Feb. 14, 1933. E. M. OLSON 1,897,327

ROOF STRUCTURE

Filed July 7, 1930

Fig. 1.

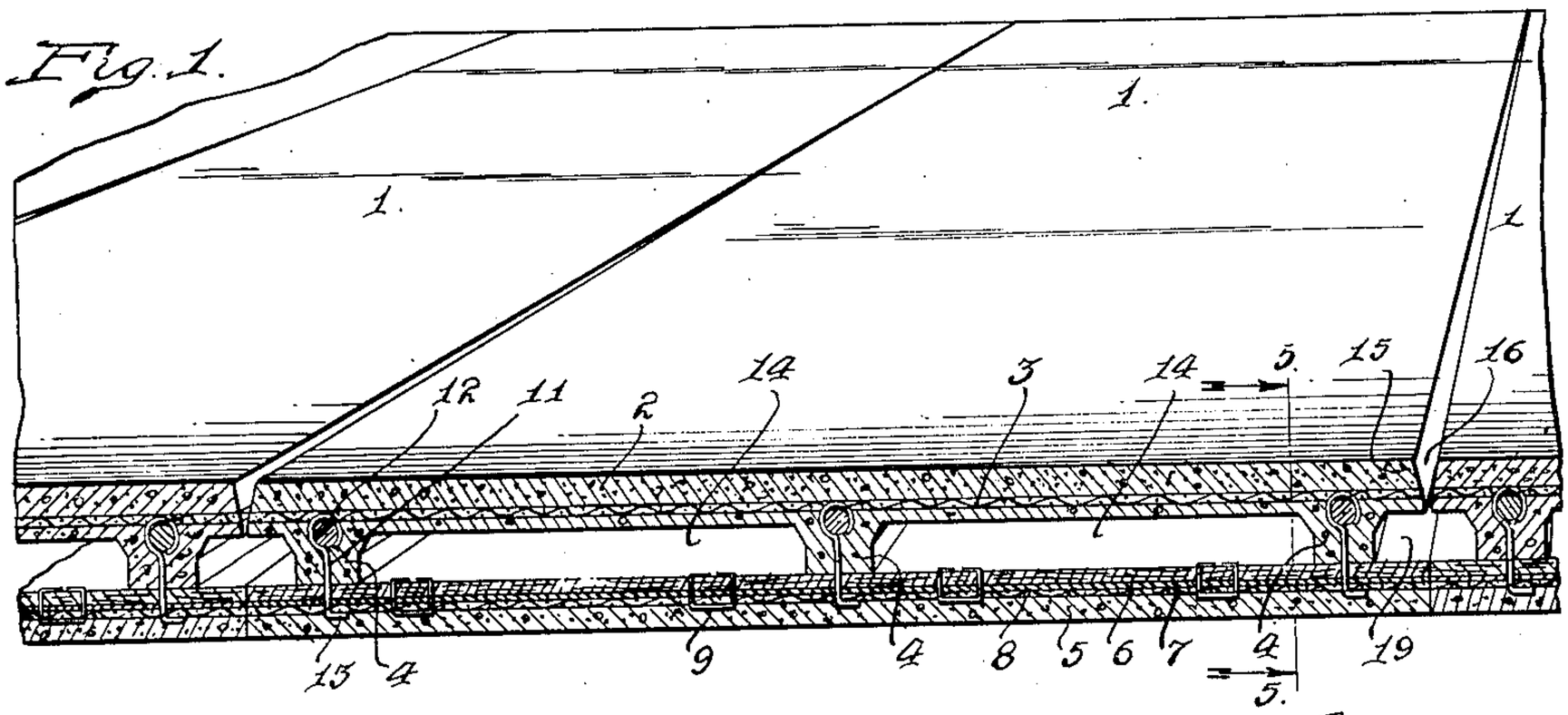

Fig. 2.

