THE JOINT EXAMINATION BOARD
PAPER P6
INFRINGEMENT AND VALIDITY
TUESDAY, 31st OCTOBER 2006
10.00 a.m. – 2.00 p.m.

Please read the instructions carefully. ***Time Allowed – FOUR HOURS***

1. You should respond to the instructions given at the end of the Client's letter.

2. Please note the following:
   a. Enter the Paper Number (P6), and your Examination Number in the appropriate boxes at the top of each sheet of paper. Number the sheets of your paper sequentially;
   b. The scripts are photocopied for marking purposes. Please write with a **dark inked pen** in the printed margins on one side of the paper only. Do not use highlighters in your answer;
   c. Do not staple or join pages together in any way;
   d. Do not state your name anywhere in the answer;
   e. Write clearly, as examiners cannot award marks to scripts that cannot be read;
   f. **Marks are awarded for the reasoning displayed and the points selected for discussion rather than the conclusions reached.**

3. Under the Examination Regulations **you may be disqualified from the examination and have other disciplinary measures taken against you if:**
   a. you are found with unauthorised printed matter or other unauthorised material in the examination room;
   b. your mobile phone is found to be switched on;
   c. you copy the work of another candidate, use an electronic aid, or communicate with another candidate or with anyone outside the examination;
   d. you continue to write after being told to stop writing by the invigilator(s).
   NO WRITING OF ANY KIND WILL BE PERMITTED AFTER THE TIME ALLOTTED TO THIS PAPER HAS EXPIRED

4. **At the end of the examination assemble your answer sheets in page number order and place in the WHITE envelope provided.** Any answer script taken out of the examination room will not be marked.

Document checklist:-
Client's letter: (2 pages)
Document A: Koolstoor Catalogue (3 pages)
Document B: EP (GB) Patent No. 777,777 B (6 pages)
Document C: US Patent No. 1,234,000 (3 pages)
Document D: REGULATION XXX (1990) (2 pages)
This paper consists of 17 pages in total, including this page.

Your Client writes to you as follows:

I am the marketing manager of a large marine outfitters and one of the items we manufacture, supply and fit are marine bulkheads particularly for supertankers, passenger ferries and passenger liners. A few years ago we obtained a European Patent (EP 777,777B) for a fire resistant door leaf to be used in openings in marine bulkheads. Bulkheads containing doors made to this design are one of our most popular items.

We recently employed a new draughtsman who informed me that he has seen our patented design of fire resistant door leaf being used in the design of other types of door, for example, for use with strong rooms to store valuable documents. To prove the point, he provided me with the attached pages from Koolstoor's 2006 Catalogue of products which provide a short description and drawings of the products with which we are concerned. We have no idea how long Koolstoor have been offering these items or whether they have actually manufactured and fitted any for their customers.

I am not as convinced as our designer that Koolstoor infringes our patent since we are offering marine bulkheads, but obviously if our invention is being used, we would want to put a stop to it or at least obtain some compensation. I can understand why our design would be attractive to the field of strong rooms, safes, vaults, etc, because they basically address the same problem of preventing potential damage from a serious fire, followed by water damage from the attempt to extinguish the fire. As with marine bulkheads, there is a need for both fire and water resistance.

We have not discussed this with anyone else and have not contacted Koolstoor at all.

Please advise me what we can do in the circumstances.

- - - 000 - - -

You check the UK Patent Office Register and find your Client's EP (GB) 777,777B was filed on 23 June 1993 without claiming priority from any earlier application. It is currently in force.

You find that the only prior art cited in EP (GB) 777,777B is US Patent No. 1,234,000 granted on July 10, 1970. However, a literature search you conduct reveals a publication entitled REGULATION XXX (1990): BULKHEAD DESIGN IN MINES, which you confirm was published by the UK Government in May 1990.

Write a memorandum of advice to your client explaining what actions your client can take if any and including the following points:

1. **Whether manufacture or sale of either of Koolstoor's catalogue items would infringe EP (GB) 777,777B;**
2. **Whether EP (GB) 777,777B is valid;**
3. **Whether EP (GB) 777,777B could be amended to improve the prospects of it being enforced against Koolstoor, and if so, how.**

Give reasons and arguments to support your conclusions.

REF: XYZ-123-A

This fire resistant door is for use with strong rooms which are used to store valuable flammable items. The door is designed to prevent damage to valuable materials contained in the safe through the most intense of fires and also to be burglar resistant.

The door 1 (shown in Figures 1 and 2) comprises a welded rectangular steel frame 10A, 10B, 10C, and 10D, to which steel plates 12 and 14 are welded, to form the skin of the door, with a gap 16 between them. Two non-metallic panels 18A and 18B made of fire resistant material such as Vermiculite line the inside faces of steel plates 12 and 14. The panels 18A and 18B are urged against the insides of steel plates 12 and 14 by a folded sheet of spring steel 19 about 1.5 mm thick which acts to hold the panels 18A and 18B in place against the plates 12 and 14 as shown in Figure 2.

