Feb. 4, 1936. D. B. FEGLES 2,029,817

ROOF COVERING

Filed Dec. 5, 1932 2 Sheets-Sheet 1

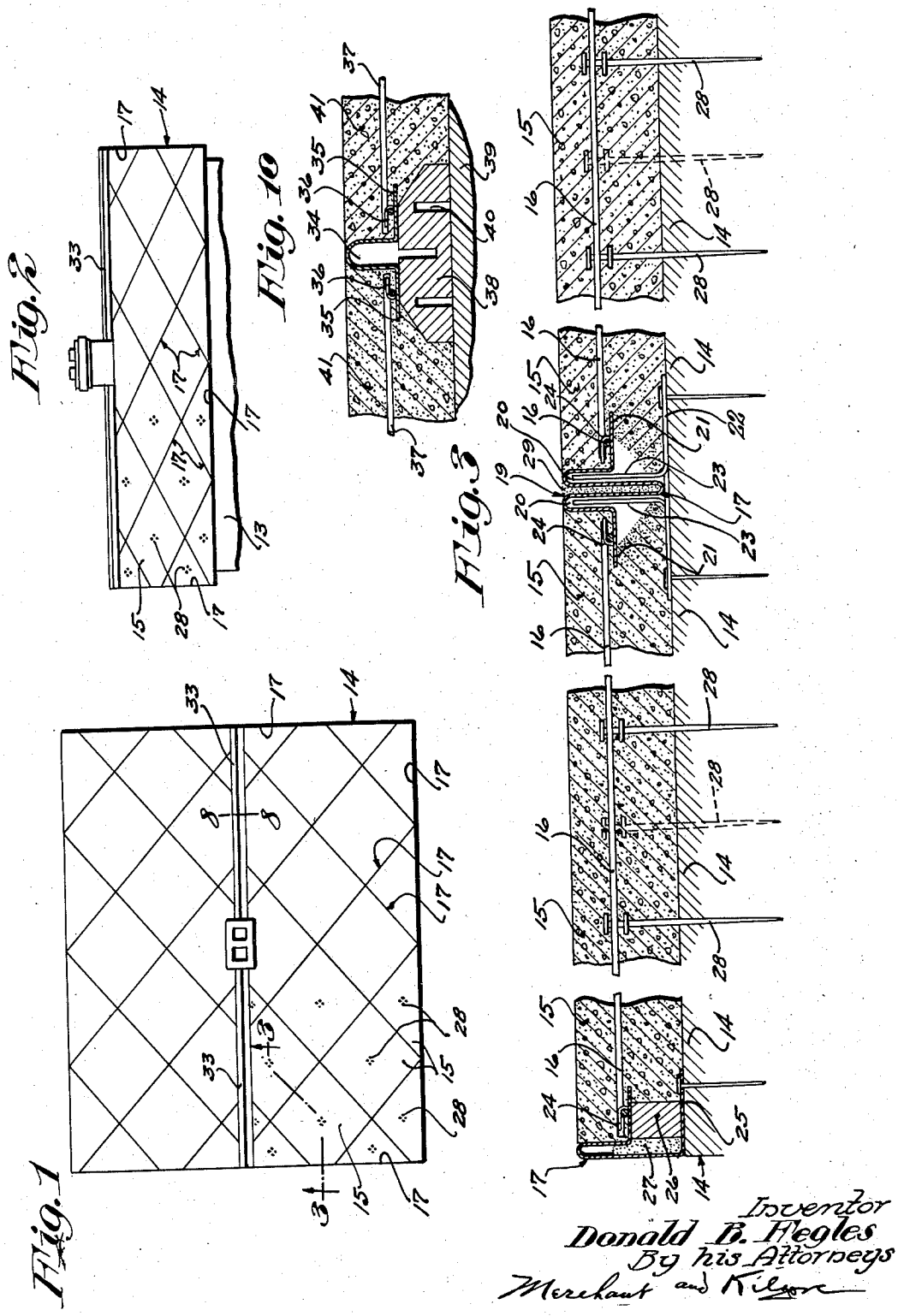


Fig. 1

Fig. 2

Fig. 10

Fig. 3

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Fig. 4

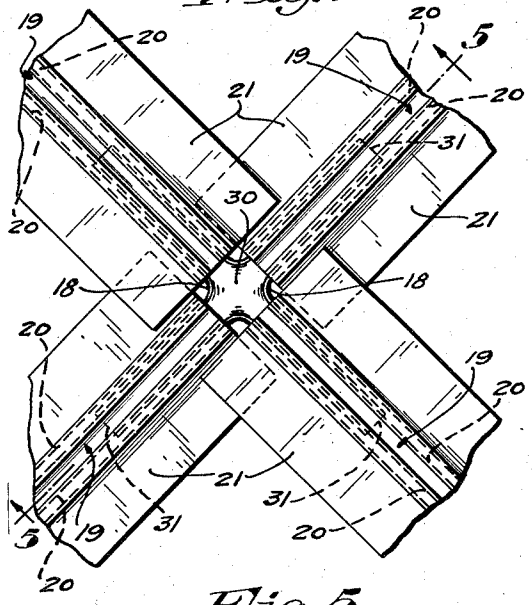


Fig. 11

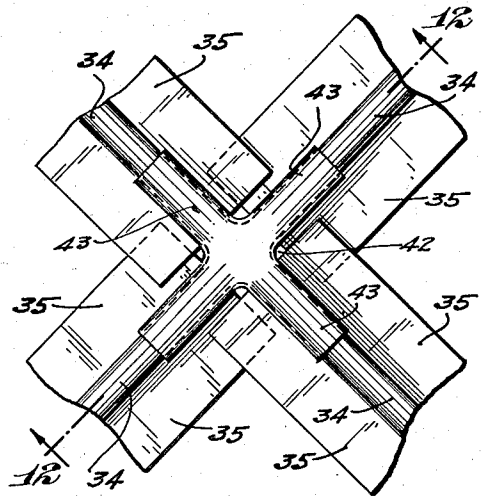


Fig. 5

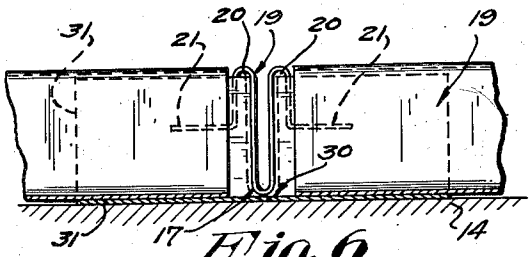


Fig. 12

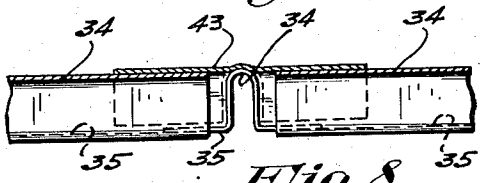


Fig. 8

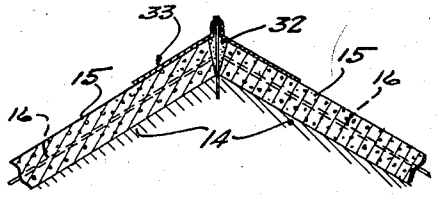


Fig. 6

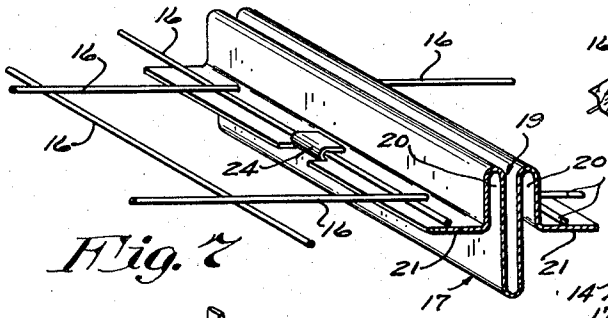


Fig. 7

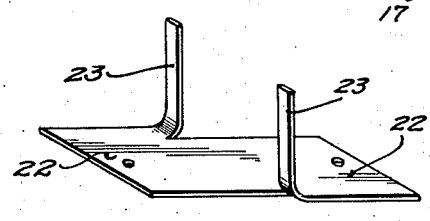
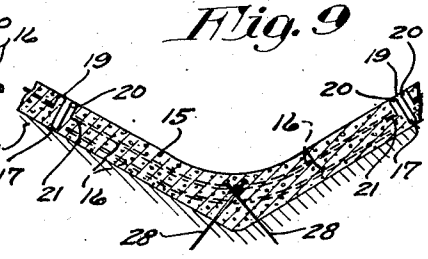


Fig. 9



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ROOF COVERING

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Application December 5, 1932, Serial No. 645,659

11 Claims. (Cl. 108—6)

My present invention relates to a roof covering for dwellings, warehouses, and in fact, all classes of buildings requiring weatherproof and fireproof surfaces.

Concrete slabs have been used in roof structures, but they have been cast over large areas, and their strength as flat plates used as structural elements. Under such circumstances it has always been necessary to cover these structural slabs with an impervious roofing material, because a large area of concrete develops small cracks through which rain water will percolate, especially in the presence of wind.

