

Feb. 14, 1961

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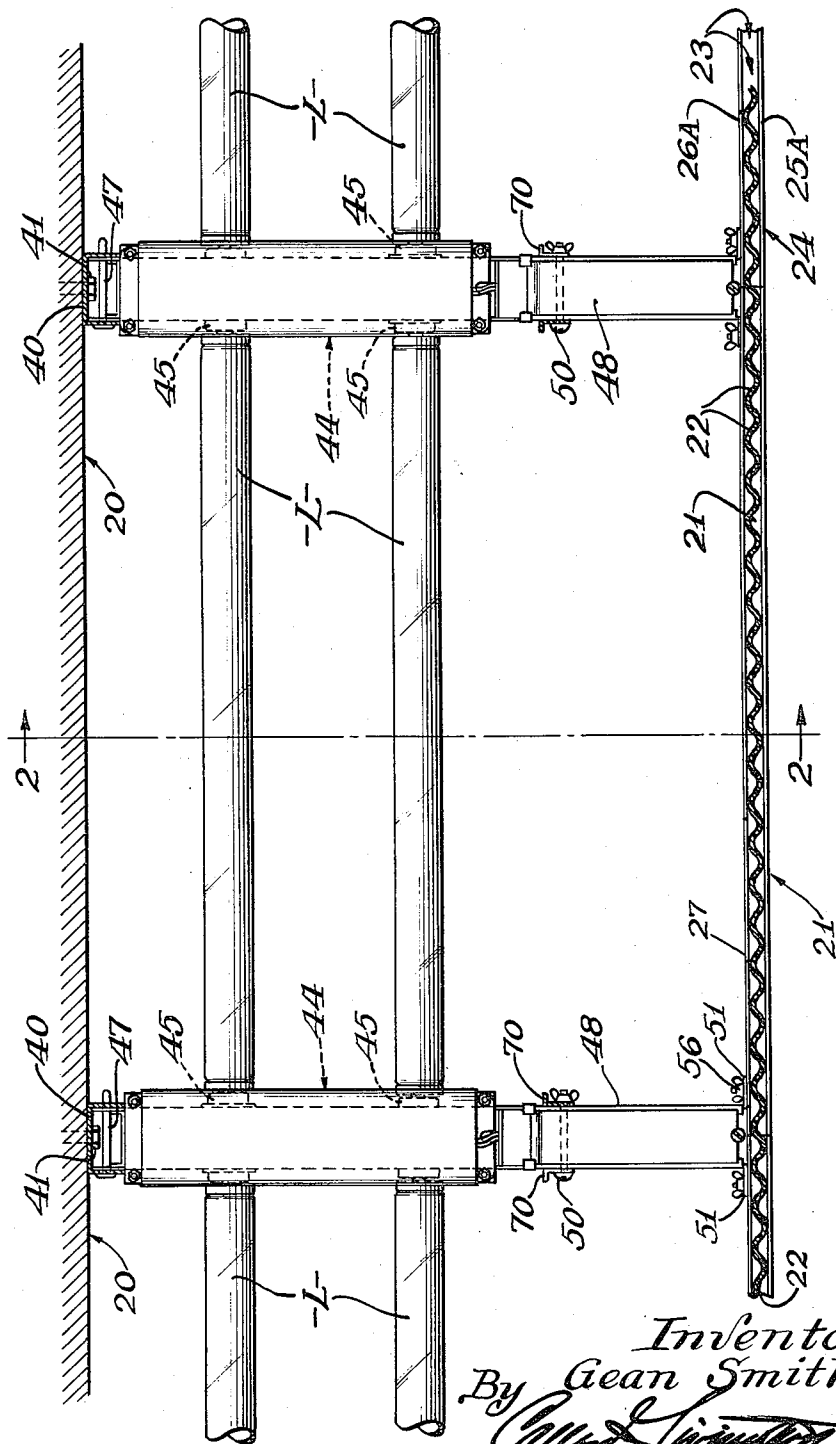
2,972,044

LUMINOUS CEILING STRUCTURE

Filed Aug. 8, 1955

5 Sheets-Sheet 1

FIG. 1.



