

## **Fire-Resistant Doors And Frames Therefor**

### **Field of the invention**

This invention relates to fire-resistant doors and refers to particularly but not exclusively, to such doors suitable for decorative use, especially in apartment blocks, commercial buildings and offices. The invention also relates to a frame for such doors that can be used on walls of different thickness.

### **Background to the invention**

There are standards in almost every country, particularly developed countries, which specify the requirements for fire-resistant doors. There is even an international (ISO) standard. Also, there are Cyclic Movement Endurance Tests (CMET) for doors.

In some countries domestic doors, especially those for use in apartment blocks, commercial buildings and offices, are required in certain situations to have a minimum fire rating. This rating must be, for example, that the door would resist the progress of a fire for up to half an hour, or two or four hours. Such doors can be made of any material and generally have a frame of metal. The doors themselves are generally of solid construction of, for example, metal, and/or hardwood. Quite often a core of a non combustible material is used. That material may be, for example, vermiculite, calcium silicate, MDF, chipboard, or the like, with or without chemical treatment. Almost invariably they are not decorative. The standards do not allow, for example, the use of glazing in such doors. Therefore, although such doors

achieve their function, in the environment mentioned above they are not attractive. Many decorative elements are not used on fire-rated doors due to their heat transference properties.

It is therefore the principal object of the present invention to provide decorative fire-resistant doors that can achieve the required function yet have a required level of decoration that is normally required in a domestic situation. A further object is to provide an improved construction of a fire-resistant door. A further object is to provide a frame for such doors where the frame can be adjusted for walls of varying thickness.

#### **Summary of the invention**

With the above objective in mind, the present invention provides a decorative fire-resistant door leaf including the central panel including a peripheral leaf frame having two spaced-apart and parallel generally vertical rails, and two spaced-apart and generally parallel horizontal rails; the peripheral leaf frame being made of a solid material; a central panel within the peripheral leaf frame and being made as a laminate of a plurality of layers of a planar material; the plurality of layers being held together by a fire resistance adhesive; the central panel including at least one decorative feature. The planar material may be of plywood.

In another form, the present invention provides a fire-resistant door including a peripheral leaf frame having two spaced-apart and parallel generally vertical rails, and two spaced-apart and generally parallel horizontal rails; the peripheral leaf frame being made of a solid material; a central panel within the peripheral leaf frame and being made as a laminate of a

plurality of layers of a planar material; the plurality of layers being held together by a fire resistant adhesive;

The solid material may be hardwood, and there are preferably five or six layers in the plurality of layers. The fire resistant adhesive may be sodium silicate or cynshir 26 E5.

The at least one decorative feature may be selected from the group consisting of brass studs; brass sheets; brass strips; plastics laminate; kick plates; vision panel; push plates; security eye viewer; ceramic tiles; timber mouldings; sequencer plates; and security wrought iron-grilles.

The vision panel may have a frame mounted to internal horizontal rails and internal vertical rails for holding a glass sheet in position relative thereto. Preferably, the glass sheet is wired Georgian glass.

A lower one of the horizontal rails may have a groove extending along the length of a lower surface thereof, a floor seal being located in the groove for providing a seal between the lower rail and the floor.

The door leaf may be an active door leaf of a door set, the door set including a passive door leaf. The passive door leaf and the active door leaf may have engaging stiles.

In further form, the present invention provides a door frame having a first portion and a second portion with there being a region of overlap between the first and second portions, the second portion being slideable relative to the first portion in the region of overlap to allow the

door frame to be used on walls of different thickness; at least one of the first portion and the second portion having a door stop.

The first portion may include the door stop which has a slot therein for slideably receiving therein an end of the second portion. Alternatively, the second portion has an inner end which cooperates with the first portion to form a door stop.

