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(54) **Fire doors**

(57) A fire door (1) comprises a timber stile (2,3) extending generally vertically along each side of the door, a timber mullion (7) extending generally vertically between and spaced from the two stiles, two outer timber rails (4,5) extending generally horizontally one along the upper side and the other along the lower side of the door, a central third timber rail (6) extending generally horizontally between and spaced from the upper and lower rails, and a panel (8) comprising a laminate of three plywood panels retained by timber beads (16) within each of the spaces bordered by one of the stiles, the mullion, the central rail and one or other of the outer rails. A sheet of glass fibre containing cloth is adhered to each inner face of the outer two plywood sheets of the panel, and an intumescent containing sheet (15) is adhered to each surface of the inner plywood sheet.

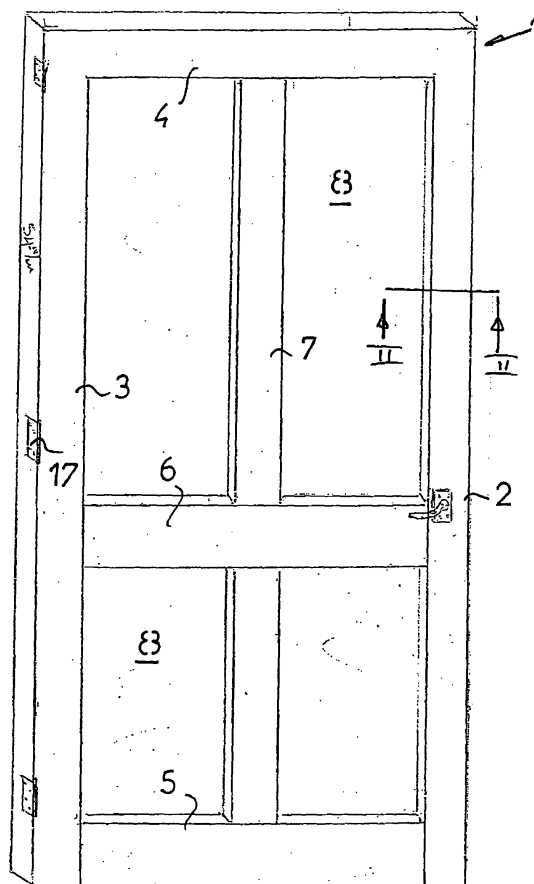


FIG. 1

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Description

[0001] This invention relates to fire doors.

[0002] Conventional fire doors are extremely heavy, difficult to install, expensive and provide relatively limited protection as a barrier against smoke and flames. One reason for the weight and consequent installation problems is the use of heavy gauge metal sheets to inhibit the progress of smoke and flames. Because of these problems, fire doors are used sparingly and generally only at key access points. This limited use can lead to a more rapid spread of a fire than would otherwise be the case if fire doors were used on all access points instead of only a selection of such access points.

[0003] One object of the present invention is to provide a relatively lightweight and easy to install timber-framed door capable of replicating the style and appearance of conventional interior and exterior doors and which, most importantly, offers full protection against the passage of smoke and flames for periods in excess of thirty minutes.

[0004] Fire protection periods in excess of such periods have been achieved in fire testing of doors in accordance with the invention; this compares very favourably with fire protection periods offered by conventional fire doors.

[0005] In one aspect, the invention provides a fire door comprising a timber stile extending generally vertically along each side of the door, a timber mullion extending generally vertically between and spaced from the two stiles, two outer timber rails extending generally horizontally one along the upper side and the other along the lower side of the door, a central third timber rail extending generally horizontally between and spaced from the upper and lower rails, a panel comprising a laminate of three plywood panels retained by timber beads within each of the spaces bordered by one of the stiles, the mullion, the central rail and one or other of the outer rails, a sheet of glass fibre containing cloth adhered to each inner face of the outer two plywood sheets of the panel, and an intumescent containing sheet adhered to each surface of the inner plywood sheet.

[0006] Air spaces may be provided between the opposed surfaces of the glass fibre containing cloth and the intumescent containing sheet.

[0007] The sheet of glass fibre containing cloth may comprise a woven ceramic cloth, which may include a filament matrix to provide added integrity.

[0008] The outer edges of each stile and the upper and lower rails preferably include lengthwise extending recesses to receive elongate fire and/or smoke seals.

[0009] The inner edge of each stile and the upper and lower rails, and the edges of the centre rail preferably include elongate grooves to receive the adjoining side edges of the panels, the panels being retained in place by the timber beads. Preferably, these beads are produced from hardwood. The stiles, mullion and rails are also preferably produced from hardwood.

