Sept. 20, 1955 L. J. SEGIL 2,718,290

SAFETY DROP-OUT MEANS FOR CEILING PANELS

Filed March 16, 1953

Fig. 1

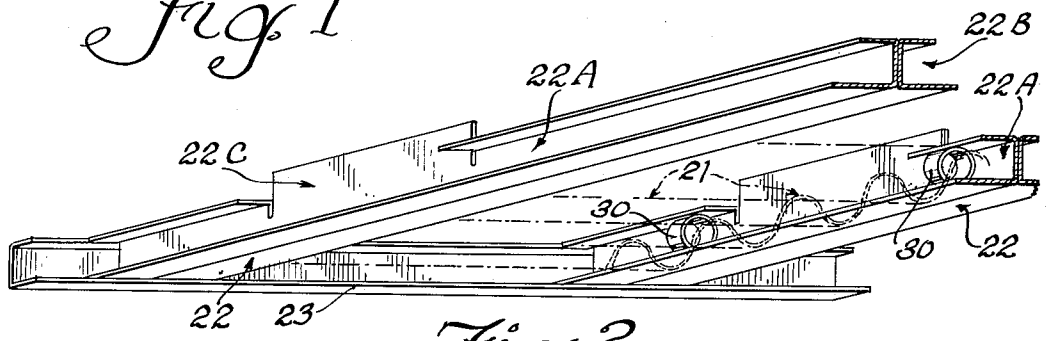


Fig. 2

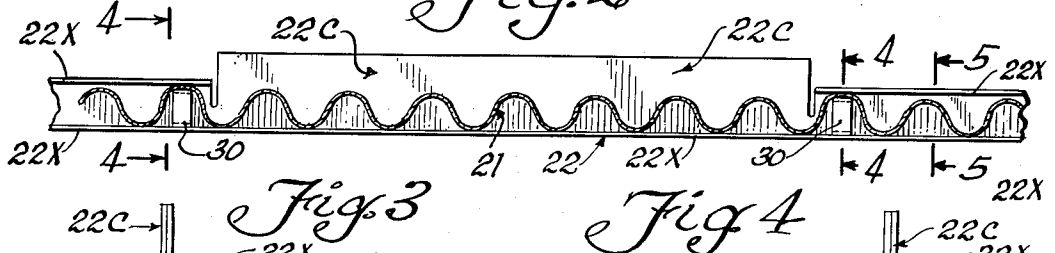


Fig. 3

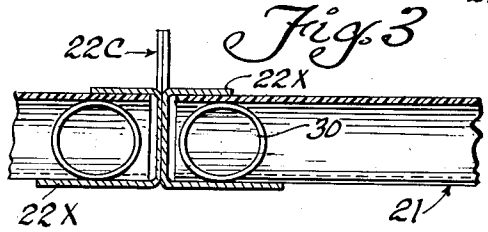


Fig. 4

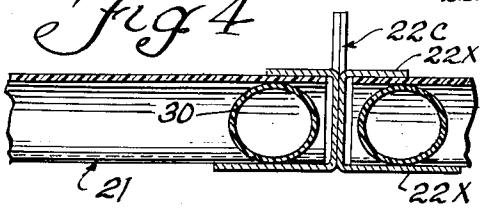


Fig. 5

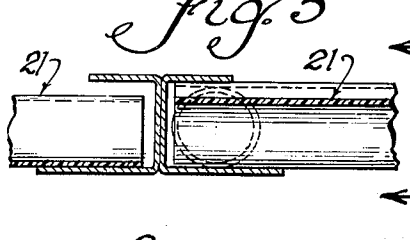


Fig. 6

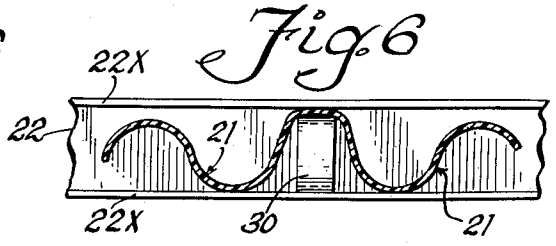


Fig. 7

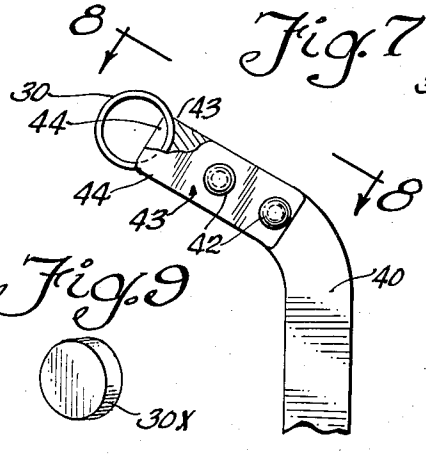


Fig. 8

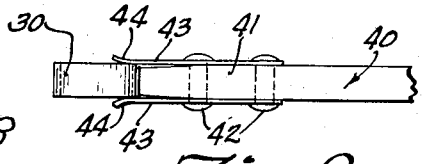


Fig. 9

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SAFETY DROP-OUT MEANS FOR CEILING PANELS

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11 Claims. (Cl. 189—45)

This invention relates to luminous ceiling structures such as disclosed in copending applications Serial Nos. 198,404 and 314,632.

So-called luminous ceiling structures consist generally of a system of special wall brackets, called a "base" and track formation therein for supporting sheets of translucent plastic material to form a secondary or virtual ceiling. In the plenum formed between the actual and virtual ceilings, some form of light source—usually fluorescent lamps—is provided, and the combination produces greatly improved illumination.

The present invention relates particularly to means for releasably securing the translucent plastic sheeting in position on the base tracks, in such manner that in the event of fire the sheeting will be dropped out promptly by reason of the heat present, so as not to interfere with any sprinkler means which may be located in the plenum.

Another purpose of the releasable sheet-retaining means is to prevent the plastic sheeting from dropping in festoons, in case of fire, as was possible with prior securing means, such as metal clips heretofore used for securing the sheeting in place in the tracks.

Another important object is the provision of diametrically yieldable retainers adapted to fit into ceiling track channels to hold ceiling sheets in place, and to release the sheets when a certain excessive load is applied thereto, as by accumulation of a weight of water from an automatic overhead sprinkler system.

