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H. C. SMITH

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BUILDING CONSTRUCTION

Filed Jan. 16, 1932

FIG. 1.

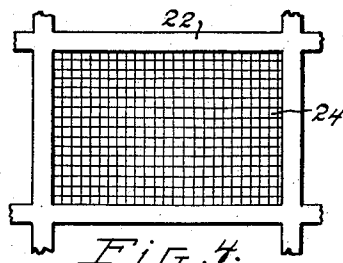
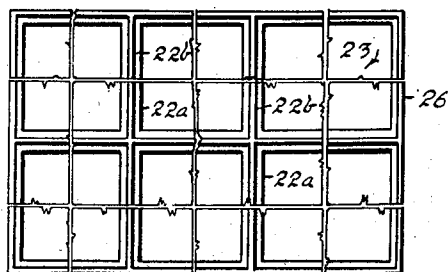
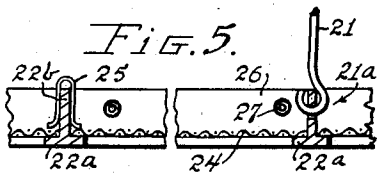
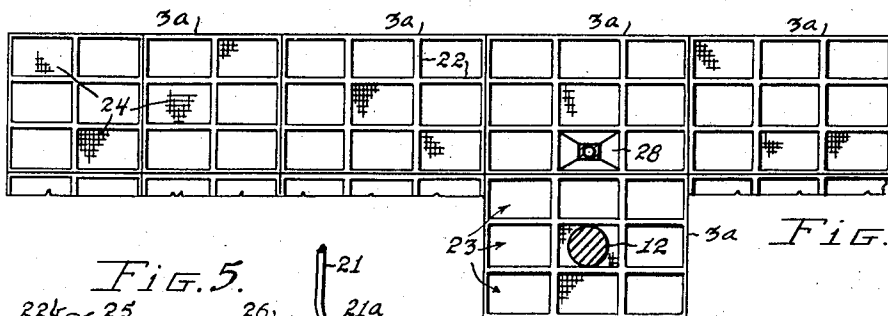
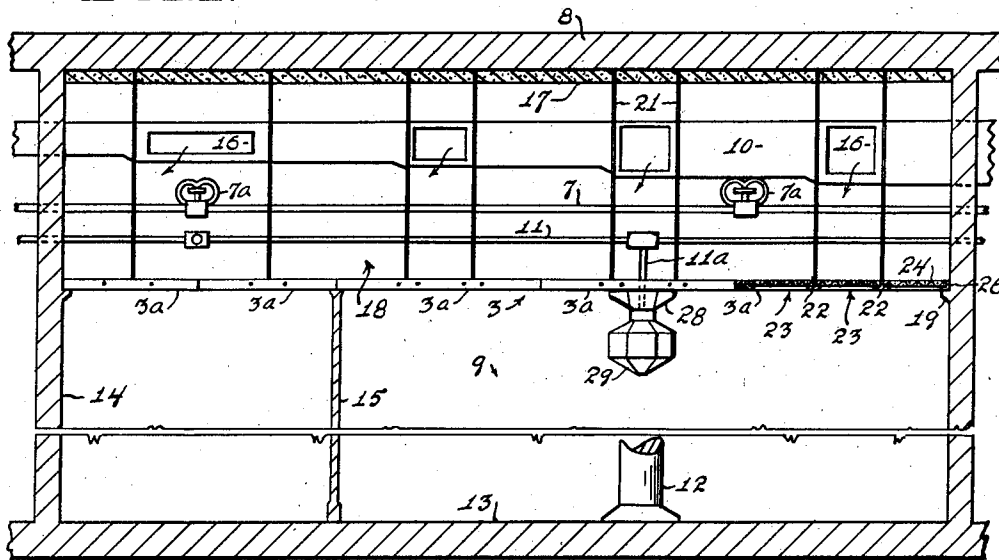


FIG. 3.

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BUILDING CONSTRUCTION

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The present invention relates to building construction, particularly walls and ceilings, and has for its primary object the provision of certain advantages with respect to such features as acoustical treatment; thermal insulation; ventilation; decoration; illumination; expediting construction; permitting several construction and finishing operations to be carried on at one time; and otherwise meeting many modern building requirements.

While the above named features are provided by my invention it is an individual object of the invention to provide improved acoustical treatment which is efficient, pleasing in appearance, reasonable in first cost, and particularly durable and fireproof.

