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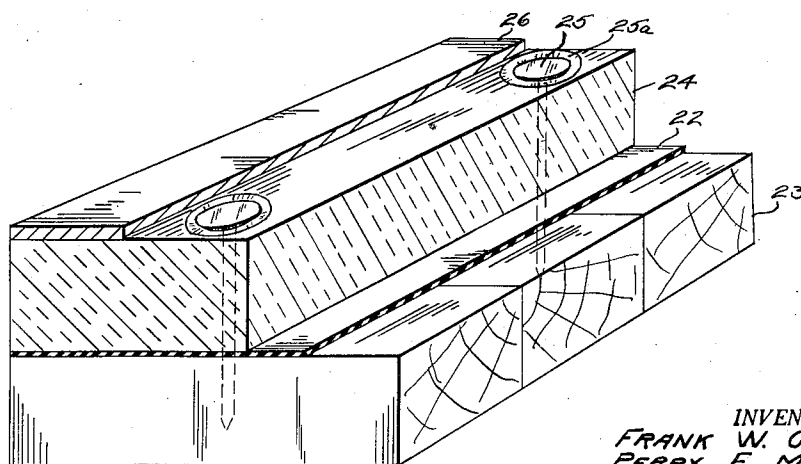
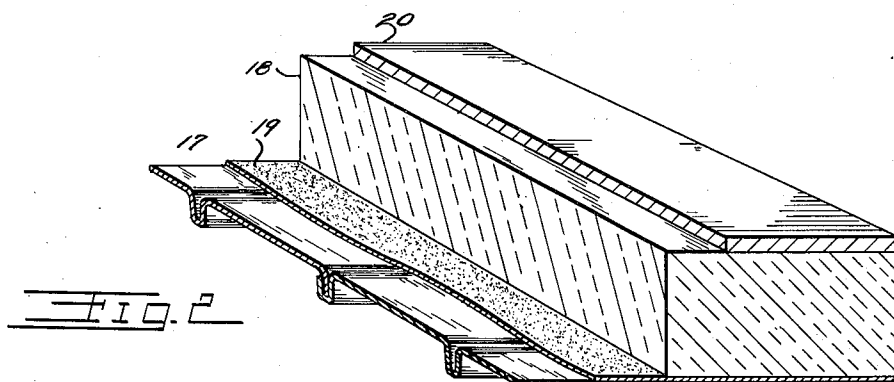
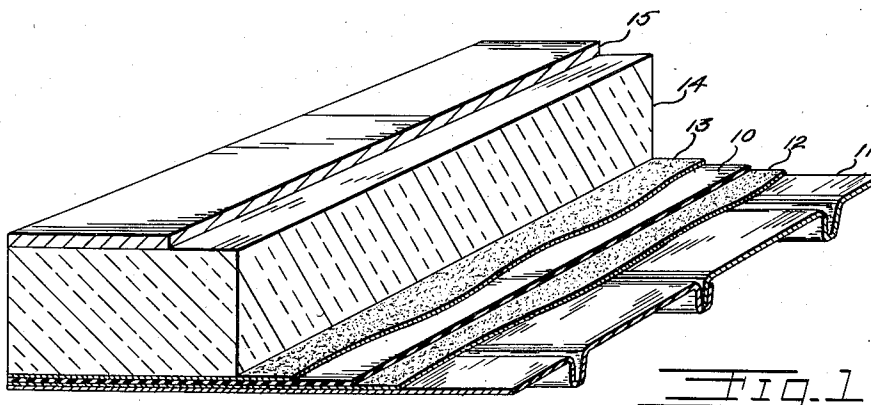
F. W. CURTIS ET AL