### **Description of the drawings**

In order that the invention may be fully understood and readily put into practical effect, there shall now be described by way of non-limitative example only a preferred embodiment of the present invention, the description being with reference to the accompanying illustrative drawings in which :

Figure 1 is a front plan view of a first embodiment installed in a door frame mounted to a wall;

Figure 2 is a vertical cross-section along the lines and in the direction of arrows 2-2 of Figure 1, with the details of the wall being omitted;

Figure 3 is a horizontal cross-section along the lines of and in the direction of arrows 3-3 of Figure 1, the details of the wall being omitted; and

Figure 4 has eight illustrations of forms of a door frame in accordance with the present invention.

### **Description of the Preferred Embodiment**

To refer to Figures 1-3, there is shown a door set which comprises a passive leaf 10 and an active leaf 12 mounted within a door frame 14 which is secured to a wall 16. The frame 14 has side jambs 17, 17a and frame head 19 as is normal. It also includes a door stop 18. The leaves 10, 12 are hingeably secured to frame 14. The frame 14 may include sound and/or noise and/or smoke and/or fire seals when and as required. Stop 18 is preferably of a depth in the range of from 15 to 25 mm.

The passive leaf 10 is hingeably connected to the side jamb 17 by hinges 20 vertically aligned and secured to both the frame 19 and the leaf 10. Leaf 10 is adapted to be secured relative to the frame 14 so that it is only opened when and as required. This is normally in the situation of, for example, the moving of furniture or the like. Active leaf 12 is pivotally attached to side jamb of frame 17a by second hinges 22 which are again secured to both frame 19 and active leaf 12 in the normal manner. Both passive leaf 10 and active leaf 12 may be provided with a door closer 24 of normal construction and operation. A door sequencer 26 may also be provided in the normal manner. Door leaves 10, 12 may be provided with an appropriate type of lock set 28 like mortise locks with lever handles and/or cylindrical locks with knob handles in accordance with the desires and requirements of the owner of the relevant property.

Each leaf 10, 12 has a peripheral leaf frame preferably made of a hardwood material. The peripheral leaf frames have vertical stiles 30, 32, 34 and 36. Vertical stiles 32 and 34 have smoke seals 38 so that upon both leaves 10, 12 being closed a secure closure results, as well

as a closure which will enable an appropriate seal to be used, if desired or required. The door leaves 10, 12 both include horizontal upper 40 and lower 42 rails which again may be made of a suitable hardwood. Passive leaf 10 includes intermediate horizontal rails 41, 43. A suitable hardwood for stiles 30, 32, 34, 36 and rails 40, 41, 42, 43 and 68 would have a density of from 575 to 625 kg/m<sup>3</sup>. A good example is "Nyatoh" hardwood. Mounted within the peripheral leaf frames are central panels 44, 46. Each of the panels 44, 46, as is shown in the drawings, has a number of decorative elements. The decorative elements illustrated and described below are not limitative and any combination of any one or more of them, or any possible permutation of any combination, may be used.

Each panel 44, 46 is preferably made as a laminate of a number of layers of plywood. Preferably, there are five or six layers of plywood. The panels 44, 46 may have any desired or required thickness such as, for example, 23mm. To secure the layers together, a fire resistant adhesive is preferably used. Examples of such adhesives are sodium silicate or cynshir 26 E5. Each panel 44, 46 is located in a groove 86 in the relevant stile/rail 30, 32, 34, 36, 40, 41, 42, 43 and 64 with a fire seal 88 preferably being provided in the groove 86. Not all layers need to be plywood. Some may be strandboard, hardwood, chipboard, fibrocement, MDF, or other material. The layers may be mixed such that, for example, one outer layer may be plywood and one hardwood or MDF (medium density fibreboard), and the intermediate layers may be chipboard and/or strandboard and/or plywood and/or MDF and/or fibrocement. It is preferred the outer layers (those visible to users) be of hardwood or plywood for appearance purposes. The panel may be used for other purposes such as, for example, internal walls, partitions, demountable partitions, screens, removable walls, folding doors or the like.

