METHOD OF ASSEMBLING AND EVACUATING AN INSULATED VACUUM PANEL
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1 Claim. (Cl. 29—455)

My invention relates to thermal insulating structures of the vacuum type and more particularly to methods of manufacturing such structures.

Vacuum insulating structures may be made to include a sealed envelope with a suitable filler material, such as glass fiber insulation, within the envelope to support the walls against external atmospheric pressure. Such structures may be made in accordance with the invention of Herbert M. Strong and Francis P. Bundy, Serial No. 236,788, filed July 14, 1951, now abandoned, and assigned to the General Electric Company, the assignee of the present invention.

Absorbed panel gases must be baked off and evacuated from such panels prior to sealing off thereof to prolong the thermal insulating properties. In conventional evacuation of such glass fiber insulating panels, the closed packed fibers offer high impedance to the diffusion of evolved gases when low pressures are reached. It is desirable to reduce the time which is required to evacuate such panels because the evacuation period is almost directly proportional to the quantity of adsorbed gases to be removed to insure low pressure for prolonged periods.

Accordingly, it is an object of my invention to provide an improved method to manufacture a thermal insulating panel.

It is another object of the invention to provide an improved method to evacuate a thermal insulating structure.

It is a further object of the invention to provide an improved method to reduce the time period of gas evolution during panel bakeout and evacuation.

In carrying out my invention in one form, panel filler material is preheated before its insertion into the panel to reduce gas evolution during evacuation.

These and various other objects, features, and advantages will be better understood from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a sectional view of a batch of filler material within an oven.

Fig. 2 is a sectional view of a partially assembled thermal insulating panel.

Fig. 3 is a sectional view of a thermal insulating panel under compression.

Fig. 4 is a sectional view of an assembled thermal insulating panel.

Fig. 5 is a sectional view of a thermal insulating panel within a bakeout oven which is equipped for panel evacuation.

In Fig. 1 of the drawing, a conventional type of heating oven which is shown generally at 10, comprises a casing 11 to define a chamber 12 therein. A pair of upstanding members 13 with a support member 14 in the form of a perforated metal plate are positioned within chamber 12 to support a bat or layer of filler material 15 therein. A pair of opposed heating elements 16 of any suitable construction are mounted on the inner walls of casing 11 to provide a heat source. An inert gas or air is preferably supplied to oven 10 by a circulating fan (not shown) to reduce the vapor pressure therein. Such a reduction in vapor pressure provides greater evolution of gas from bat 15.

In the manufacture of a thermal insulating panel in accordance with this invention, bat 15 is heated in oven 10 to remove evolved gases therefrom prior to insertion in an insulating panel. The large surface area of finely divided bat 15 contributes a major share of evolved gas which is removed by preheating at a high temperature to reduce the time period of subsequent bakeout. A glass fiber bat may be heated up to approximately 600° C. which is the softening point of the glass therein. Treatment of a layer of glass fiber filler material at 450° C. for one hour reduces the gas evolution from this bat in an evacuation cycle of 350° C. bakeout by a factor of about seven.

In Fig. 2 of the drawing, a partially assembled thermal insulating panel 17 is shown which comprises a wall 18 of a thin, flexible sheet of a material of relatively high thermal conductivity, such as low carbon steel, and a second wall 19 of a thin, flexible sheet of a material of relatively low thermal conductivity, such as stainless steel.

A port 20 is provided adjacent one end of wall 18 to evacuate panel 17. After bat 15 is preheated in oven 10, it is inserted hot between walls 18 and 19 of panel 17.

In Fig. 3, panel 17 is compressed by any suitable means, such as, for example, by opposed compression blocks 21 and 22 to close the panel edges which are then seam welded. Hot bat 15 is enclosed between opposed panel walls 18 and 19 to provide a panel structure which is then baked out and evacuated. A vacuum system (not shown) is connected to port 20 to evacuate panel 17 or if it is desired, panel 17 may be evacuated without the bakeout. Port 20 is then permanently sealed off by any suitable means, such as, for example, a weld to provide a vacuum type panel.

In Fig. 4, an assembled thermal insulating panel is shown which comprises opposed, spaced walls 18 and 19 with a seal at their edges to define an evacuated chamber in which a bat of filler material 15 is positioned. Evacuation port 20 is provided with a permanent seal 23 to maintain the panel vacuum.

In Fig. 5, a second method is shown to manufacture a vacuum type panel which comprises assembling opposed walls 18 and 19 together with a bat of filler material 15 therewithin to form panel 17. The panel edges are then sealed together by a weld. Wall 18 is provided with evacuation port 20 and an inert gas inlet 24. Panel 17 is positioned on a pair of supports 25 within oven 10 which is provided with heating elements 16 and a pair of apertures 26 and 27. A tube 28 connects port 20 through aperture 26 with a vacuum system (not shown). Gas inlet 24 is connected by a tube 29 through aperture 27 with an inert gas source (not shown).

Panel 17 is heated in oven 10 at a high temperature to preheat bat 15 therein. Such preheat treatment reduces the time period of subsequent bakeout. During this heating, an inert gas is forced through tube 29 and from panel 17 through tube 28. Such gas flushes evolved gases from the interior of the panel. If it is desired, an inert gas may be flushed through panel 17 after the preheat treatment while the panel is hot. Port 24 is then sealed off to allow panel 17 to be baked out and evacuated during a shortened time period. Preheat treatment with an inert gas reduces the evolution of panel gases during the bakeout and evacuation cycle to provide a shortened cycle.

After preheat treatment, port 20 may be temporarily capped and panel 17 removed from oven 10. Such a panel does not readSORb gases from the atmosphere. Thus, panel 17 may be stored prior to evacuation without adverse effects.
As will be apparent to those skilled in the art, the objects of my invention are attained by preheating filler material to reduce the bakeout and evacuation period of a vacuum insulating structure in which such filler material is used.

While other modifications of this invention and variations of apparatus which may be employed within the scope of the invention have not been described, the invention is intended to include all such as may be embraced within the following claim.

What I claim as new and desire to secure by Letters Patent of the United States is:

The method of shortening the evacuation cycle of an insulated vacuum panel containing a fiber glass material therein which comprises the steps of, placing the filler material in a panel, heating said panel and glass filler to substantially 450° C., maintaining said temperature for approximately one hour, simultaneously flushing said filler with an inert gas to aid in the removal of adsorbed gases, reducing the said temperature to approximately 350° C., and evacuating and sealing said panel.

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