Another object is the provision of releasable sheet retaining means for the purposes set forth, said retaining means being preferably in the form of diametrically compressible rings of a material which tends to soften in the presence of elevated temperatures such as might be encountered at ceiling levels during the initial phases of a fire at or about the time the conventional heat-sensitive overhead sprinkler systems tend to go into action.

Another object is the provision of a sheet retaining means for luminous ceiling structures, which is inexpensive to make, and easy to install and remove.

Additional objects and advantages attending the invention relate to details of the construction and operation of the commercial embodiment, all of which will appear more fully hereinafter as the following description proceeds in view of the annexed drawing, in which:

Fig. 1 is a fragmentary perspective detail of the virtual ceiling base structure showing the novel sheet retaining rings in position;

Fig. 2 is a side-elevational detail of a section of ceiling track with plastic sheeting shown in section and secured by the novel retaining rings;

Figs. 3 and 4 are complementary views of an enlarged sectional detail looking transversely across the tracks in the direction of lines 3—3 and 4—4 of Fig. 2;

Fig. 5 is an enlarged sectional detail looking in the direction of lines 5—5 of Fig. 2;

Fig. 6 is an elevational fragment, to enlarged scale, showing a detail of the retaining means as seen along lines 6—6 of Fig. 5;

Fig. 7 is a fragmentary side elevation of the head of a tool for applying the fusible retaining means;

Fig. 8 is a top plan view of the tool shown in Fig. 7.

Fig. 9 is a perspective detail of a modification showing a solid drop-out wedge.

Portions of a base structure for supporting a luminous ceiling are shown in Fig. 1, and include a channeled wall angle 23 adapted to be mounted along one of the end walls of a room at a desired level (e. g. about three feet) below the actual ceiling.