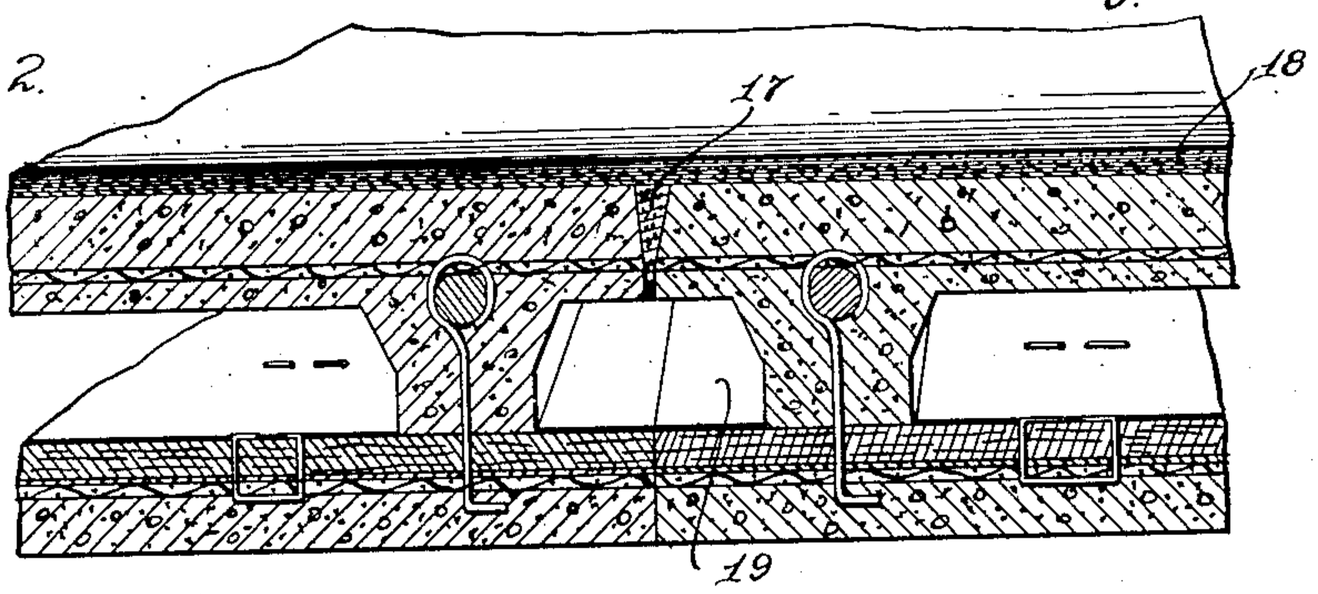

Fig. 3

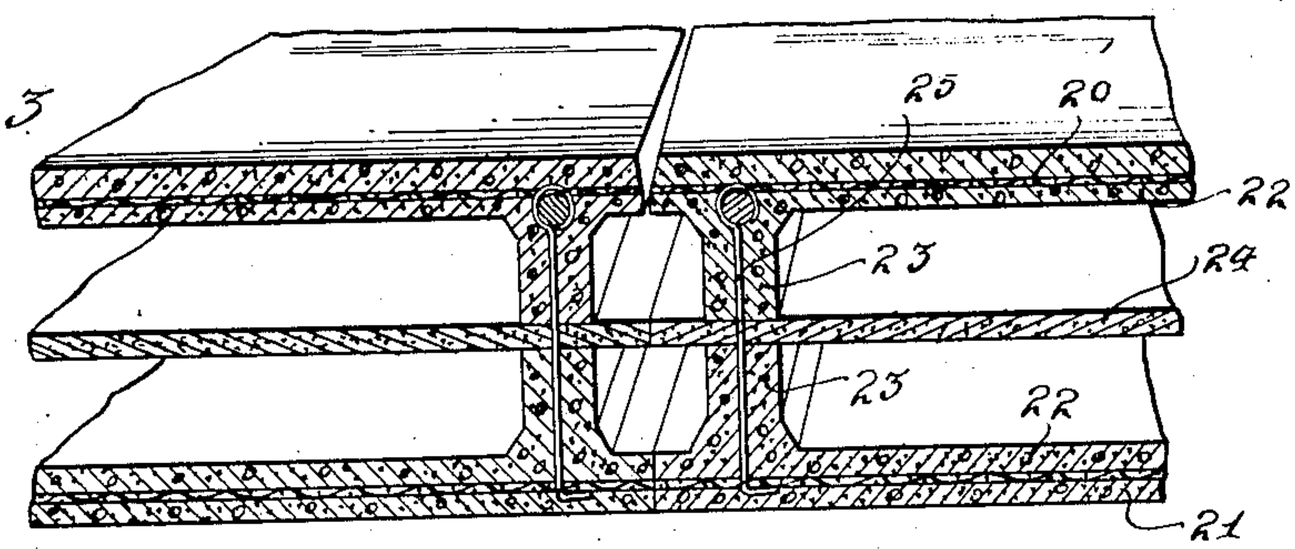

Fig. 4.

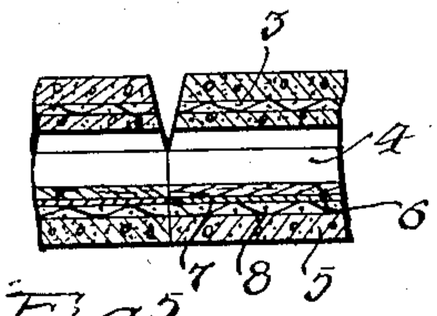

Fig. 5.

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ROOF STRUCTURE

Application filed July 7, 1930. Serial No. 465,806.

This invention is directed particularly to the provision of a roof and a preformed structural slab, a plurality of which form a complete roof. The construction is that of concrete; the arrangement is such that a double wall is provided which affords an intermediate dead air space for insulation purposes, and preferably, in conjunction with this a layer of insulating material which may be fibrous is employed. Provision is made to accommodate for expansion and contraction due to temperature changes, and particularly in the exterior portion of the slab and roof structure where the temperature changes are over a wider range than the interior. The structure while concrete is so designed as to minimize the total weight.

In the accompanying drawing:

Fig. 1 is a view in semi-perspective showing several slabs in position and illustrating them in section.

Fig. 2 is an enlarged sectional view showing a structure corresponding to that shown in Fig. 1.

Fig. 3 is a view similar to Fig. 2 showing a modified and heavier construction.

Fig. 4 shows a still further modified form illustrating a construction suitable for receiving plaster on the inner wall surface.

Fig. 5 is a section showing a joint between the ends of two slabs.

While the invention is concerned particularly with a roof slab and roof construction the invention is of a scope sufficient to cover other walls of a building, as for example, vertical walls, but for convenience the following detailed description will refer to the structure as a roof construction.

