The present invention relates to a precast slab of set cementitious material with which is incorporated an insulating insert either for heat or sound, and a deck in which such slabs are used. In applying insulation of the above type to buildings already erected, some difficulty is experienced in that such material is usually of a more or less delicate or friable nature, readily broken or mutilated. Hence, its application to such surfaces necessarily involves careful handling, which means highly skilled workmen, and high breakage loss.

If insulating material in the form of porous compositions such as gypsum or concrete are applied as a plaster to walls or ceilings, difficulties likewise arise in that the material must be carefully controlled in mixing or processing, and several coats must be applied because such compositions will not stay on the walls or ceilings evenly and this involves the use of expensive scaffolding material, forms and the like.

It is one of the principal objects of this invention to provide a slab of the precast type, that is factory made, to which insulation both from heat and/or sound may be applied either during the making of the slab or at some time subsequent thereto but prior to installation. Such a procedure has distinct advantages in that no scaffolding or forms are necessary on the job inasmuch as the insulation is put in place along with the slab in the erection of the building. The fact that the entire object is factory made facilitates its manufacture with the least amount of handling and hence initial costs are kept at a minimum.

It is another object of the invention to provide a slab of the precast variety to which a relatively fragile sound insulating insert will be applied, the insert being completely within the confines of the slab itself so as to be entirely protected during handling and shipping.

Another important object of the invention is the provision of a slab of the precast type containing a section of insulating material of a nature which may be cast therein in the factory and which will be of such a composition as will form an effective bond to the slab without further treatment.

A still more important object of the invention is the provision of a precast slab having a relatively fragile sound insulating insert therein, the slab itself having metallic edges so that when such slabs are used as a roof or floor, the under side of the slab may form an effective ceiling for the room or space below, the metal edges of the slab being supported directly from the roof purlins or floor beams. As a result, neither the material of which the slab is made nor the relatively fragile insulating insert makes direct contact with the supporting element, but on the contrary the weight of the slab is borne principally by the metal edge.

Still another object of the invention is the provision of a slab of the above type in which the insulating insert has a surface area less than the surface area of the slab to which it is attached, that is, the slab proper will have a marginal edge of cementitious material surrounding the insert. This construction permits the entire insulating insert to be exposed free from interfering purlins or beams where such slabs are incorporated into a floor, ceiling or roof. As a result, such insert is readily accessible for repair, replacement or decoration.

It is another important object of the invention to provide a slab of the above type which may be used as floor, roof, ceiling or wall slabs with an insulating insert on either or both sides thereof, as a single slab or as two slabs facing each other or back to back.

To this end the invention contemplates a slab of set cementitious material of which gypsum is typical, either with or without fillers or admixtures such as wood chips, fibers or the like, having a channelled face. This channel may extend substantially the entire length and width of the slab or it may be interrupted by cross ribs so that there will be several channels or depressions in a single slab.

It is proposed in one form that a porous composition, that is, a composition of set material having bubbles or pores therein, either communicating or non-communicating, be used as a filling for this cavity, either to completely fill the channel or depression or cast separately, cut to proper dimensions and inserted into the cavity so that the surface of the insert is substantially flush with the surface of the slab face within which it is contained, leaving an air space between the bottom of the cavity of the slab and the back of the insulating insert. Where such porous composition is of material involving the use of gypsum, it may be readily bonded to the precast slab of gypsum without any additional attention being paid to securing means, that is, the gypsum itself may first be cast and then either before or after drying the same the porous composition poured therein, the two being permitted to set and bond together.

In still another modification the insulating in-
srt may take the form of a more or less rigid sheet of material of which Celotex is typical. Where sheet material is used, such as either Celotex or the cast slabs of a porous composition as above described, it is contemplated that the sides of the slab constituting the cavity will be stepped or provided with a shoulder so that such inserts may be readily positioned within the cavity and secured there.

Where the slab face contains several such cavities and these cavities are separated by strengthening webs, the insulating insert may be confined to the individual cavities or may bridge such strengthening webs, in the latter case the webs terminating short of the face of the slab so that the web itself forms a spacer and backing for the insert which will assist in rigidly securing the parts together.