Thick panels of fibre reinforced cement 20A and 20B are attached to the outside surface of each of the steel plates 12 and 14. The fibre reinforced cement panels may be up to 30mm thick. The fibre reinforced cement panels layers 20A and 20B give the door excellent fire resistant properties. These coupled with the panels 18A and 18B have been shown to enable the door to withstand the most intense of fires, and also to resist potential forced entry using oxy-acetylene torches or the like.

The sprayed fibre reinforced panels cement layers 20A and 20B are vulnerable to damage by chipping when heavily used. The potential for damage can be mitigated by coating their outer surfaces with an ablative plastic coating 21. (An ablative material is one that vaporises from a solid phase when heated without going through liquid phase). In addition to resisting chip damage, the ablative coat 21 can be recoated easily if it vaporises in a fire. The edges of the fibre reinforced panels may be chamfered as shown to improve their appearance.

The door may be fitted with conventional security locking devices such as the combination lock 22 shown mounted on an internal mounting plate 24. Conventional security standard hinges 26 are provided.

For most applications, the outer steel plate 14 is bigger than the frame and the inner plate 12, to form a lip 28 around the door. The door is thus a plug fit into its frame with the lip 28 engaging the face of the frame. The face of the frame would be

provided with a seal to provide a smoke and waterproof seal between the door and t frame.

REF: XYZ-123-B

This fire resistant door is a modification of XYZ-123-A and has additional thermal protection, particularly for protection of paper.

In this version, instead of the folded sheet of spring steel 19, the panels 18A and 18B are coated on their inner surfaces with a hydrous sodium or potassium silicate composition which in high temperature conditions expands to form a thick cellular heat barrier. With evaporation of excess water from the silicate composition with mild heat not exceeding 90°C it becomes solidified and firmly attached to the inner surface. Should a fire develop in a building at one side of the panel, at a temperature from 100 to 150°C the silicate lining material softens and its water of crystallization begins to vaporise. The material foams, expands and when all the water has been expelled becomes a solid thick wall of porous pumice-like insulation.

In its converted form the foamed siliceous material checks heat flow through the panel and provides heat and fire protection for a period of time in excess of that required for classification as an A-rated fire door.