As shown in Fig. 1 a roof is made up of a plurality of preformed concrete slabs represented generally at 1. A slab is provided with an outer wall member 2 of concrete which may be reinforced as at 3. The wall member has spaced ribs 4. This wall member constitutes the outer portion of the slab while the inner portion is provided by a concrete wall member 5. Between the wall members there is disposed an insulation material in the form preferably of a fibrous composition as shown at 6. This fibrous composition may be relatively porous and provided on one or more sides with a covering layer of material such as paper, as shown at 17. Over the paper there may be a wire mesh or metal lath, as at 8, secured to the fibrous insulation material by stitches 9. The fibrous material may abut directly against the ribs 4 while the inner wall member 5 of concrete locks to the wire mesh or metal lath.

In order to hold the inner and outer wall members together, tie devices are provided which are embedded in each. For this purpose the outer wall may be provided with reinforcing rods and the tie devices may take the form of shaped wire lengths illustrated at 11, each having an eye 12 encircling a reinforcing rod 10, and a hook member 13. In making up a slab the outer wall member 2 may be cast with the hooks projecting therefrom, then the insulation material placed over the outer wall member which is accomplished by passing the wires 11 through the insulation material. Due to the fact that the end 13 is in the form of a hook this can be accomplished without causing a large hole in the material. Following this the inner wall member 5 is cast and it locks itself to the wire mesh. The layer of paper keeps the moisture out of the porous insulation material.

This construction forms a wall and provides dead air spaces 14. A roof is constructed of a plurality of these slabs placed next adjacent each other after the manner illustrated in Figs. 1 and 5. Preferably the edges of each outside slab member is provided with a tapering formation 15 so that when two slabs are placed next adjacent each other they cooperate to provide a V shaped opening 16. A suitable mastic such as an asphalt or tar is filled into these V shaped openings as shown at 17 (Fig. 2). Preferably over the entire roof structure a suitable waterproof covering is provided as at 18. This waterproof cover may consist of several layers of paper with intermediate layers of tar or asphalt composition which may be applied in heated condition. When the slabs are placed together further air chambers as at 19 are provided.

With a roof thus constructed a concrete formation sufficiently light in weight is provided and yet one which is of strong construction and has good insulation qualities. The dead air spaces serve to insulate as does also the fibrous interposed insulation material. The slabs may be made up in any appropriate size, and an advantageous and usual size is to make them approximately 2′ x 6′. The V shaped formation for receiving the mastic also affords for expansion space, and in this regard the apex at the V may not be entirely closed when the roof is set up thus to provide a space for expansion. As shown in Fig. 5 the V at the ends of the slabs extend to the lower edges of the ribs. Thus the outer wall members are spaced for expansion purposes while the inner wall members preferably abut directly against each other. Ordinarily the greatest temperature range is on the outside wall member while on the interior of the building the temperature is more or less uniform thus requiring less expansion compensation arrangement. Indeed, with the insulation provided, both comprising the dead air space and insulation material the expansion and contraction of the inner wall member will be relatively slight.

A modified form is shown in Fig. 3. In this form a heavier construction is shown. The outer wall member as at 20 is substantially the same as that of the outer wall member 2 of the form shown in Fig. 1, while the inner wall member 21 is similar or practically identical with the outer wall member 20 except that it is reversed. Each may be reinforced as at 22 and provided with ribs 23. Ribs are positioned to be located opposite each other and interposed between the ribs is an insulation material 24. The inner and outer walls may be tied together by means of tie members 25 which may be wire like devices, similar to those previously described. Fig. 4 shows another form wherein the outer wall members 30, which may be reinforced as at 31, has ribs 32. In this case, however, there is no concrete inner wall member as the inner wall comprises a sheet of insulation material of preferably a fibrous nature, as shown at 33, held to the concrete structure as by means of holding devices 34 and having on its inner surface an exposed wire mesh 35. Advantageously a layer of paper 36 may be between the wire mesh and the fibrous insulation material with the wire mesh held to the material by stitches 37. This form of structure is advantageous especially for walls in that plaster can be readily applied to the interior wall by putting it directly over the exposed wire mesh. The form shown in Fig. 3 is also useful for walls but it is of heavier formation than is the preferred type for roofs, as shown in Figs. 1 to 2, due to the fact that the inner wall member is of heavier construction. However, this form provides for double air spaces located on opposite sides of the fibrous insulation material and provides a very efficient insulating wall.

The slabs are advantageously made of concrete in which the sand or gravel concrete is preferably relatively fine; that is to say, there are no large stones in the mix and thus a very solid and compact and relatively nonporous finished article is provided. The tie members may vary as to form, and indeed, may be in the form of bolts or rods rather than the wire like member, although it is thought that the wire like members as shown are advantageous for the reason that they can readily be inserted through the fibrous insulation and also can be manufactured with very little cost. Another point which might be noted is that while the apex of the V shaped notches are as a rule not closed thus to permit of some expansion, yet the space is not sufficiently large to permit the mastic to escape.

As shown in the drawing, particularly in Figs. 1 and 2, one of the concrete members, which may be the outside one, may be relatively heavy; that is, relatively thick and strong so that it will support itself and other loads to which it may be subjected in use. The other concrete member may be relatively thin or light, obtaining much of its support from the first mentioned heavy concrete member through the instrumentality of the tying means. Thus while the thin concrete member may complete the slab surface and protect the insulation from exposure, it may not be relied upon for affording material strength as this may be provided by the opposite and heavier concrete member.