In all of the above cases it has been found helpful to provide a metal edging for the precast slab, which edging shall extend over three faces so that when the slabs are supported on the purlins, beams or the like, the metal covering will come in contact with the slab support rather than the gypsum itself. This, therefore, prevents any undue cracking or spalling of the gypsum material. It is likewise desirable that opposite metal members be provided with complementary parts such as a tongue and groove so that when two slabs are erected adjacent each other, their metal parts may interlock, not only to prevent undue separation of the parts under vibration but to cause a strengthening and supporting action between the various slabs, and particularly the ends thereof which occurs between beam spacings. This mating interlock may be provided on all four edges or only on opposite edges, as circumstances will dictate.

The invention further consists in the novel arrangement and construction of parts more fully hereinafter described and shown in the drawing.

In the drawing—

Fig. 1 is a plan view of a slab of this invention with the insert partially broken away.

Fig. 2 is a sectional view of a building construction involving the invention of Fig. 1.

Fig. 3 is a fragmentary sectional elevation showing a modified form of slab.

Fig. 4 is a sectional view of another form of insert.

Reverting now with particularity to the embodiments illustrated, a precast slab is shown at 1 in cross section in Fig. 2. This slab is intended for either wet or without cement and admixtures such as chips, fibers or the like, having a series of cavities 2 in one face thereof. Obviously this cavity may extend as a single depression over substantially the entire area of the slab face or it may be separated into a plurality of cavities such as shown in Fig. 1, in which six cavities occur separated by ribs 3.

In Fig. 2 the walls of this cavity are formed with a shoulder at 4, which permits the insertion of a heat and/or sound insulating section 5 thereinto, the bottom edge of the insert contacting with the shoulder 4. By choosing an insert of the proper thickness and suitably positioning the shoulder 4 during the manufacture of the slab 1, the parts may be standardized and assembled in the factory with a minimum amount of effort. Where desired the insert 5 may be secured to the slab by means of nails 6 or the like.

In this form shown in Fig. 2, the cavities in the face of the slab are divided laterally thereof by means of the rib 3 so that two cavities occur across the slab. In such case the rib 3 preferably terminates short of the slab face so as to form an additional base or support for the center portion of the insert 5.

Obviously, proportioning the slab thickness, a space may exist between the bottom of the cavity 2 and the back of the insert 5. This air space has been found to be of considerable advantage from the standpoint of insulation both for heat and sound. It will also be apparent that in some instances this air space may be cut down or adjusted to the desired extent by suitably proportioning the thickness of the top wall 7 of the slab 1 or the thickness of the insert 5, or both, as desired.

In Fig. 3 the shoulder 4 takes the form of a horizontal surface substantially parallel with the surface of the slab 1. This makes for a better support for the edge of the insert 5 where such is needed.

Fig. 4 illustrates a modified form of the invention in which the cavities 2 of the slab 1 are filled with insulating material 8 of a porous composition. This composition may vary in its ingredients, but those compositions disclosed in the patent to Sanford 2,114,048 of 1914 are typical. It is preferred, of course, that if the precast slab is made of gypsum or the like or predominantly of gypsum, that such porous composition shall likewise include sufficient cement gypsum or other material of a nature that when the porous composition is poured into the precast slab there will be a natural and effective bonding between the two bodies, making unnecessary any further fastening devices. Experience has found that for the best sound insulating effects the porous composition should be such that the pores therein are intercommunicating, said pores having substantial openings at the surface. This seems to produce an effect in which when sound impinges upon the surface thereof, it passes into the cavities or pores and due to their circuitous and tortuous nature, is trapped and lost or absorbed therein.

It will be apparent, of course, that the pouring of this composition presents no great difficulties as a factory product. It is true, of course, that porous compositions are of a nature and hence are easily broken or mutilated. The fact that the composition as shown in Fig. 4 has its surface flush with the surface of the slab, is a desirable circumstance for the outer edges of the members of a frame construction; and rigid gypsum effectively protect the more delicate material therein from damage. When such slabs are shipped from the factory to the job or handled on the job, they may be laid one on the other and there is no real danger of destruction or mutilation of the insulating material.

The sheet insulating insert of Fig. 2 may be of any desired nature such as the commercial Celotex now on the market, or it may even be made of a porous composition as described in connection with the insert 8 of Fig. 4, cast into slabs or cut into the form of slabs and inserted as a sheet into the depression of Fig. 2.