In the art of acoustical treatments of interiors it has been found that the most efficient sound absorbing materials are usually those which are ill adapted to direct exposure either for practical purposes or for the sake of appearance. Unquestionably, the most efficient material, both from acoustical and thermal insulation standpoints is a coating of fibrous material applied directly to the wall or ceiling. Mineral wool blankets are among the preferred materials and such are usually contained between sheets of cheesecloth, chicken wire or other inexpensive coverings which do not interfere with the acoustical properties. The present invention provides for the use of mineral wool blankets or in fact any sound absorbing material regardless of appearance or suitability for direct exposure.

My invention contemplates the use of hardware cloth or other foraminous material which will allow air and sound waves to pass freely while giving a substantially opaque or non-translucent appearance to the usual observer. Such material, or any other reasonably priced material capable of passing sound waves without reflecting them appreciably, is of a flexible nature incapable of supporting itself over appreciable areas without sagging, or without presenting difficulties in application.

It is therefore another object of this invention to provide for employing any acous-

tical material, thermal insulation or the like to ceilings and the like while obscuring same from direct view with superimposed material or membrane of suitable appearance, rigidity and economy.

Another object of the invention is to improve the efficiency of any well known acoustical material.

Another object of the invention is to provide for preserving the appearance of a ceiling or wall where ventilating apparatus, illuminating apparatus, structural features, and the like, or any of them, normally interfere with the provision of efficient acoustical treatment, or with decoration. In other words: where a building has unsightly structural features, or surfaces unsuited to decoration; or exposed electrical conduits; or columns connecting floor and ceiling; or exposed ventilating ducts; or where accessibility of conduits, ducts, ceiling surfaces and the like is required by reason of monolithic construction, contemplated alterations, partitions and the like, it is advantageous and an advantage of this invention that such conditions may be maintained but may be obscured by means both practical and decorative.

With the foregoing objects and advantages in view, any one of which may be carried out alone or in conjunction with others, I have provided an improved interior construction; one practical form of which I will now describe in detail so that those skilled in the building arts will be enabled to practice same.

I have illustrated by the accompanying drawing, a room which has been treated acoustically in accordance with my invention, and in which room many objectionable features common to present building construction, have been overcome and turned to advantage.

In the said drawing;

Figure 1 is a vertical section of a room in which several features and advantages of my invention have been incorporated without any greater cost than if only the acoustical advantages of my invention were sought after.

Figure 2 is a fragmentary bottom elevation of that which I hereinafter term the screen.

Figures 3, 4 and 5, respectively, are larger scale views than Figures 1 and 2, respectively, showing a fragment of the screen in plan, bottom elevation, and cross section, respectively.

More specifically, 8 indicates the ceiling of a room or enclosure 9, and altho the invention is not confined to any type of construction the structure is here shown as monolithic, since such offers greater difficulties in decorative and acoustical treatments.

The room is shown as served by a passing air-conditioning or ventilating duct, 10, as well as by electrical conduits, 11, and fire-extinguishing sprinkler pipes, 7; while columns such as, 12, connect floor, 13, and ceiling, 8, at points remote from the side walls, 14. The interior is also shown as divided by a partition, 15, of the type which does not extend to the ceiling proper. The duct, 10, is provided with an outlet opening, 16, for air delivery, which may be high velocity without objection. The ceiling surface proper is undecorated and the electrical conduits and the like are not imbedded in the ceiling. All this provides economy in construction.

To treat the interior acoustically, the ceiling is shown as coated with a suitable thickness of insulation, 17, which may be ordinary mineral wool blankets, or any other suitable material which is readily attached to the ceiling as by cementing, gluing, nailing, wiring or any other well known expedient not illustrated.

Mineral wool blankets are preferable since the wool may be exposed directly to sound waves reaching it from below, and such material is highly efficient in sound absorption.

In conformity with a salient feature of my invention, a screen generally indicated at 3 is provided, held in spaced parallel relationship to the ceiling, below the ducts, pipes and the like; thus providing a space, 18, there between. The screen is co-extensive of the ceiling area and is here shown as supported partially by the partition, 15, over which it passes, as well as by moulding, 19, secured to the side walls, 14, and also by any well known hanger devices such as wires, 21, depending from the ceiling and connected to obscure portions of the screen as at 21A, so as to be accessible but out of view.

Altho any foraminous screen may be employed, I have illustrated a screen which has advantages particularly apparent to the architect and builder. The screen consists of a rigid skeleton comprised of substantially integral inverted T ribs, 22, arranged

to provide a plurality of openings, 23, etc. The horizontal bar 22a of each rib is disposed downwardly while the vertical bar 22b of the rib is uppermost. Thus around each opening the corresponding part of the bar 22a forms a ledge or shoulder encompassing each opening.

