United States Patent

[11] 3,594,763

[72] Inventor Cecil H. Peek
P.O. Box 325, Freeport, Bahamas

[21] Appl. No. 752,928
[22] Filed Aug. 15, 1968
[45] Patented July 20, 1971

[54] **WINDOWS AND THE COMBINATION THEREOF WITH ALARM MEANS**
4 Claims, 8 Drawing Figs.

[52] U.S. Cl. 340/240, 200/83, 340/274
[51] Int. Cl. G08b 13/20
[50] Field of Search 340/229, 240, 274, 276; 53/9; 200/83

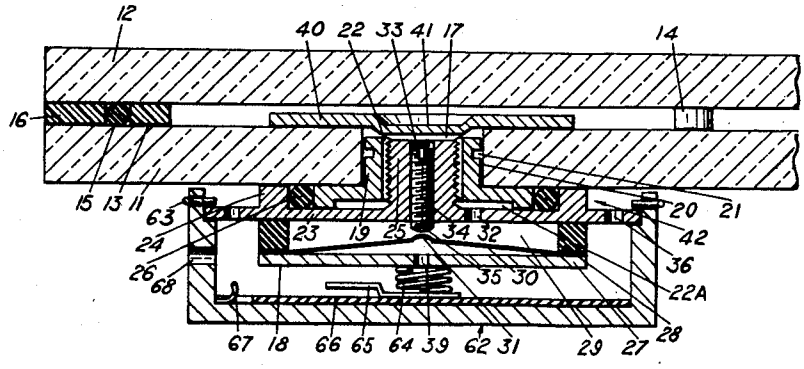
[56] References Cited

UNITED STATES PATENTS

3,374,323	3/1968	Peek et al.	340/240
3,441,924	4/1969	Peek et al.	340/274
2,496,877	2/1950	Krueger	53/9
2,401,638	6/1946	Herzog et al.	53/9

Primary Examiner—John W. Caldwell
Assistant Examiner—J. Michael Bobbitt
Attorney—Stevens, Davis, Miller and Mosher

ABSTRACT: A window comprises two panes of glass spaced apart in parallel relationship by rigid spacers of uniform thickness which are bonded to at least one of the panes, the spacers including a continuous strip placed inwardly of the window periphery and backing sealing means sealing said panes together at the window periphery, the space between the panes being evacuated. A hole in one of the panes used in the evacuation of the space may be plugged by a switch device in circuit with alarm apparatus and adapted to react to operate the alarm apparatus on equalization of the pressures within and external to the window.



PATENTED JUL 20 1971

3,594,763

SHEET 1 OF 4

Fig. 1.

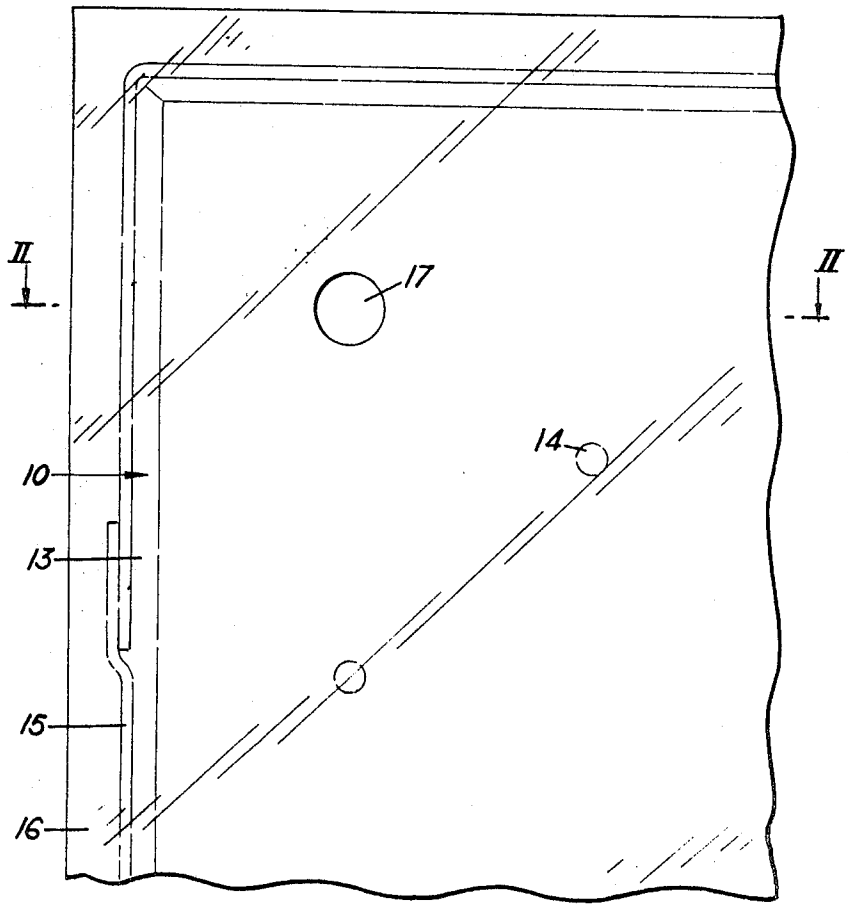
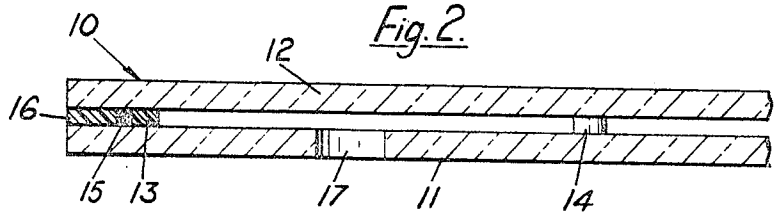


