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A. A. HEEREN ET AL

1,997,582

ACOUSTICAL BUILDING STRUCTURE

Filed July 30, 1932

Fig. 1

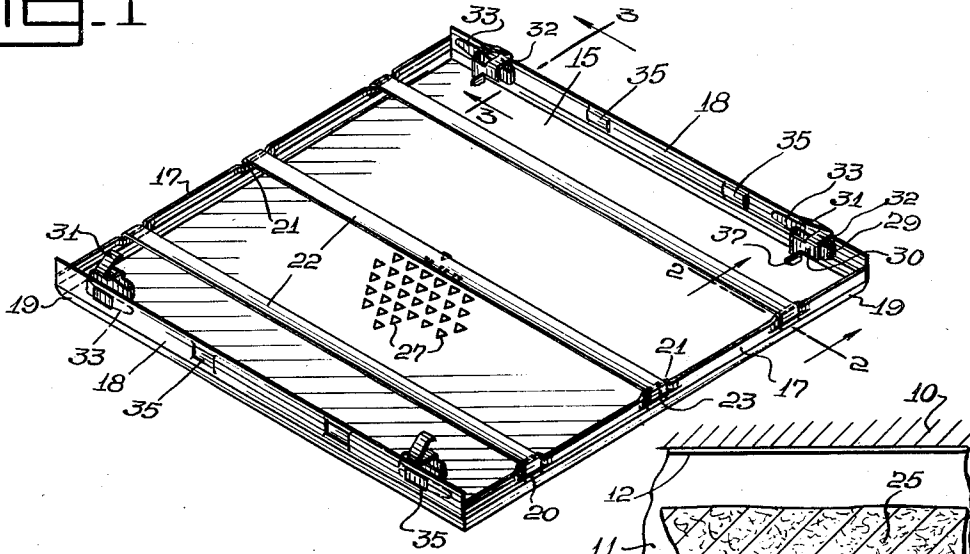


Fig. 3

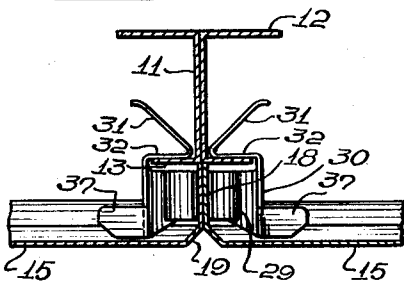


Fig. 2

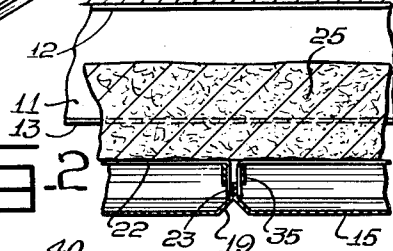


Fig. 4

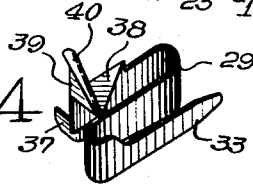


Fig. 5

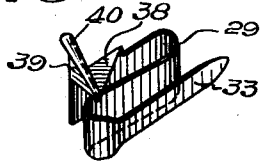


Fig. 6

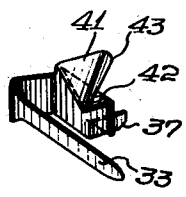
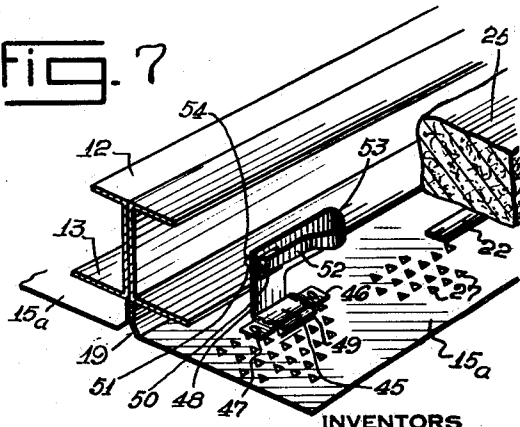


Fig. 7



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ACOUSTICAL BUILDING STRUCTURE

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22 Claims. (Cl. 189—85)

This invention relates to building constructions, and has reference more particularly to wall and ceiling constructions adapted for the correction of the acoustics in a building.

