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(54) IMPROVEMENTS IN ADJUSTABLE SUSPENSION SYSTEMS IN CEILINGS

(71) We, RONDO BUILDING SERVICES PTY. LIMITED, a company incorporated in the State of New South Wales, of 75 Windsor Road, St. Marys, New South Wales, 2760, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to suspension systems for ceilings composed of panels or tiles, and more particularly to those systems which incorporate supporting splines engageable within edge grooves, or kurfing, of the ceiling panels or tiles.

Suspension systems are known which include parallel runner bars supportable from hangers of adjustable length with parallel spline assemblies clipped to the underside of the runner bars and extending at right angles thereto. Ceiling tiles having edge grooves are supported upon horizontal splines oppositely directed on the spline assemblies, the splines on one side of the assemblies being fixed and continuous while those on the opposite side are formed on slidable elements of short length. This arrangement permits sliding of the latter for disengagement from an individual tile to facilitate its removal when required. The splines, themselves, have hitherto been provided with downwardly stepped longitudinal outer edge portions whereby each tile is supported within the entrance of its grooves upon the inner portion of respective splines and the outer edge portions thereof reduce the degree of vertical displacement of tiles, when assembled, which would otherwise be permitted.

In the transport and handling of ceiling tiles, which are of various softboard compositions, the kurfed edges are frequently damaged and with existing suspension systems this leads to faulty construction of the ceiling. Principally this appears as firstly unevenness in the horizontal alignment of the tiles and/or secondly insufficient space

between tiles and their supporting spline assemblies for the entry of a tool for sliding of the slidable elements thereof.

It is the main object of this invention to provide a ceiling suspension system which substantially overcomes these defects in a simple and efficient manner.

In one general form the invention provides a ceiling suspension system for edge grooved ceiling lining panels or tiles, comprising a plurality of hanger assemblies attachable to a supporting structure, a plurality of runner bars suspended from the hanger assemblies at a selected height, a plurality of substantially parallel spline assemblies for holding ceiling panels or tiles between adjacent spline assemblies, said spline assemblies extending beneath, and in lines crossing, the runner bars, a clip device at each of at least some of the positions of intersection of the spline assemblies and runner bars which is carried by one of said runner bars and detachably connected with a respective spline assembly, each of said spline assemblies extending substantially the entire length of one dimension of the ceiling and comprising a stationary supporting element of strip material having a longitudinally extending intermediate web portion which is substantially straight and upright, a ceiling panel securing spline formed on one longitudinal edge portion beneath the web portion, a longitudinal fold on the opposite edge portion above the web portion, and a plurality of strip-form slidable elements supported by the stationary supporting element, each of said slidable elements having a longitudinal extending intermediate web portion confronting the web portion of the respective stationary supporting element and deformed outwardly therefrom to hold an adjacent panel or tile spaced from the said stationary supporting element, a ceiling panel securing spline formed on one longitudinal edge portion beneath said deformed web and a supporting flange extending along the other longitudinal edge portion of the slidable

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element and above said deformed web and slidably engaged within the fold of the stationary element so that the spline of each slidable element is substantially coplanar with and oppositely directed to the spline of the stationary element, each of the ceiling panel securing splines on the stationary supporting elements and the slidable elements having a longitudinal edge portion bent upwardly out of the plane of the spline to form a lip for the support of a ceiling panel or panels.

It will be appreciated, therefore, that the spline assemblies of this system avoid the two problems stated above. The first problem is met by providing upwardly bent edge portions on the splines whereby the support for tiles is located well within the edge grooves where little damage occurs, and the second problem is met by providing confronting web portions on the two elements of each spline assembly in which an outwardly deformed portion is formed only in the web of the slidable element. This deformation engages the adjacent edge of a respective tile to ensure that it is spaced from its associated stationary element to permit at all times unobstructed entry of a tool for engagement with an end of the slidable element for movement thereof when desired.

The invention will now be described with reference to a preferred embodiment in respect of each of its several features referred to above.

