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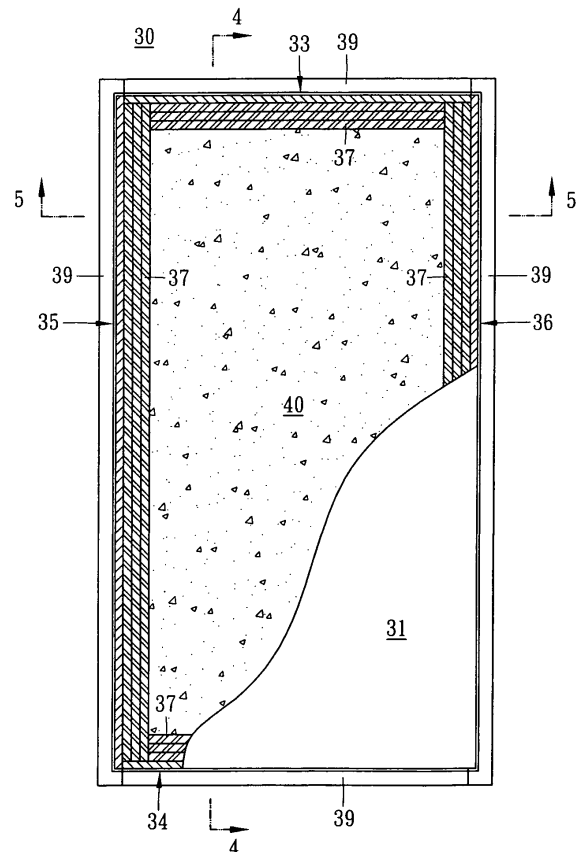
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(54) **Fireproof flat skinned door**

(57) An improved fireproof flat skinned door comprises using high fire-resisting outer sealing material particularly having an aligning structure and using calcium silicate plate as inner sealing material to cooperatively form side-frames of the flat skinned door, and using a ceramic fiber plate or fireproof core material to form a solid inner portion of the flat skinned door which, in addition to the advantage of making installation with ease, shall also provide superior fireproof effect; further, a smoke prevention strip is installed between the outer sealing material and the calcium silicate plate as inner sealing material to cooperatively form the side-frames which, when there is a fire, shall enable the side-frames of the flat skinned door to achieve the effect of preventing the fire from spreading through the flat skinned door and preventing the smoke from penetrating through edge-gap of flat skinned door, especially, the calcium silicate plate as inner sealing material will not burn to cause deformation that shall effectively prevent fire and smoke from penetrating through edge-gap of the flat skinned door, and keep the fire and smoke outside the flat skinned door.



**Fig. 3**

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**Description**

## BACKGROUND OF THE PRESENT INVENTION

## 1. Field of the Present Invention

**[0001]** The invention relates to an improved fireproof structure for flat skinned door, particularly the flat skinned door having side-frames constructed into composite structure comprising an outer sealing material with aligning structure for installation with ease and plural calcium silicate plates as inner sealing material to cooperatively form fireproof structure of the flat skinned door.

## 2. Description of Prior Art

**[0002]** Conventionally the flat skinned door has its inner side filled with fireproof material such as phenol foam to form solid inner portion which can prevent fire from burning through the door leaf to achieve fireproof effect of the flat skinned door. Therefore, when there is on fire, and even if the door leaf of the flat skinned door is burned into ash, the fire resisting material inside the flat skinned door shall still prevent the fire from burning through the flat skinned door or prevent the fire from spreading.

**[0003]** Taking the conventional flat skinned door 10 shown in Fig. 1 and Fig. 2 as an example, the fireproof effect of flat skinned door 10 is achieved by having the inner space between door leaf 11 and 12 of the flat skinned door 10 filled with phenol foam 22 to form solid inner portion which is then wrapped with magnesium oxide sheet material 23 to form fireproof structure. When there is on fire, the flat skinned door 10 shall achieve the effect of preventing the fire from burning through the flat skinned door 10 by the fire-resisting character of the phenol foam material 22 and magnesium oxide sheet material 23.