2,861,525

FIRE RETARDANT ROOF VAPOR BARRIER AND SECUREMENT MEANS

Filed Jan. 30, 1956

2 Sheets-Sheet 1



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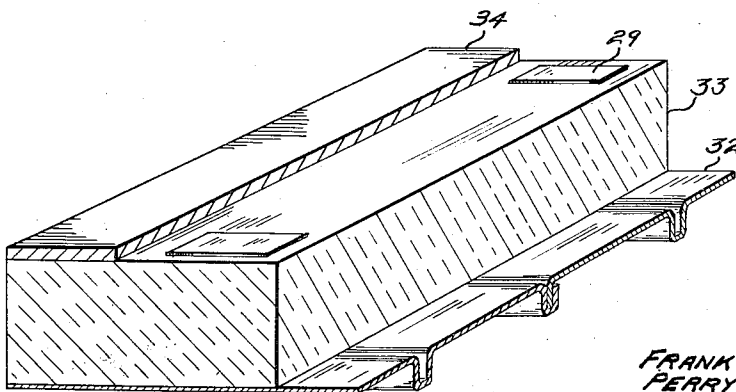
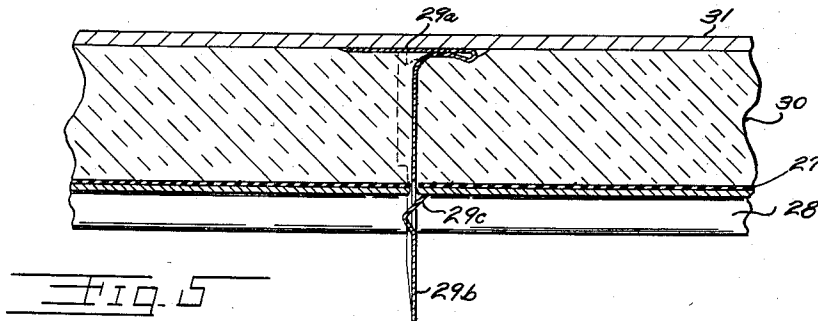
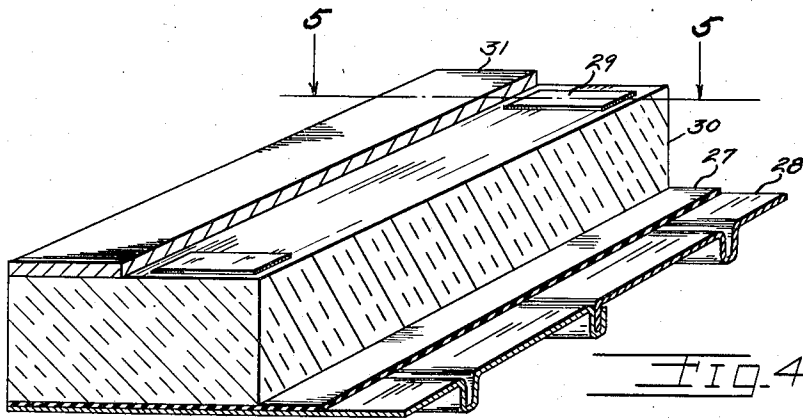
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FIRE RETARDANT ROOF VAPOR BARRIER AND SECUREMENT MEANS

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4 Claims. (Cl. 108—6.5)

The present invention relates to roof construction and more particularly to the area of the roof located between the roof deck and the insulation.

An object of this invention is to provide a new roof construction wherein the highly combustible materials such as asphalt and other combustible bituminous materials are removed from the area between the roof deck and the insulation layer.

Another object of this invention is to provide a roof construction having a fire retardant medium between the roof deck and insulating layer, which in no way will contribute to the spread of fire within the building covered by the roof.

Still another object of the present invention is to provide a non-fire-supporting roof construction comprising superimposed layers of non-combustible adhesive and fire retardant vapor barrier located between the roof deck and insulating material.

Another object of the present invention is to provide a non-fire-supporting roof construction characterized by its structural simplicity, the ease of applying its components, and its low cost. Other features of this invention reside in the arrangement and design of the various layers of material for carrying out their appropriate functions.

Further objects of the present invention and certain practical advantages will be referred to in, or will be evident from the following description of five embodiments of the invention, as illustrated in the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of a portion of one embodiment of the present roof construction; some of the parts of which are cut away to more clearly illustrate the invention.

Fig. 2 is a fragmentary perspective view of still another embodiment of the present invention.

Fig. 3 is a fragmentary perspective view of another embodiment of the present invention, and including means for retaining the various built-up roofing layers together.

Fig. 4 is a fragmentary perspective view of a modified form of the present invention applying means for retaining the various roofing layers on a steel roof deck.

