Dec. 11, 1951 J. ROSE 2,578,599

INSULATION DEVICE

Filed Aug. 28, 1948 2 SHEETS--SHEET 1

Fig. 5.

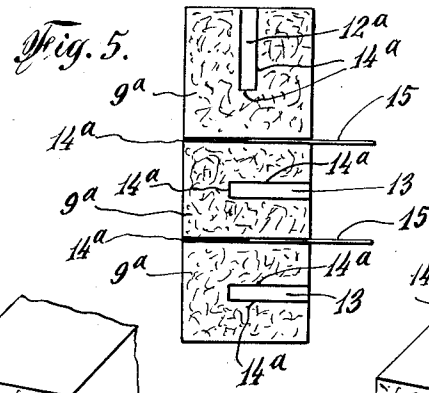


Fig. 1.

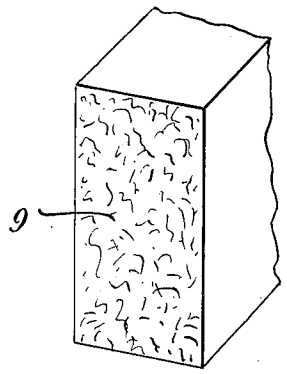


Fig. 3.

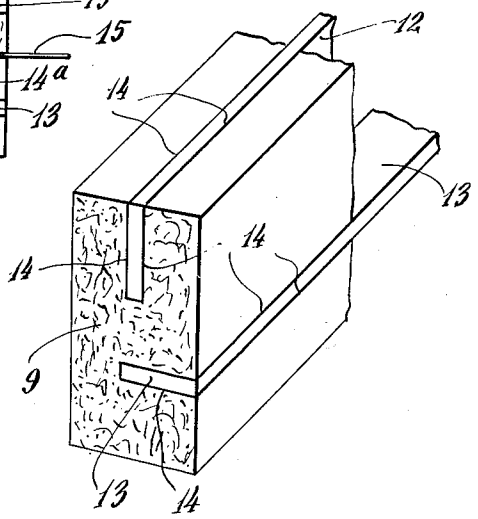


Fig. 2.

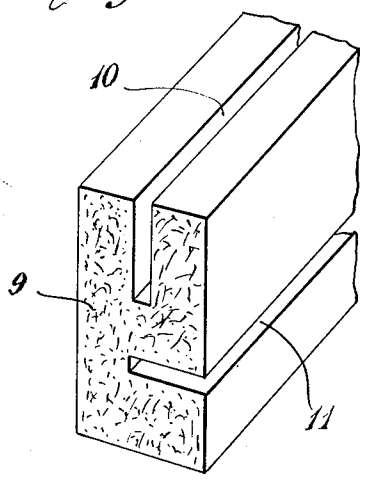
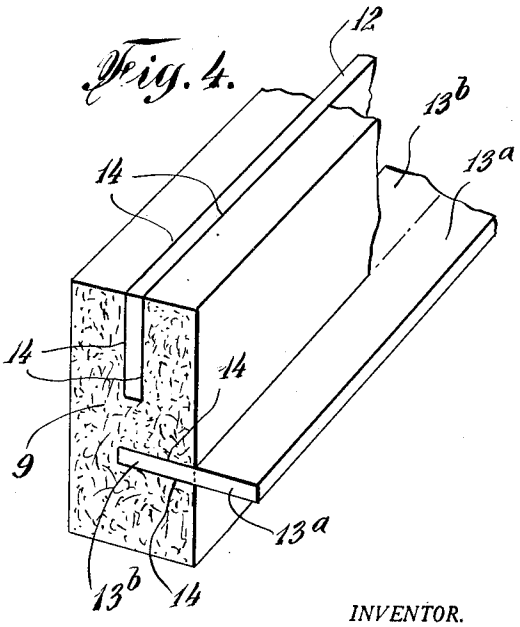


Fig. 4.