**[0004]** However since a top rail 13, a bottom rail 14, a left stile 15 and a right stile 16 of the above-mentioned conventional flat skinned door 10 all are normally made of flammable PVC foam material with poor heat-resistance or made of plastic injection material, wood or steel which, when there is on fire, are apt to serious bending deformation, the flame or smoke shall penetrate the flat skinned door 10 through the edge-gap caused by the bending deformation of the four edges of the conventional flat skinned door 10 due to high temperature of fire.

**[0005]** Besides, since the structural design for top rail 13, bottom rail 14, left stile 15 and right stile 16 of the conventional flats kinned door 10 does not take into consideration the aligning structure designed for installation with ease, extra aligning work is always required for installing the door leaf 11 and 12, the magnesium oxide sheet material 23, the top rail 13, bottom rail 14, left stile 15 and right stile 16 into correct assembling position.

**[0006]** Owing to these reasons mentioned above, there is a necessity and possibility to further improve the fire-resisting characteristics of the conventional flat

skinned door 10.

## SUMMARY OF THE PRESENT INVENTION

5 **[0007]** In view of these, the major purpose of this present invention is to provide an improved fireproof structure for flat skinned door which improvement includes using fire-resisting outer sealing material particularly with a ligning structure an dusing calcium silicate  
10 plate as inner sealing material to cooperatively form the side-frames including top rail, bottom rail, left stile and right stile, and using ceramic fiber plate or fire-resisting core material to form the solid inner portion of the flat  
15 skinned door. These, in addition to the advantage of making installation with ease, shall also provide more superior fireproof effect, when there is on fire, the side-frames of the flat skinned door shall achieve the effect of preventing the fire from spreading or burning through the flat  
20 skinned door, particularly, since the inner sealing material of calcium silicate plate shall not burn to cause distortion, the flat skinned door can prevent the flame from penetrating through the edge-gap of flat skinned door that shall keep the fire outside the door.

**[0008]** Another purpose of the invention is to provide  
25 a fireproof structure for flat skinned door which is equipped with smoke prevention strip installed between the outer sealing material and the inner sealing material of calcium silicate plate cooperatively forming the side-frames to better the effect of preventing the fire and  
30 smoke from penetrating through the edge-gap of flat skinned door.

## BRIEF DESCRIPTION OF THE DRAWING FIGURES

35 **[0009]** Fig. 1 is a sectional view of conventional flat skinned door along a horizontal line to show the fireproof structure of the conventional flat skinned door constructed with SMC plate.

**[0010]** Fig. 2 is a sectional view of the flat skinned door  
40 along a vertical line to show the fireproof structure of the conventional flat skinned door shown in Fig. 1.

**[0011]** Fig. 3 is a schematic drawing to show the fireproof structure of flat skinned door of the invention.

**[0012]** Fig. 4 is a sectional view along line 4-4 of Fig.  
45 3 for showing the fireproof structure of flat skinned door of the invention.

**[0013]** Fig. 5 is a sectional view along line 5-5 of Fig.  
50 3 for showing the fireproof structure of flat skinned door of the invention.

**[0014]** Fig. 6 is a structural drawing of an outer sealing material used on this invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

55 **[0015]** As illustrated in from Fig. 3 to Fig. 6, a flat skinned door 30 disclosed in this present invention comprises two door skins 31 and 32, a side-frames consti-

tuted by a top rail member 33, a bottom rail member 34, a left stile member 35 and a right stile member 36, and a fire-resisting core plate 40 forming a solid inner portion of the flat skinned door 30, wherein the door skins 31 and 32 are made of sheet molding compound (SMC) of reinforced fiber glass plate which surface may have smooth surface without wood grain or with imitating wood grain, or have panels, but have rough back surface for increasing the binding force when they are bond together with side-frames and core material.