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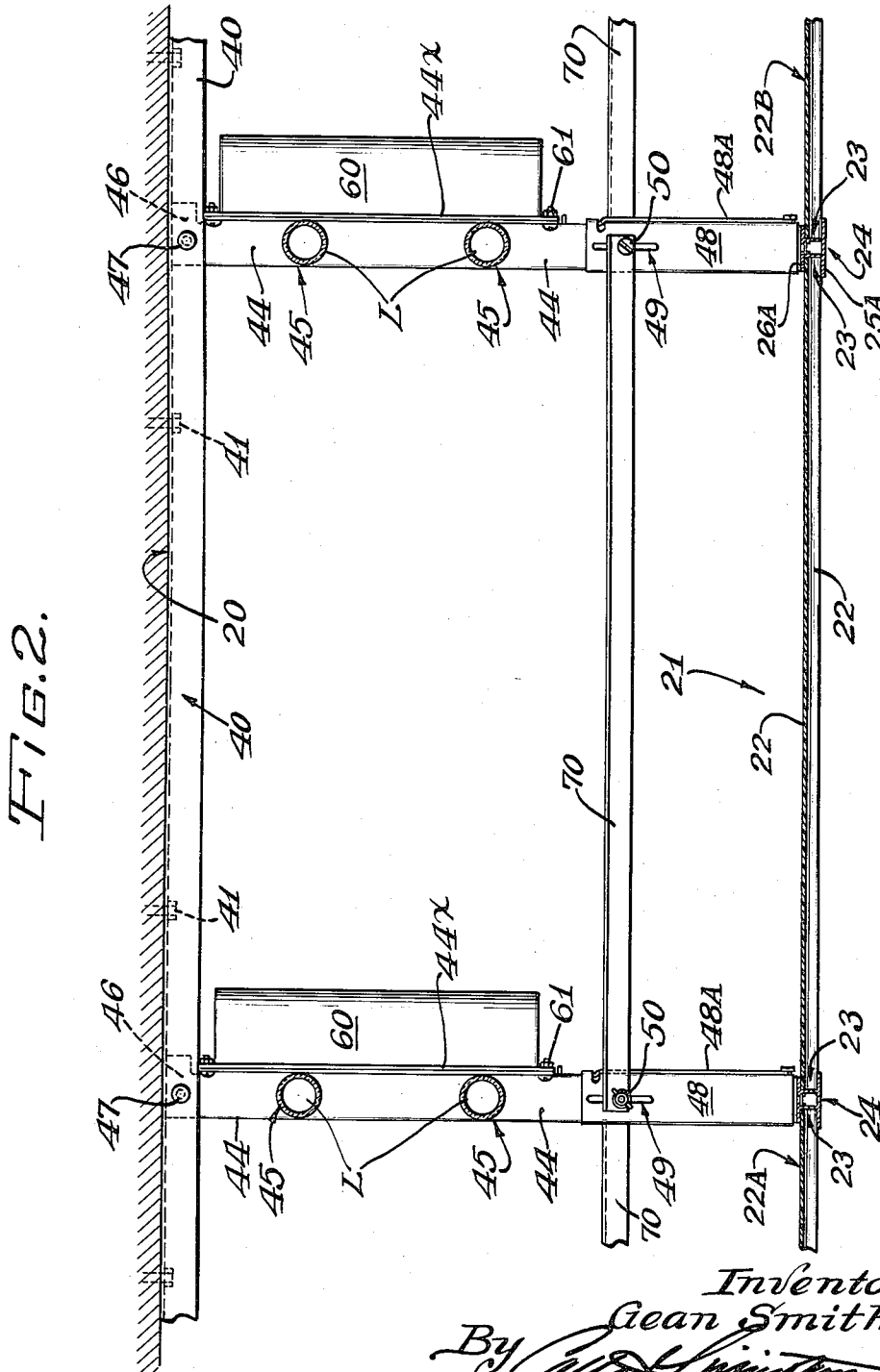
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LUMINOUS CEILING STRUCTURE

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5 Sheets-Sheet 2



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FIG. 3.

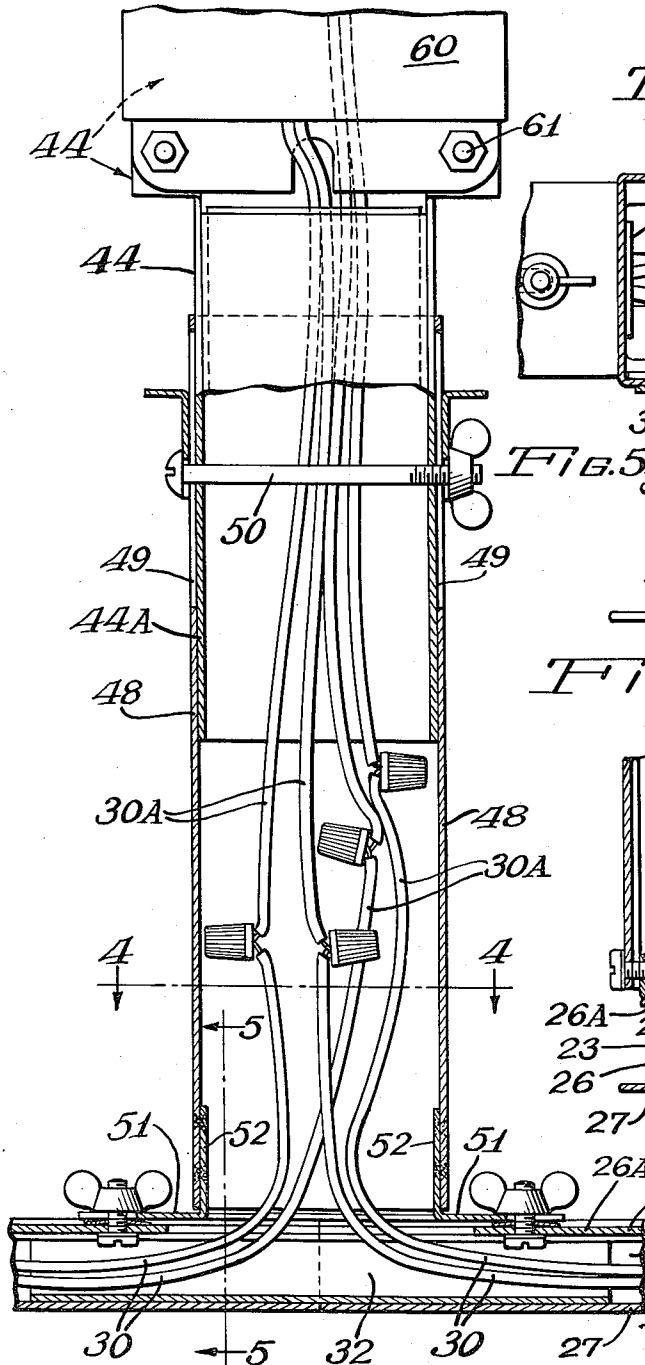


FIG. 4.