Some of the decorations used may include:

1. brass studs 48;
2. brass sheets 50 or other sheets of other decorative material attached to one or both of the panels 44, 46 by means of nails, screws, adhesives or the like;
3. brass strips 52, which could also be made of other suitable material such as, for example, a plastics material, contrasting timber, or the like;
4. plastic laminates 54 which may be secured to panel 44, 46 by nailing, screwing and/or adhesion;
5. kick plates 56 which may be of a suitable material such as, for example, stainless steel, and which may be attached by screwing, nailing, and/or adhesion;
6. a vision panel 58 which may be of "Georgian" wire glass of suitable thickness, such as, for example, 6mm, and mounted within a frame 60 secured by screws 62 into an internal vertical rails 64 and horizontal rails 41, 43. The glass may be ovular or circular, or any other desired shape.
7. a security viewer 66;

8. push plates 68 which may be of any suitable material such as, for example, stainless steel and brass, and which may be held in place by adhesion and/or nailing and/or screws;
9. ceramic tiles 70 held in place by adhesion and which may be surrounded by a timber molding 72 which may be held in place by gluing and/or nailing; and
10. timber mouldings 74 in the centre of panel 46 which may be attached by adhesion, nailing (preferably using wooden nails) and/or screwing.
11. security wrought iron decorative grille which may be installed by screws.

Active leaf 12 may have a chain door security lock 76 if desired and/or required.

Furthermore, the lower most of the rails 42 may have an elongate groove in the lower portion thereof in which a lifting/dropping smoke and/or fire and/or noise seal 80 may be located. Such a seal is intended to seal with the horizontal rail 42 and also to provide a seal with the floor 78. In this way, the active leaf 12 can be opened and closed with the seal 80 passing over the floor 78 without hindering or otherwise restricting the opening and closing movement.

Vertical stiles 36 may be provided with a plastic cover 82 in which may be provided an appropriate leaflet or slip giving details of the fire rating of the doors 10, 12 and other required statutory matter. A similar cover may be on jamb 17a in a similar location.

In Figure 4, there is shown eight variations of the frame 16. In the first seven, (A through to G) the frame 16 has a first portion 84 and a second portion 86. The jambs 17, 17a are mounted on or integral with the first portion 84. A slot extends for the length of frame 14 and in which second portion 86 can slidingly locate. The slot 88 has a depth relative to the jambs 17, 17a and the first portion 84 extends beyond jambs 17, 17a. In this way, the second portion 86 can slidably move relative to the first portion 84 and, provided the inner end 90 of second portion 86 is located within slot 88, the frame 14 would be usable. This provides a region of overlap of first portion 84 and second portion 86. Therefore, the extent of the variation in thickness of wall 16 is at a maximum the depth of slot 88. The only difference in the forms from A through to G is the shape of the frame 14, the shape not being relevant to the present invention.

In the final form shown in Figure 4, the first portion 84 is adapted to extend across a substantial part of wall 16. The second portion 86 extends over the first portion 84 to provide an enlarged region of overlap. Although there is no specific door stop 18, the extent of the second portion 86 over portion 84 creates, in effect, a door stop 18 by virtue of the step 92.

In this way, no matter the thickness of wall 16 (within a certain limits), the one frame can be used. This would provide considerable savings in installation and also considerable reduction in the inventory of frames needed to be held by construction organisations, and to thus significantly reduce their overheads. Damage to the door frame during construction/renovation processes on the property can also be minimised. It also allows greater flexibility in design, and allows the door to be correctly aligned. If desired, the frame 14 may use an adjustable door seal to assist its operational characteristics. The concurrent

progress of the other groups of builders/contractors will not be hampered by the installation of the door frame.

Although there has been described in the foregoing description a preferred embodiment of the present invention, it will be understood by persons skilled in the technology concerned that many variations and modifications in detail of design or construction may be made without departing from the present invention.

The present invention is not limited to the particular invention described but extends to all possible combinations and permutations of features disclosed and described.