**[0016]** The side-frames of flat skinned door 30 including the top rail member 33, the bottom rail member 34, the left stile member 35 and the right stile member 36 are formed into composite structure comprising an inner sealing material 37 and an outer sealing material 39.

**[0017]** Wherein the inner sealing material 37 of the side-frames of flat skinned door 30 is made of light weight, high strength, fire-resisting and fire-retarding whole piece calcium silicate plate or whole piece ceramic fiber plate or made of more than one piece of calcium silicate plate or more than one piece of ceramic fiber plate to form multiple-layer structure that provides the characteristics of fire-resisting and fire-retarding of the inner sealing material 37 of the flat skinned door 30.

**[0018]** Similarly the outer sealing material 39 of the side-frames of flat skinned door 30 is also made of light weight, high strength, fire-resisting and fire-retarding fiber reinforced plastics (FRP), reinforced glass fiber (GFR) or reinforced carbon fiber (CFR) by pultrusion process to form the structured as shown in Fig.6, that also enables the characteristics of high strength, fire-resisting and fire-retarding of the outer sealing material 39 of the flat skinned door 30.

**[0019]** In addition, since the inner sealing material 37 of forming the side-frames of the flat skinned door 30 is made of fire-resisting, fire-retarding calcium silicate plate or ceramic fiber plate, if the outer sealing material 39 is chosen to use PVC which is less fire-resisting and fire-retarding or to use steel or wood, and if the outer sealing material 39 is destroyed by fire, the flat skinned door 30 of the invention shall still achieve the effect of preventing the fire from burning through the flat skinned door 30 or penetrating through the edge-gap of the flat skinned door 30. Therefore, it means that the outer sealing material 39 of flat skinned door 30 of the invention may be chosen to use steel or wood without affecting its fireproof effect.

**[0020]** The fire-resisting core plate 40 for forming an inner solid portion of flat skinned door 30 of the invention is made of lightweight, high strength, fire-resisting and fire-retarding whole piece ceramic fiber plate which shall achieve the effect of keeping fire outside the flat skinned door 30, and prevent fire from spreading and penetrating the flat skinned door 30.

As shown in Fig. 6, the outer sealing material 39 of this present invention comprises a sealing portion 39a, a first aligning rib 39b and a second aligning rib 39c. And, there is a mounting groove 39e for positioning and installing the inner sealing material 37 is naturally formed and de-

finied from a space surrounded by the sealingportion 39a, the first aligning rib 39b and the second aligning rib 39c, and there is an aligning groove 39f is also formed on the first aligning rib 39b and the second aligning rib 39c for supporting and positioning the door skins 31 and 32 respectively.

**[0021]** Therefore, as illustrated in Fig. 4 and Fig. 5, when installing the inner sealing material 37 as side-frames of the flat skinned door 30, the installation work shall be done simply by inserting the inner sealing material 37 to the mounting groove 39e of outer sealing material 39 to which the shape of the inner sealing material 37 is correspondingly preformed for easy connection.

**[0022]** Similarly, when installing the fire-resisting core plate 40 or installing each door skins 31 or 32 to flat skinned door 30, the fire-resisting core plate 40 can be easily and rapidly installed by way of being directly inserted inside the side-frames of the flat skinned door 30 after the side-frames for the flat skinned door 30 having been assembled together, and each door skin 31 or 32 can be easily and rapidly installed with a rapid alignment effect and installation achieved simply by inserting the door skin 31 or 32 separately into the aligning groove 39f preformed on the first aligning rib 39b and the second aligning rib 39c of the outer sealing material 39.