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Fig. 6

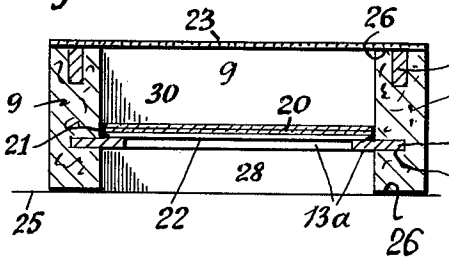


Fig. 7

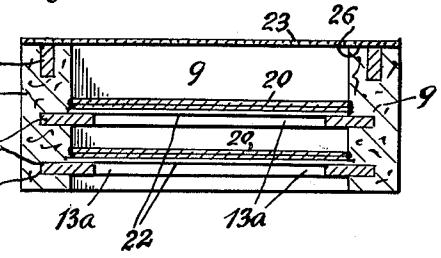


Fig. 8

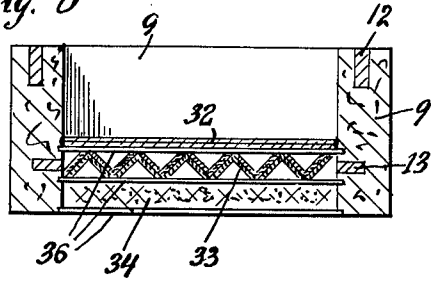
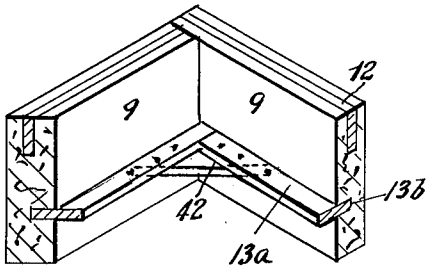


Fig. 9



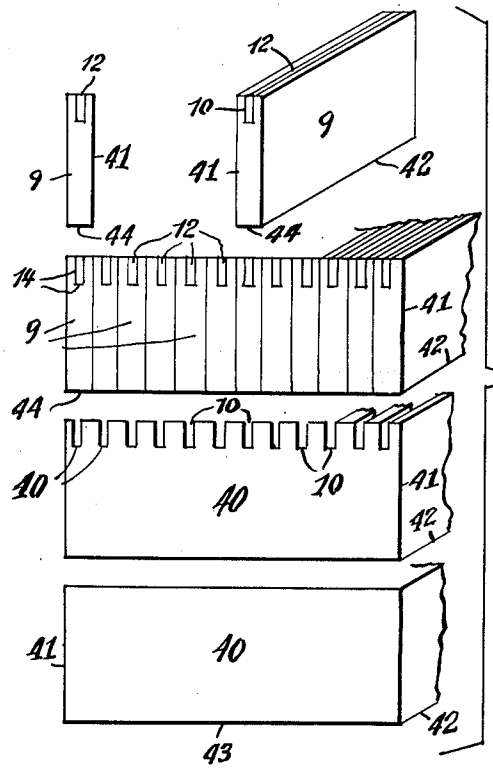


Fig. 10

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UNITED STATES PATENT OFFICE

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INSULATION DEVICE

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18 Claims. (Cl. 20—4)

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This invention relates to insulation and particularly to improvements in thermal insulation for preventing heat loss from boilers and other heating units. This application is a continuation in part of my pending applications Serial No. 661,318, filed April 11, 1946 for Shaped Insulation and Process of Thermal Insulation, now abandoned; Serial No. 661,319, filed April 11, 1946 for Thermal Insulation, now abandoned; Serial No. 741,836, filed April 11, 1947 for Thermal Insulation, now abandoned; and Serial No. 37,934, filed July 9, 1948, now abandoned, for Thermo-insulation and Process of Insulation and is related to my co-pending application Serial No. 69,179, filed January 4, 1949.

One object of my present invention is to provide thermal insulation in the form of insulating units adapted to be applied directly to the surface to be insulated. Another object is to provide a thermal insulating unit comprising a frame structure, rigid and non-flexing, of insulating material with means for supporting other insulating material within the frame, the arrangement being such that the unit includes one or more air chambers for additional insulating efficiency. Another object is to provide an insulating unit which is compact and complete in itself and which may contain or include within a frame-work different types and arrangements of insulating material. Still another object is to provide a method for prefabricating the frame members of such unit. Other objects and features of my invention will be pointed out hereinafter.

