

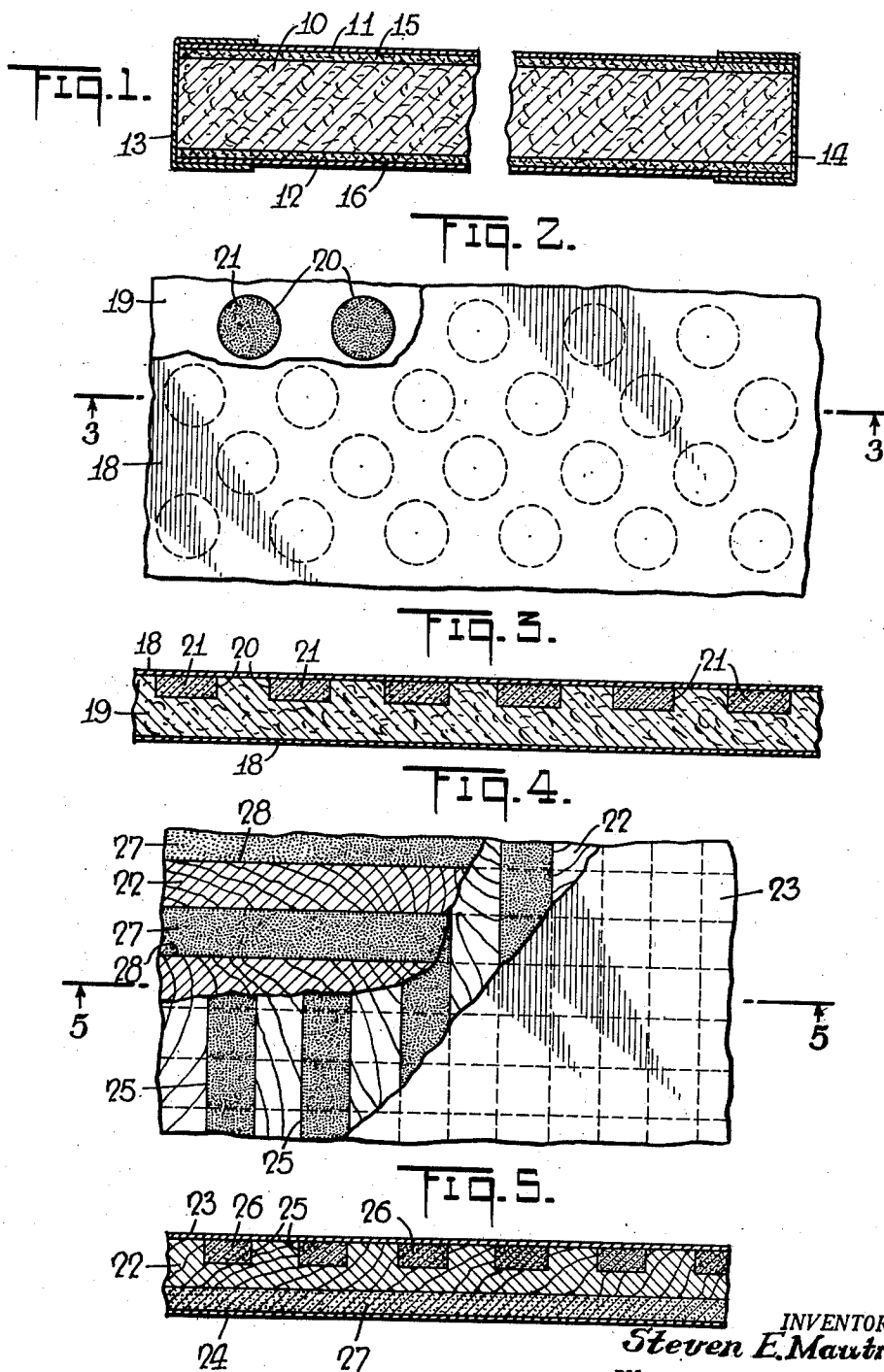
April 6, 1954

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2,674,015

INSULATING PANEL

Filed Sept. 8, 1947



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UNITED STATES PATENT OFFICE

2,674,015

INSULATING PANEL

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Application September 8, 1947, Serial No. 772,730

4 Claims. (Cl. 20-4)

1

My invention relates to insulating panels and in particular to a panel having fire-resistant properties.

It is an object of the invention to provide an improved panel construction of the character indicated.

It is another object to provide a light weight fire-resistant panel.

It is a further object to provide an insulating panel suitable for fire partitions, bulkheads, or to insulate and to cover aircraft fuselages and other parts.

It is a still further object to provide an insulating panel that is relatively simple to install.

It is a general object of the invention to provide a panel meeting the above objects and at the same time one that is relatively inexpensive and easy to manufacture.

Other objects and various further features of the invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings:

Fig. 1 is an enlarged, slightly exaggerated, fragmentary sectional view of a panel construction according to the invention;

Fig. 2 is a fragmentary partly broken-away plan view of a modified insulating panel according to the invention;

Fig. 3 is a sectional view taken substantially in the plane 3-3 of Fig. 2;

Fig. 4 is a partly broken-away plan view of a further modification according to the invention; and

Fig. 5 is a sectional view taken on the plane 5-5 of Fig. 4.

Briefly stated, my invention contemplates an insulating-panel construction utilizing a core of extremely light material, bounded on opposite sides by protective layers of relatively thin metal sheathing. The core and the sheathing may be substantially coextensive and may be bonded together, or the entire assembly may be bound and held in unit-handling relation by a frame of relatively thin metal construction. In a preferred form to be described, a flame-resistant material such as asbestos is interposed between the body of the core and the sheathing. If desired, salts having combined water or water of crystallization may be incorporated with the core.