[0010] Once assembled, the fire door has the weight

and appearance of a conventional interior or exterior door.

[0011] The invention will now be described by way of example only, with reference to the accompanying diagrammatic drawings, in which:-

Figure 1 is a perspective front view of a fire door in accordance with the invention;

Figure 2 is a section taken along line II-II of Figure 1;

Figure 3 is a perspective exploded view of a panel which forms part of the door illustrated in Figure 1; and

Figure 4 is a side view of a timber bead which forms part of the door illustrated in Figure 1.

[0012] The fire door 1 illustrated in the drawings has a timber frame comprising stiles 2, 3, upper and lower rails 4, 5 a central rail 6 and a mullion 7. Each of the four spaces bordered by one of the stiles, the upper or lower rail, the mullion and the central rail is filled with a laminated plywood panel 8 which is illustrated in greater detail in Figure 3.

[0013] As will be seen from Figure 2, each hardwood stile comprises an outer recess 9 which receives an elongate fire or smoke seal (not shown) and an inner recess 11 into which the adjoining side edge of a panel 8 locates. The sections of the upper and lower rails is the same as that illustrated in Figure 2 with the width and thickness dimensions being typically 70mm × 54mm respectively. The dimensions of the inner recess are typically 15mm × 20mm. The side edges of the central rail and the mullion are formed with recesses which are the same as the inner recess 11 formed in the stiles and rails. Thus, when fitted each panel is securely located within these recesses of the stiles, rails and mullion.

[0014] As will be seen from Figure 3, each panel comprises a laminated assembly of three plywood panels. Typically the thickness of each plywood panel is 4mm. Adhered to the inner surface of each outer plywood panel 12 is a sheet of glass fibre cloth which is coated on at least one side with an intumescent material. Adhered to the opposed faces of the centre plywood panel are intumescent sheets 15 typically those known as "intumescent paper". The glass cloth and the intumescent paper sheets are adhered in place typically using an acrylic exotropic adhesive including a quantity of intumescent material.

[0015] The panels are retained in place by means of hardwood beads 16 as shown in Figure 4.

[0016] Hinges 17 are secured to the respective stile, intumescent paper being positioned between the hinges and the respective stile surface.

[0017] In the event of fire, the intumescent content of the panels rapidly expands to create an effective barrier to the passage of fire, heat and smoke.

[0018] From the foregoing, it will be appreciated that the fire doors described are of relatively light weight and replicate the appearance, weight and other characteristics of a conventional timber door.

[0019] It will be appreciated that the foregoing is merely exemplary of fire doors in accordance with the invention and that modifications can readily be made thereto without departing from the true scope of the invention.

8. A fire door as claimed in any one of the preceding claims wherein the stiles, mullion and rails are produced from hardwood.

5 9. A fire door substantially as herein described and as described with reference to the accompanying drawings.

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Claims

1. A fire door comprising a timber stile extending generally vertically along each side of the door, a timber mullion extending generally vertically between and spaced from the two stiles, two outer timber rails extending generally horizontally one along the upper side and the other along the lower side of the door, a central third timber rail extending generally horizontally between and spaced from the upper and lower rails, a panel comprising a laminate of three plywood panels retained by timber beads within each of the spaces bordered by one of the stiles, the mullion, the central rail and one or other of the outer rails, a sheet of glass fibre containing cloth adhered to each inner face of the outer two plywood sheets of the panel, and an intumescent containing sheet adhered to each surface of the inner plywood sheet. 15
2. A fire door as claimed in claim 1 wherein air spaces are provided between the opposed surfaces of the glass fibre containing cloth and the intumescent containing sheet. 20
3. A fire door as claimed in claim 1 or claim 2 wherein the sheet of glass fibre containing cloth comprises a woven ceramic cloth. 25
4. A fire door as claimed in claim 3 wherein the woven ceramic cloth includes a filament matrix to provide added integrity. 30
5. A fire door as claimed in any one of the preceding claims wherein the outer edges of each stile and the upper and lower rails include lengthwise extending recesses to receive elongate fire and/or smoke seals. 35
6. A fire door as claimed in any one of the preceding claims wherein the inner edge of each stile and the upper and lower rails, and the edges of the centre rail include elongate grooves to receive the adjoining side edges of the panels, the panels being retained in place by the timber beads. 40
7. A fire door as claimed in claim 6 wherein the timber beads are produced from hardwood. 45