Fig. 5 is an enlarged sectional view taken along the plane of line 5—5 of Fig. 4 and showing in detail the means of securing the roofing material on the deck.

Fig. 6 is a fragmentary perspective view of still another built-up roof construction employing the general concept of the present invention.

Before describing in detail the herein disclosed embodiments of the invention, it is to be understood that the present invention is not limited to the structural details or the particular arrangement of parts herein shown, as structures embodying the present invention may take other forms. It also is to be understood that the phraseology and terminology herein used are for purposes of description and not of limitation, as the scope of the present invention is denoted by the appended claims.

To those skilled in this art it is well known that the various combustible materials located between the in-

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ulation layer and the roof deck play an important part in the spread of fire in a building which incorporates this type of roof structure. In normal roof construction the area between the roof deck and insulating material normally contains large quantities of highly combustible bituminous materials. Such materials have the effect of spreading the fire beneath the roof within the building, when the underside of such roof is exposed to the fire within the building. When flames or high fire temperatures impinge on the undersurface of the roof deck certain unburned gases in the combustible bituminous materials are liberated. These liberated gases cannot escape upwardly through the insulating layer and water-proofing surface of the roof and therefore are forced downwardly through the joints of the roof deck into the building where they become ignited by the flames or high temperature. These liberated gases flowing from the combustible bituminous materials are primarily responsible for the spread of fire on the underside of the roof deck. As the liberated gases become ignited the remaining combustible bituminous material is transformed into a molten state and drips freely through the roof deck into the building and thereby contributes still another factor in the spreading of the fire within the building. When a temperature of approximately 800 degrees Fahrenheit or higher is maintained at the underside of the roof deck, it was found in tests that the combustible bituminous materials will contribute to the fire directly below the roof.

The present invention pertains to the area between the roof deck and roof insulation, which heretofore contained the highly combustible bituminous material. The present invention contemplates the complete removal of all such combustible bituminous and asphalt materials from this area of the roof. One of the means of carrying out the present invention is to substitute a fire retardant vapor barrier layer which may also include layers of non-combustible adhesive for said combustible materials. The fire retardant vapor barrier layer may consist of a specially compounded tough fire retardant plasticized polyvinyl chloride flexible materials such as Koroseal, which is a product manufactured by the B. F. Goodrich Company and is supplied in a sheet approximately 0.004 inch thick. The material will not support combustion but rather chars and decomposes into ash at 350 to 400 degrees Fahrenheit. Fire-retardant plasticized polyvinyl chloride materials are elastic and remain flexible at all normal working temperatures. Their resistance to aging in this use is excellent with no oxidizing, check, cracking or peeling. Applicant does not wish to limit himself to this particular product since any material having similar characteristics may be used.

A preferred non-combustible adhesive material consists of a tacky viscous bonding material having a base of reclaimed rubber and asbestos fibers with a chlorinated hydrocarbon solvent. The adhesive layer remains elastic indefinitely and when dry will not support combustion but rather chars at 850 to 900 degrees Fahrenheit. The material may be readily applied with a squeegee, brush, roller coater, or any other suitable device. Applicant does not wish to limit himself to this particular material since any suitable material producing similar results may be used.

The present invention does not contemplate altering the standard insulation and built-up roof construction which normally include a layer of insulation composed of vegetable fiber board, glass fiber or other suitable insulating materials and a water proofing surface covering the insulation.

Based upon actual test results, it was concluded that the present vapor barrier construction makes no contribution to the spread of fire within a building; even when used with a combustible vegetable fiber board in-

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sulation, extensive spread of fire beyond the zone of direct exposure did not occur.

As seen in the accompanying drawings the fire retardant vapor barrier layer or sheet may be secured by various means to both metal and wooden roof decks.

