April 7, 1959 H. E. MILLS 2,880,475

WINDOW UNIT

Filed May 10, 1957 2 Sheets-Sheet 1

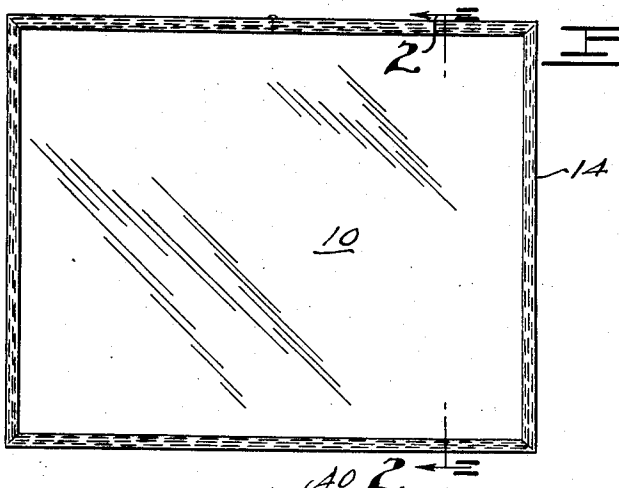


FIG. 1.

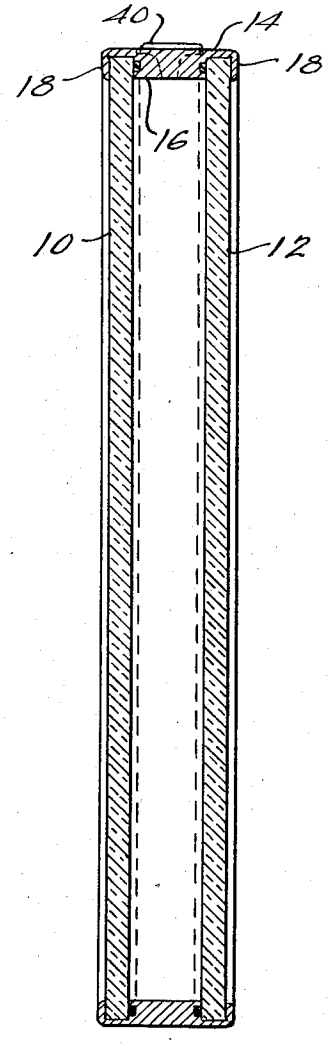


FIG. 2.

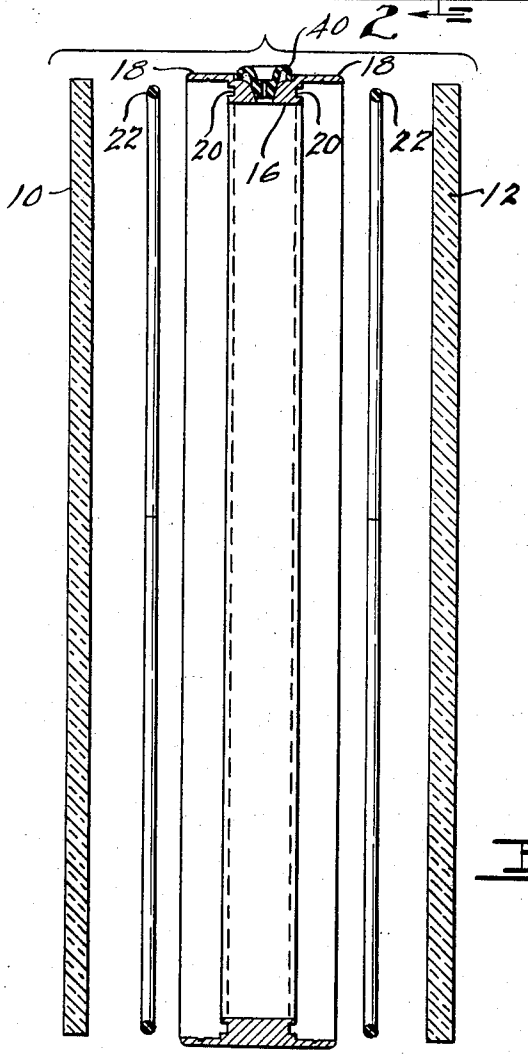


FIG. 3.