Accordingly my invention is embodied in thermal insulating structures and units as hereinafter described and as illustrated in the accompanying drawings in which

Fig. 1 is an end view of a strip, broken away, of insulating material from which the frames of the insulating units are constructed.

Fig. 2 is an end view of a partially fabricated strip, broken away.

Fig. 3 is a similar view but illustrates a still further step in the fabrication of the frame strip.

Fig. 4 is a similar view illustrating additional supporting means for insulation placed within the frame.

Fig. 5 is an end view of a frame strip consisting of a plurality of frame members.

Fig. 6 is a cross sectional view of one form of complete thermal insulating unit embodying the invention.

Fig. 7 is a similar view showing a modification.

Fig. 8 is a similar view showing a still further

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modification in which the frame contains a combination of different insulating materials.

Fig. 9 shows a corner construction of the frame.

Fig. 10 is a composite diagrammatical view illustrating the method of prefabricating the frame strips.

The thermal insulating unit according to my invention consists of a hollow frame made up of frame strips which in turn are prefabricated to serve as frame members in that they include reinforcing means which may or may not serve as supports for insulation placed within the frame. The finished product is a boxlike unit adapted to be affixed to the surface to be insulated and thereafter an outer covering may be used for insulating efficiency and appearance.

Inasmuch as inorganic material such as diatomaceous earth, expanded vermiculite, rock wool, glass wool, 85% magnesia and the like or cork, polystyrene foam block or other organic material are poor heat conductors and therefore admittably adapted for thermal insulation, I propose to construct the aforesaid frame from strips cut from rigid blocks of such selected material which is commercially available in block form. Some of these insulating blocks will withstand temperatures up to 1800 degrees Fahrenheit. The block is brittle, friable and relatively soft. When a relatively thin strip is severed from such a block, it is fragile and it is practically impossible to fabricate the strip for use as a frame member without breakage or damage unless the strip is reinforced. One feature of my invention therefore relates to reinforcing a relatively long, thin, fragile strip of brittle, friable material so that the strip may become usable for the purpose of my invention. A frame of small dimensions may be made of short strips of brittle heat insulating material without reinforcing means and with reasonable care in handling may be used with a degree of safety from breakage and I do not limit myself to the use of reinforced frame strips for my frame structure for frames of small or large dimensions which may be used in connection with my insulating device.

Figs. 1–5 illustrate how the strip is fabricated and reinforced. Fig. 1 illustrates the strip itself marked 9. The strip is preferably higher than wider because it is more efficient as insulation for my frame and because of other advantages. The strip is provided with grooves 10 and 11 as shown in Fig. 2. Into these grooves I place reinforcing members 12 and 13 as shown in Fig. 3, adhesive as shown at 14 being applied to secure the members in the grooves. A finished strip as shown in

Fig. 3 may be used for constructing a frame for the support or as a container for other insulating material. This form is not shown.

I prefer to provide the frame strip with reinforcing members of hard material and which also serve as supporting means within the frame. Such a strip is shown in Fig. 4 in which a horizontal reinforcing member 13*a*, 13*b* is inserted in the horizontal groove 11 of the strip 9, see Fig. 2. The portion 13*a* form a ledge extending inwardly into the finished frame. The vertical member 12 is the same as that shown in Fig. 3 and adhesive 14 will also be used. The reinforcing members extend the full length of the strip.

The thermal insulating material to be placed within the frame may be polished aluminum foil which is a good insulator. Because of its low emissivity rate it radiates little heat; being very thin it conducts little heat to its supporting means and having a polished surface it reflects 90 to 95% of the heat rays. A layer of such foil with an air space on both sides is at least equal in thermal value to an inch-thick layer of other insulation.