Fig. 2.



Inventor
CECIL H. PEEK

By Stevens, Davis, Miller & Mosher

Attorneys

Fig. 3A.

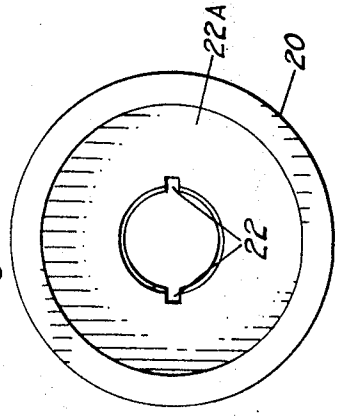
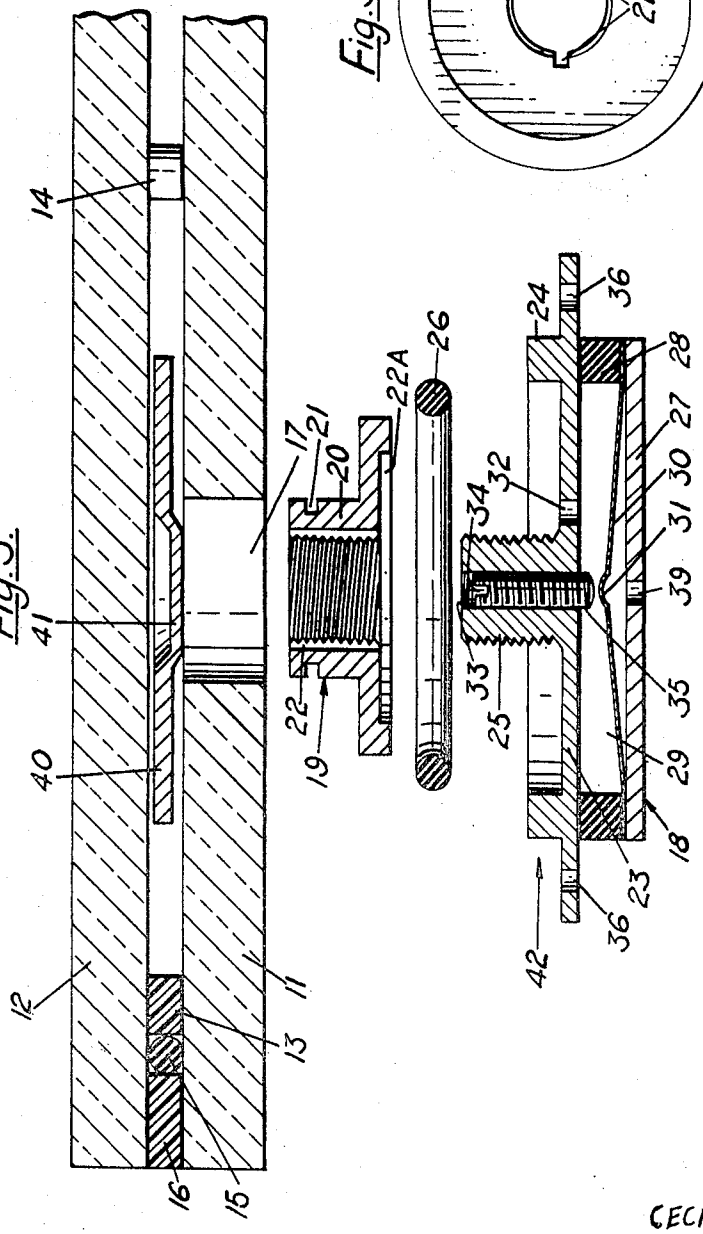


Fig. 3.