INVENTOR.
Herbert E. Mills.
BY
Ballaff & McKinley
ATTORNEYS.

April 7, 1959 H. E. MILLS 2,880,475

WINDOW UNIT

Filed May 10, 1957 2 Sheets-Sheet 2

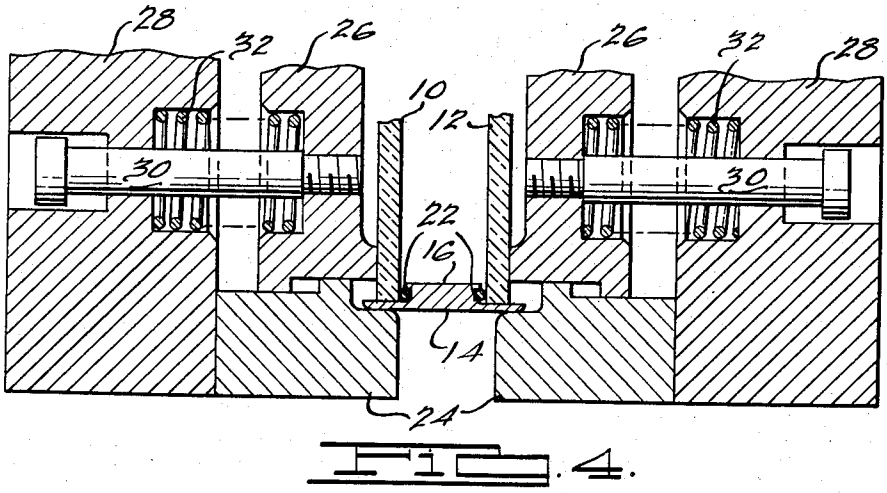


FIG. 4.

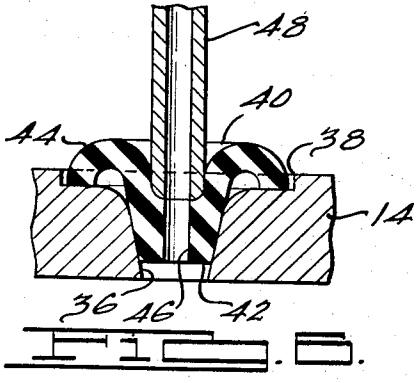


FIG. 6.

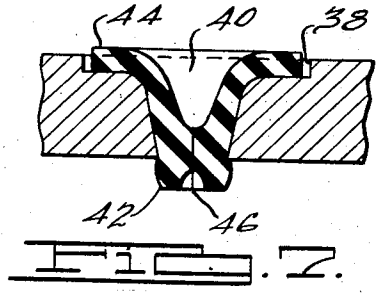


FIG. 7.

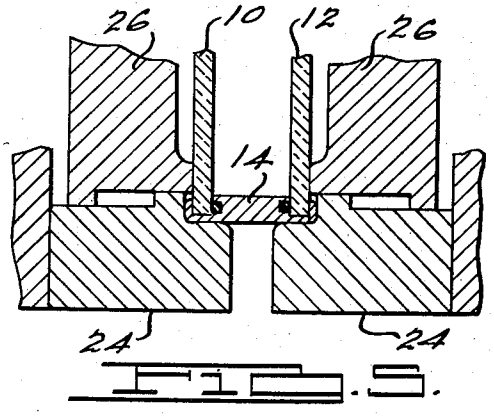


FIG. 5.

INVENTOR.
Herbert E. Mills.
BY
Ballaff & McKinley
ATTORNEYS.

United States Patent Office 2,880,475 Patented Apr. 7, 1959

2,880,475

WINDOW UNIT

Herbert E. Mills, Detroit, Mich., assignor to Mills Products, Inc., Walled Lake, Mich., a corporation of Michigan

Application May 10, 1957, Serial No. 658,426

7 Claims. (Cl. 20—56.5)

This invention relates to a double glazed window unit suitable for use in a stove door or as a window or door unit in a building and has particular relation to a window unit of this type in which the space between the glass panels is evacuated to provide good insulating qualities and to prevent the formation of condensation due to temperature differences between the inner and outer panels. The invention is also directed to a novel method of evacuating and then sealing the space between the spaced glass panels.