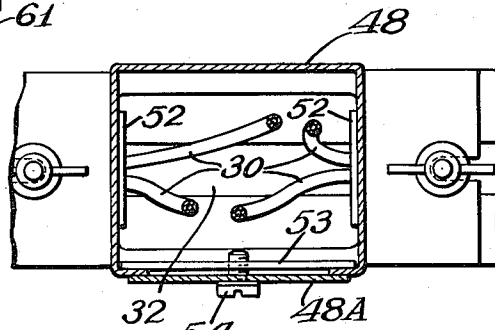


FIG. 5A.

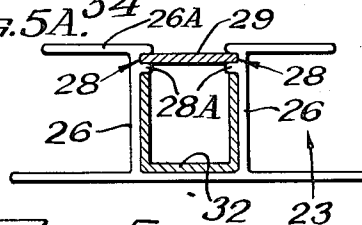
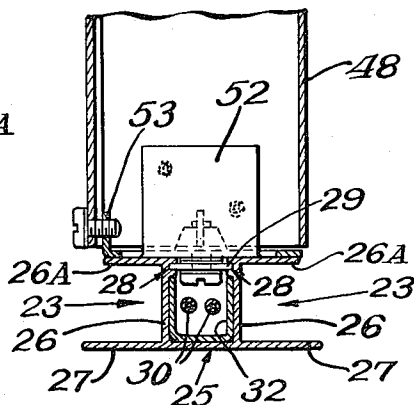


FIG. 5.



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LUMINOUS CEILING STRUCTURE

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FIG. 6.

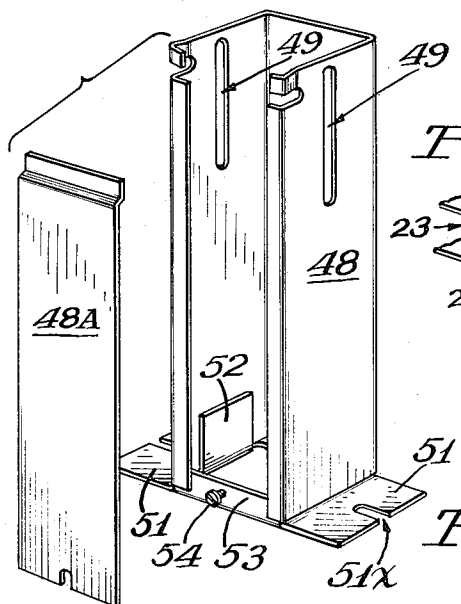


FIG. 7.

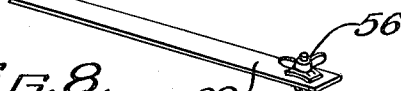


FIG. 8.

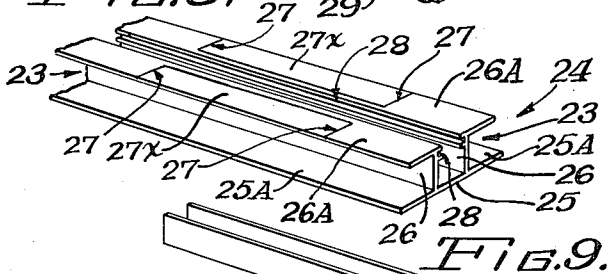


FIG. 9.

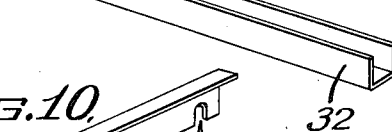


FIG. 10.

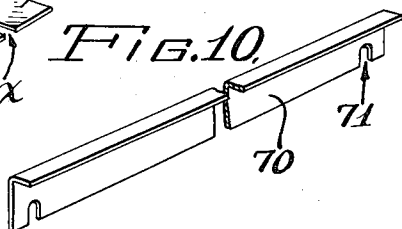


FIG. 11.