Referring now to Fig. 1 wherein I have shown a fire retardant vapor barrier layer 10 secured to a steel roof deck 11 by means of a non-combustible adhesive layer 12 which is applied in any suitable manner over the deck 11. A second layer of non-combustible adhesive 13 is applied to the fire retardant vapor barrier layer 10 and adhesively secures a layer of insulation 14 having a water proofing surface 15 to said vapor barrier layer 10. It will be understood that the adhesive layers 12 and 13 may be applied in any suitable manner such as roller coating, brushing, spraying, pouring from a can or using a mechanical applicator, since it is in a liquid form at the time of application. The adhesive layers 12 and 13 need not completely cover the entire surface of the roof deck and vapor barrier layer but may be applied in ribbons or in a serpentine pattern or in any other manner wherein sufficient adhesive will be present to achieve the desired results. It will be understood that this particular construction may be applied to a poured or precast deck, or wood deck as well as to the steel deck shown.

In Fig. 2, I have shown a modified form of the present invention wherein all combustible bituminous material has been removed from the area between the roof deck 17 and insulation layer 18. This construction differs somewhat from Fig. 1 in that the fire retardant vapor barrier layer 10 of Fig. 1 is absent and only a layer of non-combustible adhesive 19, of the type heretofore described, is used to secure the insulating layer 18 to the metal roof deck 17. The insulation layer 18 is provided with a water-proofing surface layer 20 composed of any suitable material. The present construction shown in Fig. 2 is equally applicable to poured, precast or wood deck constructions. This roof construction has been found to make no contribution to the spread of fire within a building.

In Fig. 3 I have shown another embodiment of the present invention wherein a fire retardant vapor barrier layer 22 is shown applied to a wooden roof deck 23. The vapor barrier layer 22 forms a covering for the entire wooden roof deck 23. An insulation layer 24 is applied over the vapor barrier layer 22 and secured thereto by suitable nails 25 having large heads or combined with large washers 25a. A water-proofing surface 26 of suitable material is then applied over the insulating layer and forms a protective coating for the roofing materials as well as the heads of the nails.

The roof construction of Fig. 4 is similar to that shown in Fig. 3 but differing with regard to the type of roof deck to which the vapor barrier layer is applied. In Fig. 4, the vapor barrier layer 27 is shown as applied between metal or steel deck 28 and a layer of insulation 30. For the purpose of securing the vapor barrier layer 27 to deck 28 special clips 29 are used. These clips are made of one piece of metal having an enlarged head portion 29a and a pointed shank 29b. An outstanding prong 29c is cut out of the material forming the shank of the clip and bent into a substantially L-shape as seen in Fig. 5. The prong 29c is resilient and constructed to yield and conform to the general contour of the clip as it is driven into the steel roof deck 28 which is made up of a plurality of channels. The prong 29c will then spring back into its generally L-shape position, as seen in Fig. 5, after passing through the metal deck 28 to form a barb-like projection which engages the lower surface of the metal deck and prevents removal thereof. The clips form a tight joint when driven through the steel deck and provide a simulated "gasket effect" between the clips and the vapor barrier layer so as to form

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a good seal. The roof construction of Figs. 4 and 5 is also provided with a suitable water-proof surface 31.

In Fig. 6, I have shown a roof construction portraying the present invention in its broadest aspect. As can be readily observed, all combustible bituminous and asphalt materials have been removed from the area between the roof deck 32 and the insulation layer 33. The non-combustible adhesive layers and fire retardant vapor barrier layers have been omitted in this particular embodiment. The insulation layer 33 may be secured directly to the metal deck 32 by means of clips 29 as shown and described in Figs. 4 and 5. A suitable water-proof surface 34 is applied to the insulation layer 33.

In constructing a roof as shown in Fig. 1 the first layer of non-combustible adhesive is spread over the surface of the roof deck while in a liquid form, so that a relatively thin layer of material is deposited on the roof deck.

After spreading the first layer of non-combustible adhesive, a thin sheet of non-combustible fire retardant vapor barrier is then placed upon the first layer of the non-combustible adhesive. This material is generally supplied in rolls and may be easily placed by a simple unrolling process.

A second layer of non-combustible adhesive is then spread over the surface of the fire retardant vapor barrier by any suitable means. This layer need not be spread over the entire surface and may take the form of ribbons or serpentine pattern as heretofore described.

A layer of suitable insulation is then applied to the second layer of non-combustible adhesive and a water-proofing surface coating is then applied to the layer of insulation.