Inventor
CECIL H. PEEK

Stevens, Davis, Miller & Mosher

Attorneys

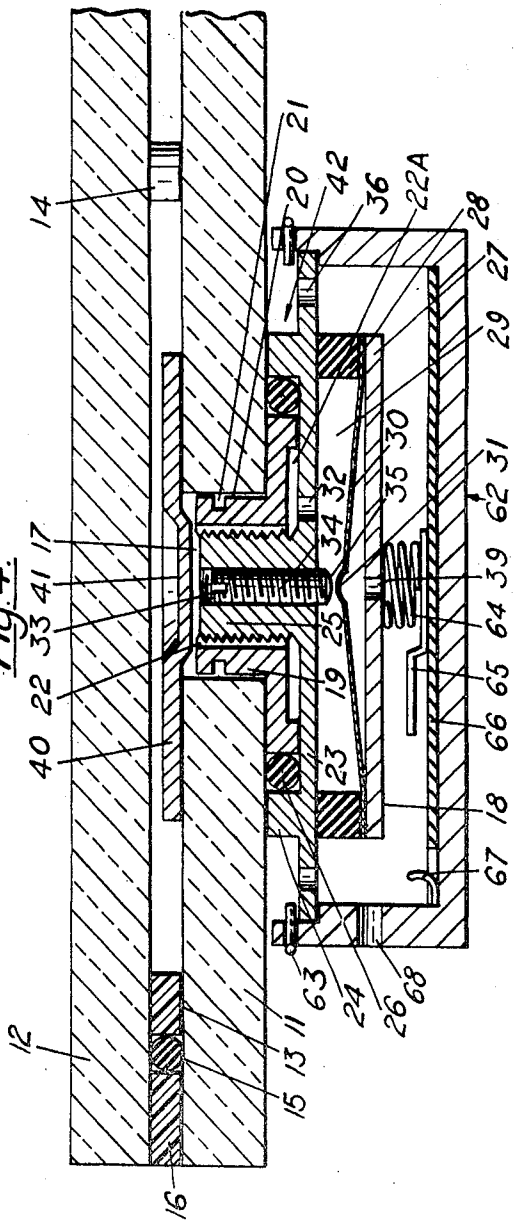


Fig. 4.

Inventor
CECIL H. PEEK

By Stevens, Davis, Miller & Mosher

Attorneys

Fig. 5.