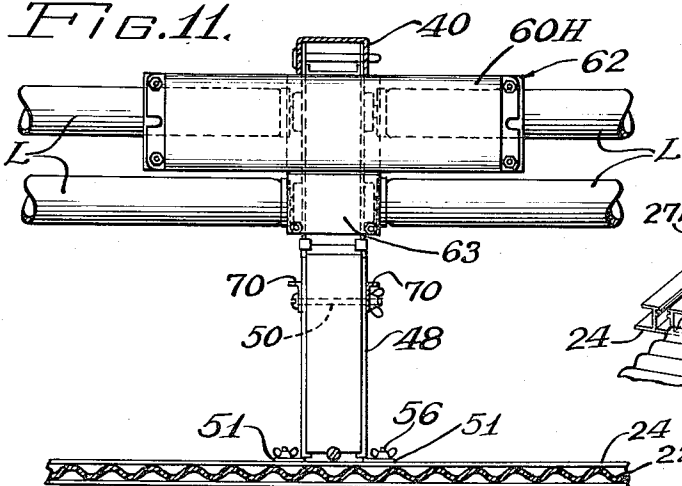
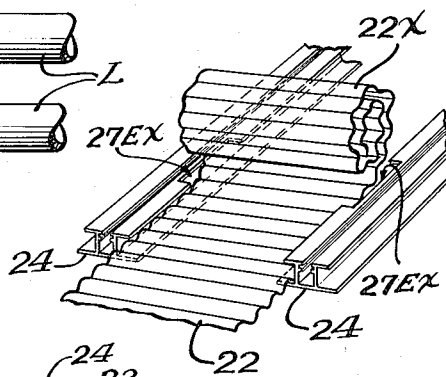


FIG. 16.



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FIG. 12.

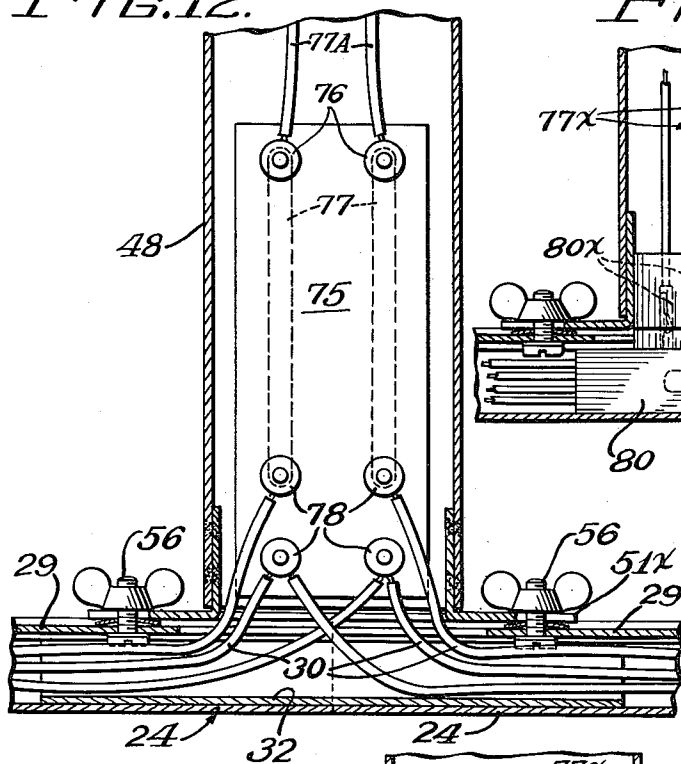


FIG. 13.

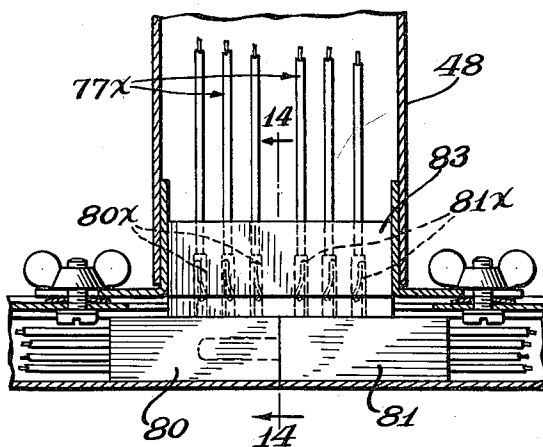


FIG. 14.

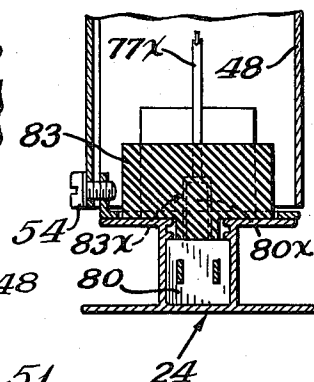
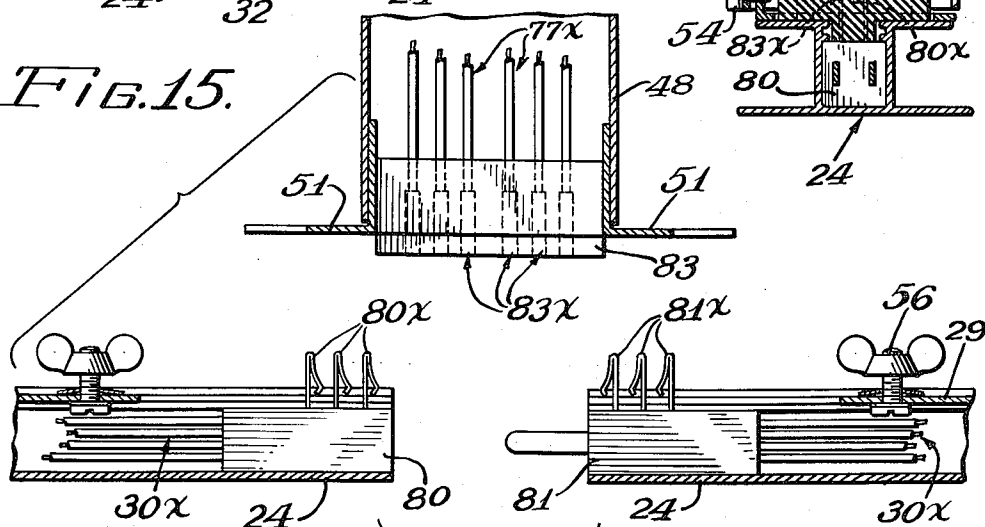


FIG. 15.