Pre-formed metal reinforced concrete or cement slabs also have been used in roof structures; but in such circumstances, the metal reinforcement in adjacent slabs has been connected after the slabs are put in place, and the joints between the slabs filled with a grouting, with a result that this structure, when completed, is in effect the same as that of a single cast slab covering a large area. Concrete or cement slabs also are used as a roof covering but are pre-cast in a form similar to tile and laid upon a roof in an articulate manner with overlapping edges.

The object of this invention is the application of a relatively thin sectional covering of cementitious material to an existing or new roof structure and of the approximate weight of other fireproof covering, such as tile or slate. This improved roof covering includes a plurality of joint strips, arranged on a roof to divide the same into a plurality of relatively small areas of any desired shape, and an individual slab of cementitious material cast or molded on the roof structure in each area. These individual slabs have a water-tight bond at all of their edges with the adjacent joint strip, which completely bound the same. Said joint strips are transversely expansible or contractible and permit individual expansion or contraction of the slabs without breaking the bond or water-tight joint between said strips and slabs.

If necessary to prevent the slabs from drifting from their original positions, the same are anchored, substantially at their centers, to the roof structure, and movement thereof, due to expansion or contraction, will be with respect to said centers and will prevent the joint strips from being crushed or otherwise rendered inoperative by such movement of the slabs.

Concrete shrinks in setting and thereafter expands and contracts with rising and falling temperatures. Without some ingenious plan to prevent it, concrete laid on a roof in a thin layer, of lateral dimensions equal to the ordinary residence, would, because of this expansion and contraction, crack and allow rain water to seep therethrough. It would do this even if reinforced, to any practical amount, with steel, unless it were freely suspended which, of course, is wholly impracticable. To prevent these cracks, the lateral dimensions of each slab in my improved roof covering will be made so small that the accumulated resistance, due to friction between the slab and the surface on which it lies, will be less than the tension value of cement or the combined tension value of cement and steel reinforcement. The slab will, therefore, expand and contract without cracking, but the edge or marginal portions of the slabs will move laterally only a small amount and there will be continual widening and closing of the vertical space between adjacent slabs. This would, except for the introduction of the joint strips intimately connected to the slabs, allow rain water to run through the marginal spaces. Although the joint strips bend when distorted, they remain water-tight along their length. I also provide novel means for forming water-tight joints at the ends of the joint strips where their lines intersect.

