 350/1, 195,
 196, 311, 318; 156/99

ABSTRACT: A transmitting filter window assembly for use in high-thermal stress environments. The window assembly is a composite and includes an external window surface of high-strength clear glass to which is bonded, with a clear and transparent rubber bonding agent, an internal near infrared filter window surface of "Schott" glass or equivalent.



PATENTED JAN 11 1972

3,633,984



INVENTORS
LEONARD F. SMOLLEN,
RALPH E. LARSON JR. AND
BY GERALD H. KARR
Harry A. Herbert Jr.
Orsen Jacobian
ATTORNEYS

COMPOSITE, INFRARED TRANSMITTING, STRESS-FREE WINDOW

BACKGROUND OF THE INVENTION

This invention relates to a near infrared transmitting window filter assembly which is useable in high thermal stress environments and, more particularly, to a composite, near infrared, stress-free window assembly which may be efficiently and effectively used in such environments.

The term "high thermal stress environments" is intended to include, but is not limited to, environments in which there is thermal stress because of high temperature produced by heat applied to the internal window surface, thermal stress due to cold shock on the external window surface, thermal stress caused by rapid change in temperature (i.e., from 276° F. to -30° F. in approximately 40 seconds), thermal stress produced by and associated with near infrared pulsed energy sources, and thermal stress caused by high-temperature gradients in the plane of the window.

There is, and has been, a critical need for a stress-free window which acts as a near infrared filter and is useable in high thermal stress environments. Conventional designs that use a single piece of filter glass often shatter and are unuseable in high-thermal stress environments.

Our invention, a composite window (i.e., a window assembly) fulfills this need and, thereby, constitutes a significant advance in the state of the art.

SUMMARY OF THE INVENTION

This invention relates to a window assembly (i.e., a composite window) ideally suited for use in high thermal stress environments.

An object of this invention is to provide a window which is useable in an environment where the temperature varies over wide limits in a short period of time.

Another object of this invention is to provide a window, which will withstand the thermal stress due to very high temperatures resulting from heat applied to the internal surface, cold shock on the external window surface, and temperature gradients in the plane of the window.

Still another object of this invention is to provide a window which will withstand thermal stress produced by, and associated with, near pulsed infrared or continuous radiation sources.

These, and still other and related objects of this invention will become readily apparent after a consideration of the description of the invention and reference to the drawing.

DESCRIPTION OF THE DRAWING

The drawing is a schematic representation of the top plan view, in cross section, of a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings is depicted a preferred embodiment of our invention in a free edge (i.e., unrestrained) condition. The embodiment is a window assembly (i.e., a composite window) 10 having a plane-surfaced element 20 and an internal filter-type plane-surfaced element 30 in juxtaposed relation. Interposed between external element 20 and internal element 30 is a bed of clear and transparent rubber 40 which bonds external element 20 and internal element 30 to each other.

External element 20 with opposing surfaces 21 and 22 is of a high-strength thermal shock resisting, clear and transparent glass, such as "Chemcor," a trade name of the Corning Glass Company for a chemically strengthened glass which has a

deeper precompression layer at the surface than normally achieved by tempering. Element 20 is preferably one quarter of an inch thick and may have means such as projecting rib 23 by which the composite window may be mounted and clamped.

Internal element 30, with opposing surfaces 31 and 32, is a glass near-infrared filter, such as RG 715 "Schott" glass filter, manufactured by the Jena Glass Works, Incorporated of the Federal Republic of Germany, which filter has the property of transmitting at least 99 percent of impinging near infrared radiation in the 7,000 to 9,000 Angstrom units range. Element 30 is preferably 2 millimeters thick; but could be thicker depending on the type filter characteristics desired.

It is to be noted that external element 20 and internal element 30 of window assembly 10 have the same or similar coefficient of thermal expansion.

The bed of clear and transparent rubber 40, which is a bonding agent, is a clear, transparent, low-temperature, vulcanizing rubber, such as GE602 which is manufactured by the General Electric Company. The bed 40 is preferably one thirty-second of an inch thick.

MODE OF OPERATION OF THE PREFERRED EMBODIMENT

Light impinges upon surface 32 of internal element 30 of window assembly 10. Element 30 is opaque to all radiation, except near infrared in the 7,000-9000 Angstrom range. Radiation in that range is passed (i.e., transmitted) through internal element 30 and surface 31, without breaking or cracking of element 30, of window assembly 10. Radiation in that range then passes through rubber bed (and bonding agent) 40 and impinges upon surface 22 of external element 20. Infrared radiation is then passed through external element 20 and surface 21.

Thermal stresses in element 30 are minimized because it is freely floated on the bed of flexible rubber, element 40. Mounting and clamping forces are exerted on external element 20, which is not thermally stressed because it is transparent to infrared radiation.

However, in the unlikely event that internal element 30, which is brittle, is cracked or broken by thermal or mechanical loads, the bed (and bonding agent) 40 holds the pieces of element 30 securely in place.

While there has been shown and described the fundamental features of our invention, as applied to a preferred embodiment, it is to be understood that various substitutions and omissions may be made by those skilled in the art without departing from the spirit of the invention.

What we claim is:

1. A window assembly, comprising:

- a. an external plane surfaced element of a high-strength, clear and transparent glass and including means by which the window assembly may be mounted and clamped;
- b. an internal plane-surfaced filter in juxtaposed relation to the external plane-surfaced element; and
- c. means for bonding the external plane-surfaced element of high-strength, clear and transparent glass to the internal plane-surfaced filter, with the bonding means permitting passage of radiation from the internal plane-surfaced filter to the external plane-surfaced element of high-strength, clear and transparent glass, the internal plane-surfaced filter being freely floated on the bonding means.

2. The window assembly, as in claim 1, wherein the internal plane-surfaced filter transmits at least 99 percent of the near infrared radiation in the 7,000 to 9,000 Angstrom units range which impinges upon it.

* * * * *