A principal object of the invention is to provide a new and improved vacuum type double glazed window unit. A further object of the invention is to provide a double glazed window unit which is economical to manufacture and assemble and which is provided with a novel valve by means of which the space between the panels may be evacuated and then sealed. Another object of the invention is to provide an improved method of evacuating and sealing space between a pair of window panels in a double glazed window unit.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings, of which there are two sheets, which by way of illustration show a preferred embodiment of the invention and what I now consider to be the best mode in which I have contemplated applying the principles of my invention. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawings:

Fig. 1 is an elevational view of the improved double glazed window unit of this invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is an exploded sectional view of the parts comprising the window unit;

Fig. 4 is a fragmentary sectional view illustrating one step in the assembly of the window unit;

Fig. 5 is a view similar to Fig. 4 and showing a subsequent operation in the assembly of the unit;

Fig. 6 is an enlarged fragmentary sectional view illustrating one step in the evacuation of the unit; and

Fig. 7 is an enlarged fragmentary sectional view illustrating the condition of the valve after the unit has been evacuated and sealed.

The window unit illustrated in the drawings comprises a pair of spaced glass panels **10** and **12** and a clamping and sealing member **14** for maintaining the panels **10** and **12** in spaced parallel relation in the assembly. The spacing member **14** is preferably made as an extruded strip of aluminum and has a central spacing portion **16** and lateral edge portions **18**. The spacer portion **16** may be provided with a groove **20** at each side thereof adapted to receive the continuous resilient gasket **22** which may be made of any suitable material such as silicone rubber.

The spacer **14** may be bent to the required shape, and its meeting ends may be welded or otherwise secured together to provide an air-tight construction in the assembly. Assembly of the unit is illustrated in Figs. 4 and 5 from which it will be seen that the gaskets **22** are first placed within the peripheral grooves **20** in the spacer **14** and the glass panels **10** and **12** are then pushed up against the gaskets **22** and rest upon the lateral edges **18** of the spacer **14**. The spacer **14** is supported on a pair of movable die blocks **24** which are slidably supported beneath a pair of supports **26**, each of which engages one of the panels **10** or **12** along one edge thereof to initially position the glass panels relative to the spacer.

The movable die blocks **24** are actuated by rams **28**, each of which is slidably guided by a bolt **30** secured to one of the supports **26**. A spring **32** reacts between each ram **28** and its associated support **26** to urge the blocks **24** to their retracted positions shown in Fig. 4. When the die blocks **24** are actuated, the edge portions **18** of the spacer **14** are bent inwardly against the outer edge portions of the glass panels **10** and **12** as illustrated in Fig. 5 to securely clamp the panels in sealing engagement against the gaskets **22**. The panels **10** and **12** are sealed completely around their peripheries in the manner described, and the unit is then ready to be evacuated and sealed.

At a suitable point in the periphery of the spacer **14** there is provided an opening **36** which may be inwardly tapered as shown or otherwise constricted for a purpose to be described. The opening **36** is counter-bored at its outer end as at **38**. A plug valve **40** is adapted to be inserted into the opening **36** and the space between the panels may be evacuated through the valve **40** which also seals the opening **36** after the unit is evacuated.

The valve **40** is made of a suitable resilient, deformable material such as silicone rubber, and as shown in Fig. 6, in its normal or unstressed condition the valve **40** has a tapered inner end **42** and an annular curled outer rim **44**, and the valve body is provided with an aperture **46** of suitable shape through which the space between the panels may be evacuated.

One step in the evacuation of the unit is illustrated in Fig. 6 which discloses an evacuating tube **48** placed against the outer end of the valve **40**. The aperture **46** in the valve is normally open when the valve is partially inserted into the opening **36** in the manner illustrated in Fig. 6, so that the unit may be evacuated through the tube **48** at such time. After the unit has been evacuated, the valve **40** is pushed inwardly further into the opening **36** by an axially directed force applied through tube **48**. As the inner end portion of the valve **40** passes through the opening **36** the valve body is constricted and deformed into the position shown in Fig. 7 in such manner as to close off and seal the aperture **46**. It will be noted that the inner end **42** of the valve body passes completely through the opening **36** and thereupon expands to its unconstricted condition to provide a means for yieldingly retaining the valve **40** in sealed condition within the opening **36**. The outer flange **44** of the valve is seated firmly against the counterbore **38** to prevent the valve from being pushed too far through the opening **36**. The tube **48** is then removed and the aperture **46** will remain completely sealed to maintain the evacuated atmosphere within the unit.

While I have illustrated and described a preferred embodiment of my invention, it is understood that this is capable of modification, and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A double glazed closure unit including spaced glass panels and a continuous spacer disposed between said panels at their edges, said spacer having an inwardly

tapered opening therein communicating with the space between said panels, and a plug valve of resilient, deformable material having an aperture therethrough, said valve being insertable into said opening in said spacer in a first position in which said aperture is opened to said space to permit evacuation of said space, said valve being deformable by an axially inwardly directed force into a second position in which the taper of said opening constricts the body of said valve to close the aperture therein, the inner end of said valve being adapted to pass inwardly through said tapered opening and to thereupon expand beyond the confines of the inner end of said opening to yieldingly retain said valve in said opening.

2. A double glazed closure unit including spaced glass panels and a continuous sealing and spacing member disposed between said panels at their edges, said member having an opening therein communicating with the space between said panels, and a plug valve of resilient, deformable material having an aperture therethrough, said valve being insertable into said opening in said member in a first position in which said aperture is opened to said space to permit evacuation thereof, said valve being deformable by an axially inwardly directed force into a second position in said opening in which the said opening deforms and constricts said valve to seal the aperture therein.

3. A double glazed closure unit comprising a pair of spaced glass panels, a continuous spacer between said panels at their edges, a continuous gasket providing a seal between said spacer and each glass panel, said spacer having its lateral edge portions bent inwardly, upon assembly of the unit, against the outer edge surfaces of said panels to clamp said panels against said gaskets, and a plug valve of resilient material inserted through an opening in said spacer and having an aperture through which the space between said panels may be evacuated, said plug valve being deformed by insertion thereof into said opening after evacuation of said space to thereby seal the aperture through said plug valve.

4. A double glazed closure unit comprising a pair of spaced glass panels, a continuous extruded spacer between said panels at their edges, a continuous gasket providing a seal between said spacer and each glass panel, said spacer having its lateral edge portions bent inwardly, upon assembly of the unit, against the outer edge surfaces of said panels to clamp said panels against said gaskets, said spacer having an opening therein communicating with the space between said panels, and a valve body of resilient, deformable material inserted into said opening in said spacer and having an aperture through

which the space between said panels may be evacuated, said valve body being deformed and constricted by insertion thereof into said opening thereby to seal the aperture in said valve body, said valve body having an unconstricted inner end larger than the inner end of said opening to retain said valve body in said opening.

5. A method of evacuating and then sealing the space between a pair of spaced glass panels having a continuous spacer therebetween, which method comprises forming an opening through said spacer leading to the space between said panels, providing a plug valve of resilient, deformable material having an aperture therethrough, inserting said plug valve partially into said opening, evacuating the space between said panels through the aperture in said plug valve, and then forcing said valve further into said opening to deform and constrict said valve and thereby seal said aperture.

6. A method of evacuating and then sealing the space between a pair of spaced glass panels having a continuous spacer therebetween, which method comprises forming an inwardly tapered hole through said spacer leading to the space between said panels, forming a plug valve of resilient, deformable material having an aperture therethrough, inserting said plug valve partially into said tapered opening with its said aperture open, evacuating the space between said panels through the aperture in said plug valve, and then exerting an axially inwardly directed force on said plug valve to force its inner end further into said tapered opening to deform and constrict said valve and thereby seal the aperture in said valve.

7. A method of evacuating and then sealing the space between a pair of spaced glass panels having a continuous spacer therebetween, which method comprises forming an inwardly constricted opening through said spacer leading to the space between said panels, providing a plug valve of resilient, deformable material having an aperture therethrough, inserting said plug valve partially into said opening, applying an evacuating tube to the outer end of said valve and evacuating the space between said panels through said aperture and tube and then exerting an axially inwardly directed force on said tube to force said valve further into said constricted opening to deform and constrict said valve and thereby seal the aperture therein, and withdrawing said tube from said valve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,982,351	Phillips	Nov. 27, 1934
2,565,937	Verhagen	Aug. 28, 1951