To the above end, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a plan view of a dwelling having a gable roof on which the improved roof covering is laid;

Fig. 2 is a fragmentary side elevation of the dwelling and roof covering shown in Fig. 1;

Fig. 3 is a fragmentary view principally in section taken on the irregular line 3—3 of Fig. 1, on an enlarged scale;

Fig. 4 is a fragmentary plan view of certain of the joint strips at their lines of intersection;

Fig. 5 is a view partly in elevation and partly in section taken on the line 5—5 of Fig. 4;

Fig. 6 is a perspective sectional view of one of the joint strips and the attached metal reinforcement;

Fig. 7 is a perspective view of one of the combined spacers and supports;

Fig. 8 is a fragmentary detail view in section taken on the line 8—8 of Fig. 1, on an enlarged scale;

Fig. 9 is a fragmentary detail view showing the

improved roof covering as the same will be laid in a valley;

Fig. 10 is a fragmentary detail view principally in section showing another form of joint strip;

Fig. 11 is a fragmentary plan view of joint strips of the type shown in Fig. 10 at one of their lines of intersection; and

Fig. 12 is a view in section taken on the line 12—12 of Fig. 11.

The numeral 13 indicates a dwelling, as an entirety, with the exception of its roof structure 14, which is of the gable type. My improved roof covering, when applied to the roof of a new building, may be laid directly on the board-covering thereof, or when applied to the roof of an old building may be laid on the shingles or other covering thereof.

The improved roof covering consists of a relatively thin body of concrete or other cementitious material which covers the entire area of the roof structure 14, and which body comprises a multiplicity of individual slabs 15, in each of which, as shown, is a metal reinforcement 16. These cementitious slabs 15 are spaced apart at their opposing edges or margins to permit independent expansion or contraction thereof. The slabs 15 on a given side or surface of the roof structure 14, are, as shown, in the same plane. Joint strips 17 are interposed between the spaced edges of the slabs 15 and have intimate contact therewith to form water-tight joints therebetween. These joint strips 17 are transversely expansible or contractible with the slabs 15, are made in sections, and the ends thereof, at their lines of intersection, are spaced apart, see Fig. 4, which leave voids 18 which are filled, as will hereinafter appear. Each joint strip 17, except those at the outer edges of the roof structure 14, is formed from a single piece of copper or other suitable material which is folded to form a main channel 19 and an inverted channel 20 at each side of said main channel. Formed with the outer legs of the channels 20 are out-turned flanges 21 which are substantially midway between the top and bottom of the main channels 19.

The joint strips 17 are supported and held in place by combined spacers and supports 22, one of which is shown in Fig. 7. Each combined spacer and support 22 comprises a flat sheet metal body member having a pair of upstanding prongs 23 that are laterally and edgewise spaced. These combined spacers and supports 22 are secured to the roof structure 14 by nails, and their prongs 23 loosely extend into the inverted channels 20 with freedom to permit lateral movement of the legs of said channels and of the channels 19. The joint strips 17 at the bottoms of their main channels 19 rest on the combined spacers and supports between the prongs thereof.

The individual metal reinforcements 16 are primarily supported on the flanges 21 and held thereby above the roof structure 14. These metal reinforcements are attached to the flanges 21 by clips 24 cut and pressed from said flanges, see Fig. 6. By thus attaching the metal reinforcements 16 to the flanges 21, the outer legs of the joint strips 17 will move with said metal reinforcements during expansion or contraction thereof.

The joint strips 17, at the outer edges of the roof structure 14, are in the form of an inverted channel, and the respective flanges 21 are formed therewith, and supporting flanges 25 are formed with the outer legs of said strips. These flanges 25 rest on the roof structure 14 and are secured thereto by nails, see Fig. 3.

Loose filler strips 26, of wood or other suitable material, are interposed between the flanges 21 and 25 of the outer joint strip 17 with freedom for lateral shifting movement to compensate for expansion or contraction of the respective slabs 15. The space between the filler strips 26 and the outer legs of the respective joint strips 17 is filled with a roofing mastic 27.

Each slab 15 is attached, substantially at its center, to the roof structures 14 by an anchor 28, which, as shown, consists of four double-headed nails driven into the roof structure 14 with their tops slightly above the plane of the flanges 21. The purpose of anchoring the slabs 15 to the roof structure 14 is to prevent said slabs from drifting from their original positions and thus to save the joint strips 17 from being crushed or otherwise rendered inoperative. By thus holding each slab 15, movement thereof, due to expansion or contraction, will be with respect to its center, and movement of the attached joint strips 17 bounding said slab will be evenly distributed.