**[0023]** Particularly, the side-frames of the flat skinned door 30 of the invention is tightly and completely sealed and wrapped by the sealing portion 39a of the outer sealing material 39 to increase the structure strength of the flat skinned door 30, and the side-frame of the flat skinned door 30 are constructed with the inner sealingmaterial 37 and the outer sealingmaterial 39 to cooperatively form fire-resisting and fire-retarding composite structure, also the inner portion of the flat skinned door 30 is made of whole piece ceramic fiber plate to form fire-resisting core plate 40. These provide a fireproof structure for flat skinned door 30 comprising a composite structural side-frames with whole piece fire-resisting core plate 40 inside which possesses not only the characteristic of high fire-resisting but also the special advantage of no deformation to significantly improve the fireproof effect of the flat skinned door 30 in preventing fire from burning or penetrating through the flat skinned door 30.

**[0024]** In addition, a smoke prevention strip 50 may be further installed in the mounting groove 39e of the outer sealing material 39, so that the side-frames of the flat skinned door 30 of the invention shall be equipped a smoke prevention strip 50 between the outer sealing material 39 and the inner sealing material 37 to prevent the smoke or fire from penetrating through edge-gap of the flat skinned door 30 of the invention.

**[0025]** Further, the combination of variety appearance design for the portion between the first aligning rib 39b and second aligning rib 39c of the outer sealing material 39 can decorate the flat skinned door 30 with variety of patterns and ornaments.

**[0026]** Taking the flat skinned door 30 shown in from Fig. 3 to Fig. 6 as an example of embodiment of the in-

vention, the outer sealing material 39 used on the flat skinned door 30 has been made its second aligning rib 39c extended out wardly to form an extended edge-rim 39d for the purpose of decoration. Accordingly, various different appearance of the flat skinned door 30 can be therefore obtained only by varying the ornament design to the edge-rim 39d of the outer sealing material 39.

**[0027]** Although the example as illustrated above has been described in its more preferred embodiment, the partial changes or modifications which may be made without departing from the spirit of the invention, and is apparent to those skilled in the art shall still be considered as covered by the appended claims of the invention.

### Claims

1. An improved fireproof structure for flat skinned door comprising two door skins (31, 32), a side-frames constituted by a top rail member (33), a bottom rail member (34), a left stile member (35) and a right stile member (36), and a fire-resisting core plate (40) forming a sold inner portion, **characterized in that** the side-frames is constructed with an inner sealing material (37) and an outer sealing material (39) to form a composite structural side-frames, and the outer sealing material (39) is structured to comprise a sealing portion (39a) for sealing four edges of flat skinned door, a first aligning rib (39b) and a second aligning rib (39c) both carrying a aligning groove (39f) for inserting the door skins (31, 32), and amounting groove (39e) provided for installing the inner sealing material (37). 5
2. The improved fireproof structure for flat skinned door of claim 1, **characterized in that** an extended edge-rim (39d) is extended outwardly from the second aligning rib (39c) of outer sealing material (39). 10
3. The improved fireproof structure for flat skinned door of claim 1, **characterized in that** a smoke prevention strip (50) is installed in the mounting groove (39e) between the outer sealing material (39) and the inner sealing material (37). 15
4. The improved fireproof structure for flat skinned door of claim 2, **characterized in that** a smoke prevention strip (50) is installed in the mounting groove (39e) between the outer sealing material (39) and the inner sealing material (37). 20
5. The improved fireproof structure for flat skinned door of claim 1, 2, 3 or 4, **characterized in that** the outer sealing material (39) is fiber reinforced plastic, reinforced glass fiber or reinforced carbon fiber. 25
6. The improved fireproof structure for flat skinned door of claim 1, 2, 3 or 4, **characterized in that** the inner sealing material (37) is constructed with whole piece calcium silicate plate or ceramic fiber plate. 30
7. The improved fireproof structure for flat skinned door of claim 1, 2, 3 or 4, **characterized in that** the inner sealing material (37) is multiple-layer structure constructed with more than one piece of calcium silicate plate or ceramic fiber plate. 35
8. The improved fireproof structure for flat skinned door of claim 5, **characterized in that** the inner sealing material (37) is multiple-layer structure constructed with more than one piece of calcium silicate plate or ceramic fiber plate. 40
9. The improved fireproof structure for flat skinned door of claim 1, 2, 3 or 4, **characterized in that** fire-resisting core plate (40) is constructed with ceramic fiber plate. 45
10. The improved fireproof structure for flat skinned door of claim 8, **characterized in that** fire-resisting core plate (40) is constructed with ceramic fiber plate. 50