Horizontal track members 22 are seated at their free ends in channel portions of the wall angles, so as to extend in parallelism, about three feet apart for the full length of the room, it being understood that wall angles 23 are mounted on both end walls of the room so that both ends of the tracks 22 have support at opposite ends of the room. Additional intermediate suspensory means (not shown) are also generally employed.

The track sections 22 are of especial construction in that they include oppositely-facing horizontal sheet-channels 22A, 22B with entrance openings 22C, said openings in the several parallel tracks being aligned so that corrugated plastic sheeting 21 may be fed into oppositely facing pairs of track channels for overhead support to define the virtual ceiling.

The plastic sheeting 21 is translucent but usually not transparent; and the corrugations provide stiffness while permitting the material to be rolled for transport and for insertion or removal from the base structure.

The corrugations in the sheeting 21 are dimensioned to fit closely into the channels 22A, 22B, etc. of tracks between the upper and lower flanges 22X thereof (Fig. 2). However, the flexibility which attends such corrugating permits the sheeting to yield and flatten out to an extent which makes it very easy to slide the sheeting into and out of the track channels, and once in position, the corrugations tend to resume their normal shape and substantially fill the channel space between said upper and lower track flanges 22X, and the sheeting is thereby confined in the channels against rattling or vibration.

However, at the entrance openings 22C (as in Fig. 2) it is apparent that a portion of the upper flange is missing, and it is possible for the sheeting to move upwardly here and vibrate, as in response to strong air movements.

In practice, there are commonly a considerable number of entrance sections 22C; so that some means for preventing vibration or dislodgement of the sheeting in the neighborhood of the entrance openings is required to prevent disturbance from wind drafts. Where air-conditioning is employed the problem becomes additionally significant, especially where the plenum between the actual and virtual ceilings is used as an air duct.

Heretofore a metal clip was employed to secure the sheeting in the channel tracks. This practice is objectionable in that the clips, when applied to the lower flange 22X (as they must be in practice), are unsightly. Moreover, in case of fire, such clips do not let go, while other sections of the plastic tend to flatten out, fuse, and drop irregularly from the tracks in festoons.

The type of plastic employed for the luminous ceiling sheeting 21 is preferably vinyl acetate, which will begin to soften at temperatures in the region of 140°–150° F., and will thereafter fuse. Where automatic sprinkler systems are installed in the actual ceiling it is legally required that any virtual ceiling panels shall drop out promptly so as not to interfere with the spraying action of the sprinkler heads.

According to the invention, a sheet retaining means is provided in the form of an annulus 30 (Figs. 1, 3, and 6) of fusible material, preferably the same vinyl acetate plastic from which the sheeting 21 is made. Fusibility is not essential, however, for sprinkler-release installations.

The diameter of the ring or tubular retainer **30** is slightly greater than the distance between the upper and lower track flanges **22X**; and the width between the two axial edges of the ring is a fraction of its diameter (approximately one-half), so as to afford a slight stiffness to the ring sufficient to assure that it will hold its tubular shape but can be compressed (diametrically) enough to press the same into the track channel. This width of the ring also gives a good contact area on the face of the ring for pressure against the sheeting, and spans a maximum chordal distance across the arc of the corrugations (as in Fig. 6) without throwing the curvature of the latter out of shape. While the width of these rings **30** is not critical, they can preferably be about one-half of the diameter of the full arc of a sheet corrugation.

As illustrated, particularly in Figs. 1 and 2, one of the deformable retaining rings **30** is pressed into the track channel at each side of each sheet entrance section or opening to prevent vibration and looseness of the sheeting in this region especially.

The present practice is to employ spans of the sheeting **21** in standard legal lengths of about 25 feet each, so that in long rooms there will be several contiguous spans in each track section; but these will not necessarily terminate at track entrance openings **22C**, so that additional retaining and drop-out rings **30** may be placed at the ends of each span of sheeting, as well as at the entrance sections, and also at any desired intermediate points, depending upon the requirements for any particular installation.