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LUMINOUS CEILING STRUCTURE

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Filed Aug. 8, 1955, Ser. No. 526,869

7 Claims. (Cl. 240-9)

This invention pertains to luminous-ceiling installations in which an artificial or secondary ceiling is composed of sections of translucent plastic panelling fitted into parallel tracks which are suspended below an actual ceiling to define a plenum between the latter and the virtual or luminous ceiling, with lamps (preferably of the fluorescent type) disposed in the plenum above the plastic panels to procure a more efficient and pleasingly diffused illumination.

Some of the important features and objects of the invention relate to the provision of a new supporting track structure for the plastic sheeting, and particularly to the provision of a double-channel track having a raceway or wireway formed as an integral part thereof; to a slidable closure strip for the raceway; to a telescoping coupling channel for joining tracks end to end without blocking the raceway; to the provision of a novel and highly economical supporting structure for adjustably suspending the track sections from the actual ceiling, including particularly such things as hanger sleeves providing vertical adjustments and also having wireways cooperable with those in the track sections, together with certain lighting fixtures energized from the wiring concealed therein and in the track sections, these features making possible an almost wholly pre-wired installation.

Still further features relate to structural details of hanger, track, and spacer components and attaching means therefor, and to a plug-in junction connecting means for connecting conductors in the wireway with the conductors in contiguous track sections as well as with equipment associated with the hanger means.

Additional objects and aspects of novelty and utility reside in details of the construction and operation of the embodiment described hereinafter in view of the annexed drawings in which:

Fig. 1 is a fragmentary elevational view of a section of ceiling track and suspension means therefor with tubular lighting accessories;

Fig. 2 is a transverse sectional detail, with parts shown in elevation taken across the view of Fig. 1 along lines 2-2;

Fig. 3 is an enlarged vertical sectional detail through one of the combination junction and hanger sleeve assemblies seen in Figs. 1 and 2;

Fig. 4 is a horizontal sectional detail looking along lines 4-4 of Fig. 3;

Fig. 5 is another sectional detail looking along lines 5-5 of Fig. 3;

Fig. 5A is an enlargement of lower parts of Fig. 5;

Fig. 6 is a perspective detail of one of the combination junction and hanger sleeves with its cover removed;

Fig. 7 is a perspective detail of one of the track insert strips;

Fig. 8 is a fragmentary perspective detail of one of the track sections;

Fig. 9 is a perspective detail of a coupling insert channel for joining track sections;

Fig. 10 is a foreshortened perspective of one of the transverse spacer bars;

Fig. 11 is a fragmentary elevational detail to reduced scale of one of the junction and hanger stations in a construction similar to that seen in Fig. 1 but modified to carry the lamp ballast unit in a horizontal position;

Fig. 12 is an enlarged vertical cross section of a form of the junction box shown in Fig. 3 modified to include a terminal board;

Fig. 13 is a fragmentary sectional detail of the lower region of the structure of Fig. 12 modified to include a plug-in type of terminal or junction connector means;

Fig. 14 is a cross sectional detail taken along lines 14-14 of Fig. 13;

Fig. 15 is an exploded perspective view of the assembled parts shown in Fig. 13;

Fig. 16 is a perspective view of a pair of tracks illustrating the feeding of the plastic panelling into track entrances.

The present disclosures provide improvements, such as alluded to above, over the type of ceiling construction shown in certain copending applications, Serial Nos. 314,632, filed October 14, 1952, and 397,946, filed December 14, 1953, both of which relate to a double track means for supporting the plastic sheeting, but neither of which affords any of the wiring, suspension, track-coupling, or adjustment features such as are provided by the present constructions.

In Fig. 1, an actual ceiling is indicated at 20 and the virtual or so-called luminous ceiling (and more particularly, a portion of one panel section thereof) is indicated therebelow at 21, the same consisting of an elongated length of transversely corrugated, translucent (but usually not transparent), semi-flexible plastic sheeting 22 suspended along its opposite longitudinal edges in side-opening grooves or channels 23 respectively situated on opposite sides of a track section 24, the construction of which is one of the features of novelty of the present disclosures and will be more particularly described hereinafter.

In such installations, the plenum formed between ceilings 20 and 21 will be utilized to house the illuminating means (and sometimes also to serve as a distributing duct for conditioned air), the illuminating means in the present embodiment consisting of a plurality of tubular type fluorescent lamps L which are especially supported and wired by certain novel constructions forming part of the present improvements.

A transverse view of the parts just described is seen in Fig. 2, referring particularly to the novel double track sections 24, of which two are shown, there being three spans of plastic sheeting 22, 22A, 22B shown to illustrate especially the manner in which the double tracks receive the edges of such sheeting in their respective pairs of channels 23.

A short section of track 24 is depicted in Fig. 8, and consists in an integrally formed body, preferably of extruded light-weight metal such as aluminum, comprising a relatively wide bottom plate or face 25 having two spaced, upstanding walls or webs 26 along the mid-region thereof, and each of said webs having a laterally-projecting, longitudinally-extensive upper flange 26A along the outside of its upper margin or free edge, said upper flanges respectively overlying the corresponding bottom flanges 25A (see also Fig. 5), whereby the two side-opening channels or tracks 23 are formed.

Of importance also in this double track construction are the parallel, aligned, inside cover-plate grooves 28 which slidably receive strips of cover plate metal 29 such as shown in Fig. 7, and which also serve as rigidifying stops for certain insertable coupling channels, to be described.

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The pair of upstanding webs 26 in the tracks define an elongated channel which constitutes a raceway or wireway to receive the conductors employed to feed the lamps L; and the cover strips 29 seal off this channel but are easily removable for access as required so that the electrical wiring, as will further appear, is safely protected and concealed, yet is fully accessible for installation and servicing. The manner in which conductors 30, for example, lie in these wireways is illustrated in Figs. 3 and 5.

A simple means for joining sections of track end to end is disclosed in Fig. 9, and consists of a length of U-shaped metal channel 32 dimensioned to telescope snugly into the central channel or wireway of the track section in the manner depicted in Figs. 3, 4, and 5A, it being noted in the latter view especially that the insert coupling channel 32 is installed with its longitudinally open side uppermost (it will also fit reversely, and can be used to dispense with the cover plate in this manner). It should be noted that the pair of cover-plate grooves 28 are formed by laterally inward extensions of the upper flanges 26A and narrow ribs 28A therebelow running along the inside upper margins of the upstanding wall webs 26, so that the upper edges of the insert coupling channel 32 fit closely up beneath these narrow ribs 28A, thereby rigidifying the juncture of any two track sections joined by such an insert channel coupling 32, it being understood that such juncture or coupling, as depicted in Fig. 3, utilizes one short channel coupling piece 32 inserted partially in each confronting end region of the two sections of track to be joined.

It will be further understood by reference to Figs. 3 and 5 that the wireway or middle channel in the track sections is not obstructed by the inserted channel couplings 32, and that conductors 30 freely traverse these short coupling sections and, moreover, at certain juncture points (as in Fig. 4) permit a changed course of travel of the wires from the tracks and couplings as for three purpose of joinder with other conductors 30A (Fig. 3).

Since installation of these virtual ceiling constructions is most frequently made in pre-existing structures in which obstructions, clearances, wall angles, and other architectural peculiarities must be accepted as encountered, it is of great importance that the supporting framework and track structures be as flexibly adjustable and adaptable as possible to expedite installation and keep costs within reasonable limits. To this end, the present improvements offer great advantages both as to track installation and electrical wiring, one of the important aspects of novelty in this connection relating to what is termed for convenience the pin-hanging, channel-mounting means, illustrated with reference to Figs. 1 and 2, and consisting of ceiling channel sections 40 which are attached to the main ceiling by means of suitable lag screws 41, or the like, penetrating the bottoms of the channels, which are placed flush up against said ceiling with the channels opening downwardly, as in Fig. 1.

In the usual installation, lamps L will be required, and accordingly the hanger structure will next include socket units or sleeves 44 which are, in effect, rectangular sheet metal channels having suitably placed lamp sockets 45 mounted in the opposite side walls thereof (Fig. 1), said sleeves each having at one, upper end oppositely-aligned pierced lugs 46 (Fig. 2) which fit into the ceiling hanger channels 40 and are secured to the latter by means of long cotter or similar cross pins 47 (Fig. 1) passing through aligned placement holes provided at appropriate intervals along the length of said ceiling hanger channels 40.

At their lower extremities, the socket channels or sleeves are dimensioned to telescope into the upper ends of hanger sleeves 48, the interfit being shown to particular advantage in Fig. 3 wherein it will be observed that a considerable extent of the lower end portion 44A of the

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socket sleeve enters the cavity of the hanger sleeve 48, the latter being provided with oppositely aligned, longitudinally-enlarged adjustment slots 49 (Figs. 2 and 6, also) receiving a long transverse wing bolt 50 which penetrates prepared, aligned holes in said lower end portion 44A of the hanger sleeve, it being now apparent that said hanger sleeves may be adjusted vertically to require heights to the limit permitted by the length of the adjustment slots 49.

At the lower end of the hanger sleeves (Fig. 6) are attached by spot welding angle plates of peculiar cut-out shape to provide a pair of oppositely projecting hanger flanges 51 and two upstanding welding flanges 52 (Fig. 3) spot welded to the inside wall faces of the hanger sleeves, as well as a narrow upstanding stop flange 53 which is drilled and tapped to receive a screw 54 for cover plate 48A, and which also acts as a stop for the latter.

Referring to Figs. 1, 2 and 3, the upper hanger sleeves 44 are provided with longitudinally-extensive side flanges 44X along the opposite sides thereof to provide a bedding seat for a ballast unit 60 secured thereto by bolts 61 engaging in said flanges, there being usually one such ballast unit required for each pair of lamps L.

In some installations, especially where shallow plenums are required, the construction shown in Fig. 11 is provided, wherein the ballast unit 60H is mounted to extend horizontally on a special base plate 62 which is bolted crosswise instead of vertically onto the flanges of the hanger sleeve, and the gap otherwise closed by the ballast and base plate (in vertical installation) is closed by a small fill-in plate 63.

The suspension of the sets of parallel tracks is completed by application of wing bolts and nuts 56 carried on the shutter or closure strips 29 (Fig. 7) to engage in the open-ended bolt slots 51X (Fig. 6) provided in the angle brackets 51 at the bottom of each lower hanger sleeve or channel, in the manner shown in Figs. 1 and 3.

Each hanger station is exactly spaced with respect to another by means of spacer bars 70 constructed as shown in Fig. 10 and consisting of precut lengths of angle bar having laterally-opening wing-bolt slots 71 situated at predetermined locations near the respective free ends thereof to engage the adjustment bolts 50 in the manner depicted in Figs. 2 and 3, the wing nuts being tightened immediately after any necessary levelling adjustments have been made with respect to the lower hanger sections 48 (slots 49).

One of the important advantages inherent in the invention is the fact that the lamp sections and even entire track sections may be prewired and the installation assembled on the job mainly from stock parts, by reason of which very significant economies may be realized in the manufacturing, assembling, installing, and planning operations.

To these ends, a further feature pertaining to the electrical system is the provision of prewired terminal means, such as shown in Fig. 12, and which includes an insulating panel 75 dimensioned to fit within one of the lower hanger sleeves or channels 48, and having a plurality of connection terminals 76 thereon prewired, as by conductors 77, 77A, to a ballast unit such as the units 60, 60H heretofore described in view of Figs. 1 and 11, conductors 30 in the raceway of the track sections 24 conjoining with said lower hanger sleeve section may be easily led to and connected with terminals 78 for energizing the appertaining lamps L; and in many planned installations, the several track sections comprising the supporting framework for the virtual ceiling structure may also be prewired, which is to say that the required conductors such as feeder wires 30 will be laid into the track wireways at the factory so that the installers have only to connect said wires to terminals 78 for example.

A still further simplification of the electrical wiring for pre-wired layouts is afforded by the provision of plug-in connecting means such as portrayed in Figs. 13 through

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15, wherein mating terminal plugs 80, 81 (Fig. 15) are fitted into the wireways at the end of conjunctive or abutting track sections 24 and disposed respectively at the open ends of said wireways in the manner of the female plug 80 shown in Fig. 15 for coupling with the male plug 81 when the two ends of the appertaining tracks are brought together in the manner shown in Fig. 13.

Each of said plug sections is provided with the necessary number of laterally-projecting contact springs 80X and 81X, which in turn are adapted to be plugged upwardly, and jointly, into correspondingly aligned sockets 83X in a third plug-in or receptacle or junction terminal 83 secured in the lower end opening of the appertaining lower hanger sleeve member 48, said sockets each having contact means therein connected as by conductors 77X to the corresponding socket and ballast means for the lamps served by that track section.

Preferably, the track sections 24 in this embodiment will be prewired at the factory with the necessary conductors 30X laid in the wireways thereof and connected with the proper terminals 80X and 81X in the track plugs; and the junction plugs 83 will likewise be prewired and properly connected as by conductors 77X to the appertaining ballast unit to be mounted thereabove on the hanger means as shown.

Thus, the installation is, in a manner of speaking, automatically wired-in or connected-up as the various track sections are fitted into position, the conjunctive ends of each meeting pair of tracks being brought together first to join the appertaining plug members 80, 81, for example, and thereafter the joined sections being then elevated into position to set the lateral terminal prongs 80X and 81X home into the junction receptacle 83, whereupon the wing nuts at 56 are turned home and the installation and feeder wiring at that point is completed, it being understood that at some point along each track span, usually at one or the other ends thereof, the track feeder conductors 30 or 30X will be connected appropriately with a main power line (not shown) feeding the whole system.

After installation of the suspension framework and track system, the lamps L may be placed and the plastic panelling slid into the tracks. For the latter purposes, after extruding, each section of track 24 is cut to length and then placed in a die (not shown) which applies a pair of knock-out cuts 27 about six inches apart on both upper flanges 26A near one end, at least, of each section. The installers then apply a plier to the knock-out span 27X thus formed between each pair of cuts and break it out, thereby forming a track entrance passage 27EX (Fig. 16) which facilitates paying in the plastic sheeting from a roll 22X.

I claim:

1. In a luminous ceiling structure, elongated hanger-channel means pendantly supported from a main ceiling, a plurality of spans of elongated track sections supported in parallelism in a horizontal plane from said hanger-channel means, each track section including: a central channel flanked on opposite sides by a pair of upper and lower longitudinally-extensive flanges defining a laterally opening track channel to receive one longitudinal edge of a ceiling sheet the opposite edge of which is supported in the confronting track channel of an adjacent parallel track section; electrically energized illumination lamps supported by said hanger-channel means, the latter having an open lower end fitting against the conjunctive ends of certain track sections; the latter having energizing feed conductors in the central channel portions thereof and connecting with plug-in connector means disposed in the central channel portion of said certain track section at said conjunctive ends thereof to establish connection between the conductors in said conjoined sections; the hanger-channel means which supports said certain track sections having plug-in connector means at said open lower end thereof electrically engageable with said track plug-in means and connecting with the appertaining said

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lamp means; said complementary plug-in connector means in the conjoined track sections providing a structural interconnection which couples the appertaining track sections together.

2. Panel-supporting means for use in a luminous ceiling structure and comprising: an elongated hanger member having oppositely divergent feet at one of its ends and a wire passage extending from end to end completely therethrough; and a pair of elongated panel-supporting track sections mounted in collinear alignment at confronting ends beneath the feet of said hanger member with each track section having one of its confronting ends supported by removable attachment to one of said feet in spaced relation to the similarly attached end of the other track section, each said section comprising a central channel portion open along the length of its top and having a panel-supporting track along each of its opposite sides adjoining said top, said track sections each having a cover plate removably keying into the open top thereof and respectively removably attached to the appertaining foot portion of the hanger member supporting the sections as aforesaid, the cover plates at the supported confronting ends of the two track sections being spaced apart so that the central channel portions of the track sections at said ends communicate freely into the open end of the hanger member thereat to provide wireways through the aligned sections and from each of the latter into the hanger member.

3. A structural assembly comprising in combination: a pair of integrally formed track sections each having an elongated central channel open along its top and flanked by a pair of upper and lower laterally-projecting side flanges, each pair of side flanges defining a laterally-opening side track channel, said sections being joined in endwise contiguity by a coupling channel telescoped into the central channels of the contiguous track sections whereby the respectively corresponding channels of each section are aligned in substantially uninterrupted communication to define wireways, said central channel having along its opposite open upper margins a pair of parallel grooves, and at least one of said sections having a hanger channel extending upwardly therefrom and secured thereto by flange means removably attached to spaced-apart insert means each telescoped into said grooves in one of the contiguous sections.

4. In a sub-ceiling structure, panel-supporting beams and wireways adapted to be suspended by hanger means from a main ceiling and comprising integrally formed, elongated channels of rectangular cross-section open along the top and having along opposite sides thereof integral upper and lower pairs of spaced panel-supporting flanges, each top flange continuing inwardly a short distance beyond the appertaining channel wall along the upper open margins thereof to define an upper groove rib aligned with the like rib on the opposite side of the channel, there being a lower groove-forming rib running along each inside channel wall beneath the corresponding upper groove rib to form with the latter a longitudinal groove running along the inside upper margin of the channel on each side, said lower groove ribs projecting into the channel far enough to afford an abutment for the upper edge of a channel shaped coupling member adapted to be inserted into the confronting ends of contiguous beams to rigidly couple the latter; said grooves being adapted to receive telescopically therein lengths of cover plate to close the beam channels and define wireways which may be provided with openings at any position along the beam by selecting two or more lengths of said cover plate the adjacent ends of which are spaced apart to provide such openings and slidable into abutment to close such openings.

5. In a sub-ceiling structure elongated track beams having a central channel of rectangular cross section open along the top and a pair of vertically spaced upper and lower panel-supporting flanges running along each side thereof with a pair of aligned cover plate grooves

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formed on the inside walls of the channel at the top open margins of said channel by a pair of upper and lower longitudinal ribs, the upper ribs each being an integral continuation of the appertaining upper panel flanges; cover plate sections slidably receivable in said plate grooves and hanger means for said beams comprising open-ended tubular members having oppositely directed foot flanges at their bottom ends and each adapted to rest upon a section of cover plate telescoped into said grooves in a beam section, said plate sections being spaced apart beneath said bottom end of the hanger member to open communication from the beam channel into the hanger; and means removably attaching each said foot portion to the appertaining plate section; the upper ends of said hanger members being adapted for attachment to an overlying supporting means, the communicating interiors of the beam channel and tubular hanger members affording a wireway.

6. In a luminous ceiling structure of the class described, elongated track beams having a wireway channel extending the length thereof and open along a top portion of the beam, said beams having parallel grooves bordering the open top portions on opposite inner sides of the channels thereof to receive slidably therein lengths of cover plate; means telescopingly insertible endwise into said beams for coupling endwise meeting lengths of beam without closing the said top portions thereof at the juncture; and hanger means providing an intercepting wireway and conjoining the coupled beams at said juncture, said hanger means comprising a tubular member open at its opposite ends with one of said ends adapted to overlie the open channel portions at said juncture, said coupled beams each having a length of

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cover plate telescoped into the grooves thereof and said plates being spaced apart beneath said overlying open end of the hanger member, and means removably attaching the overlying end portion of said hanger member to each of said lengths of cover plate, whereby the wireways in each of the conjoined members communicate with each other.

7. A construction according to claim 5 further characterized in that one of said hanger members is conjoined with a pair of end-to-end abutting track beams and each foot flange engages as aforesaid with a section of cover plate telescoped into one of the abutting beams, and each channel in said beams contains a plug-in electrical wire connector cooperable with the connector in the other beam and with terminal connector means at the conjoining lower end of said hanger member, whereby to facilitate connections with wires in said wireways in assembling and disassembling said beams and hangers.

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