The main channels 19 are filled with a roofing mastic 29 of such consistency that it will remain plastic and permit movement of the legs of said channel during expansion or contraction of the joint strips 17. To form water-tight joints between the spaced ends of the joint strips 17, at their lines of intersection, cup-like body members 30 are placed in the voids 18 between the ends of said strips and said voids and members, filled with mastic 29 at the time the channels 19 are filled therewith. Each body member or connector 30 is provided with radial arms 31 in the form of channels in which the bottom portions of the main channels 19 are seated. At the time the voids 18 are filled with mastic 29, these arms at the ends of the joint strips 17 are also filled with the mastic. The telescoping portions of the joint strips 17 and the arms 31 are also of sufficient length to form water-tight joints, which prevent the seepage of water therebetween. The body members or connectors 30 and their arms 31 are preferably formed from the same material as the joint strips 17.

The longitudinal joint between the slabs 15 at the ridge of the roof structure 14 is filled with a roofing mastic 32 and said joint is covered by a sheet metal ridge strip 33 secured to the roof structure 14 by nails; and the legs of said joint overlap sufficiently with the roof covering to form weather-tight joints therebetween.

In some instances, in place of the body members 30, it might be desirable simply to place a plug of wood or other suitable material in the voids 18, prior to the pouring of the cementitious material on the roof structure, and thereafter to remove said plugs and fill the voids 18 with a roofing mastic.

In applying the improved roof covering to a roof structure, the joint strips 17 are laid on said structure to divide the same into a plurality of rectangles, squares or poly-sided figures of the desired transverse dimensions. It will, of course, be understood that features such as dormers, gables and the like will influence the lay-out of the joint strips. After the joint strips have been placed on the roof structure and held in place by the combined spacers and supports 22, the metal reinforcement will be placed in the areas formed by the joint strips 17 and supported at their margins on the flanges 21 and at mid-span by the anchors 28. These flanges 21 and anchors

28 primarily support the metal reinforcement 16 substantially midway between the upper surface of the roof structure and the tops of the joint strips 17.

The metal reinforcement 16 may consist of wire mesh, expanded metal or bars. After the metal reinforcement is put in place, the clips 24 are bent over the marginal rods of the reinforcement to attach said reinforcement to the joint strips 17; next, the voids 18 and channels 19 are filled with the roofing mastic 29; and finally, the cementitions material is poured on the roof structure in the areas bounded by the joint strips 17 and raked off so that the top thereof is substantially flush with the tops of the joint strips 17. This pouring of the cementitious material embeds the metal reinforcement 16, flanges 21 and anchors 28 therein. The upper surface of the cementitious material, before the same sets, may be finished to give any desired effect and it also may be of any desired color.

Fig. 9 shows a valley in which the improved roof structure is laid.

In this section of the roof structure due to its peculiar shape the metal reinforcement 16 is arranged in upper and lower layers and the metal reinforcement 16 in the upper layer is held at the bottom of the valley by the respective nails 28.

Referring now in detail to the invention, as shown in Figs. 10, 11 and 12, the structure is the same as that just described except that a simpler and less expensive joint strip is used. This joint strip 34 is in the form of an inverted channel having on the lower edges of its legs, out-turned flanges 35 from which clips 36 are cut and pressed for attaching the metal reinforcement 37 thereto. The spacer and support 38 for the joint strip 34 is, as shown, a strip of wood nailed to the roof structure 39 and longitudinally grooved both on its top and bottom at transversely spaced points, as indiacted at 40. The object of thus grooving the combined spacer and support 38 is to prevent the same from warping and also to permit the same to be compressed during expansion of the slabs 41.

The voids 42, between the ends of the joint strips 34, at their lines of intersection, are closed by a pressed metal connector cap 43 in the form of a cross, the arms of which are channel-shaped in cross-section and fit over and telescopically engage the joint strips 34.