The invention is illustrated in the accompanying drawings, in which:—

Fig. 1 is a fragmentary perspective view of part of a suspended ceiling constructed according to the invention;

Fig. 2 is an enlarged perspective view of a channel member and stationary and sliding spline members holding ceiling tiles;

Fig. 3 is a perspective view of a clip device used for securing the stationary spline members to the channel members;

Fig. 4 is an exploded elevation of a channel member, a clip device, stationary and sliding spline members and ceiling tiles;

Fig. 5 is a view of the parts shown in Fig. 4 in an assembled condition but shown at right angles to the plane of Fig. 4, and with the tiles omitted;

Fig. 6 is a perspective view of a supporting hanger used for supporting the ceiling; and

Fig. 7 is a perspective view of a supporting hanger supported on a threaded rod.

The invention is applied to the improvement of ceiling suspension systems constructed cheaply principally of sheet metal and providing for ready adjustment of the supporting level for the ceiling while permitting assembly of all of their components in situ. An important provision, furthermore, is that it is possible for the ceiling

panels 10 themselves to be assembled or disassembled when desired.

According to the invention with reference to the drawings the complete structure 11 (Fig. 1) is suspended from fixing points (not shown) on a roof or upon floor beams of a room of higher level by means of suspension hangers 12 or 13.

The suspension hangers are of two preferred forms. In the first form 12 shown in Figs. 1 and 6 a "U" shaped spring clip 14 with diverging free arms 15 is rivetted at its base 16 to a vertical plate 17 forming the body of the hanger 12. Holes 18 are provided near the ends of the arms 15 and a ceiling suspension rod 19 is passed through said holes so that the hanger 12 is locked upon said rod by the impinging action of the spring arms 15 on said rod. If the arms 15 are displaced towards one another the rod will be released so that the hanger 12 can be slid up or down said rod 19.

The lower end of the body plate 17 is slotted to form inwardly directed hooks 20 and 20A. One hook 20A is normally twisted at an angle to the principal plane of the body plate 17 for a purpose to be described later.

The second form of hanger 13 shown in Figs. 1 and 7 is formed from a body 17A similar to the body 17, with the exception that its upper end 21 is bent at right angles and drilled to receive a threaded suspension rod 19A. Nuts 22 adjustably clamp the body 17A to the rod 19A. The low end of said body is provided with hooked projections 20 and 20A as before.

A runner bar 23 of any desired form providing it has a longitudinal base of suitable enlarged dimension, is held by the hanger 12 or 13 between its confronting end hooks 20 and 20A (Figs. 6 and 7). In a complete ceiling suspension system 11 several or many parallel runner bars 23 will be suspended by spaced hanger assemblies 12 or 13 to form the foundation from which the ceiling tiles 10 will be supported.

It is the usual practice to provide the runner bars 23 of the system with a longitudinal slot 24 (Figs. 2, 5 and 6) bordered by inturned longitudinal jaws 25. A suitable form of spline bar 26 for the supporting of the ceiling panels 10 is supported at right angles to the runner bars 23 by individual clip devices 27 (Figs. 3, 4 and 5). By the invention each clip device 27 is formed as a plate of sheet metal folded approximately U-shaped with a flat base 28 and approximately parallel arms 29. At an intermediate position the two arms 29 may have outwardly directed tabs 30. The outer edge of each arm carries a single longitudinally extending hook element 31 which are located at longitudinally spaced positions along the clip device 27 and have their hooks 31 confronting. An enlarged base

portion 32 (Figs. 4, 5 and 6), or other attachment portion, of the spline bar 26 may be positioned with the spline bar at right angles to the runner bar 23 by inserting this base portion 32 obliquely between the two hooks 31 of the clip 27 and then turning the spline bar 26 to its correct assembly position with respect to the runner bar 23. It is preferred, that previous to this the clip device 27 is forced upwardly into the slot 24 of the runner bar 23 with its base portion 28 leading, as shown in Fig. 5, so that the clip 27 will be held by the tabs 30 in its arms 29 between the longitudinal jaws 25 of the runner bar 23. From this assembly a very rigid connection between components results.

