March 3, 1959 H. F. MOYER 2,875,792

MULTIPLE SHEET GLAZING UNITS

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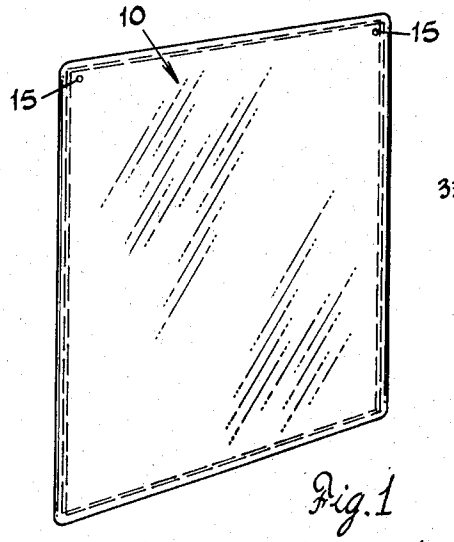


Fig. 1

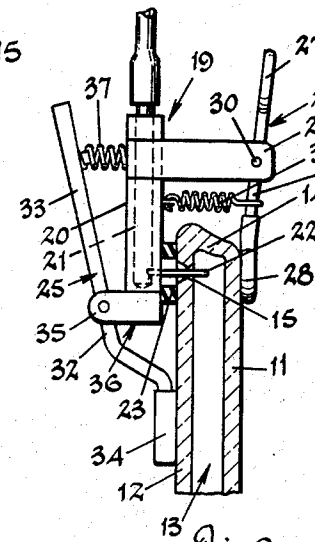


Fig. 2

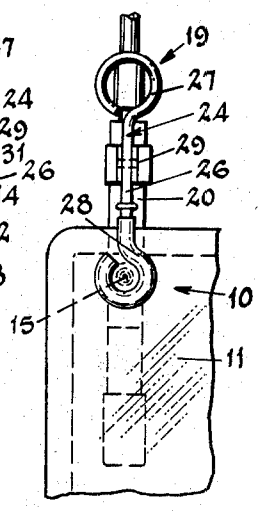


Fig. 3

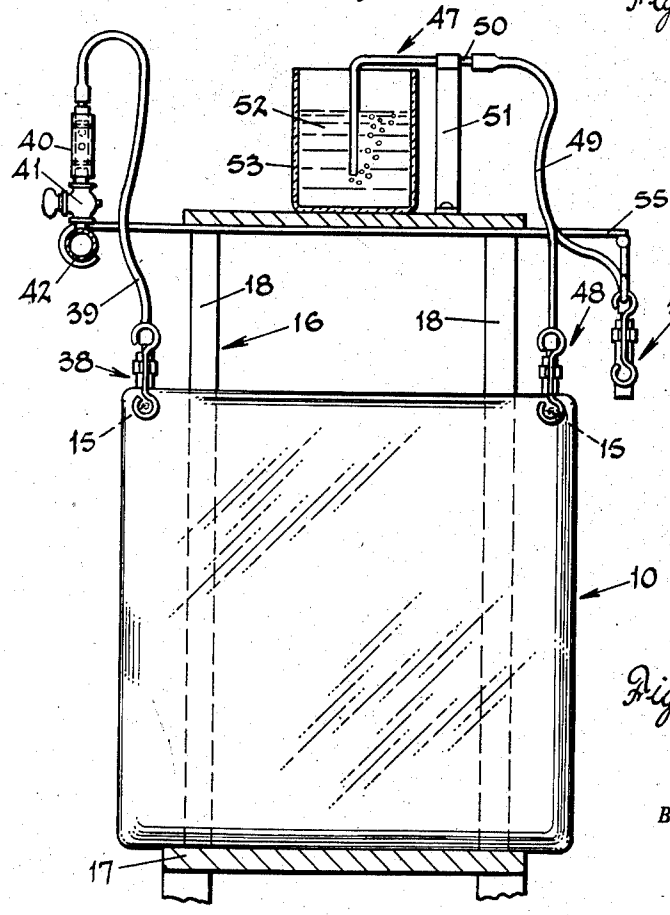


Fig. 4

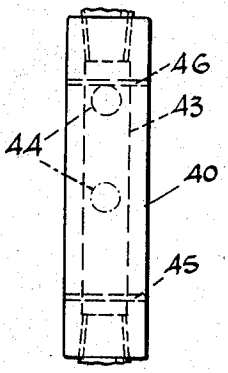


Fig. 5

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MULTIPLE SHEET GLAZING UNITS

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10 Claims. (Cl. 141—4)

This invention relates broadly to multiple sheet glazing units, and more particularly to a novel method and apparatus for dehydrating and testing such units.

Multiple sheet glazing units may be described generally as comprising two or more sheets of glass which are sealed entirely around their edge portions in spaced relation to provide a hermetically sealed dead-air space therebetween. Due principally to their insulating and condensation preventing qualities, such units have become well established in the building trades and have found wide usage as windows for buildings, show cases, vehicles, refrigerators, and the like.