What I claim is:

1. The combination with a roof, of a covering for the roof comprising sectional metallic joint strips on the roof dividing the same into a plurality of individual areas, the ends of the joint strips radiating from each corner of each area being spaced apart, each joint strip having a pair of legs laterally spaced apart, a slab of cementitious material cast in each area, and means for closing the voids between the ends of the joint strips at their lines of intersection, comprising connecting members having channel shaped arms telescoping with the laterally spaced legs of said joint strips, whereby each slab is free for expansion or contraction in all directions independent of adjacent slabs.

2. The combination with a roof, of a covering for the roof comprising sectional metallic joint strips on the roof dividing the same into a plurality of individual areas, the ends of the joint strips at their lines of intersection being spaced apart, each joint strip having a pair of laterally spaced legs, a slab of cementitious material cast in each area, and body members closing the voids between said ends of the joint strips, said body members having arms overlapping the joint strips.

3. The combination with a roof, of a covering for the roof comprising metallic joint strips on the roof dividing the same into a plurality of individual areas with the ends of the strips spaced apart, certain of the joint strips having main channels and inverted channels outward of the main channels, yieldable means closing the voids between the spaced ends of the strips and extending into and filling certain of the channels adjacent the ends of the strips, the outer legs of the inverted channels having outturned flanges that are spaced above the roof, and a slab of cementitious material cast on the roof in each area and embedding the respective flanges.

4. The structure defined in claim 3 which further includes spacers for the joint strips anchored with respect to the roof and having upstanding prongs that extend into the inverted channels with freedom to permit lateral movement of the legs of the channels.

5. A structure of the class described comprising joint strips having laterally spaced independently movable members, connectors for the ends of said strips each having a pair of similarly spaced members telescopically engaging the members of said strips and arranged to form a plurality of individual areas, and a slab of cementitious material cast in each of said areas and bounded on all sides by the respective joint strips and connectors, the joint strips radiating from each corner of each area being non-continuous and loosely associated with said connectors, whereby the joint strips and connectors bounding each area are capable of independent movement with the respective slab in expansion and contraction and whereby the contiguous inner members of the joint strips and connectors bounding each area are capable of independent lateral movement with respect to the slab in expansion and contraction and in respect to the outer members of the respective joint strips and connectors, and the adjacent slabs.

6. A roofing structure of the class described comprising joint strips each including a pair of laterally spaced legs, connectors for the ends of said strips each including a pair of similarly spaced legs telescopically engaging the legs of said strips to form a plurality of individual areas bounded by the contiguous legs of said strips and connectors, and means for securing a slab of cementitious material, cast in each area, to certain of said legs.

7. The structure defined in claim 6 which further includes metal reinforcement imbedded in each slab and connecting certain of said legs.

8. The structure defined in claim 6 in which certain of said legs are formed with laterally turned flanges adapted to be imbedded in the slabs and which structure further includes metal reinforcement imbedded in each slab and connecting certain of said flanges.

9. In a roofing structure, an expansion joint for adjacent areas of monolithic material, comprising joint strips each including a pair of laterally spaced legs, connectors for the ends of said strips each including a pair of similarly spaced legs telescopically engaging the corresponding legs of said strips to form therewith a plurality of individual areas, whereby the monolithic material filling adjacent areas is separated by the spaced legs of said strips and connectors for expansion and contraction in all directions.

10. In a roofing structure, an expansion joint for adjacent areas of monolithic material, comprising joint strips each including a pair of laterally spaced legs, said joint strips being arranged to form a boundary of a plurality of individual areas with the ends of the strips spaced apart, and yieldable means closing the voids between the spaced ends of said strips and extending into and filling the space between the ends of the legs thereof, whereby the areas of monolithic material may expand or contract in all directions from the approximate centers of said areas.

11. A roofing structure comprising a plurality of adjacent slabs of monolithic material, transversely and longitudinally yieldable means bounding the sides of each slab and providing an expansion joint between said slabs, and means individually anchoring each slab at its approximate center only to the supporting surface of the roof, whereby said slabs are held in predetermined fixed relation to each other with freedom for substantially uniform expansion and contraction in all directions from said centrally disposed anchoring means.

DONALD B. FEGLES.