The placement of the drop-out rings **30** is facilitated by use of a tool (such as shown in Figs. 7 and 8), which consists of a handle **40** having an offset head **41** to which are attached, as by rivets **42**, a pair of thin claw plates **43** of spring metal having offset lips **44** at their outer edges beyond the end of the stick head, to grasp and releasably hold one of the rings **30**.

The tool handle is preferably about five feet long, to reach the average low ceiling installation. The rings **30** are seated in the tool claw (as in Fig. 7), and simply forced into place in the track and will remain there upon proper withdrawal of the tool head in a straight out-and-down motion, the spring of the jaw plates **43** being just sufficient to prevent the rings from falling out, the main force of insertion being exerted back against the head of the stick between the lips **44**. To remove the rings the procedure is reversed except that a slight sidewise turning of the jaw head assists in unseating the rings.

The simple and inexpensive drop-out rings **30** fulfill all requirements admirably in preventing fluttering or other abnormal movements of the sheeting; and they are easily installed and removed, highly inconspicuous, rust proof, and non-injurious to both the sheeting and the enamel on the channel tracks. The rings also accommodate themselves to dimensional irregularities in the sheeting and tracks; they begin to soften promptly in the presence of excessive heat, but maintain their sheet-securing effectiveness in the presence of otherwise elevated temperatures and humidity.

In some installations, air currents arising from various sources may tend to dissipate heat too rapidly to soften the drop-out wedges **30** immediately in the initial stages of a fire. Likewise, while the metal base tracks in some situations may heat up very rapidly, they may also retard the heating of retaining rings owing to the high heat conductivity of the metal, so that it is frequently possible for a sprinkler system to release before either the drop-out means or the panelling has an opportunity to soften sufficiently to drop out.

However, the softening of the drop-out means will tend generally to occur closely in point of time with the softening of the sheeting; and, if the latter is softened softened sufficiently to lose its sustaining rigidity and fall from the tracking, the weight of the deformed sheeting will assist in release of the drop-out rings. If sprinklers

are present and release properly, the water load on the sheeting will drop out the panels regardless of whether the drop-out rings or wedges have become softened by heat, or not.

The temperature range of 140° to 150° F. for softening of the drop-out rings is not limiting, but is illustrative of one satisfactory range which is related to the fusing temperature of 165° F. for one type of sprinkler head. In general, the temperature sensitivity or softening factor for the rings may be selected to match that of the particular sheeting **21** employed in any particular installation, or to meet insurance requirements in any particular installation.

In those installations which do not involve fire sprinklers in the plenum, it is sufficient that the rings soften or relax at about the same temperature as the sheeting used; and the preferred temperature range for most installations is the aforesaid 140–165° F. range; although sheeting has been used which will not soften sufficiently to drop or festoon until a sustained temperature of well over 300° F. has been passed.

The most satisfactory shape for the drop-out channel wedges **30** is that of a ring or annulus, by reason of the sensitivity of this form to change in shape with diametric compression in the presence of heat owing to the existing tension as a result of forcing the rings into the track channels.

However, a solid body, such as the disc **30X** (shown in Fig. 9) may be used, and in such case the material should be of springy consistency and of low softening temperature, since there is a greater mass to be relaxed or displaced. Also, the holding contact of a ring with the sheeting and channel is a point contact because substantially tangential, so that a sort of rolling movement of the ring results from the pull of the sheeting.

Apart from the foregoing safety-release aspects of the drop-out retaining means in incendiary circumstances, they have a distinct utility as very effective, inexpensive, inconspicuous, easily-installed and removed panel retainers for a channel-track base system.

I claim:

1. In a ceiling structure, the combination with sheeting supported along opposite edges in channeled tracks, of retaining means in the form of an annulus having a diameter slightly exceeding the width across the track channel so as to fit tightly into the latter upon said sheeting to press the same against a side of the channel, said annulus being fabricated of a plastic material of the class of the vinyl acetates and having a wall thickness affording some inherent diametric springiness to the annulus so as to be diametrically yieldable and expansible to enter and fit firmly in the track channel, and be removable therefrom by application of moderate force thereto.