Furthermore, according to this invention, the spline bar (shown in detail in Figs. 4 and 6) consists of a first strip 26 of sheet metal formed with one longitudinal edge portion 33 extending at right angles to its main body portion 41 to form a spline engageable within the edge slot 34 of a ceiling panel 10 for supporting same in position. This strip, for convenience is herein referred to as the stationary supporting element 26 of the slide bar. Its opposite longitudinal edge portion 35 is folded into an oval shape one side of which extends beyond the transverse line of its main body portion 41 with the end of the strip turned back upon the underside of the main body portion 41 to form a longitudinal slot 36.

A second strip of sheet metal, herein referred to as the slidable element 37 of the spline bar, has one longitudinal edge portion 38 bent to form a spline for engagement in the edge groove 34 of a ceiling panel 10 and its other longitudinal portion formed into a hook-like flange 39. The sliding element 37 may be mounted with its main body portion 40 located back-to-back with the main body portion 41 of the stationary element 26 and its hooked flange 39 extending through the slot 36 in the stationary element 26 and its spline 38 oppositely facing to the spline 33 of the stationary element 26.

In this assembled condition both the elements 26 and 37 of the spline bar may be supported from runner bars 23 by engagement of the oval shaped edge portion 32 of the stationary element 26 between the hooks 20 and 20A of the clip device 27. This connection although supporting the stationary element 26 in a rigid condition will not impede sliding of the slidable element 37 with respect thereto for the purpose of assembly and disassembly of individual ceiling panels 10.

In some instances where it is desired to utilize a cheaply formed type of ceiling tile or panel 10 and it is therefore necessary to conceal, by covering, the joints 42 (see Fig. 4) between these panels 10, provision is

made by this invention for the support of a T-shaped cover strip 43 the head 44 of which will overlie the marginal edges 45 of respective ceiling panels 10. The stem 46 of this strip 43 terminates at its outer end in a longitudinal enlargement, for example, of teardrop section 47. This strip 43 may be readily assembled to the ceiling suspension after otherwise completed assembly of the ceiling 11 by forcing its stem 46 upwardly between the slidable and stationary elements 37 and 26 of the spline bar. The intermediate web of the body portion 40 has an outward deformation 48 with respect to an upright intermediate web of the stationary element 26. The enlarged edge 47 of the cover strip 43 may be supported in the pocket so formed between the two web portions. After assembly of the hangers 12 or 13 (Figs. 1, 6 and 7) the angularly bent hook 20A may be bent into the plane of the strip 17 with pliers or the like so that its inner edge 53 bites into the runner bar 23 to lock the hanger thereon.

WHAT WE CLAIM IS:—

1. A ceiling suspension system for edge grooved ceiling lining panels or tiles, comprising a plurality of hanger assemblies attachable to a supporting structure, a plurality of runner bars suspended from the hanger assemblies at a selected height, a plurality of substantially parallel spline assemblies for holding ceiling panels or tiles between adjacent spline assemblies, said spline assemblies extending beneath, and in lines crossing, the runner bars, a clip device at each of at least some of the positions of intersection of the spline assemblies and runner bars which is carried by one of said runner bars and detachably connected with a respective spline assembly, each of said spline assemblies extending substantially the entire length of one dimension of the ceiling and comprising a stationary supporting element of strip material having a longitudinally extending intermediate web portion which is substantially straight and upright, a ceiling panel securing spline formed on one longitudinal edge portion beneath the web portion, a longitudinal fold on the opposite edge portion above the web portion, and a plurality of strip-form slidable elements supported by the stationary supporting element, each of said slidable elements having a longitudinally extending intermediate web portion confronting the web portion of the respective stationary supporting element and deformed outwardly therefrom to hold an adjacent panel or tile spaced from the said stationary supporting element, a ceiling panel securing spline formed on one longitudinal edge portion beneath said deformed web and a supporting flange extending along the other longitudinal edge portion of the slidable

portion 32 (Figs. 4, 5 and 6), or other attachment portion, of the spline bar 26 may be positioned with the spline bar at right angles to the runner bar 23 by inserting this base portion 32 obliquely between the two hooks 31 of the clip 27 and then turning the spline bar 26 to its correct assembly position with respect to the runner bar 23. It is preferred, that previous to this the clip device 27 is forced upwardly into the slot 24 of the runner bar 23 with its base portion 28 leading, as shown in Fig. 5, so that the clip 27 will be held by the tabs 30 in its arms 29 between the longitudinal jaws 25 of the runner bar 23. From this assembly a very rigid connection between components results.

Furthermore, according to this invention, the spline bar (shown in detail in Figs. 4 and 6) consists of a first strip 26 of sheet metal formed with one longitudinal edge portion 33 extending at right angles to its main body portion 41 to form a spline engageable within the edge slot 34 of a ceiling panel 10 for supporting same in position. This strip, for convenience is herein referred to as the stationary supporting element 26 of the slide bar. Its opposite longitudinal edge portion 35 is folded into an oval shape one side of which extends beyond the transverse line of its main body portion 41 with the end of the strip turned back upon the underside of the main body portion 41 to form a longitudinal slot 36.

A second strip of sheet metal, herein referred to as the slidable element 37 of the spline bar, has one longitudinal edge portion 38 bent to form a spline for engagement in the edge groove 34 of a ceiling panel 10 and its other longitudinal portion formed into a hook-like flange 39. The sliding element 37 may be mounted with its main body portion 40 located back-to-back with the main body portion 41 of the stationary element 26 and its hooked flange 39 extending through the slot 36 in the stationary element 26 and its spline 38 oppositely facing to the spline 33 of the stationary element 26.

In this assembled condition both the elements 26 and 37 of the spline bar may be supported from runner bars 23 by engagement of the oval shaped edge portion 32 of the stationary element 26 between the hooks 20 and 20A of the clip device 27. This connection although supporting the stationary element 26 in a rigid condition will not impede sliding of the slidable element 37 with respect thereto for the purpose of assembly and disassembly of individual ceiling panels 10.

In some instances where it is desired to utilize a cheaply formed type of ceiling tile or panel 10 and it is therefore necessary to conceal, by covering, the joints 42 (see Fig. 4) between these panels 10, provision is

made by this invention for the support of a T-shaped cover strip 43 the head 44 of which will overlie the marginal edges 45 of respective ceiling panels 10. The stem 46 of this strip 43 terminates at its outer end in a longitudinal enlargement, for example, of teardrop section 47. This strip 43 may be readily assembled to the ceiling suspension after otherwise completed assembly of the ceiling 11 by forcing its stem 46 upwardly between the slidable and stationary elements 37 and 26 of the spline bar. The intermediate web of the body portion 40 has an outward deformation 48 with respect to an upright intermediate web of the stationary element 26. The enlarged edge 47 of the cover strip 43 may be supported in the pocket so formed between the two web portions. After assembly of the hangers 12 or 13 (Figs. 1, 6 and 7) the angularly bent hook 20A may be bent into the plane of the strip 17 with pliers or the like so that its inner edge 53 bites into the runner bar 23 to lock the hanger thereon.

WHAT WE CLAIM IS:—

1. A ceiling suspension system for edge grooved ceiling lining panels or tiles, comprising a plurality of hanger assemblies attachable to a supporting structure, a plurality of runner bars suspended from the hanger assemblies at a selected height, a plurality of substantially parallel spline assemblies for holding ceiling panels or tiles between adjacent spline assemblies, said spline assemblies extending beneath, and in lines crossing, the runner bars, a clip device at each of at least some of the positions of intersection of the spline assemblies and runner bars which is carried by one of said runner bars and detachably connected with a respective spline assembly, each of said spline assemblies extending substantially the entire length of one dimension of the ceiling and comprising a stationary supporting element of strip material having a longitudinally extending intermediate web portion which is substantially straight and upright, a ceiling panel securing spline formed on one longitudinal edge portion beneath the web portion, a longitudinal fold on the opposite edge portion above the web portion, and a plurality of strip-form slidable elements supported by the stationary supporting element, each of said slidable elements having a longitudinally extending intermediate web portion confronting the web portion of the respective stationary supporting element and deformed outwardly therefrom to hold an adjacent panel or tile spaced from the said stationary supporting element, a ceiling panel securing spline formed on one longitudinal edge portion beneath said deformed web and a supporting flange extending along the other longitudinal edge portion of the slidable