Although this method of preparing the non-fire supporting built-up roof construction applies to the illustration shown in Fig. 1, it will be understood that the methods of building up the roof sections shown in Figs. 2 through 6 are practiced in the same manner with the exception of omitting one or more layers of non-combustible adhesive or the thin sheet of fire retardant vapor barrier.

In view of the foregoing description, taken in conjunction with the accompanying drawings, it is believed that a clear understanding of the construction, operation, and advantages of the present invention will be quite apparent to those skilled in this art.

Having thus described my invention and illustrated its use, what I claim is new and desire to secure by Letters Patent is:

1. A non-fire-supporting roof construction, comprising a roof deck of a structural character which permits communication between opposite faces thereof in the event of a fire therebelow and in relatively close proximity thereto, an insulating layer having a surface area of a size to substantially completely overlie said roof deck, said insulating layer being provided with a water-proofing upper surface, a non-fire contributing vapor barrier layer which also has a surface area of a size to substantially completely overlie said roof deck, said vapor barrier layer consisting essentially of organic plastic material in sheet form and being located between said roof deck and said insulating layer and being effective to substantially eliminate the spread of a fire in relatively close proximity to the under face of said roof deck, and securing means for said insulating layer and said vapor barrier layer, said securing means comprising a non-fire contributing adhesive layer on at least one of the faces of said vapor barrier layer.

2. A non-fire-supporting roof construction, comprising a roof deck of a structural character which permits communication between opposite faces thereof in the event of a fire therebelow and in relatively close proximity thereto, an insulating layer having a surface area of a size to substantially completely overlie said roof deck, said insulating layer being provided with a water-proofing

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upper surface, a non-fire contributing vapor barrier layer which also has a surface area of a size to substantially completely overlie said roof deck, said vapor barrier layer consisting essentially of organic plastic material in sheet form and being located between said roof deck and said insulating layer, non-fire contributing adhesive layers on opposite faces of said vapor barrier layer, one of said adhesive layers securing said vapor barrier layer to said roof deck and the other adhesive layer securing said insulating layer to said vapor barrier layer, said vapor barrier layer and said adhesive layers being effective to substantially eliminate the spread of a fire in relatively close proximity to the under face of said roof deck.

3. A non-fire-supporting roof construction, comprising a roof deck of a structural character which permits communication between opposite faces thereof in the event of a fire therebelow and in relatively close proximity thereto, an insulating layer having a surface area of a size to substantially completely overlie said roof deck, said insulating layer being provided with a water-proofing upper surface, a non-fire contributing vapor barrier layer which also has a surface area of a size to substantially completely overlie said roof deck, said vapor barrier layer consisting essentially of polyvinyl chloride in sheet form and being located between said roof deck and said insulating layer and being effective to substantially eliminate the spread of a fire in relatively close proximity on the under face of said roof deck, and securing means for said insulating layer and said vapor barrier layer, said securing means comprising a non-fire contributing adhesive layer, containing a chlorinated solvent, on at least one of the faces of said vapor barrier layer.

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4. A non-fire-supporting roof construction, comprising a roof deck of a structural character which permits communication between opposite faces thereof in the event of a fire therebelow and in relatively close proximity thereto, an insulating layer having a surface area of a size to substantially completely overlie said roof deck, said insulating layer being provided with a water-proofing upper surface, a non-fire contributing vapor barrier layer which also has a surface area of a size to substantially completely overlie said roof deck, said vapor barrier layer consisting essentially of polyvinyl chloride in sheet form and being located between said roof deck and said insulating layer, non-fire contributing adhesive layers on opposite faces of said vapor barrier layer, one of said adhesive layers securing said vapor barrier layer to said roof deck and the other adhesive layer securing said insulating layer to said vapor barrier layer, said vapor barrier layer and said adhesive layers being effective to substantially eliminate the spread of a fire in relatively close proximity to the under face of said roof deck.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,861,525

November 25, 1958

Frank W. Curtis

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the drawings, Sheets 1 and 2, for "F. W. CURTIS ET AL.", each occurrence, read -- F. W. CURTIS --; same two sheets of drawings, lower right-hand corner, strike out "PERRY E. MILLER", each occurrence.

Signed and sealed this 11th day of August 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents