

July 14, 1959

S. E. SORENSON

2,894,291

SUSPENDED CEILING SYSTEM

Filed July 31, 1956

2 Sheets-Sheet 1

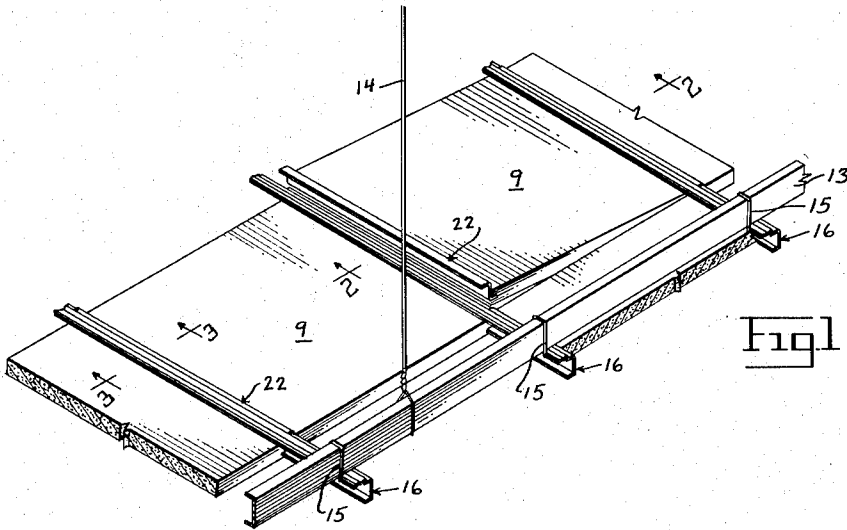


Fig. 1

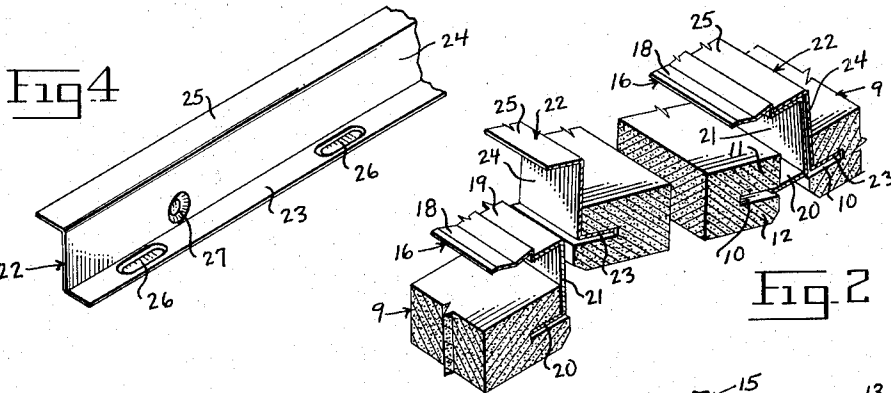


Fig. 2

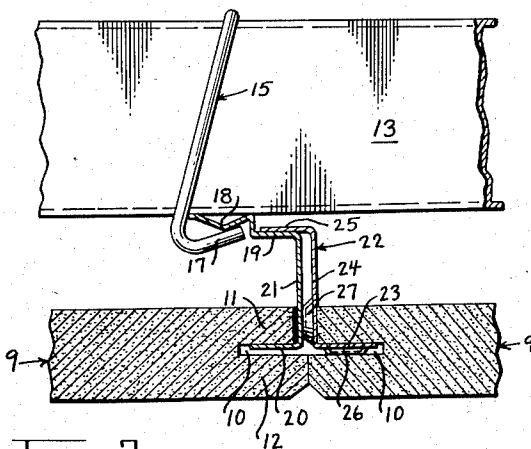


Fig. 3

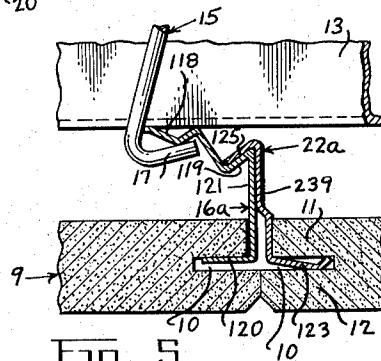