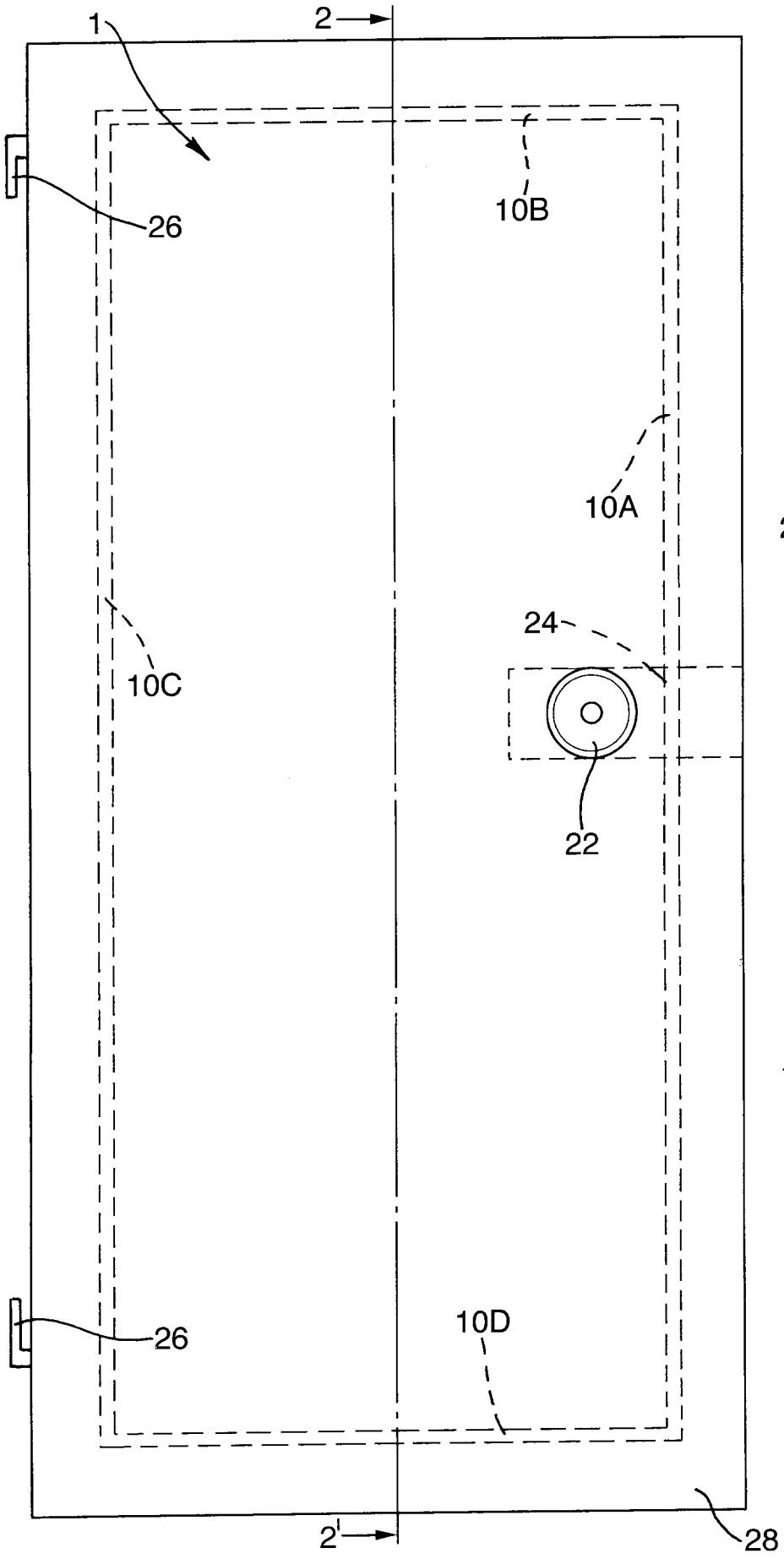

Fig.1.

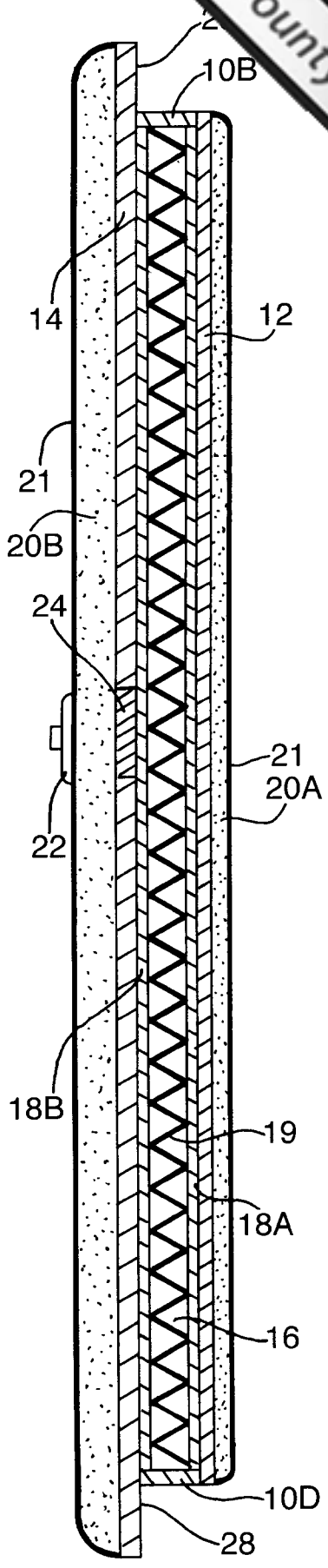

Fig.2.

European Patent (GB) 777,7
Filed 23.06.19
No Priority Claim
Granted 12.07.1997

FIRE RESISTANT DOOR LEAF

This invention relates to fire resistant door assemblies which are particularly suitable for use in the field of marine bulkheads in ships registered in the United Kingdom. Marine fire doors must conform to an internationally recognised set of regulations.

The regulations applicable to fire resistant marine bulkheads specify that marine fire doors are required to pass a standard fire resistance test. The test for a so-called "A30" or "A60" door requires that the average temperature on the unexposed side of the door must not increase by more than 180°C above the initial temperature at any one point within thirty or sixty minutes respectively. The regulations also specify that the fire door must contain a steel membrane and be arranged so that the door is a plug fit into its frame thus minimising smoke and water penetration around the door.

In conventional marine doors, the door leaf comprises a heat-resistant core of, for example, Vermiculite, sandwiched between two steel panels. The core is fairly thick in comparison with the two panels. If a fire occurs on one side of the door, the Vermiculite core cuts down the rate of heat transfer from one steel panel to the other. The core, which is relatively easily damaged, is also protected in use by the stronger and more resilient outer panels, which can be painted and to which door furniture such as locks, latches and hinges can be secured. It should be noted that Vermiculite has now replaced asbestos, which is now banned for marine construction in the UK.