element and above said deformed web and slidably engaged within the fold of the stationary element so that the spline of each slidable element is substantially coplanar with and oppositely directed to the spline of the stationary element, each of the ceiling panel securing splines on the stationary supporting elements and the slidable elements having a longitudinal edge portion bent upwardly out of the plane of the spline to form a lip for the support of a ceiling panel or panels.

2. A ceiling suspension system as claimed in claim 1, wherein the longitudinal fold on said opposite edge portion of the stationary element of each spline assembly is in the form of a hollow enlargement.

3. A ceiling suspension system as claimed in claim 1 or 2, wherein a T-section covering strip having an enlargement on the end of its dependent leg is provided for covering the marginal edges of the ceiling panels when said enlargement on its leg is forced between the two elements forming any spline assembly.

4. A ceiling suspension system as claimed in any one of the preceding claims, wherein each hanger assembly comprises attachment plates having means for anchorage to the supporting structure, said runner bars are channelled on their underside, each said clip device being approximately U-shaped and insertable base first into the channel of the respective runner bar, and having hooks to hold the respective spline assembly at the said intersection.

5. A ceiling suspension system as claimed in claim 4, wherein the hooks on said clip device are formed in arms of the U-shaped clip device at spaced longitudinal positions thereof with their hooked portions confronting each other, and wherein the clip device has one or more outwardly directed tabs in each open arm of the body for locking with flanges in the respective runner bar.

6. A ceiling suspension system for supporting edge grooved ceiling lining panels or tiles at a desired height, and being assemblable at the construction site to comprise a plurality of attachment plates having means for anchorage to downwardly directed supports, substantially parallel runner bars each extending across one dimension of the ceiling and each having a longitudinal channel, at least one hook element on each attachment plate engaged with a runner bar, a plurality of substantially parallel spline assemblies each extending across another dimension of the ceiling and at right angles

to the runner bars, and clip devices at some or all of the points of intersection of the runner bars and spline assemblies, each clip device being of U-shape with one or more outwardly flared lugs on the arms of the U-shaped device and a pair of longitudinally spaced hooks one on the lower ends of respective ones of each of the arms the said hooks confronting each other along the length of the clip device, each said clip device having its base forced into the channel of the respective runner bar with its flared lugs locked therein, and each spline assembly having a stationary part of strip material with a longitudinally extending intermediate web portion which is substantially straight and upright, a spline formed on one longitudinal edge portion of the stationary part and below the intermediate web and engaging within the edge groove of a ceiling panel to support same, and a hollow fold extending longitudinally on the other edge portion above the intermediate web portion and engaged by the hooks of respective clip devices, and each spline assembly also having a plurality of slidable parts supported by the stationary part, each of said slidable parts having a longitudinally extending intermediate web portion confronting the intermediate web portion of the stationary part and bowed outwardly therefrom with a spline formed on one longitudinal edge portion below the bowed web portion and a supporting flange on the other longitudinal edge portion above the bowed portion, said flange being hooked within the hollow fold of the stationary part and slidable therealong, the spline of each slidable part being oppositely directed from the spline of the stationary part with all of said splines provided with an upwardly bent longitudinal edge portion to form a lip to engage in part of the edge groove of one or more ceiling panels to support same, whereby by sliding of one or more of the slidable parts one edge of a ceiling panel may be disengaged from the suspension system for removal of the panel.

7. A ceiling suspension system substantially as herein described with reference to Figures 1 to 6, or to Figures 1 to 6 as modified by Figure 7 of the accompanying drawings.

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