These openings, except in cases about to be cited, are each provided with a slightly larger rectangular insert, 24, of hardware cloth, of such mesh and wire size as to support itself suitably over the corresponding opening while resting upon the ledges provided and each insert is loosely disposed on the corresponding ledges except for clips, 25, employed to retain them from vibration or accidental upward movement.

In conformity with another object of this invention, as will be appreciated by those seeking to standardize on materials, sizes, and the like in building construction, said skeletons are provided by, and may actually be, metal window frames of the type now noted for their durability, pleasing appearance, standardized sizes and shapes, and fire-proof and rigid qualities. In the present embodiment I have shown a plurality of these metal window frames connected to provide the full ceiling screen. In this embodiment each complete metal window frame is shown as bounded on all sides by an integral rib of angle iron, 26, the abutting ribs of two adjacent frames being connected by bolts, 27, to provide an assembly of great rigidity. It is well known that these frames are to be had on the market in a wide variety of standard sizes which may be variously combined according to this invention to provide a substantially co-extensive rigid screen-skeleton to fit any standard dimension of ceiling, wall or other surface.

The clips, 25, are simply of inverted U shape snapped over the ribs, 22, to retain the screen inserts in place. Obviously, these inserts are very easily installed and may be cut from narrow widths of wire cloth which might otherwise be wasted; thus conserving material while enabling the builder to purchase same at lower rates. It will be apparent that the entire skeleton may be hung in place before the screen inserts are applied as a workman may reach thru on uncovered openings to install inserts in adjacent openings.

Where the columns occur, same pass thru a corresponding opening; the margins of such opening being formed by adjacent ribs which may be formed to closely embrace the column; the particular frame thru which the column passes being assembled around the column from smaller units, or a single unit split to fit around the column and then welded to original shape.

An electrical conduit, 11, is shown pass-

ing down thru a corresponding opening; the said opening being here shown as covered by an escutcheon plate, 28, or the like in keeping with the lighting fixture, 29, below.

5 Either before or after the job is completed, the frames and screen may be decorated as desired; it being understood that screening of the proper wire size and mesh may be decorated in keeping with other wall
10 surfaces of the room without reducing its total area of openings.

Ventilating air supplied thru the duct may be delivered into the space, 18, at high velocity without fear of objectionable air
15 noise or draft. The sound absorbing material above, and the air space between same and the screen, as well as the screen proper, all co-act to absorb air noises caused by the ventilating air.

20 Also, and that which is of decided advantage in air conditioning; the fine mesh of the screen and its resistance to air flow will cause the air supplied by the relatively small duct opening, 16, to distribute itself
25 quite evenly thruout the space, 18, and then filter slowly downwardly thru the screen cloth at low velocity and so provide equal distribution of air thruout the room and correspondingly even distribution of heating or cooling effect, as the case may be.

In the case of cooled and dehumidified air, much difficulty has heretofore been experienced in that relatively cold dehumidified air descends from the duct openings to
35 the floor without even distribution of ventilating and cooling effect thruout the room. In the case of my improved construction, cold air entering the space, 18, substantially horizontally will mix with warmer rising
40 air and will reach the proper temperature equilibrium before descending to the occupied levels of the room; this construction providing all the advantages of the usual expensive and costly reheating methods now
45 resorted to in air-conditioning work to prevent stratification of cold air. In other words, the screen provides a fine mesh grille of very great area. It will also be apparent to those skilled in the acoustical arts that
50 sound waves passing to the insulation at the ceiling will be absorbed as usual while passing thru the wire screening without being reflected thereby, particularly since the wire cloth inserts are not stretched to a taut
55 position. The clips retaining the screen inserts hold them down against any tendency to vibrate as a whole to certain tones.

It is also an advantage of this invention that the air space between the screen and
60 the insulation at the ceiling acts to absorb some of the sound waves even before they reach the insulation, while the small percentage of waves reflected from the insulation are further deadened in passing back
65 thru this air space and thru the screen. In

some air-conditioning practices the duct, 10, would be used as an exhaust duct, air being drawn from the room up thru the screen. Also, in some instances acoustical effects may be improved by drawing ventilating air upwardly thru the screen. In any event, my improved ceiling construction permits of flow of air in either direction.

At all times the sprinkler system is obscured but it is none the less effective if operation thereof is required. In such case, the great strength of the screen skeleton will well withstand any load imposed by water filtering thru it while the screening will more evenly distribute the water. Where there is appreciable heat being developed below the screen, the relatively large area of exposed screen-wire surface will result in a very rapid evaporation of water in the heated air and the room will be far more quickly filled with a flame suffocating blanket of steam or vapor than in the case of ordinary sprinkler practice.