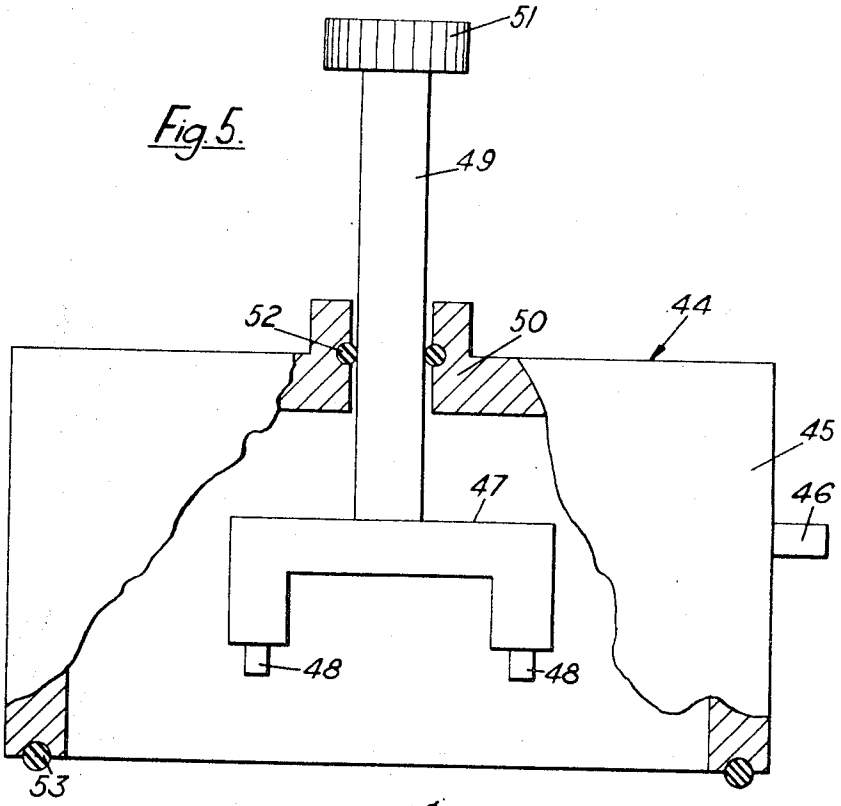


Fig. 6.

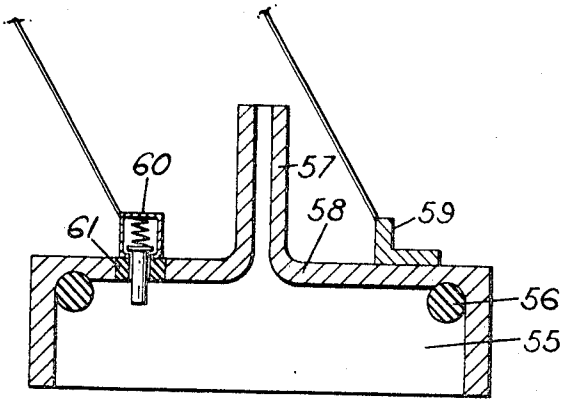
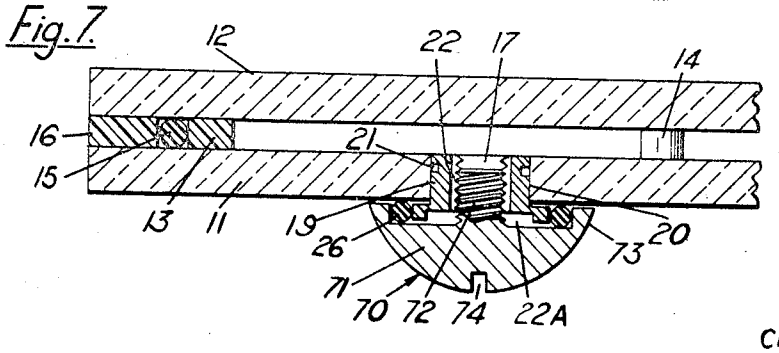


Fig. 7.



Inventor
CECIL H. PEEK

By Sterms, Davis, Miller & Hosfer

Attorneys

WINDOWS AND THE COMBINATION THEREOF WITH ALARM MEANS

This invention relates to windows and the combination thereof with alarm means.

According to the present invention, a window comprises two panes of glass spaced apart in parallel relationship by spacer means of rigid material and of uniform thickness therebetween and bonded to at least one of said panes, said spacer means including a continuous strip somewhat inwardly of the window periphery and elements dispersed within the area bounded by said strip, said strip backing means sealing said panes together at the window periphery, the gaseous volume contained between said panes and said strip being at a pressure less than that external to the window, and that one of said panes which in use is the inner pane having therein a hole through which the cavity or space between the panes was evacuated and which is plugged.

Also, according to the present invention, I provide the combination with alarm apparatus of a window closing an opening and comprising two panes of glass spaced apart in parallel relationship remote from their edges by spacer elements of rigid material which are bonded to at least one of said panes, said panes being sealed together at their edges to define therebetween a cavity or space wherein the pressure is less than the external pressure and holds in the closed circuit condition a switch device plugging a hole through which said cavity or space was evacuated and which is in the inner one of said panes, said switch device interrupting an electrical circuit which includes said alarm means and being adapted to react to operate said alarm means on equalization of the pressures, and said hole locating between said panes a floating disc of stainless steel or other material of similar hardness through the medium of a dimple proud of said disc and loosely fitting into said hole.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a front elevation showing one corner of a window according to the invention;

FIG. 2 is a section on the line II–II of FIG. 1 with the thickness dimensions approximately doubled;

FIG. 3 is a fragmentary section corresponding to part of FIG. 2 but with all dimensions approximately quadrupled, the view being exploded for clarification and the electrical contacts being shown in the open position as when the pressures are equalized (alarm position);

FIG. 3A is a plan view of a bush;

FIG. 4 is a fragmentary section corresponding to FIG. 3 but with the parts closed up, and showing a cap used in the connection of the switch with an alarm system;

FIG. 5 is an elevation on the same scale as FIG. 3, with parts broken away, illustrating a tool for use in evacuating a window according to the invention and fitting the window with a plug or switch;

FIG. 6 is a sectional elevation, again on the same scale as FIG. 3, of a tool for use in testing the degree of vacuum in a window according to the invention equipped for connection into an alarm circuit; and

FIG. 7 is a sectional elevation of one corner of a window according to the invention, particularly suitable for acoustic purposes.