One form of my insulating unit therefore may comprise a frame constructed of strips as shown in Fig. 4 with metallic foil supported on the ledge 13*a*. Such a unit is shown in Fig. 6. The layer 20 is metallic foil. One or more sheets of foil may be used. The sheets are shaped to fit within the frame. If the foil layer is strong enough to remain suspended from the ledges 13*a*, the edges of the layer may be secured to the ledges by adhesive as at 21. Preferably, however, wires as at 22 may be secured to the ledges in any suitable manner and the foil placed upon the wires, the entire layer of foil and wires being sealed airtight to the frame by adhesive 21 as shown. A cover 23 may be cemented to the top of the frame. The finished units are then placed side by side upon the surface 25 to be insulated, cement being used as at 26.

Each unit will now have an air chamber 28 below the foil containing entrapped air which is a good insulator. The chamber 30 above the foil may also be sealed or left open until the units are all in place when a general covering may be applied in known manner, not shown.

If the surface 25 is curved, the bottoms of the frames may be shaped accordingly and cement may be used to tie one unit to an adjacent unit. These details are not shown.

If more than one layer of foil is needed, additional layers may be supported as shown in Fig. 7 in which the frame strips carry two or more horizontal reinforcing members 13*a*—13*b*. The vertical spacing of the layers of foil will be made to suit a given case for best efficiency.

Foils may be supported in the manner shown in Fig. 5. Here the frame is constructed of four sides each made up of several strips. The individual strips are marked 9*a*. The topmost strip has a reinforcing insert 12*a* secured by adhesive 14*a*. The two lower members 9*a* each has a horizontal reinforcing member 13 as in Fig. 3. Between the strips 9*a* there is placed a layer of foil 15 held in place by adhesive or cement 14*a* which also serves to secure the strips 9*a* together to form a frame side member.

Foil insulation may be combined with other insulation as shown in Fig. 8 in which a layer of foil 32, a layer of corrugated asbestos paper 33 and a bat insulation layer 34 are respectively supported

upon wires 36 in the strips 9. Fig. 9 shows how frames may be held together at the corners by corner supports 42 on the ledges 13*a*. The sides of the frames may be nailed together, cemented together or secured by other suitable means.

The thermal insulating unit according to my present invention is light in weight, strong in construction, easily handled and applied. It is inexpensive to manufacture and has thermal value, for the same size and dimensions, greater than other insulation. It may be supported on a surface to be insulated by clips, straps, wires and other suitable means known in the art of insulating, the same as used in connection with block insulation. It will be seen from Figs. 3 and 4 that the reinforcements 12 and 13 although made of hard material of good heat conducting capacity nevertheless, because they do not contact each other, will not cause excessive heat to flow from a heated surface through the hard material to the top of the frame, the reinforcements themselves being insulated by the strip. A single preformed piece of hard material, which may be of stiff, thin metal and angle or channel shaped and properly used will accomplish the same result and may be employed in place of two pieces. The frame strips may be of square cross section, but then they will be more expensive.

Fig. 10 illustrates diagrammatically a method for prefabricating the frame strips. A block 40 of desired insulating material may be obtained commercially in sizes suitable for the purpose. Such a block will have known dimensions indicated by the height 41, the length 42 and the width 43. The block is held or supported in any suitable manner so as to be worked upon. For the sake of illustration let it be assumed that the height and length of the block correspond with the height and length of the frame strip to be made. Let it also be assumed that the width 43 is such that the block may be cut or sliced into, say, twelve strips as illustrated. Then the first step in the method is to cut into the top surface of the block in one operation twelve grooves 10 spaced so as to be centered, preferably, in the strips to be cut thereafter. Next twelve reinforcing members 12 are in one operation placed in the grooves, either from above or lengthwise. Adhesive may be applied to the grooves and to the members 12. Fig. 10 shows the two steps of grooving and inserting the members 12. Thereafter the block is sliced into the twelve strips. Only two are shown separate.

These operations of supporting the block, grooving the upper surface and inserting the reinforcing members may all be done by well known types of grooving machines, jigs, holders and the like, not shown. Likewise the slicing of the block may be done by any suitable slicing machine or sawing machine with multiple saws. The severed strips are now reinforced and capable of being handled for further work. It is clear that any suitably dimensioned block may be used.

The forms of the invention shown and described herein are to be considered merely as representative. It will be apparent to those skilled in the art that numerous modifications may be made therein without departing from the spirit and principles of the invention or the scope of the appended claims.