Thus the conventional marine fire door leaf derives its main flexural stiffness from its outer panels and its main heat resistance from the core region.

According to the present invention there is provided a fire-resistant door leaf, suitable for closing-off an opening in a marine bulkhead, comprising two panels with a core region between the panels, characterised in that the core region contains a membrane (11) of relatively high flexural rigidity whilst the panels (12) each exhibit a thermal conductivity which is lower than that of the core membrane (11) and are each thicker than the core membrane.

The fire-resistant door leaf of the present invention, in common with the art, also comprises a core sandwiched between two panels, but the core in the present invention provides the main flexural stiffness to the door leaf. The panels between

which the core is sandwiched constitute the main heat-resisting medium. Th
core has a much higher flexural rigidity than either of the outer panels, whilst
panels each have a much lower thermal conductivity than the core. Also, the core membrane itself will be much thinner than either of the outer panels.

Such a door leaf, deriving its main flexural stiffness from its core region and its main heat resistance from its outer panels, is thus a complete reversal of conventional thinking in the field of fire-resistant marine doors. This new construction is advantageous because only one relatively heavy membrane is used, rather than two so the door leaf will be less heavy than a conventional fire-resistant door leaf. It will also be less expensive. The heat-resistant outer panels can be selected from modern materials such as fibre-reinforced cement, although more conventional materials might equally well be used in some circumstances.

The core membrane can be faced on each of its opposing sides with the heat-resistant panels or there can be provided an air gap between the core membrane and one or both of the panels. One way of providing an air gap is to create corrugations in the membrane running from side to side or from top to bottom of the door leaf. This will increase the flexural rigidity of the door whilst enabling a relatively thin and lightweight membrane to be used. An air gap is advantageous because air is a good heat insulator, the presence of an air gap at the core region increases the fire-resistant properties of the door leaf yet further and gives added protection to the relatively high-thermal-conductivity core membrane.

One especially advantageous door leaf construction embodying the invention, to be described in detail hereafter, uses fibre-reinforced cement panels each of which has an outer skin of higher density than the rest of the panel. Such panels are currently available commercially, and lend themselves ideally to the construction of a door leaf embodying the invention. The outer skin protects the rest of the panel from impact, and door furniture such as locks, latches and bolts can be screwed direct to it without necessarily having to be screwed through to the core membrane.

Where a corrugated membrane is used, the corrugations are advantageously straight-walled rather than curve-walled in form, and the acute angle between the wall and the base is preferably within the range of 45 degrees to 90 degrees to give optimum strength to the corrugated membrane. Angles outside the limits of this range are less resistant to buckling.

Where a corrugated membrane is used, the corrugations preferably run across the door leaf, i.e. from side to side rather than from top to bottom, since the leaf is then flexurally more rigid in the directions in which it is most likely to be subject to bending forces in use.

In the accompanying drawings:

Figure 1 shows the a door leaf in front elevation when installed in its surrounding door frame;

Figures 2a and 2b show two plan view cross-sections through Figure 1 of different embodiments of the invention;

Figure 3 shows an alternative core membrane 11.

In Figure 2a, the steel membrane 11 is a corrugated mild steel folded plate between the two fibre-reinforced cement panels 12. The corrugations are straight-walled, and the reflex angle between the wall and base of each corrugation is 135 degrees, so that the acute angle defined between each wall and base is 45 degrees in this particular embodiment.

The panels 12 are each glued to respective base portions of the corrugated steel plate membrane 11. Each panel 12 is of uniform density for the greater part of its thickness, but each exhibits a hard skin region of much higher density on its outward-facing surface. The skin region is referenced 12a.

The capping channel 13 is U-shaped in cross-section. It extends around the periphery of the composite rectangular panel-core membrane-panel "sandwich", and it is corner-mitred and welded into a rectangular framework. It is made, in this particular embodiment, of stainless steel.

The opposite top and bottom edges of the core membrane 11 are turned over at 90 degrees to the general plane of the membrane, so that they constitute flanges abutting the adjacent inner face of the capping channel 13. Holes are formed in the channel 13 at points spaced along its length where it abuts the membrane-edge flanges just referred to. The membrane-edges are then spot-welded to the capping channel 13 through these holes, and the welds later ground flat against the outer face of the channel.

Because the core membrane 11 is corrugated, an air gap 14 is created between the two fibre-reinforced cement panels 12. In the particular embodiment illustrated, there is a 20mm spacing between the facing inner surfaces of the two panels 12. The core membrane is folded from mild steel plate 1.6 mm thick. Each of the panels has an overall thickness of 15 mm and the hard outer-facing skin of each panel is 2 mm thick. The door leaf overall is 2440 mm high x 1200 mm wide.

In Figure 2b, a flat steel membrane 11 is sandwiched between two fibre-reinforced cement panels 12 with no air gaps in the core region. The panels 12 are bounded by a stainless steel peripheral capping channel 13.

The construction of the door frame surrounding the leaf is conventional, not of the essence of the invention, and can readily be settled by those skilled in the field.

CLAIMS

1. A fire-resistant door leaf suitable for closing-off an opening in a marine bulkhead, comprising two panels with a core region between the panels, characterised in that the core region contains a membrane (11) of relatively high flexural rigidity whilst the panels (12) each exhibit a thermal conductivity which is lower than that of the core membrane (11) and are each thicker than the core membrane.

2. A door leaf according to Claim 1 and characterised in that there is an air gap (14) between the two outer panels (12) in the core region of the door leaf.

3. A door leaf according to Claim 1 or 2 and characterised in that the air gap is created by corrugations in the core membrane (11).

4. A door leaf according to Claim 2 or 3 and characterised in that the transverse walls of the corrugations are angled between 90 degrees and 135 degrees to the base walls of the corrugations.

5. A door leaf according to any of the preceding Claims and characterised in that the panels (12) are each composed of fibre-reinforced cement material exhibiting an outward-facing skin (12a) of higher density than the rest of the panels.

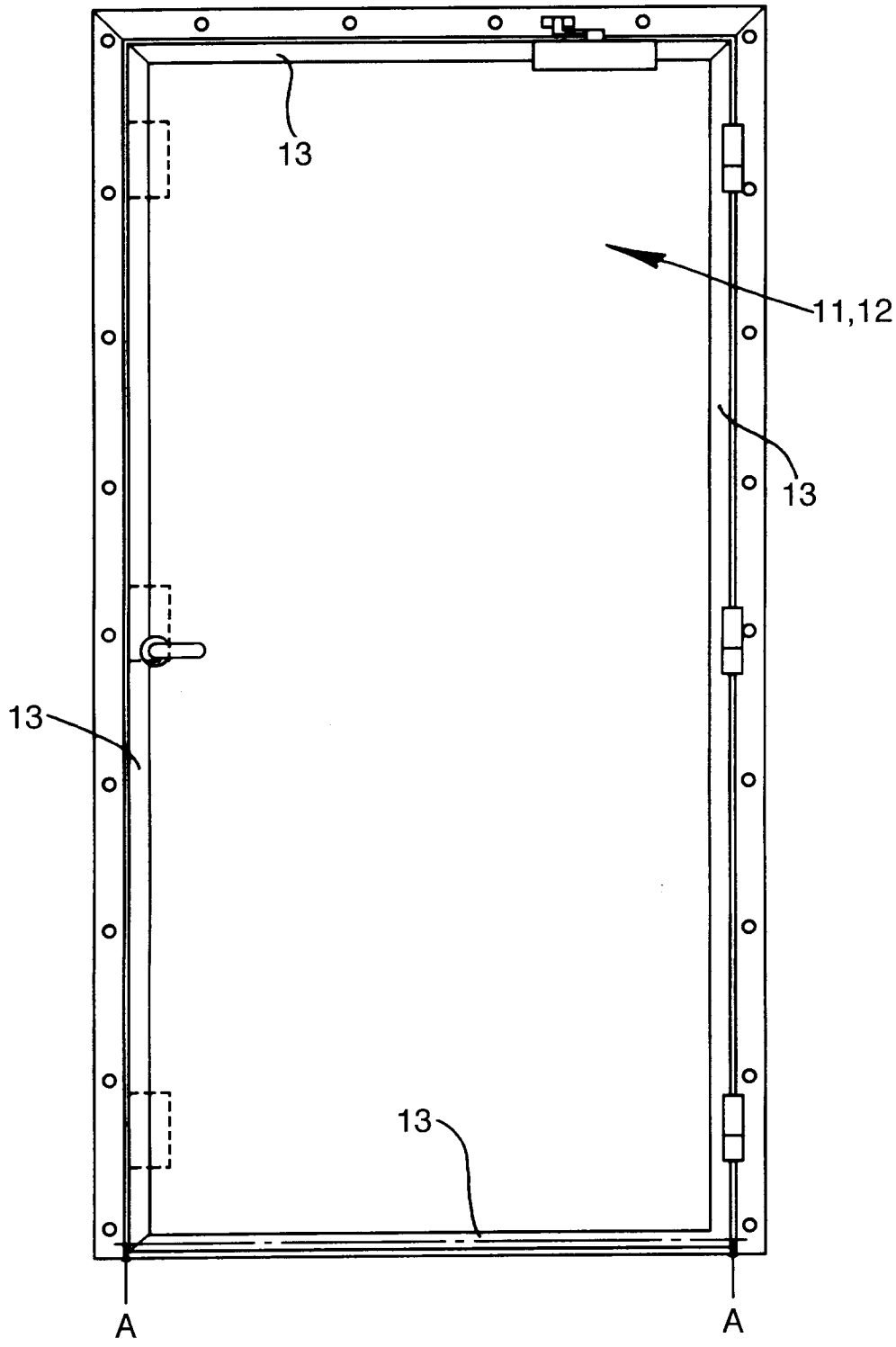

Fig.1.

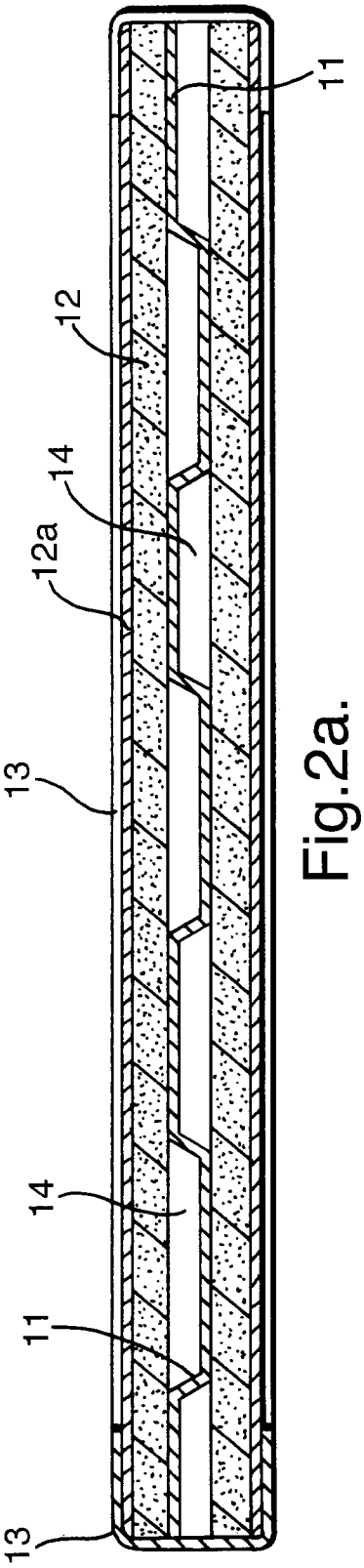

Fig.2a.

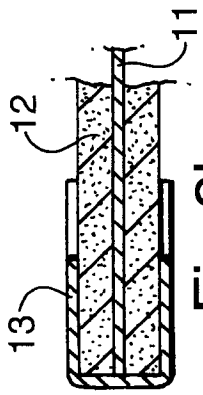

Fig.2b.

Fig.3.

FIRE WALL, BULKHEAD AND PANEL

The invention relates to fire resistant structures and more particularly has reference to fire walls, bulkheads and panels.

There are several fundamental requirements which must be satisfied in the design of structures of this type, which incidentally may be used in all classes of building construction as for example, ship or marine construction as well as housing. These requirements include the use of incombustible and fire resistant materials in the construction of a wall or bulkhead capable of withstanding intensely high temperatures for long periods without collapse or failure. Also needed are materials which after heating will not crack, rupture or disintegrate when suddenly subjected to the cooling effects or the force of a liquid pumped against the structure at high pressure as for example by fire fighting apparatus. The weight of the construction material is also a highly important factor to consider and one which will influence the design of any type of building construction. It is an essential requirement that the wall or bulkhead must possess a low unit weight.

Therefore, it is an object of the invention to provide a hollow box-like fire resisting wall or bulkhead of a core or fire screen formed of one or more members having insulation or fire proofing material fixed thereon or placed and secured between the members thereof.

A further object of the invention is the provision of a thin hollow box-like metal fire resisting wall, bulkhead or panel section having fire proofing on the interior of each face thereof and a fire resistant core formed of one or more corrugated metal sheets having fire proofing material fixed thereon or placed and secured between the sheets thereof.

To make the invention more clearly understood, the accompanying drawings illustrate means for carrying the invention into practical effect. The several necessary elements comprising our invention may be varied in construction, proportions and arrangement without departing from the spirit and scope of the claim.

In the drawings:

Figure 1 shows a horizontal sectional view of the fire resistant wall, bulkhead or panel;

Figure 2 shows a partial horizontal sectional view on the line C-C in detailed enlargement;

Figure 3 shows a partial sectional view similar to Figure 2, but showing a modification of the fire resistant core.

Figures 1 to 3 show a bulkhead 1 with sheet metal face plates 2 and 3, the inner side of each face plate being lined with a sheet material 18 attached to a layer of granular material 19 which is itself cemented to the plate. Both materials 18 and 19 are fire insulants, the sheeting 18 being formed of asbestos and the like, and the layer 19 being formed of Vermiculite or a similar substance. Within the wall or bulkhead of Figure 1 there is mounted a fire resistant core or screen formed of a metal corrugated sheet 9 having a fire resistant insulant 10 such as Vermiculite on both sides thereof. The core is of equal length to the height of the panel and is placed vertically therein. The fire resistant core is secured within the bulkhead by filler blocks 11 and 12 spot welded to every third crown of corrugated sheet 9 and the face plate 3, respectively, as well as to each other and also through means of a plurality of filler blocks 14 welded to the face plate 2. Filler blocks 12 and 14 on the face plates are used to compensate for the thickness of the asbestos and Vermiculite.

In the alternative embodiment of Figure 3 the fire resistant core is formed of two metal corrugated sheets 38 and 39 between which is placed the fire proofing material or insulant 40. Fixing screws 43 secure the sheets 38 and 39 to the fire resistant material or insulant 40 in the overlapped area of the corrugated sheets 42.

A low unit weight for the bulkheads is an important requirement and while the structures of Figures 1 to 3 are formed entirely of steel sheet metal and insulating materials, it is possible to reduce the weight by up to 15% by decreasing the thickness of the fire insulant without affecting the safety factor. The structures of the invention possess the important ability to meet rigid standard fire tests. The walls shown in Figures 1 to 3 have undergone tests where the bulkhead is mounted in the open side of a testing furnace at 1700°F so that one side is exposed to the heat of the furnace fire and the other is unexposed. Under these conditions the bulkheads maintained their structural integrity.

We claim:

1. A fire wall comprising two spaced apart face plates, fire insulating material secured to a face of each of said plates, a fire resistant core formed of a corrugated sheet with fire insulant on the face(s) thereof, said mounted core and face plates being secured against movement with respect to each other.

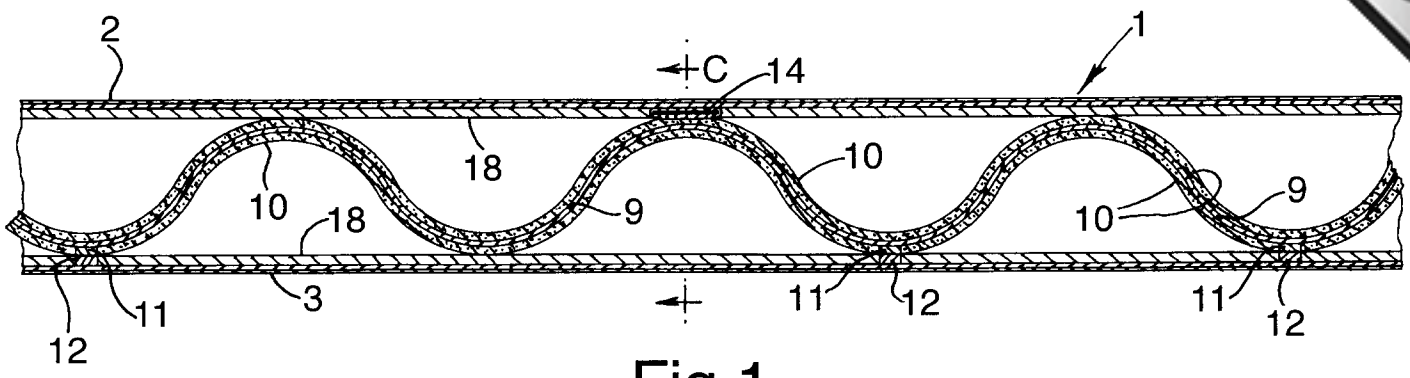

Fig.1.

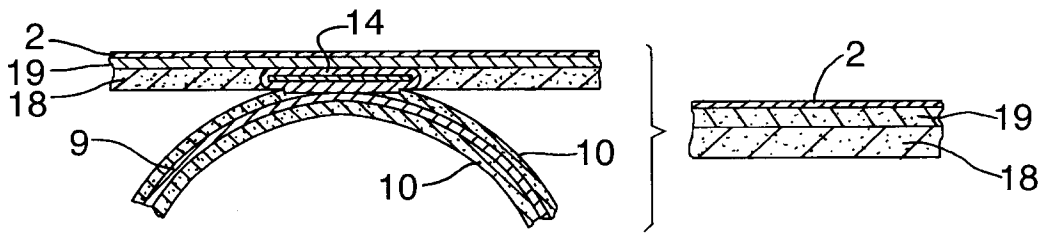

Fig.2.