Fig. 4

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2 Sheets-Sheet 2

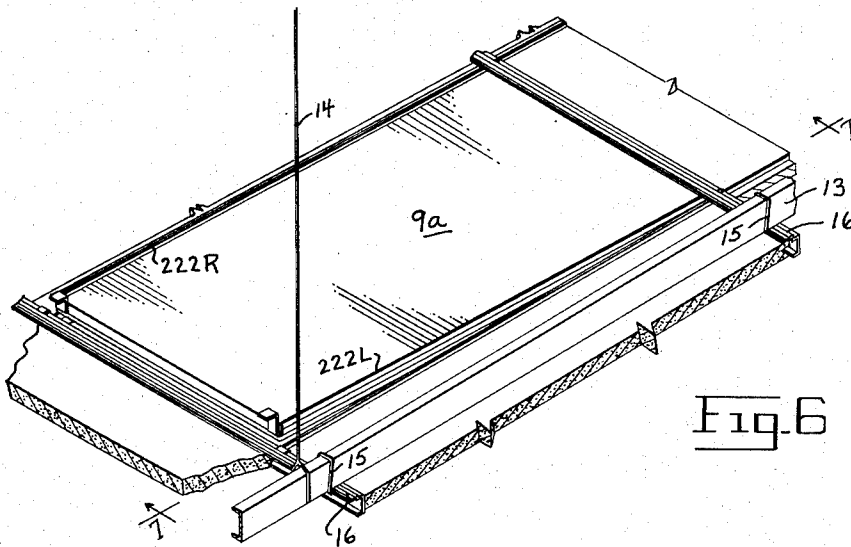


Fig. 6

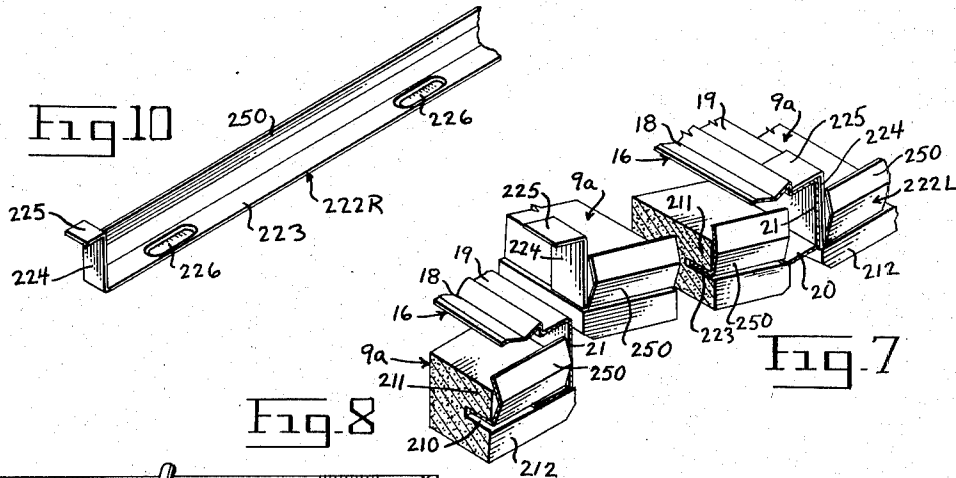


Fig. 10

Fig. 8

Fig. 7

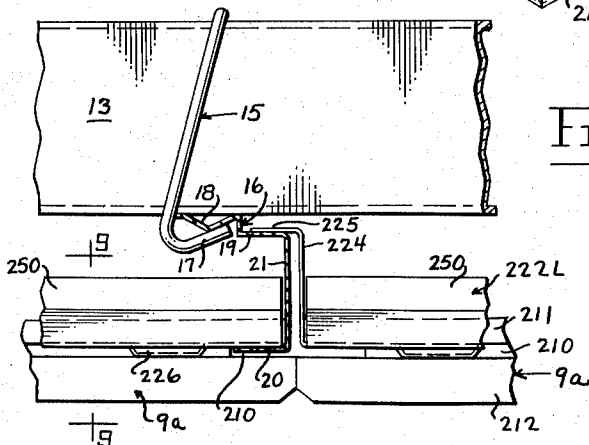
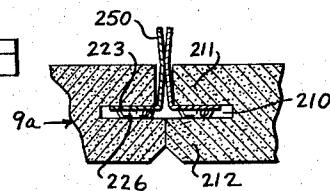


Fig. 9



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2,894,291

SUSPENDED CEILING SYSTEM

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Application July 31, 1956, Serial No. 601,262

23 Claims. (Cl. 20—4)

The present invention relates to suspended ceiling systems in which the expanded ceiling is made up of multiple panels such as acoustical tiles and the suspension means is completely hidden from view from below. This application is a continuation-in-part of my copending application, Ser. No. 464,431, filed October 25, 1954.

The present architectural trend is toward overhead application of utility lines in the space above a suspended ceiling. Access to power or telephone wires, plumbing, etc., in this space is obviously required on occasion. Also, it is commonly desired to shift the ceiling lights to better meet the requirements of new tenants. Thus, the advantages attendant upon providing individual removal of the ceiling tile without damaging them are considerable.

In the past the only systems which have permitted ready individual removal and replacement of suspended ceiling tile or panels have had a part of the suspension system exposed to view from below, the best known of these prior systems being characterized in that the edges of the tile rest on exposed flanges provided by grid members having a generally inverted T-section. The exposure of these flanges or, in fact, the exposure of any part other than the face of the tile itself is normally considered to be highly objectionable from an ornamental standpoint. Having the foregoing in mind it is a principal object of the invention to provide a practical ceiling suspension system which corrects this obvious defect in the systems commercially common today without unduly complicating the supporting grid and without necessitating the use of special tools.

Other more particular objects and advantages will, together with this general object, appear and be understood in the course of the following description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a top perspective view, partly in vertical section, illustrating my system in operation and with one tile partially removed.

Fig. 2 is an enlarged fragmentary vertical sectional view taken as indicated by line 2—2 of Fig. 1 and still in top perspective.

Fig. 3 is an enlarged fragmentary vertical sectional view taken as indicated by line 3—3 of Fig. 1.

Fig. 4 is a fragmentary top perspective view of one of the end hangers.

Fig. 5 is a view taken as Fig. 3 and illustrating a modified hanger and runner.

Fig. 6 is a top perspective view, partly in vertical section illustrating an alternative system for longer tiles in operation and with one tile partially removed.

Fig. 7 is an enlarged fragmentary vertical sectional view taken generally as indicated by line 7—7 of Fig. 6 and still in top perspective.

Fig. 8 is an enlarged fragmentary vertical sectional view taken along one of the side hangers in the ceiling

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installation and with the runner in transverse vertical section.

Fig. 9 is a transverse vertical sectional view through a side joint taken as indicated by line 9—9 of Fig. 8.

Fig. 10 is a fragmentary top perspective view of one of the side hangers.

Referring to the drawings it is seen that I have illustrated my invention as applied to the suspension of acoustical panels or tiles 9 each of which is provided in at least two opposite edges thereof with a groove or kerf 10. This kerf separates a top lip 11 from a bottom lip 12 and it will be noted that the tile has been backcut such that the top lip 11 has somewhat less projection than the bottom lip 12. Accordingly, when the juncture or joint of two abutting tiles is viewed in vertical cross-section, the opposed kerfs 10 and resulting horizontal gap between the shorter top lips 11 give a cutout of inverted T-shape for receiving suspension apparatus.

Before detailing this apparatus, it will be noted that my suspension system may utilize conventional channel headers 13, commonly known as lather's channel, which are regularly spaced in parallel relation across the ceiling space and are suspended from the overhead structure as by hanger wires 14. Clamped to and beneath these headers by wire clips 15 are runners 16 of a general channel configuration. The clips 15 are formed of single strands of wire and are of general U-shape for straddling a header 13. At its ends each clip has foot prolongations 17 bent back at an acute angle to the plane of the clip proper. As best shown in Fig. 3, these feet 17 are adapted to grip a generally V-shaped upper step 18 formed in runner 16 and press the edges of the step up against the underside of a header 13.

Continuing to further details of the runner 16, it is seen that each is of a general channel shape having a stepped upper flange formed by upper step 18 and a flat lower step 19, a lower flange 20, and an upright web or center section 21 extending between the lower step 19 and the lower flange 20. The latter is designed to fit into the kerf 10 along the back edge of a tile and engage the underside of the respective top lip 11 to support the back end of the tile. For a purpose which will be hereinafter brought out in course of describing the procedural steps incident to applying the tile to and removing the tile from their ceiling positions, the vertical width of the kerf 10 into which the lower flange 20 is received is intentionally greater than the thickness (gauge) of the flange. To support the opposite or front end of the tiles there are provided end hangers 22 of a generally Z-shape cross-sectionally speaking. Each of these hangers has a bottom horizontal flange 23 complementing the lower flange 20 of the runners, a central standing flange 24, and a top horizontal flange 25 directed oppositely to its bottom flange 23 for seating in the lower step 19 of the runners.

The bottom flange 23 of the hangers is downwardly dished at regular intervals as at 26 to increase the effective vertical thickness of the flange to that of the kerf 10 into which it is to fit. In this manner the hanger can have a relatively snug fit in the tile so that the hanger will not rock relative to the tile and so that the hanger and tile can be handled as a unit during application of the tile. In this regard, if the tile material is quite soft, it may be desirable to have the effective thickness of the bottom flange 23 of the hanger slightly greater than the thickness of the kerf to assure a snug fit of the hanger with the tile. The distance between the under face of the top hanger flange 25 and the upper face of the bottom hanger flange 23 is made equal to the distance between the upper faces of the lower runner step and the bottom runner flange. This assures that the upper faces of the bottom runner and hanger flanges 20,

23, respectively, will be at the same level when the top hanger flange 25 rests on the lower step 19. In this latter regard, the steps 18, 19 should have a vertical spacing exceeding the thickness of the top hanger flange 25 so that the latter is free to move lengthwise along the lower step 19 and the supporting runner 16 and beneath the channel headers 13 to which the runner is clipped. The central flange 24 of the hangers may be dimpled as at 27 in the direction of the upper flange 25 to aid in a proper spacing of the central flanges of the hangers and runners. Related to this spacing is the fact that for best stability it is desirable to have the central hanger flange 24 bear against the free end of the top lip 11 of the tile into which the hanger is fitted.

To erect my suspension system the headers 13 are first suspended as by the wire hangers 14 in parallel level relation at intervals normally from two to four tile widths. The runners 16 are then secured by the clips 15 to the leaders in crosswise relation thereto and separated the width of one tile from each other. With the headers and runners thus fixed in position, the next step is the actual installation of the tiles 9. It is normally the easiest procedure to insert the hangers 22 in the tiles first before raising them to the ceiling. To install a tile and hanger assembly it is first tilted at an angle with the hanger uppermost so as to clear the runners, and the assembly is then raised through the opening between two runners until the kerf at the lower edge of the tilted tile is on the same level as the bottom flanges 20 of the runners. For ease of description consider the front face of a runner as being the face of the central flange 21 from which the flange 20 projects and the back face as being the other face of the central flanges, and let the hanger end of the tile be termed the front end thereof. Also, let the runner which lies proximal to the elevated front end of the tilted tile now under discussion be termed the front runner, and the runner which lies proximal to the lower back end of the tile be termed the back runner. With the tilted tile elevated with its hanger as aforesaid, the applicator slips the kerf 10 of the tile's back edge onto the bottom flange 20 of the back runner as shown in Fig. 2. Then he allows the front end of the tile with its hanger to drop into place, the central flange 24 of the hanger sliding downwardly relative to the back face of the front runner until the hanger's top flange 25 comes to rest upon the lower step 19 of the front runner. In the course of this downward movement of the hanger-carrying front end of the tile, it will be apparent that the tile will have performed a swinging action with the fulcrum of the pivot being the lower edge of the top lip 11 at the back end of the tile. This fulcrum gradually moves rearwardly along the upper face of the lower flange 20 of the back runner as the tile pivots to a level position. The significance of having the vertical width of the kerf 10 greater than the thickness of the bottom runner flange 20 which is received therein will now be apparent, the greater width permitting the tile to partake of such pivotal action. The tile should then be adjusted horizontally so that the back edge of the bottom lip 12 at the back end of the tile will project rearwardly slightly beyond the back face of the back runner. This slight projection is shown in Fig. 3. At the same time the backcut of the overlying upper lip 11 must be sufficient to provide enough gap between the lip and the front face of the related back runner to permit the tile to be tilted at its front end should it be later desired to remove the tile by reversing the application procedure.

Referring to Fig. 1 it can be seen that any tile which lies in part beneath a header 13 must be first placed in position alongside of the header and then be slid sideways with its hanger along the lower step 19 of the front runner and with the top lip 11 of its back end along the bottom flange 20 of the back runner to bring the tile beneath the header 13.

Thus it is seen that if access is required to the space

above one of the tiles 9, the tile can be readily removed by reversing the installation procedure, and namely by pushing up the front or hanger-carrying end of the tile to elevate the related hanger 22 free of its runner 16 and then shifting the tile forwardly while in its tilted position so as to free the back edge of the tile from the bottom flange 20 of the other supporting runner. If the tile to be removed lies partially beneath one of the headers 13 it is necessary to first remove one of the tiles against which its side edges abut, shift the tile sideways from beneath the header, and then remove it as just described.

In Fig. 5 I have illustrated a modified runner 16a and end hanger 22a in operative position. Like the runners 16, the runner 16a is generally channel shaped having a bottom flange 120 fitting loosely in the kerf 10 at the back end of a tile, an upstanding central section 121, and a stepped top flange. At its outer or front side the latter has an upper step 118 which is the same as the step 18 and is gripped by the feet of a clip 15 to be held thereby against a header 13. Accordingly, it will be seen that the only difference between runners 16a and 16 resides in the bottom step 119 of the top flange, and namely in the fact that this step slopes downwardly from the top of the central section 121 toward the upper step 118 instead of being horizontal.

Hanger 22a is generally Z-shaped and at its upper end has a downwardly sloping flange or locking lip 125 complementing the sloped lower step 119 of the runner 16a. Continuing from this upper flange the hanger 22a has a section 239 which extends downwardly, then slopes backwardly away from the upper flange 125, and then continues downwardly to intersect a lower flange 123 corresponding to the lower flange 23 of hanger 22. This lower flange 123 is generally V-shaped with the vertex of the V being lowermost and offset toward the free back edge of the flange. The depth of the V corresponds to the depth of the dished portions 26 in the lower hanger flange 23, the purpose of the V being to fill the kerf 10 into which the hanger is inserted.

The manner of installation of the modified runner 16a and end hanger 22a is the same as that aforescribed for runner 16 and hanger 22, and it will be apparent that other changes in shape can be made in the parts of the system without departing from the basic teachings of the invention.

Some acoustical tiles are produced elongated such as a 12 x 24 inch size. Many makes of these tiles will unduly sag if only supported at their ends, but will support their own weight satisfactorily across their width. Such a tile has been designated 9a in Fig. 6 and is illustrated with a modified suspension system which will now be described. This modified system incorporates the same runners 16, clips 15, and headers 13, the change being the use of a pair of side hangers instead of an end hanger 22. Such a pair consists of complementing right and left hand members designated 222R and 222L, respectively. At their front ends these members have top flanges 225 for seating on the lower step 19 of a runner 16 in the same manner as flanges 25 of the end hangers 22. Extending downwardly from these top flanges 225 are central sections 224 corresponding to end hanger sections 24, and extending rearwardly from the latter are bottom flanges 223 which correspond functionally to end hanger flanges 23 in that they are fitted into the tile. For this purpose tile 9a has a kerf 210 extending therearound forming continuous top and bottom lips 211, 212, the former being backcut in the same manner as top lip 11 of tile 9. For clarity the long edges of tile 9a will be referred to as the sides and the short edges as the ends. Examining Figs. 6-9 it is seen that bottom flange 223 has a width no greater than the depth of kerf 210 and a length slightly less than the length of tile 9a. Furthermore, flange 223 desirably is downwardly dished at intervals to form cups 226 whose function

is to fill the kerf in the same manner as the dish portions 26 of the end hangers 22. To longitudinally strengthen the side hangers, the right and left hand sides of hangers 222R and 222L, respectively are provided with upstanding reinforcing flanges 250 which are joined to the respective side edges of the hangers' bottom flanges 223. Thus it is seen that these side hangers can be formed from a single sheet of material.

In preparing for the installation of tiles 9a the runners 16 are spaced apart the length of the tiles and clipped in place to the headers as before. A pair of side hangers is then inserted into the kerfs 210 along the side edges of the tile 9a to be applied and with the central standing sections 224 of the hangers resting against the front edge of the top lip 211 at the front end of the tile. The latter is then tilted with its front end upward and raised between the front and back runners by which it is to be supported. Then the back edge of the tile is eased toward the bottom flange 20 of the back runner to bring the rear end portions of the side hangers' bottom flanges 223 to rest on flange 20. The forward end of the tile is then lowered to bring the side hanger flanges 225 to rest on the lower step 19 of the front runner. During this lowering action the rear ends of the side hangers act as a pivot and at the same time work further onto the bottom flange 20 of the back runner to give longitudinal support to the tile. In this regard the vertical thickness of the kerf 210 must be sufficiently greater than the combined thickness of runner flange 20 and side hanger flange 223 to permit the pivotal action of the tile. The tiles 9a and their side hangers can be shifted sideways along the runners the same as tiles 9 and their end hangers to bring them beneath a header 13. As in the case of the end hangers, it can be readily understood that a tile equipped with side hangers is removed by reversal of its installation procedure.

Referring to Fig. 9 it is seen that the reinforcing flanges 250 of the side hangers are desirably ribbed outwardly in the opposite direction from the respective bottom flanges 223 so that there will be a line sealing contact at the joint between adjacent hangers. This sealing contact can be aided by slightly canting the top hanger flanges 225 so that the top flanges of each pair of side hangers tend to slope downwardly toward one another.

The advantages of the invention, it is thought, will have been clearly understood from the foregoing detailed description of the illustrated preferred embodiments. Minor changes will suggest themselves and may be resorted to without departing from the spirit of the invention, wherefore it is my intention that no limitations be implied and that the hereto annexed claims be given a scope fully commensurate with the broadest interpretation to which the employed language admits.

What I claim is:

1. In a ceiling suspension system, a runner having a bottom support flange and a top flange spaced thereabove and stepped to provide a lower step and an upper step, and a hanger completely located no higher than the uppermost extremity of said upper step, said hanger having a top flange resting on said lower step and a bottom panel support flange directed oppositely from said bottom support flange of the runner.

2. In a ceiling suspension system, a generally U-shaped runner having an upright center web and having a bottom flange and a top flange joining said web, said top flange being stepped to provide an inner lower step joining said web and an outer upper step, and a generally Z-shaped hanger having a top flange resting on said lower step and a bottom flange directed oppositely from said bottom flange of the runner.

3. In a ceiling suspension system, a runner having a bottom flange and a top flange spaced thereabove and stepped to provide a lower step and an upper step, said upper step being generally V-shaped with its vertex downwardly and said lower step being flat, and a hanger

having a flat top flange resting on said lower step and a bottom flange directed oppositely from said bottom flange of the runner.

4. In a ceiling suspension system, a generally U-shaped runner having vertically spaced top and bottom flanges, and a generally Z-shaped hanger having a top flange resting on said top flange of the hanger and having a bottom flange directed oppositely from said bottom flange of the runner, said bottom flanges of the runner and hanger having respective upper panel supporting surfaces which occupy the same plane, and said bottom flange of the hanger extending below said plane a greater amount than said bottom flange of the runner.

5. In a ceiling suspension system, a runner having a top flange with an uppermost surface defining a header engaging plane and said runner having a bottom flange spaced beneath its said top flange, and a hanger resting on said top flange and having a bottom flange directed oppositely from said bottom flange of the runner, said bottom flanges of the runner and hanger having respective upper panel support surfaces occupying a common plane which is parallel to said header engaging plane, and the overall thickness of the bottom flange of the hanger being thicker than the overall thickness of the bottom flange of the runner.

6. In a ceiling suspension system, a generally U-shaped runner having a standing central section extending between top and bottom terminal flanges, said top flange being stepped to provide an upper step along its free edge portion and a lower step merging with said central section, said upper step being concave downwardly along its length.

7. The structure of claim 6 in which the longitudinal side edges of said upper step define a plane which is parallel to said bottom flange.

8. In a ceiling suspension system, a pair of front and back parallel spaced runners each having a bottom support flange and a top flange spaced thereabove and stepped to provide a lower step and an upper step, and a hanger having a top flange at its front end resting on said lower step and located no higher than the uppermost extremity of said upper step of said front runner and having an elongated bottom panel support flange resting by its back end on said bottom support flange of said back runner.

9. The structure of claim 8 in which said bottom flanges of the front and back runners have respective support surfaces which occupy the same plane and in which said bottom flange of the hanger extends below said plane a greater amount than said bottom flanges of the runners.

10. In a ceiling suspension system, a pair of front and back parallel spaced runners each having an uppermost forwardly directed header engaging surface and a lowermost forwardly directed support flange spaced therebeneath, each of said runners having a shelf between its said surface and flange which is unobstructed above by other structure of the runner, and a panel assembly having hanger means projecting forwardly at the front thereof and resting on said shelf of the front runner, the forwardly projecting portion of said hanger means being completely located no higher than such shelf, said panel assembly having a loose tongue-and-groove interfit with said bottom flange of the back runner and covering the underside of such runner, the looseness of said interfit being sufficient to permit the front end of said panel assembly to be pivoted upwardly from said front runner through an arc large enough to allow the rear end of the tilted panel assembly to be freed of its said interfit with said bottom flange of the back runner.

11. In a ceiling suspension system, a generally U-shaped runner having an upright center web and having a bottom flange and a top flange joining said web, said top flange being stepped to provide an inner lower step joining said web and an outer upper step, a generally Z-shaped hanger having a top flange resting on said lower

step and an elongated bottom flange directed by its length oppositely from said bottom flange of the runner.

12. The structure of claim 11 in which a strengthening lip extends upwardly from one of the longitudinal side edges of said elongated bottom flange of the hanger.

13. In a ceiling suspension system, a generally U-shaped runner having vertically spaced top and bottom flanges, and a generally Z-shaped hanger having a top flange resting on said top flange of the hanger and having an elongated bottom panel support flange directed by its length oppositely from said bottom flange of the runner, said panel support flange of the hanger extending by its underside lower than said bottom flange of the runner and having its upper side higher than the latter said flange.

14. In a ceiling suspension system, a pair of front and back parallel spaced runners each having an upright web section and a forwardly directed bottom flange at the bottom of said web section, and a set of right and left parallel spaced hangers resting by their front ends on said front runner and each having an elongated bottom flange resting by its back end on said bottom flange of said back runner, and a panel formed with side kerfs receiving said bottom flanges of said hangers for support of the panel, said panel having its front end located rearwardly of the bottom of said front runner and having its back end formed with a bottom lip covering and spaced below the underside of said back runner by a gap which is large enough to permit the front end of said panel to be sufficiently pivoted upwardly together with said hangers from said front runner about the back ends of the hangers as pivots, to allow the rear end of said bottom lip and the rear ends of said hangers to be freed from said bottom flange of said back runner.

15. In a ceiling suspension system, a pair of front and back parallel spaced runners each having an upright web section and a forwardly directed bottom flange at the bottom of said web section, and a set of right and left parallel spaced hangers resting by their front ends on said front runner and by their back ends on the bottom flange of said back runner, each of said hangers having an elongated bottom flange intermediate said runners, and a panel formed with side kerfs receiving said bottom flanges of the hangers for support of the panel, said panel having its front end located rearwardly of the bottom of said front runner and having a back end portion covering and spaced below the underside of said back runner by a gap which is large enough to permit the front end of said panel to be sufficiently pivoted upwardly together with said hangers from said front runner about the back ends of the hangers as pivots, to allow said rear end portion of the panel and the rear ends of said hangers to be freed from said back runner.

16. In a ceiling suspension system, a pair of front and back parallel spaced runners each having an upright web section and a forwardly directed bottom flange at the bottom of said web section, and a set of right and left parallel spaced hangers resting by forwardly projecting front end portions on said front runner and by their back ends on the bottom flange of said back runner, each of said hangers having panel support means intermediate said runners, and a panel formed with side kerfs receiving said panel support means, said panel having its front end located rearwardly of said front runner and said projecting front end portions of the hangers and having a back end portion covering and spaced below the underside of said back runner by a gap which is large enough to permit said projecting front end portions of the hangers to be sufficiently pivoted upwardly from said front runner about the back ends of the hangers as pivots, to allow said rear end portion of the resulting tilted panel and the rear ends of the tilted hangers to be freed together from said back runner.

17. In a ceiling suspension system, a pair of front and back parallel spaced runners each having an upright

web section and a forwardly directed bottom flange at the bottom of said web section, and a set of right and left parallel spaced hangers resting by forwardly projecting front end portions on said front runner and by their back ends on the bottom flange of said back runner, each of said hangers having a general L-section between said runners providing a panel support flange directed toward the other hanger and an upright reinforcing flange, and a panel formed with side kerfs receiving said panel support flanges and with backcuts above said kerfs for passage of said reinforcing flanges, said panel having its front end located rearwardly of said front runner and having a rear end portion covering and spaced below the underside of said back runner by a gap which is large enough to permit said panel and hangers to be pivoted upwardly together about the back ends of the hangers as pivots, and thereby raise said projecting front end portions of the hangers relative to said front runner sufficiently to enable said rear end portion of the panel and the rear ends of said hangers to be freed from said back runner.

18. In a ceiling suspension system, a runner having a bottom flange with an upper support surface, and a hanger having a top flange at one end resting on said runner at a level above said upper support surface and having an elongated terminal bottom flange directed by its length oppositely from said bottom flange of the runner for supporting a panel, the underside of said terminal bottom flange being interrupted along its length by downwardly depressed portions all of which are spaced toward the runner from the free end of the terminal bottom flange, said depressed portions depending to a level lower than that of the underside of said bottom flange of the runner with the remainder of said underside of said terminal bottom flange having a level corresponding to the level of said upper support surface.

19. In a ceiling suspension system, a runner having a forwardly directed bottom flange with an upper support surface, and a fore-and-aft extending elongated hanger resting by its front end on said runner at a level at least as high as said upper support surface and having an elongated panel support bottom flange extending rearwardly of said runner to the terminal back end of the hanger, said panel support bottom flange being interrupted along its length rearwardly of said runner by a downwardly depressed portion spaced forwardly from said back end of the hanger a distance at least as great as the fore-and-aft width of said upper support surface, said depressed portion depending to a level lower than that of the underside of said bottom flange of the runner with the remainder of the underside of said panel support bottom flange of the hanger having a level corresponding to the level of said upper support surface.

20. In a ceiling suspension system, a plurality of parallel spaced elongated headers having coplanar bottom surfaces, and a plurality of elongated channel-like regularly spaced parallel runners extending at cross-angles to said headers and each having a top flange and a bottom flange therebeneath interconnected by a web section, each said top flange being stepped to provide an upper step engaging said bottom surfaces of the headers and a lower step merging with said web section for supporting a hanger, said lower step being spaced below said bottom surfaces, and clip means holding said upper steps of the runners against said bottom surfaces of the headers.

21. In a ceiling suspension system, an elongated support, an elongated runner disposed at cross-angles with respect to said support, said runner having a stepped flange providing an upper step and a lower step and having a central web which merges with said lower step, and means operatively associated with said support and runner for holding said upper step against said elongated support with said lower step spaced below the support for receiving a hanger.

22. The structure of claim 21 in which the longitudinal side edges of said upper step both engage said support and

occupy a common plane which is at substantially right angles with respect to the plane of said central web.

23. In a ceiling suspension system, a generally U-shaped runner having a bottom flange and a top flange which is stepped to provide a lower step and an upper step, a generally Z-shaped hanger having a top flange resting on said lower step and an elongated bottom flange directed by its length oppositely from said bottom flange of the runner, said upper step of the runner being generally V-shaped with its vertex downwardly, and said lower step of the runner and said top flange of the hanger being flat.

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