In the production of such units it is customary to remove the humid or moisture-laden air from the space between the sheets and replace it with dry air or gas which acts as an insulating medium between the respective sheets of the unit. This process is generally carried out under sea level conditions and after the dry air or gas has replaced the moisture-laden air from the space between the respective sheets, the space is permanently hermetically sealed to retain the dry insulating medium. However, when the glazing units of this type are used at high altitudes, the external pressure on the respective sheets is reduced as compared to the pressure of the insulating medium sealed within the unit under sea level conditions. Consequently the greater internal pressure of the confined gas subjects the unit to abnormal stresses resulting, in some cases, in breakage of the unit.

It is therefore a primary object of this invention to provide a novel method and apparatus for testing the strength of multiple sheet glazing units.

Another object of the invention is to provide a novel method and apparatus for replacing humid or moisture-laden air within the space between the respective sheets of multiple sheet glazing units with an insulating medium while simultaneously testing such units for strength.

A further object of the invention is to provide a novel method of regulating the internal pressures to which multiple sheet glazing units are subjected during strength testing of the units.

A still further object of the invention is to provide novel apparatus for introducing dehydrated air or gas into the space between the respective sheets of multiple sheet glazing units.

Other objects and advantages of the invention will become more apparent during the course of the following description when taken in connection with the accompanying drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a perspective view of an all-glass multiple sheet glazing unit with which this invention is concerned;

Fig. 2 is a side view of apparatus of the invention for introducing dehydrated air or gas into the enclosed space provided in multiple sheet glazing units;

Fig. 3 is a front view of the apparatus for introducing dehydrated air or gas into a multiple sheet glazing unit shown in Fig. 2;

Fig. 4 shows the apparatus for introducing dehydrated air or gas into the space provided in a multiple sheet glazing unit and for simultaneously testing the unit for strength; and

Fig. 5 is a view showing a novel flow indicator used with the invention.

With reference now to the drawings, there is shown in Figs. 1 and 2 a multiple sheet glazing unit **10** which comprises sheets of glass **11** and **12** spaced from one another as at **13** by an edge wall portion **14**. Dehydration holes **15** are provided through at least one of the respective sheets, and as shown herein, are provided in the sheet **12**. It is through these dehydration or breather holes that dehydrated air or gas is forced into the space **13** between the sheets to displace humid or moisture-laden air that may be contained therein.

Prior to testing and replacing the moisture-laden air within the multiple sheet glazing units, the units are placed on a support rack **16** (Fig. 4) which comprises a bottom support arm **17** and back support legs **18**. While in position on the rack **16**, dehydrated air or gas is brought to the units by means of novel nozzles **19** shown in Fig. 2.

More particularly, the nozzles **19** comprise a base **20** having a passageway **21** therein which communicates with a small tube **22** at one end thereof. The tube **22** is at substantially right angles to the passageway **21** and is adapted to fit within a dehydration hole **15** so as to direct the dehydrated air or gas into the space **13** between the respective sheets **11** and **12**.

To assure that the nozzles direct only dehydrated air or gas into the space **13**, there is provided a sealing washer or ring **23** secured to the base **20** which together with the nozzle is snugly held against the outside face of the sheet **12** by means of clamps **24** and **25**. The clamp **24** is formed of an arm **26** having a hooked handle portion **27** and a clamping portion **28** provided with a suitable rubber or plastic sleeve so as not to mar or scratch the glazing unit. The arm **26** is mounted between a bifurcated member **29** by means of a pin **30**, the bifurcated member in turn being secured to the nozzle base **20**. A spring **31** is connected to the base **20** of the nozzle and to the arm **26** and urges the clamping portion **28** into clamping relation with one side of the glazing unit **10**.

The clamp **25** comprises an arm **32** having a handle **33** and a clamp portion **34** formed of rubber or plastic to insure good frictional contact with the unit. The arm **32** is pivotally mounted between the legs **35** of a bracket **36** carried by the nozzle base **20**. A compression spring **37** carried by the base **20** of the nozzle and engageable with the handle **33** of clamp **25** urges the clamp portion **34** into clamping engagement with the glazing unit. Thus by virtue of the clamps **24** and **25** and the washer **23**, the nozzles are held in firm air-tight engagement with the glazing unit. In other words, the washer **23** is compressed along the area around the dehydration hole **15** and seals the hole against the introduction of atmospheric air into the space **13**.

Before introducing dehydrated air or gas into a glazing unit **10** one or more of such units are placed in position on the rack **16** and a nozzle **19** is connected to one of the dehydration holes **15** therein as indicated by the numeral **38** in Fig. 4. The nozzle indicated at **38** is connected by a flexible tube **39** to a flow indicator **40** which in turn is connected through a valve **41** to a dehydrated air or gas supply pipe **42**.

More particularly, as shown in Fig. 5, the flow indicator **40** is formed of plastic or glass and has a cylindrical passageway **43** therethrough in which is carried an indicator ball **44**, which is adapted to move upwardly in the passageway **43** when air or gas is flowing. Thus, the ball

44 either indicates flow or no flow and does not indicate the amount of flow. In its inoperative position the ball 44 rests upon a lower pin 45, and when in operation it is restrained at the upper end of the passageway 43 by a pin 46.