2. In a ceiling structure of the class including parallel channel tracks adapted to receive and support the opposite edges of a span of sheeting therein in the plane of a virtual ceiling, improvements comprising, to wit: drop-out retaining means in the form of annuli of a diameter to fit snugly into the track channels to wedgingly press the sheeting edge portions against a side of the channel at selected intervals along the channel where said annuli may be positioned.

3. Retaining means according to claim 2 further characterized in that said annuli are formed from a fusible material adapted to melt at a predetermined drop-out temperature for the purpose of freeing said sheeting for dropping out of the track at certain elevated temperatures, as in case of fire.

4. In a ceiling structure of the class described, the combination, with confronting track channels for supporting ceiling sheeting along opposite edges disposed in the channels, of retaining means in the form of wedge members having inherent limited yieldability in at least one diametric dimension and pressed into said channels upon said sheeting edges therein at selected intervals along the

track channels with said dimension extending crosswise of the latter to wedge the sheeting in position therein.

5. The combination of claim 4 in which said retaining members are adapted to relax their wedging action in the presence of fire and formed of a fusible material which will soften and deform at a preselected abnormal temperature above a predetermined maximum normal room temperature, to free said sheeting for dislodgement from the track channels, as in the case of fire causing said abnormal temperature.

6. In a ceiling structure of the class having parallel confronting channel tracks to support the opposite edges of a span of ceiling sheeting, improvements comprising, to wit: drop-out retaining means in the form of diametrically yieldable annuli of a normal dimension to fit snugly into said channels between an inner side of the latter and the sheeting to press the latter against the remaining inner side of the channel in a wedging action, said annuli being fitted into the track channels as aforesaid at predetermined intervals therealong to secure said sheeting against movement therein.

7. Retaining means according to claim 6 in which said annuli are constructed of a heat-sensitive material having a temperature sensitivity which will cause the same to become deformed at temperatures above a predetermined normal level so as to relax in a diametric direction, at least, and thereby relax said wedging and securing action thereof so as to free the sheeting to drop from said channels, as in case of fire.

8. In a virtual ceiling structure, the combination with parallel track channels adapted to seat the opposite longitudinal edges of ceiling panels, of drop-out retaining means in the form of a plurality of insert wedges having a dimension to fit snugly but easily into said channels and pressed into the latter onto the edge portions of the panelling therein at selected intervals with only moderate tightness whereby to be displaceable to free said panelling from the wedging action thereof by application to the panelling of a force which tends to withdraw said edge portions of the panelling outwardly of the channels, when said force exceeds a predetermined value.

9. In a ceiling structure, in combination with semi-flexible ceiling sheeting supported along its edges on narrow, horizontally-extending ledge formations with

closely overlying surface portions defining supporting grooves for said sheeting, retaining and hold-down wedge means in the form of rounded wedges having limited yieldability in at least one diametric direction and of a size in said direction closely approximating the distance laterally across said grooves so as to be wedgingly insertible into the latter against a portion of the sheeting resting therein as a removable retaining and hold-down means preventing vibration and dislodgment of the sheeting in said grooves.

10. A holding wedge for use with plastic-sheeting ceilings wherein the sheeting is supported only along edges resting in narrow shallow grooves, said wedge comprising a circular shape having a crosswise dimension for press fit into said grooves upon the edge of the sheeting supported therein, said shape having limited yieldability in said crosswise dimension so as to be wedgingly insertible in said grooves at desired intervals along the edgewise extent of said sheeting to provide a limited hold-down force on the sheeting and normally restrain movement of edgewise parts of the sheeting in said grooves.

11. Holding-wedge means for plastic-sheeting ceilings in accordance with claim 10 and further characterized in that said wedge is made of a heat-sensitive material which will relax at least in said crosswise dimension of the rounded shape in the presence of heat above a predetermined temperature so as to free said sheeting for movement out of said grooves.

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