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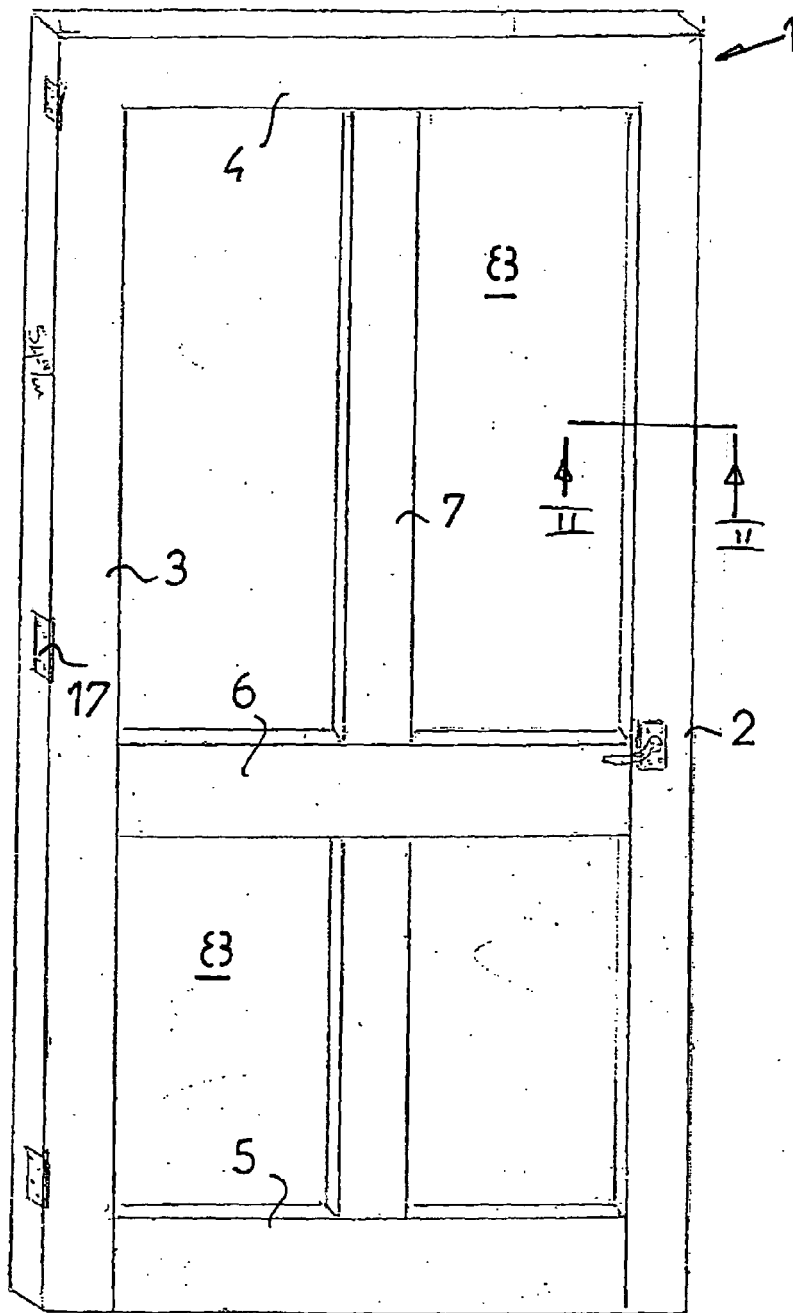


FIG. 1

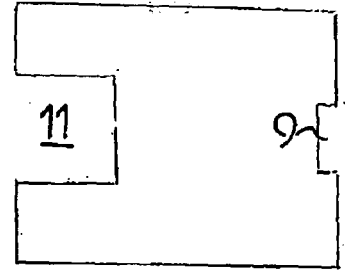


FIG. 2

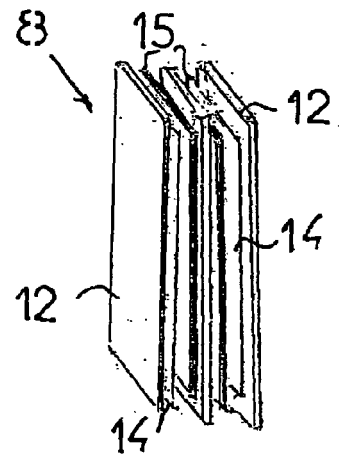


FIG. 3

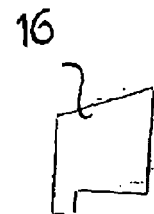


FIG. 4