To introduce dehydrated gas or air into a glazing unit, the valve 41 from the supply pipe 42 is opened causing dehydrated air to flow through the flexible tube 39, through the nozzle indicated at 388 and into the space 13 between the respective sheets 11 and 12. This flow of dehydrated air causes the humid or moisture-laden air contained within the space 13 to be forced out through the second dehydration opening.

In order to test the unit for its strength properties while the moisture-laden air is being replaced there is provided a novel method of simulating altitude conditions by increasing the internal pressure of the dehydrated air within the space 13 with respect to the atmospheric pressure existing on the outside of the glazing unit.

More particularly, the method includes the restricting or setting up of a resistance to the flow of the exhausted air or gas from the second dehydration hole. To accomplish this, there is provided a variable pressure device 47 which is connected to the second dehydration hole by means of a second nozzle 48 similar to the nozzle indicated above. The nozzle 48 is connected by a flexible hose 49 to one end of a tube 50 which forms part of the variable pressure device 47, the tube 50 being adjustably mounted by an arm 51. The other end of the tube 50 is submerged in a liquid bath of water 52 or the like contained in a tank 53.

By regulating the height of the bath 52 with respect to the end of tube 50 the amount of back pressure set up within the tube and transmitted through the flexible hose to the second nozzle 488 and to the space 13 between the sheets 11 and 12 of the glazing unit 10 can be regulated. Consequently, pressures are set up within the space 13 similar to those which are encountered when the unit is used at altitudes where the internal and external pressures are unequal. Of course, when the internal pressure exceeds that set up by the column of water or other liquid 52, bubbles will release excess pressures and maintain the pressure within the space 13 of the glazing unit substantially constant. It will be evident that the column of liquid may be either increased or decreased to regulate the desired pressure within the space 13 or, the end tube 50 may be moved with respect to the column of liquid to regulate the pressure within the said space.

Thus, according to the present invention dehydrated air or gas may be placed in the insulating space between the respective glass sheets of multiple sheet glazing units while the units are simultaneously tested for their strength properties. Of course it will be apparent that any number of units may be tested simultaneously by providing a plurality of sections along the support rack 16 and by providing additional nozzles connected to the supply pipe 42. For example, as shown in Fig. 4, an additional pressure regulating nozzle 54 is shown for purposes of illustration as being hung from a hanger arm 55 secured to the rack 16.

It is of course to be understood that the form of the invention disclosed herein is to be taken as the preferred embodiment thereof, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. The method of treating multiple sheet glazing units which comprises introducing a dry insulating medium into a glazing unit, and forcing a part of the medium within said unit out of said unit against a controlled back pressure in excess of atmospheric pressure to increase the internal pressure within said unit to simultaneously remove any moisture-laden medium from within the unit and test the unit for strength.

2. A method of treating and testing multiple sheet glazing units having an enclosed space therein and having two openings extending into said space from the external surface of said unit, which comprises introducing dry air into said space through one of said openings, causing said dry air to flow through said space and to sweep out the moisture laden air held therein through the other of said openings, and providing a controlled back pressure on the air leaving the unit to place the air within the unit at a controlled super-atmospheric pressure to test the unit for strength simultaneously with removing moisture from within.

3. The method of treating and testing multiple sheet glazing units as defined in claim 2, in which the air pressure of the air leaving the unit is controlled by exhausting the air against a fixed hydrostatic head.

4. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit having a substantially air-tight interior, an entrance opening and an exhaust opening, which comprises means for supplying dry gas under pressure to said entrance opening, a pressure regulating device, said device including means to allow gas to pass through said device at a predetermined pressure and to prevent gas from passing therethrough at below the predetermined pressure, and means for conveying the exhaust gas to said pressure regulating device from said exhaust opening.

5. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit as defined in claim 4, in which the pressure regulating device includes means for selectively adjusting the predetermined pressure.

6. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit having a substantially air-tight interior, an entrance opening and an exhaust opening, which comprises means for supplying dry gas under pressure to the entrance opening of the unit, removable means sealing said gas supply means to the entrance opening of the unit in airtight relationship, discharge means for carrying off gas from said exhaust opening, removable means sealing said discharge means to the exhaust opening of the unit, and a pressure regulating device connected to said discharge means which allows gas to pass through said outlet pipe at a predetermined pressure and prevents movement of gas therethrough below the predetermined pressure.

7. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit as defined in claim 6, in which the pressure regulating device includes means for selectively adjusting the predetermined pressure.

8. An apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit as defined in claim 7, in which there is provided a valve in said entrance pipe for adjusting the rate of gas flow and an indicator for indicating the flow of gas through said pipe.

9. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit as defined in claim 4, wherein said pressure regulating device is hydrostatically controlled.

10. Apparatus for simultaneously testing and removing moisture from within a multiple sheet glazing unit as defined in claim 6, wherein said pressure regulating device is hydrostatically controlled.

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