I claim:

1. A roofing or wall slab, comprising a concrete member having ribs running from one edge to another, another concrete member facing the first and positioned on the ribbed side of the first, a sheet of heat insulation material between the two concrete members, said sheet of material resting substantially flush on the second mentioned concrete member, and the ribs of the first mentioned concrete members resting upon the said sheet of insulation material, and means imbedded in concrete members and passing through the insulation material for tying all of said elements together.

2. A roofing or wall slab comprising a concrete outside member having integral ribs on its interior surface, a fibrous sheet of insulation abutting the ribs with dead air spaces formed between the insulation and the concrete, another concrete member cast upon said insulation material, and wire screen or mesh secured to the insulation material into which the second concrete member ties.

3. A roofing or wall slab comprising a concrete outside member having integral ribs

on its interior surface, a fibrous sheet of insulation abutting the ribs with dead air spaces formed between the insulation and the concrete, another concrete member cast upon said insulation material, wire screen or mesh secured to the insulation material into which the second concrete member ties, and means embedded in both concrete members and passing through the fibrous insulation material for tying all of said elements together.

4. In a concrete construction for a wall or roof, two separate slabs of concrete with an interposed sheet of insulation material, wire like members embedded in the concrete members and passing through the insulation material, said wire like members having an eye formation at one end and a hook formation at the other adapted to pass through the insulation material, and reinforcing means in one of the concrete members over which the eye like formation at one end of the wire like members fit.

5. A roofing or wall slab comprising a concrete member having ribs on its inner surface, another concrete member next adjacent the ribbed surface, a sheet of insulation material between the two concrete members, means passing through the insulation material to tie the two concrete members together, the second mentioned concrete member having edges substantially perpendicular to its exposed face so as to substantially abut corresponding edges of a next adjacent slab, the edges of the first mentioned concrete member being angularly disposed so as to form a notch when placed adjacent another slab for the reception of a mastic.

6. A roof construction comprising, a plurality of concrete slabs composed of inner and outer concrete members with an interposed sheet of insulation material, the edges of the outer concrete members being angularly disposed so that the cooperating edges of adjacent slabs form notches, a mastic in the notches for sealing the point between adjacent slabs, and a waterproof covering over the slabs.

7. In a roof or wall construction, the combination of an exterior concrete member provided with ribs, a sheet of fibrous insulation material abutting the ribs, a wire screen or mesh secured to the insulation material on its inner surface adapted to receive and key to the insulation material a layer of concrete, plaster or the like.

8. In a roof or wall construction, the combination of an exterior concrete member provided with ribs, a sheet of fibrous insulation material abutting the ribs, a wire screen or mesh secured to the insulation material on its inner surface adapted to receive and key to the insulation material a layer of concrete plaster or the like, and means passing through the insulation material for tying the same to the concrete member.

9. A structural slab of concrete or the like comprising a member of cementitious material provided with ribs, a sheet of insulating material laid over the ribs and forming with the cementitious member air chambers between the ribs, another member of cementitious material laid over the insulating material and keyed thereto, and means embedded in both cementitious members and passing through the insulating material for tying said members together in one structural unit.

10. A structural slab of concrete or the like comprising a concrete outside member, an intermediate layer of insulating material comprising a sheet of insulating material disposed next adjacent the outside concrete member, said outside concrete member and insulation material having portions disposed in direct contact with each other, an inside member of concrete or the like cast upon the insulation material on the opposite side thereof from the outside concrete member and lying substantially flush against the same, and tying means embedded in both inside and outside members and extending through the insulation material for tying all of said elements together.

11. A structural slab of concrete or the like comprising a relatively heavy concrete member, insulation material comprising a sheet of insulation disposed along one face of the said concrete member, and said concrete member and sheet having portions lying flush against each other, a relatively thin member of concrete or the like lying substantially flush against the insulation on the side opposite the first mentioned concrete member, and means embedded in both concrete members and extending through the insulation for tying all of said elements together and for sustaining the relatively thin second named concrete member from the relatively heavy first mentioned concrete member.

In testimony whereof I affix my signature.

EDWARD M. OLSON.