## The Claims

1. A decorative fire-resistant door including a peripheral leaf frame having two spaced-apart and generally parallel vertical rails, and two spaced-apart and generally parallel horizontal rails; the peripheral leaf frame being made of a solid material; a central panel within the peripheral leaf frame and being made as a laminate of a plurality of layers of a planar material; the plurality of layers being held together by a fire resistant adhesive; the central panel including at least one decorative feature.
2. A fire-resistant door including:
  - (a) a peripheral leaf frame having two spaced-apart and parallel generally vertical rails, and two spaced-apart and generally parallel horizontal rails;
  - (b) the peripheral leaf frame being made of a solid material; and
  - (c) a central panel within the peripheral leaf frame and being made as a laminate of a plurality of layers of a planar material.
  - (d) the plurality of layers being held together by a fire resistant adhesive; and wherein the panel material is one or more selected from the group consisting of the plywood, chipboard, strandboard, hardwood, medium density fibreboard, and fibrocement.
3. A door as claimed in claims 1 or 2, wherein a layer of adhesive is applied between each of the plurality of layers.
4. A door as claimed in either of claims 1 to 3, wherein the solid material is hardwood.
5. A door as claimed in any one of claims 1 to 4, wherein there are five layers in the plurality of layers.

6. A door as claimed in any one of claims 1 to 4, wherein there are six layers in the plurality of layers.
7. A door as claimed in claim 1, wherein the planar material is plywood.
8. A door as claimed in claim 3, wherein the layer of adhesive comprises sodium silicate.
9. A door as claimed in any one of claims 1 or 4 to 8, wherein the at least one decorative feature is selected from the group consisting of:
  - (a) brass studs;
  - (b) a brass sheet;
  - (c) a brass strip;
  - (d) plastics laminate;
  - (e) kick plates;
  - (f) vision panel;
  - (g) push plate;
  - (h) security eye viewer;
  - (i) ceramic tiles; timber moulding;
  - (k) security wrought decorative grille; and
  - (l) sequence plate.
10. A door as claimed in claim 9, wherein the vision panel has a frame for holding in relation thereto and within the frame a glass sheet, the frame being secured to internal horizontal and vertical rails.
11. A door as claimed in claim 10, wherein the glass plate is wired Georgian glass.

12. A door as claimed in any one of claims 1 to 11, wherein a lower one of the horizontal rails has a groove extending along the length of a lower surface thereof, a floor seal being located therein for providing a seal between the lower rail and the floor.
13. A door as claimed in any one of claims 1 to 12, wherein the door is an active door leaf of a door set, the door set including a passive door leaf; the passive door leaf and the active door leaf having engaging stiles.
14. A door as claimed in claim 13, wherein the passive door leaf is in accordance with any one of claims 1 to 12.
15. A fire resistant building panel including a plurality of layers held together by a fire resistant adhesive and wherein each of the layers is one or more selected from the group consisting of: plywood, chipboard, hardwood, strandboard, medium density fibreboard and fibrocement.
16. A fire resistant building panel as claimed in claim 15, wherein the plurality of layers includes a first outer layer selected from the group consisting of: plywood, hardwood, and medium density fibreboard.
17. A fire resistant building panel as claimed in claim 16, wherein the plurality of layers includes a second outer layer parallel to and spaced from the first outer layer, the second outer layer being selected from the group consisting of: plywood, hardwood, and medium density fibreboard.
18. A fire resistant building panel as claimed in any one of claims 15 to 17, wherein there is provided a plurality of intermediate layers selected from the group

consisting of: plywood, hardwood, chipboard, strandboard, medium density fibreboard and fibrocement.

19. A fire resistant building panel as claimed in claim 18, wherein each of intermediate layers is the same.

20. A fire resistant building panel as claimed in claim 18, wherein each of intermediate layers is different.

21. A fire resistant building panel as claimed in claim 17, wherein the first outer layer is the same as the second outer layer.

22. A fire resistant building panel as claimed in claim 17, wherein the first outer layer is different to the second outer layer.

23. A fire resistant building panel as claimed in any one of claims 15 to 22, wherein the fire resistant adhesive is sodium silicate or cynshir 26 E5.