In all cases it has been found desirable to edge the precast slab with metal in order to give not only strength to the otherwise comparatively weak cementitious product, but also to serve as an interlocking means for contiguous slabs on the job and to prevent direct contact of the cementitious material with the supporting members such as purlins, beams or the like.
This protecting metal edge may take the form of an element 9 covering one edge of the slab and extending as a flange 10 over one face, the end 11 being turned down and embedded into the slab to prevent separation therefrom. The element 9 may also be provided with a tongue or the like 12 engageable with a corresponding groove 13 on the complementary metal member attached to the opposite edge of the slab. Obviously all of the edges of the slab may be thus provided, or only some.

In erection, reference is made to Fig. 2 in which slabs A and B as above described are interlocked together by means of the mating action of the metal members 9 and are supported from the beam or purlin 14. As shown, the slab proper contacts with the support 14 by a metal to metal contact, that is, flange 10 of the metal elements 9 is in direct contact with the flange of the beam 14. This prevents any undue crushing of the comparatively fragile inserts 5 which would be the case if that sheet extended completely over the entire face of the slab 1.

Due to this interlocking effect of the metal elements on adjacent slabs, an effective I beam results so that a single slab may extend well beyond two given beams or supports and the free end entirely supported and held by the interlocking engagement therewith of the surrounding slabs. This makes for a very effective construction, rendering unnecessary the special designing of the steel work for particular lengths of slabs or vice versa. The present slabs may, therefore, be erected at random without regard to beam spacing.

These inserts may be decorated or painted with any desired material which will not destroy the porosity thereof to such an extent as would detract from the efficient absorption of sound or prevention of heat transmission. Such paint or decoration may take the form of cold water mixtures or in fact any material which will not close the pores.

While in Fig. 2 the slabs have been shown as being placed with their insert side down, as for instance in the roof of a large auditorium, where the under face of the slab forms the ceiling thereof, yet obviously it may be desirable in some instances to place the slabs of Fig. 2 in an up-side-down manner on the beams 14, as for instance in the floor of a building. In such event a wood or other floor may be applied directly over the top of such slab without in any way disturbing the insert 5 and still maintaining the effectiveness thereof.

In like manner these slabs may be used in partitions erected vertically, with the insulation 5 or 8 at one side only, or a slab of double thickness having cavities on each side thereof. While similarly utilized effectively, or two slabs erected with their inserts facing each other. By suitably spacing such slabs, or even slabs without inserts, from each other, partitions or walls of any desired thickness may be had with the use of slabs of a standardized thickness. Obviously more insulating material may be inserted between such slabs if found necessary or desirable. It will be obvious, of course, that if during the course of time these inserts become damaged or inefficient by reason of the clogging of the pores, they may be readily replaced by simply taking them out and putting new inserts in the cavities. This may be done with the minimum amount of effort and without in any manner destroying or disturbing the slabs within which they occur. Inasmuch as the insulation inserts are of comparatively small extent, a large area need not be replaced in case of damage to a small part.

This is an important desideratum.

While the invention has been shown with particular reference to a specific combination, yet it is to be understood that the invention is not to be limited thereto but is to be restricted only by the scope of the claims.

I claim:
1. A precast slab of set cementitious material having a cavity in one face thereof and an insulating insert located in said cavity in which an air space exists between the slab body and the insert.

2. A precast slab of set cementitious material having a plurality of cavities in one face thereof, a web located between two adjacent cavities and insulation in each cavity and in contact with the face of said web.

3. A precast slab of set cementitious material having a plurality of cavities in one face thereof, a web located between two adjacent cavities and sheet insulation bridging a plurality of cavities.

4. A precast slab of set cementitious material having a plurality of cavities in one face thereof, a web located between two adjacent cavities and sheet insulation bridging a plurality of cavities and supported by said web.

5. A precast slab of set cementitious material having edge portions of greater thickness than a point intermediate said edges, a cavity between said edges, a shoulder between an edge and a cavity and insulation material seated on said shoulder and covering said cavity.

6. A precast slab of set cementitious material having edge portions of greater thickness than a point intermediate said edges, a cavity between said edges, a shoulder between an edge and a cavity and insulation material seated on said shoulder and covering said cavity, said insulation being also supported by said web.

7. A building construction including supporting elements, a deck supporting said series of precast slabs of set cementitious material each slab having a cavity in one face, insulation in said cavity, the surface of the sound insulation being flush with the slab face, those portions of the slab in contact with the supporting element being covered with metal.

8. An acoustical construction comprising a backing member having its front area formed to provide a multiplicity of cavities and an intervening cavity wall, and a facing of thin sheet metal covering said cavities and being secured to the front surface areas of the intervening walls of each of said cavities.

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