5 In the construction of the ceilings of buildings of the type employing a perforated metal membrane backed by sound absorbing fiber pads, it is desirable to have the erection operation as simple as possible in order to reduce the cost thereof. It is desirable to have the acoustical pads combined as a unit with the perforated metal membrane and so arranged that the resulting unit can be snapped into place on its supporting structural strip by a simple upward movement.

15 An object of this invention, therefore, is to provide an acoustical ceiling construction in which the erection is as simple and inexpensive as possible.

20 Another object of the invention is to provide an acoustical membrane and sound absorbing pad unit which may be easily snapped into place from below onto supporting strips; also to improve building constructions in other respects hereinafter specified and claimed.

25 Reference is to be had to the accompanying drawing forming a part of this specification, in which

30 Fig. 1 is a perspective view of one of our improved perforated metal membranes,

Fig. 2 is a sectional elevation through a ceiling construction employing the membrane units of the invention, taken on line 2—2 of Fig. 1,

35 Fig. 3 is a fragmentary sectional elevation through a building construction and shows details of the membrane unit and clip structure in sectional elevation as viewed when taken substantially on line 3—3 of Fig. 1,

40 Fig. 4 is a perspective view of a modified form of the attaching clips,

Figs. 4, 5 and 6 are perspective views of modified forms of attaching clips, and

45 Fig. 7 is a perspective, sectional view of a form of construction employing a further modified form of attaching clip.

50 In constructing our improved ceiling construction, we attach to a ceiling surface 10, a metal runner or rail 11 comprising two channels having their webs spot-welded in back-to-back position, said rails having upper outstanding flanges 12 and lower outstanding flanges 13. The upper flanges 12 may be attached to the ceiling surface 10 by nails, screws, detachable clips or any other suitable fastening device. The rails are attached to the ceiling surface 10 in spaced parallel rela-

tion with a center-to-center distance substantially equal to the width of perforated metal membranes 15 which are suspended below said rails in a manner to be hereinafter described.

5 The membranes 15 are preferably square, but they may be rectangular or any other desired shape. These membranes are provided on two opposite edges with outstanding flanges 17, and on the two other opposite edges with outstanding flanges 18 of somewhat greater width than the flanges 17. Beveled sections 19 connect the membrane 15 with the flanges 17 and 18. A plurality of severed slits 20 are formed in each of the flanges 17 and the section of metal above said slit is forced inwardly to form an offset strap 21. A plurality of bars 22 have outwardly extended flanges 23 formed one on each end of each bar, and said flanges extend downwardly on the outside of the offset straps 21 into the space between said straps and the remainder of the flange 17, so that said bars 22 form parallel supports for a fibrous pad 25 of acoustical sound absorbing material, such as mineral wool, hair felt or the like. It will be seen that the pad 25 is supported a substantial distance above the membrane 15 which aids somewhat in increasing the sound absorption efficiency of the unit when sound passes through perforations 27 formed in the membrane 15 to be absorbed by the pad 25. The perforations cover the entire area of the membrane 15 and may be triangular, round, square or any other desired shape.

55 In order to suspend the membrane 15 from the rails 11 we provide resilient clips 29 which are preferably S-shape. One leg 30 of the clip 29 is formed into an upwardly inclined cam surface flange 31 which is connected by latching shoulder 32 to the clip leg 30. Another leg 33 of the clip 29 is comparatively narrow and is arranged to slide into a retaining strap 35 which is struck out from one of the flanges 18 so as to form a retaining socket for the leg 33. The latching shoulder flange 32 extends over the S-shaped clip 29, and as the membrane 15 is moved upwardly, the cam surface 31 contacts with the edge of one of the rail flanges 13 so that the clip 29 is flexed sufficiently to permit the latching shoulder 32 to snap into place on top of the flange 13. In order to prevent undue flexure of the clip 29 during the upward movement of the membrane 15, an outstanding lug 37 is formed on the clip leg 30 and is arranged to bear against the inner surface of the membrane 15. Several of the attaching straps 35 are provided along the flanges 18 because where as the ceiling is erected close to a wall, it

may be necessary to cut one of the membranes short of its full width, in which case the clip flange 33 may be moved over to one of the other attaching straps 35.

5 The form of attaching clip shown in Fig. 4 is substantially the same as that shown in Figs. 1 and 3 except as to the latching arrangement. A latching shoulder 38 is preferably triangular in shape and is provided with an upstanding triangular shaped flange 39. An outstanding lip 10 40 is formed along the inclined upper edge of the flange 39, said lip 40 being arranged to bear against the edge of the rail flange 13 during the upward movement of the membrane 15. The form of clip shown in Fig. 5 is practically the same as that shown in Fig. 4 except that the guiding lug 37 is omitted. The form of clip shown in 15 Fig. 6 is substantially U-shaped and an upwardly inclined flange 41 is formed along the inner edge of a triangular shaped latching shoulder 42. The upwardly inclined edge of the flange 41 has an outwardly extending lip 43 so that the cam surface for engaging the rail flange 13 is formed at the junction between the flange 41 and lip 43.

25 In the form of the invention shown in Fig. 7, an offset strap or plate 45 has depressed ends 46 which may be secured to a membrane 15a by spot-weld 47 or the like, so that the plate 45 is spaced apart a slight distance from said membrane 15a. An attaching clip 48 extends vertically and has 30 an outstanding flange 49 which extends underneath the plate 45 so as to attach the clip 48 to membrane 15a. The upper part of the clip 48 is provided with an aperture 50 through which extends a latching lug 51, which extends transversely from a leg 52 which is connected to the clip 48 by a resilient loop 53. The latching lug 35 51 has an inclined cam surface 54 which is arranged to engage the lower edge of the rail flange 13 during the upward movement of the membrane into its final position below the beam.

We would state in conclusion that while the illustrated examples constitute practical embodiments of our invention, we do not wish to limit 45 ourselves precisely to these details, since manifestly, the same may be considerably varied without departing from the spirit of the invention as defined in the appended claims.

Having thus described our invention, we claim 50 as new and desire to secure by Letters Patent:

1. In an acoustical building construction, a building surface, hanger means connected with said surface, rails supported by said hanger means, perforated, metallic membranes forming 55 the exposed surface of the structure, and clips detachably secured to said membranes, said clips having latches adapted for snapping engagement with said rails.

2. A building surface characterized by being 60 fireproof, easily washable, and esthetically pleasing, said surface comprising perforated, metallic membranes having resilient clips detachably secured in place on the inner face of said membranes, said clips adapting said membranes to 65 be snapped into place against metallic support means.

3. A fire and vermin-proof acoustical construction for buildings, comprising a building surface, support means, a perforated, metallic, membrane 70 subsurface, and vermin-proof, sound absorbent material between said surfaces, said metallic membranes being provided with offset, spaced straps or plates, and resilient clips having transversely extending flanges extending below said 75 straps or plates so as to support said membranes

on said support means and adapting said membranes to be snapped into place below said support means.

4. In a building structure, a perforated metallic membrane surface construction comprising 5 supports provided with engagement means, and latching clips detachably secured to offset straps struck from the metal of said membrane, said clips having resilient means for snapping into engagement with said engagement means on said 10 supports.

5. A perforated membrane unit for building structures, comprising a planular face, transversely extending flanges formed on said membrane, and an individual resilient clip detachably 15 secured to one of said flanges, said clip having a latch adapted for snapping engagement with a building support.

6. A perforated membrane for acoustical building structures, comprising a planular face 20 blank, a separate resilient latching clip, and means associated with a transversely extending flange on said membrane providing a support for said clip.

7. In a perforated, metallic unit for building 25 structures, a planular face blank, the edges of said blank being turned upwardly to form sides, a clip having a flange detachably secured to one of said sides, and a resiliently held latch member formed on said clip for snapping engagement 30 with a structural member.

8. In a clip for supporting perforated metallic membranes, a body portion, a flange extending transversely from said body portion, said body 35 portion being provided with an aperture, a resilient loop formed on said body portion and having a latch member extending through said aperture, said latch member being arranged to detachably secure said membranes to a structural 40 member.

9. In a building construction, a supporting beam having an outstanding flange, a perforated, metallic membrane having upturned edges engaging the bottom of said flange, an offset plate 45 associated with said membrane, a resilient clip having an outstanding section engaging under said plate, a resilient section associated with said clip, said resilient section being provided with a cam surface inclined at an acute angle to the horizontal, a shoulder formed on said resilient 50 section below said cam surface, said cam surface being arranged to engage said flange after said membrane and clips are manually actuated in an upwardly direction so as to cause said resilient section to flex and permit said shoulder to seat 55 on top of said flange, thus supporting said membrane on said flange.

10. In means for supporting perforated metal membranes upon structural strips, a resilient clip 60 having outstanding sections arranged to engage said membranes, a cam surface and latching shoulder formed on said clip, said shoulder being arranged to latch over a portion of a strip after the cam surface is caused to engage said strip by upward manual actuation of said membranes, and a lug formed on said clip adjacent 65 said latch shoulder, said lug being arranged to engage the inner face of said membranes so as to prevent undue distortion of said clip during the latching operation.

11. In an acoustical building construction, a perforated, metal membrane having outstanding 70 flanges formed around the edges thereof, support bars connecting two opposite flanges, a fibrous pad supported on said bars, and latches carried 75

by two other opposite flanges for connecting said membrane to a structural strip.

12. A clip adapted for securing a membrane unit to a support in a building structure, comprising a body portion, a flange for frictional engagement with said unit, means for engaging said support, and a resilient portion adapted to flex when said clip is pressed against a support.

13. A clip adapted for securing a membrane unit to a support in a building structure, comprising a body portion, a flange for frictional connection to said unit, means for engaging said support, and a resilient portion intermediate said body portion and said means adapted to flex when said clip is pressed against a support.

14. In a membrane unit structure, a membrane having a substantial face area, upstanding flanges on the edges of said membrane and forming the outer boundaries of said membrane, the flanges of two opposite edges providing abutment faces for adjacent membranes and being wider than the remaining edge flanges, and offset strap means on said wider flanges for receiving clips for attaching said membrane to support means.

15. In a perforated membrane unit structure for acoustical purposes, a membrane having a substantial face area, upstanding flanges on the edges of said membrane and forming the outer boundaries of said membrane, the flanges of two opposite edges providing abutment faces for adjacent membranes and being wider than the remaining edge flanges, clips on said wider flanges for attaching said membrane to support means, and said remaining upstanding flanges being provided with means for receiving support bars to span said membrane and provide support for sound absorbent material.

16. A metallic membrane building surface, comprising individual units, means for supporting said units, resilient clip means for connecting said units to said supporting means, said clip means comprising a body portion and means for resilient engagement with said supporting means, and a strap member attached in spaced relationship to the inner face of a membrane unit for providing means for frictionally engaging said clip means.

17. In an acoustical building construction, a perforated membrane having flanges formed around the edges thereof, support bars connecting two opposite flanges, a sound absorbing pad supported on said bars, and latch means carried by two other opposite flanges for connecting said membrane to a support member, said respective flanges being provided with means for engage-

ment with said bars and latch means to hold the same in place.

18. A structure of the class described, comprising a membrane unit, an upstanding flange on said unit, and a plurality of offset straps at spaced intervals on said flange for receiving separate clip means for connecting said unit to support means, said straps being in greater number than the clips used so that after a portion of said membrane is severed there will be straps to receive clips on the remaining part.

19. A clip adapted for securing a membrane unit to a support in a building structure, comprising a resilient loop body portion, means for connecting said clip to a membrane, and means for engaging a support, the axis of said resilient loop body portion being in substantially perpendicular relationship to said membrane.

20. A clip adapted for securing a membrane unit to a support, comprising a resilient loop, means for engaging a support, and a flange for engagement with means on said membrane to connect said clip thereto, the axis of said resilient loop extending substantially perpendicularly to said membrane, and said flange extending transversely of said loop axis.

21. In a structure of the class described, a flanged support, a membrane unit below said support, a flange at the edge of said membrane, and a latching clip adjacent said membrane edge, said clip having a latch engaging over a flange of said support and forming the active connection for said membrane unit with said support, said latching means bearing against one face of said support flange and urging said membrane toward said support, whereby said membrane flange is brought into substantial contact with the other side of said support flange.

22. In a structure of the class described, parallel flanged supports, membrane units below said supports in edge-to-edge relationship, flanges at the edges of said membranes, latching clips adjacent said membrane edges, said clips having latches for engaging over the flanges of said supports and forming the active connection for said membrane units with said supports, said latching means bearing against one face of said support flanges and urging said membranes toward said supports, whereby said membrane flanges are brought into substantial contact with the other sides of said support flanges.

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