Referring to Fig. 1 of the drawings, my invention is shown in application to a panel having a relatively thick central core 10 of extremely light or low-density material, such as cellulose (e. g. balsa wood) or cellular cellulose acetate.

2

The core 10 is protected on opposite faces thereof by relatively thin metal sheathing, such as steel plates 11-12, which are shown substantially co-extensive with the core 10. Channels 13-14, which may be of relatively thin metal, embrace the sheath plates 11-12 and the core 10, to secure the sandwich construction and to render the same unit-handling. The channels 13-14 may cooperate with other longitudinally extending channels (not shown) to complete the framework for a panel of desired size, as will be clear.

In accordance with the invention, a flame-resistant material may be interposed between the body of the core 10 and the metal sheathing plates 11-12. In the form shown in Fig. 1, this material is asbestos which may be applied in the form of a first relatively thin blanket or layer 15 between the core 10 and the plate 11, and in the form of a second relatively thin blanket or layer 16 between the core 10 and the plate 12.

In Figs. 2 and 3, I illustrate an alternative construction, which may be framed similarly to the frame of Fig. 1, but which is perhaps more adaptable to the employment of flame-resistant materials, such as crystalline salts that are not readily applied in layers. Thus, in Fig. 2, the panel may include a covering sheath 18 of relatively thin metal and a core 19 again preferably of a low-density cellulose material, such as cellulose or cellular cellulose acetate. The core 19 may include a plurality of openings to retain the salt, and these openings may be holes 20 drilled (in the form shown part way) through the core 19, so that at least the openings are exposed to one face of the core 19. The salt to be applied in the openings 20 may be sodium carbonate, an alum, or other salt preferably having substantial water of crystallization, and the salt fill 21 in each opening is preferably leveled off flush with the surface of the core 19. The salt may thus be said to be interposed between the sheath 18 and the body of the core 19. The openings in Figs. 2 and 3 may be drilled into the core 19 as suggested above, but in a preferred cellular cellulose-acetate construction the press which forms the core includes a plurality of projections or studs which may suitably form the openings 20 in the pressing operation.

In the alternative arrangement of Figs. 4 and 5, the panel may again comprise a core 22 of a cellulose material, such as balsa wood, bounded on opposite sides by sheathing plates such as the plates 23-24. The flame-resisting salt in the form shown is contained within substantially parallel grooves or slots 25, which may be formed

opening to one face, say, the upper face, of the panel. Again, the salt fills 26 in these grooves or slots 25 are preferably leveled off flush with a surface of the core 22. If desired, the opposite surface of the core 22 may be protected in a similar manner by fills 27 of salt in grooves 28, running substantially parallel to each other and at right angles to the grooves 22 on the first or upper face of the panel core 22.

In application of the above panels to aircraft, it has been found desirable to make the cellulose or cellulose acetate cores relatively thick, say, of the order of one-quarter to one-half inch thick. The metal sheathing is preferably of high melting-point material, such as steel, and is of the thinnest tolerable gauge. Twenty-six gauge material or even thinner will be found to be quite satisfactory. A gauge of comparable thickness may be employed in the channel or other construction for framing the panel.

In tests of my sandwich construction panels, it has been found that up to temperatures of about 390° F., the panel materials remain substantially inert. There may be some steam and gases liberated, and as the temperature is increased the organic material will char but will retain much of its fire-resistant and insulating properties. The panels have been subjected to temperatures of 2200° F. at one side for periods up to thirty minutes and the temperature at the other side did not exceed 800° F. Since the sandwich construction is sufficiently tight so as to prevent air circulation, the organic matter does not burn but merely chars and retains much of its insulating properties. Since my sandwich construction is reasonably tight, the formation of gas or vapor due to heat may spread the metal sheath plates and even the inner layers and thus form layers of air to act as further insulation or heat transfer retarders.

In general, the sandwich construction is designed as a fire retarder or heat insulation and after once being subjected to high temperatures, say of the order of 2000° F., would ordinarily be replaced by a new panel or panels. The panels may be repeatedly heated to moderate temperatures (of the order of 390°) without substantial loss of efficiency, but if once heated to the higher temperatures noted above, the panels would not retain their original efficiency on subsequent heatings.

It will be appreciated that I have disclosed a relatively simple panel construction which may be applied with effectiveness to aircraft, and for other applications. The relatively low density of the more bulky element (the fibrous cellulose or

cellulose acetate, at about five pounds per cubic foot) may assure an extremely light-weight assembly. The fact that the panel can be formed with the protective materials in a unit construction makes for easy application, as desired. In certain cases, it may be desirable to utilize my panel construction as the sole material for fire partitions, bulkheads, or for the outer sheet coverage of an aircraft. In such applications the panel may serve the functions of fire, heat, and noise insulation in addition to performing a structural function.

If desired, the various layers forming the sandwich construction may be cemented or bonded together and thus avoid the necessity of the edge frame 14 shown.

While I have described my invention in detail for the preferred forms shown, it will be understood that further modifications may be made within the scope of the invention as defined in the appended claims.

I claim:

1. In a panel of the character indicated, a core of a cellulose material, said core having a plurality of openings on one face thereof, a salt having substantial water of crystallization in said openings and leveled off flush with said face, and a relatively thin metal sheath on opposite sides of said core.

2. A panel according to claim 1, in which said openings are holes extending into said core and are open to one face thereof, and in which said holes are filled with said salt.

3. A panel according to claim 1, in which said openings are substantially parallel grooves on one face of said core.

4. A panel according to claim 1, in which said openings include a first plurality of substantially parallel grooves on one face of said core, and a second plurality of substantially parallel grooves on the opposite face of said core, one plurality of said grooves running generally perpendicular to the other plurality of said grooves.

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