Referring now to the drawings, and firstly to FIGS. 1 and 2, a window 10 comprises two panes 11 and 12 of glass spaced apart in parallel relationship by spacer means of rigid and clear plastics material and of uniform thickness and bonded to one of said panes. The spacer means comprised a continuous strip 13 somewhat inwardly of the window periphery and discs 14 dispersed within the area bounded by the strip 13.

The panes 11 and 12 are sealed together by sealing means comprising inner and outer seals. The inner seal 15 is a length of resilient material such as rubber or a plastics material, preferably of circular section, which allows turning at the corners without deforming, the material having a diameter slightly greater than the distance between the panes 11 and 12 thus to ensure that the seal 15 is under compression when the window is complete. The length of material forming the seal 15 is pressed against the strip 13 and the ends of said length of material are overlapped, to form a joint in the seal. The outer seal 16 is of epoxy polysulphite or other sealing compound and is pressed into the recess between the panes 11 and 12 and the inner seal 15.

The panes 11 and 12 are of 32 ounce glass which is about 0.156 inch thick, and both the spacer strip 13 and the spacer discs 14 are about 0.03 inch thick. The strip and disc thicknesses may be greater in windows to be utilized solely for acoustic purposes, and the type of glass used for the panes 11 and 12 and the relative dispositions of the discs 14 may, of course, be varied in accordance with the area and type of the window. Moreover, the discs, or some of them, could be non-transparent and display a name and/or an advertisement or the like.

Air is extracted from between the panes 11 and 12 to form a partial vacuum, through a hole 17 close to one corner of the pane 11, which could be the inner or outer pane depending on the use of the window. The pane 11 would normally be to the inside for burglar alarm windows, and to the outside for prisons and asylums. A vacuum of the order of 8 to 15 inches of mercury has been found to be suitable and the hole 17 is plugged after evacuation of the space between the panes.

The spacer strip 13 could be metal or other nonresilient material. It ensures correct spacing of the panes 11 and 12 near the window periphery and also ensures that the load is evenly applied to the seal and the spacer discs 14 when the window is evacuated. Strip 13 also forms the inner bearing surface for the inner seal 15.

The outer seal 16, or both seals 15 and 16, may be replaced by a premoulded seal shaped to fit into the recess defined by the panes 11 and 12 and the inner seal 15 or by the panes and the strip 13. Such a premoulded seal would have a T-shaped cross section with the stem of the T accommodated in said recess.

Referring now to FIGS. 3 and 4 wherein parts already described with reference to FIGS. 1 and 2 are designated by the same reference numerals, the hole 17 is plugged by a switch device 18 which interrupts an electric circuit (not shown) including alarm means (not shown) and is adapted to react to operate said alarm means on equalization of the pressures within and external to the window. The hole 17 locates the tapped stem 19 of a bush 20. The stem 19 has a peripheral groove 21 and the latter assists adhesion of the stem to the hole surround by means of a suitable adhesive or cementing compound such as Araldite (Registered Trade Mark). Two longitudinal grooves 22 are formed in the stem adjacent the tapped opening therein and extend completely through the bush. A recess 22A is turned in the top of the bush 20.

The switch device 18 comprises a disc-shaped baseplate 23 with a peripheral flange 24 and a central threaded stud 25 which screws into the tapped opening of the bush 20. The dimensions of the baseplate 23 and the head of the bush 20 are such that a small clearance is left between the flange 24 and the periphery of the head, and an O-ring seal 26 coated with silicone grease is compressed in said clearance as the switch device is screwed into position.

An outer circular plate 27 is held in spaced and parallel relation to the baseplate 23 by an annular spacer 28 of ceramic or similar electrical insulating material, which both seals the space 29 between the plates and locates in position a diaphragm 30 which has a central contact 31 of precious metal such as platinum proud of its surface opposed to the baseplate 23. A hole 32 is provided in the baseplate to communicate with the recess 22A, so that the switch space 29 communicates with the space or cavity between the panes 11 and 12.