I claim:

1. A thermal insulating device for application broadside to a surface to be insulated for pre-

vention of heat transmission therefrom comprising a box-frame structure, the sides of said structure being made from fragile strips formed from a light, heat insulation containing air cells and of an inherently brittle and friable nature, said sides extending from said surface; reinforcing means of a relatively hard, dense, heat conducting material extending longitudinally of and substantially coextensive with said strips, said reinforcing means also extending transversely of said strips for a substantial distance so as to prevent flexing and breakage of said strips and structure, the transverse dimension of said reinforcing means being less than the same dimension of said strips so as to prevent heat flow directly through said reinforcing means from said surface to the side of said structure remote from said surface; heat insulating material in said structure extending from side to side of said structure, said insulating material being supported and retained by means supported by said structure.

2. The device according to claim 1 wherein the said reinforcing means comprises suitably shaped members and the said members being at least partially extended inwardly from the periphery of said fragile strips.

3. The device according to claim 1 wherein the said reinforcing means consists of a suitably shaped member, and said member being positioned so as to be insulated by the insulation forming the body of said sides of said box-frame structure, a portion of said insulation forming said body being interposed between said member and said surface.

4. The device according to claim 1 wherein the said strips are secured together at the corners of said structure with suitable means so as to prevent breakage of said structure at said corners and also to secure said strips in airtight relation, one with another.

5. The device according to claim 1 wherein the said reinforcing means comprises suitably shaped members and said members being at least partially imbedded in said fragile strips.

6. The device according to claim 1 wherein the said means for supporting the said heat insulating material in said structure comprises means extending from the inner sides of said structure intermediate said surface and the outside of said structure.

7. The device according to claim 1 wherein the said side strips of said structure are of greater height than width.

8. The device according to claim 1 wherein the said heat insulating material in said structure comprises insulative foil.

9. The device according to claim 1 wherein the said heat insulating material in said structure comprises foil made of aluminum.

10. The device according to claim 1 wherein the said heat insulating material in said structure comprises aluminum foil having a polished, heat reflecting surface.

11. The device according to claim 1 wherein the said heat insulating material in said structure comprises insulative foil and the said foil being sealed by its edges to the inner sides of said structure intermediate the said surface and the outside of said structure so as to seal off the air in said structure in front of and in the rear of said foil.

12. The device according to claim 1 wherein the said heat insulating material in said structure comprises different bodies of heat insulating materials.

13. The device according to claim 1 wherein the said heat insulating material in said structure comprises different bodies of heat insulating materials and the said materials being in non-contacting relation, one with another.

14. The device according to claim 1 wherein a closure means is attached to an open side of said structure the said means extending over the entire said side.

15. A thermal insulating device comprising a box-frame structure for application broadside to a surface to be insulated for prevention of heat transmission therefrom, the sides of said structure being made from strips formed from a light, heat insulation containing air cells and of an inherently brittle and friable nature and heat insulating material extending from side to side of said structure, the said heat insulating material extending from said side to side of said structure and being supported and retained on means extending and projecting from the inner sides of said structure.

16. The device according to claim 15 wherein the said heat insulating material in said structure is supported and retained by means on the inner sides of said structure intermediate said surface and the outside of said structure.

17. The device according to claim 15 wherein a closure means is attached to an open side of said structure and the said means extending over the entire said side.

18. A thermal insulating device for application broadside to a surface to be insulated for prevention of heat transmission therefrom comprising a frame structure having sides made from fragile strips of suitable insulating material of low thermal conductivity, said sides extending from said surface; reinforcing means supported and retained by said fragile strips for preventing flexing and breakage of said strips in the normal handling thereof, said reinforcing means comprising relatively hard, heat conducting material extending substantially along at least one dimension of said fragile strips, said reinforcing means being in non-contacting relation with said surface and the side of said strips remote from said surface so as to prevent heat flow directly through said reinforcing means from said surface to the said side of said strips; heat insulating material occupying the space inside said frame structure and extending from side to side of said structure and supported and retained by said structure.

JAY ROSE.

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