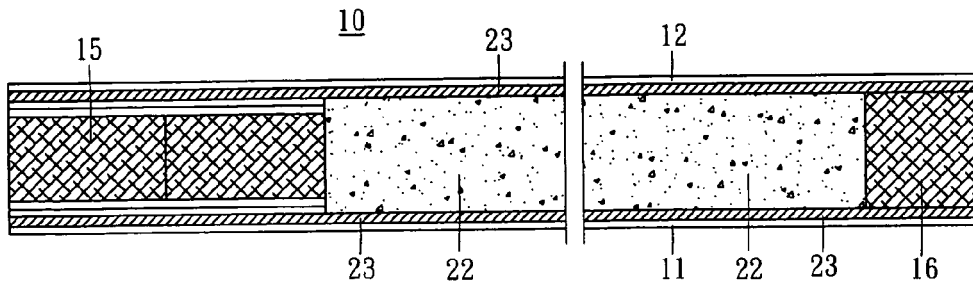


Fig. 1

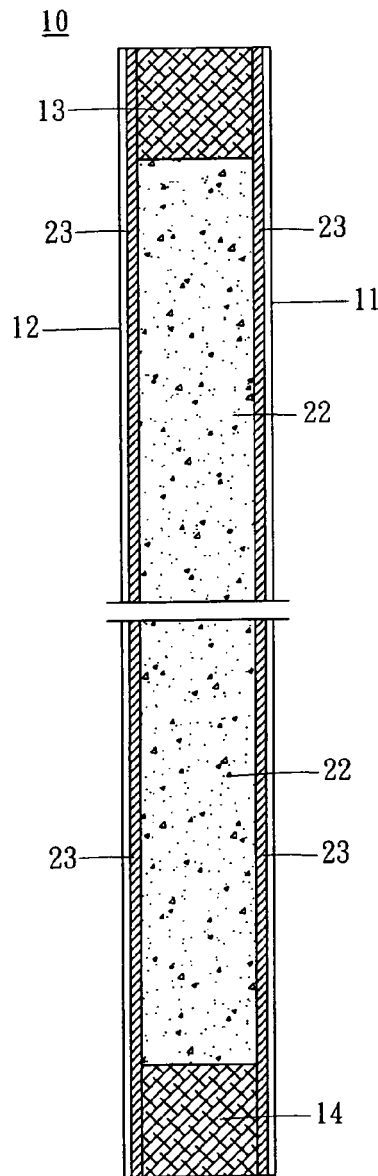


Fig. 2

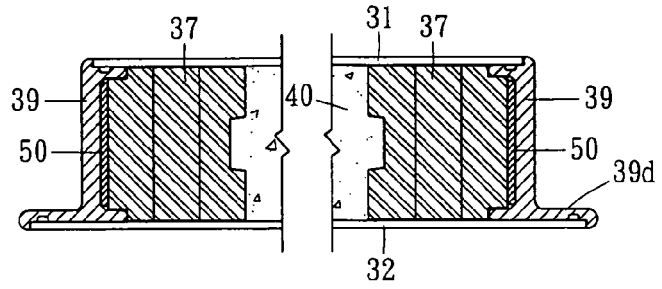


Fig. 5

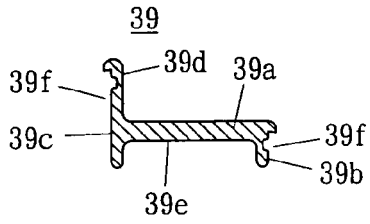


Fig. 6

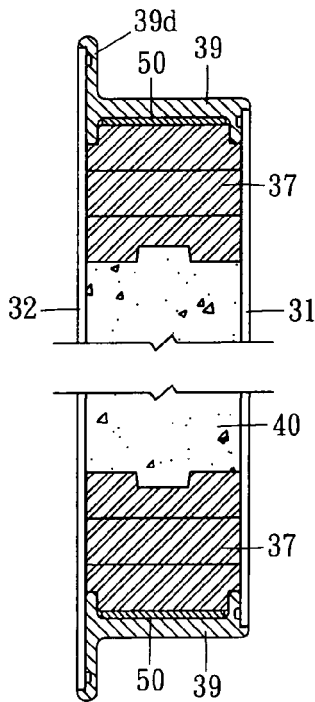


Fig. 4

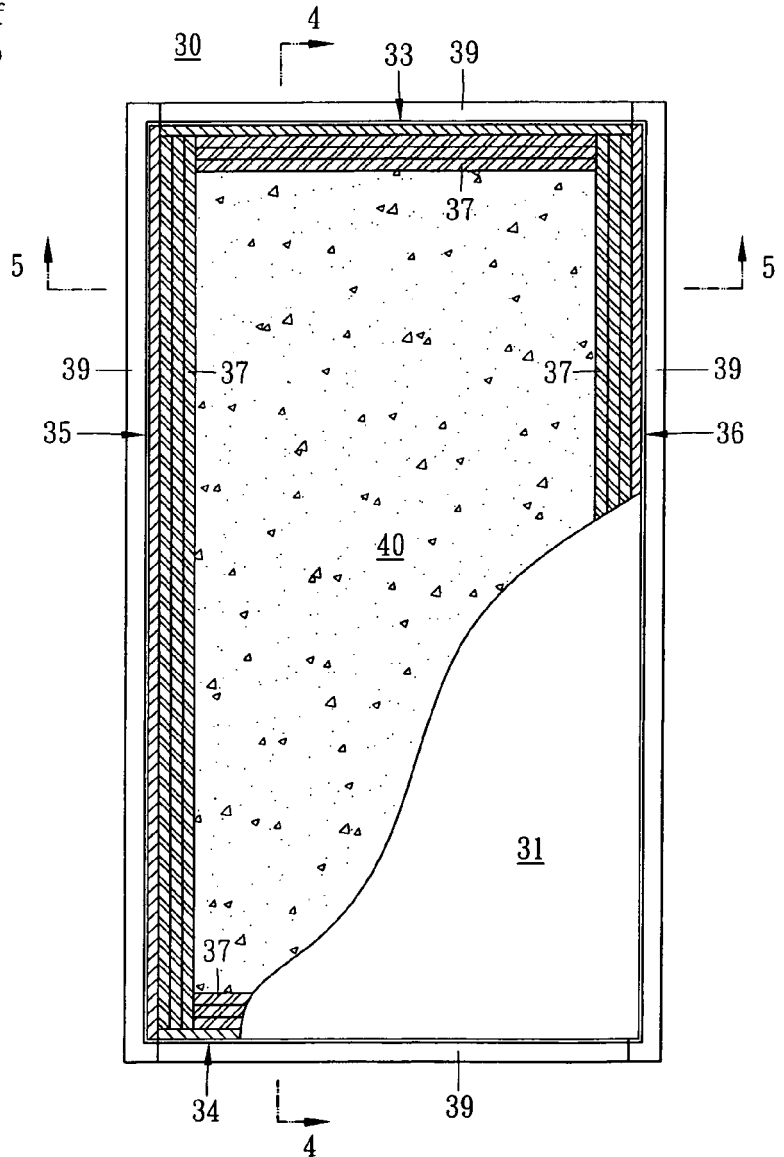


Fig. 3



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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>16 February 2006</b>	Examiner <b>Baath, S</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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