The stud 25 has a central tapped opening 33 with a fine thread and in this is engaged a threaded pin 34 at whose end

opposed to the diaphragm is a contact 35 also of precious metal such as platinum. The pin 34 enables adjustment of the setting of the switch device. The plate 23 has two small holes 36 therein for engagement by a suitable tool (hereinafter described) when assembling the switch device 18 to the bush 20. A small hole 39 is provided in plate 27 to ensure there is no air lock to restrict the operation of diaphragm 30.

On the space or cavity between the panes 11 and 12 being evacuated to provide therein a vacuum of the order of, say, 2.5 inches Hg, the diaphragm 30 is drawn inwards (see FIG. 4) and the contacts 31 and 35 close together. This locks the relay and the alarm system is inoperative. When the vacuum drops below a predetermined value, say 2 inches Hg, the diaphragm 30 flexes outwardly and pulls the contact 31 from the contact 35, breaking the electrical circuit and releasing the relay, thus operating the alarm system, (see position of contacts 31 and 35 in FIG. 3).

A feature of the present invention is the location in the space or cavity between the panes 11 and 12 of a disc 40 of stainless steel or other material of similar hardness. The disc 40 is thinner than said space or cavity and is approximately 0.020 inch thick. The disc 40 is centrally dimpled at 41 and the dimple is of such a size that it is a loose fit in the hole 17. It will be manifest that the disc will remain in position. The dimple does not prevent free passage of air between the space 29 and the space or cavity between the panes 11 and 12. The disc covers the hole 17 and its purpose is to thwart any attempt to drill through the external pane 12 with the object of sealing off the switch from the space or cavity between the panes 11 and 12. In the initial stages of drilling, the vacuum may not be distributed as the drill fills the hole being made in the plane 12. The disc 40 will rotate freely on being encountered by a drill and will make further drilling of the pane 11 very difficult if not impossible, without setting off the alarm.

Referring now to FIG. 5 of the drawing, a tool 44 suitable both for evacuating the space or cavity between the panes 11 and 12 and securing a plug or switch device to the bush 20 plugging the hole 17, comprises a chamber 45 having an inlet pipe 46 to which a vacuum pump (not shown) can be connected. Inside the chamber 45 is an adapter 47 having pins or prongs 48 to be engaged in the holes 36 in the switchplate 23 or centering similar holes in the head of the plug. The adapter 47 is mounted on one end of a shaft 49 which extends through the top 50 of the chamber and has a knurled knob 51 at its other end. An O-ring seal 52 is fitted at the top of the chamber where the shaft passes through, and a second O-ring seal 53 is fitted around the periphery at the open lower end of the chamber.

In operation of the tool 44, the plug or switch device is loosely screwed into the tapped stem 19 of the bush 20, thus to enable centrinering of the tool. Air is exhausted from the space or cavity between the panes 11 and 12 via the hole 17 and the chamber 45. When the correct vacuum is reached, the vacuum pump is shut off and the knurled knob 51 is rotated to screw the plug or the switch device fully into the tapped stem 19.

FIG. 6 illustrates a simple tool for testing the operation of the switch and the degree of vacuum in a window according to the invention when the hole 17 is plugged by a switch 18 as shown in FIG. 3. The tool comprises a small chamber 55 which fits over the switch 18. An O-ring 56 is fitted inside the chamber to form a seal between the chamber and the switch, and a tubular duct 57 leading from the base 58 of the chamber enables connection of a vacuum pump to the chamber.

Two electrical wires are connected to this tool, one to contact 59 which is in electric continuity, through the body of the tool 58, with the baseplate 23 of the switch 18, and the other to a spring-loaded plunger 60. This plunger is insulated from the body of the tool 58 by an insulator 61 and makes electrical contact with the top plate 27 of the switch 18.

FIG. 4 also illustrates one method of connecting the switch 18 with an alarm device (not shown). A metal cap 62 is fitted over the switch 18 and is held in position by a circlip 63. A spring 64 provides the electrical connection between the plate 27 of the switch 18 and a contact 65 insulated from the cap 62 by a layer 66 of insulating material. The spring 64 also ensures that there is a tendency for the cap 62 to be forced off the switch 18, and this causes pressure to be exerted on the circlip 63. A contact 67 is secured directly to the cap 62 and provides electrical continuity for a wire from the alarm circuit (not shown) via the cap 62 and the baseplate 23 to the contact 35. A hole 68 is provided in the cap 62 for through passage of the conducting wires from the alarm system to the switch.