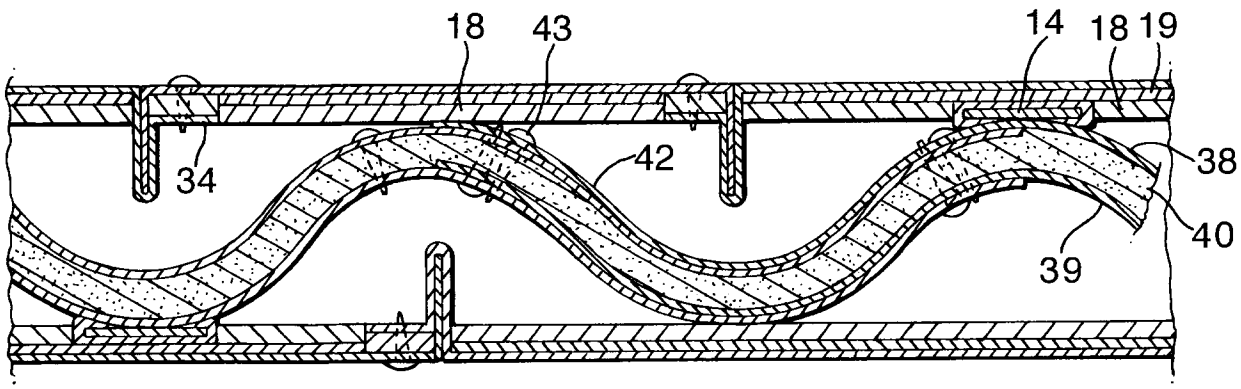

Fig.3.

REGULATION XXX (1990): BULKHEAD DESIGN IN MINES

Fireproof bulkheads in underground mines, particularly gold mines, where underground fires, slippage and floods are a particular hazard must be provided with fireproof doors for access through the bulkhead. A suitable fireproof bulkhead door design is required to withstand explosive forces too.

The recommended bulkhead door is shown in detail in Figure 1. The bulkhead includes a fire proof door 18 containing a centre 16 made of steel sheet. Fixed to either side of the steel sheet are thermally insulating slabs 14 and 15 made from asbestos cement (fibre reinforced cement, in which the fibres are asbestos). The fixings shown are steel rivets 19 in asbestos sleeves which keep the sheet and slabs in close contact.

The bulkhead door is opened and closed by steel hinge at one side. The hinge and angle iron 1 are welded to the flat portion 2 as shown. In this way the bulkhead door is a plug fit into its frame, providing a relatively air-tight and water-tight fire resistant closure.

The bulkhead door has extreme strength and rigidity, and possesses in maximum degree all the desired fireproof characteristics. It will be understood that under action of extreme heat the enclosed metallic core will be effectively protected against deformation, because of the surrounding and intervening fireproof material which constitutes the main framework and which is rigid and non-metallic and undeformable by heat, and that therefore the door structure is effectively maintained under all circumstances and will not break down under the action of heat.

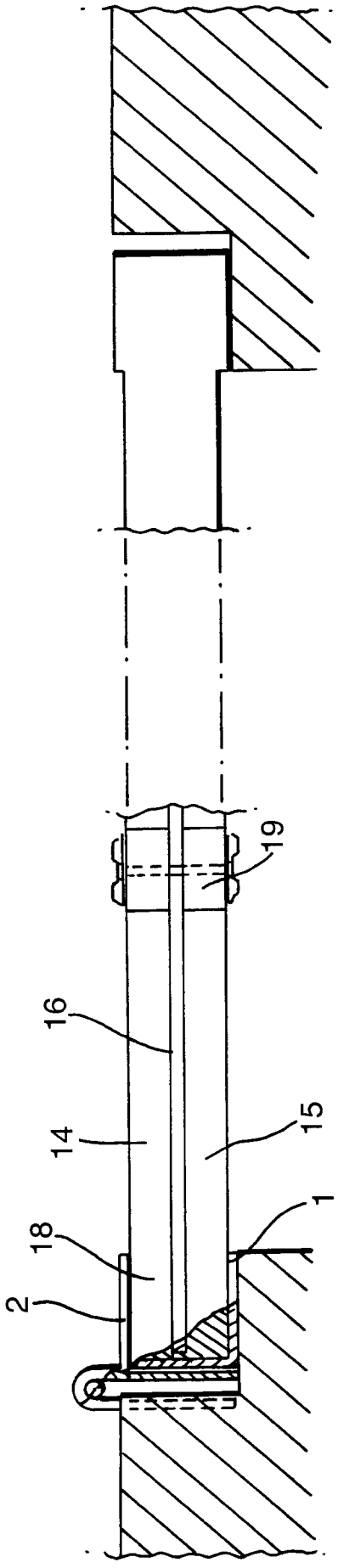

Fig.1.