In the case of a large room divided into a plurality of small offices by partitions such as 15, reaching only partially the ceiling proper, the lighting and ventilating system may be substantially the same as for one office or room and the air space, 18, is co-extensive of all divided parts of the original large room, and the partitions may be moved without interfering with the acoustical material or insulation. Sound created in one divisional part of the complete interior will not pass to an adjoining room in the appreciable volumes experienced with rooms ordinarily divided by partitions such as 15 since only a small portion of waves rising on one side of a partition can be reflected downwardly to the other side.

Even leaving aside all the other advantages mentioned herein, my invention provides a distinct and finished appearance to the ceiling of a room while permitting of treating the ceiling with acoustical material even of an unsightly nature. Of course, the same treatment herein described may be applied to side walls.

The screen forms a false ceiling composed of a skeleton frame acting to support inserts. For accessibility to spaces above the false ceiling, these inserts are removable while for acoustical, ventilation, fire-extinguishing and like purposes, the false ceiling is made foraminous to pass air currents, sound waves, and water, while the foraminous character of the inserts is preferably such as to render the space above the false ceiling inapparent to the casual observer.

In contradistinction to ordinary false ceilings which are substantially structural extensions of the ceilings proper, my improved ceiling may be comprised of several similar and interchangeable manufactured units as shown; each more or less independently

suspended while all co-acting to provide for the ready installation of a complete screen or false ceiling. Each unit is of such dimension that it may be readily installed
 5 and possesses a high degree of rigidity for a relatively economical distribution of metal.

The wires employed for suspending each unit are shown as passing thru corresponding
 10 apertures 32 in the vertical portions of those ribs which are remote from the extreme outer boundaries of the unit, so that strains are evenly distributed. By this method of suspension the entire false ceiling or screen may be installed devoid of
 15 sagging and without recourse to heavy girder construction in ceilings of large area; whereas otherwise greater weight and expense would be involved.

The present invention obviously provides a co-extensive space between the screen and the ceiling proper, devoid of all structural elements with the exception of the widely
 20 spaced suspending wires. In fact the present invention provides that which is in reality a suspended false screen or ceiling of suitable rigidity between points of suspension, altho otherwise possibly incapable of
 25 spanning a great area without intermediate suspension. The bolts employed need only be sufficient in number and strength to hold the units in proper juxtaposition and horizontal alignment without however being required to counteract sagging.

Those skilled in the art will recognize that in instances where a space between intrados, soffits and the like is to be thus screened, a single frame unit may be selected of such size as to span the space without intermediate suspension and in such case
 40 the close arrangement of inverted T ribs provided by the frame units will provide for holding the inserts in the advantageous manner previously described.

My invention may be applied to practically any building construction; at no needless expense where the building has been previously constructed, and without departure from usual construction in the case of
 50 new buildings.

Sound absorbing material is less expensive of application where the ceiling expanse is interrupted only by the suspension wires and obviously enough my invention
 55 provides a unique and inexpensive combination for carrying out the objects of my invention; said combination consisting in most cases of a large area of sound absorbing material, a plurality of metal frames each of smaller area and each frame providing a
 60 multiplicity of still smaller openings each covered by a foraminous insert.

While in the foregoing I have been specific as to certain constructions, materials,
 65 and arrangement of parts, and adaptations

to specific building conditions, such is done only by way of example and to show the flexibility of application of my invention to varying conditions and I do not limit myself to any specific combinations; my
 70 invention being of broad nature, and while thruout the specification and ensuing claims the term ceiling is employed, it is to be understood that the invention is equally applicable to other walls such as the side walls.
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I claim:

1. In a structure having a ceiling, a plurality of inverted T metal frame members angularly intersecting one another to provide a skeletonized false ceiling spaced below the ceiling proper and defining a multiplicity of openings each bounded by an encompassing ledge, foraminous ceiling obscuring inserts one for each opening and resting on the corresponding ledge; said
 80 false ceiling and inserts obscuring the space between the false ceiling and the ceiling proper.
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2. The structure as in claim 1 and further including sound absorbing material in said
 90 space.

3. The structure as in claim 1 and further including clips engaging the innermost parts of said inverted T members to retain said inserts.
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4. The structure as in claim 1 and further including, means obscured by said inserts connecting said frame members to the ceiling proper.

5. The structure as in claim 1 and further including; means obscured by said inserts connecting said frame members to the ceiling proper; said inserts removably lodged in certain of the said openings and said
 100 means accessible thru such openings.
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