When testing the vacuum in the window the cap 62 is removed from the switch 18 by removing circlip 63. This removes the electrical circuit of the alarm system from the switch.

The test tool (FIG. 6) is electrically connected to the test circuit incorporated in the vacuum pump (not shown). The test tool is placed over the switch 18 and when the contacts 31 and 35 are closed, a lamp is illuminated. The degree of vacuum in the switch space 29, which is the same as that in the space or cavity between the panes 11 and 12, is equalized by a vacuum applied to the other side of the diaphragm and the switch contacts then move apart, thus extinguishing the lamp. Thus both operation of the switch and the degree of vacuum inside the window are tested.

Referring now to FIG. 7, the window therein illustrated is intended for acoustic insulation only and a plug 70 replaces the switch 18 of FIGS. 3 and 4. Parts already identified are denoted by the same reference numerals as in FIGS. 3 and 4. There is, of course, no need for the disc 40.

The plug 70 consists of a head 71 which incorporates a means of turning such as a screwdriver slot 74, the head having a peripheral flange 73 to secure the O-ring 26 in position, and a threaded stem portion 72 which screws into bush 20.

To apply the vacuum, tool 44 is used with a modified adapter 47 to fit the slot 74 in the plug head 71.

I claim:

1. The combination with alarm apparatus of a window closing an opening and comprising two panes of glass spaced apart in parallel relationship remote from their edges by spacer elements of rigid material which are bonded to at least one of said panes, said panes being sealed together at their edges to define therebetween a cavity or space wherein the pressure is less than the external pressure and holds in the closed circuit condition a switch device plugging a hole through which said cavity or space was evacuated and which is in the inner one of said panes, said switch device interrupting an electrical circuit which includes said alarm means and being adapted to react to operate said alarm means on equalization of the pressures, and said hole locating between said panes a floating disc of stainless steel or other material of similar harness through the medium of a dimple proud of said disc and loosely fitting into said hole.

2. Alarm-actuating apparatus comprising:

a. first and second panels of similar areal dimensions and impervious to air;

b. means interspacing said panels in parallel relationship and sealingly uniting them together along a closed peripheral path to define between said panels a heremetically sealed cavity in which prevails a predetermined air pressure less than atmospheric air pressure;

c. a housing mounted on one of said panels, said housing comprising first and second electrically conducting plates spaced apart along a closed path by an insulating and sealing medium to form a switch space, said second plate being closer to said one panel than said first plate and the periphery of said second plate projecting outwardly from said housing, said first and second plates each having an opening formed therein;

d. said one of said panels having an opening therein;

e. a bush having a tapped stem which partially plugs said panel opening.;

f. switching means comprising a diaphragm mounted in said switch space and secured to said first plate by said insulat-

ing and sealing medium with one face in communication with said cavity through said second plate and panel openings, and the other face in communication with atmosphere through said first plate opening, a first electrical contact mounted on said diaphragm, a threaded stud projecting from said second plate and engaging in said tapped stem, said stud having an axial tapped bore opening into said housing and into said cavity, a threaded pin engaging in said tapped bore and having an end entering said chamber, a second electrical contact mounted on said end in alignment with said first contact, said diaphragm being movable in response to changes in said predetermined air pressure between a position wherein said first and second contacts engage and a position wherein said first and second contacts do not engage;

g. a metal cap fitting with clearance over said housing and removably attached to said projecting periphery of said second plate, a third electrical contact mounted on and within said cap and insulated from said cap, a spring

providing electrical continuity between said third contact and said first plate and thus through said diaphragm to said first contact, a fourth electrical contact mounted directly on and within said cap and thus providing electrical continuity through said cap and said second plate to said second contact, said cap having therein a hole through which extend electrical conducting wires from an alarm device to said third and fourth contacts.

3. Alarm-actuating apparatus according to claim 2, wherein said means interspacing said panels comprises a continuous strip somewhat inwardly of the panel peripheries and elements dispersed within the area bounded by said strip, said strip backing means sealing said panels together at heir peripheries.

4. Alarm-actuating apparatus according to claim 3, including a floating disc of hard material disposed between said panels, said disc having a dimple proud thereof and loosely fitting into said panel opening.