Dec. 27, 1955 HERBERT K. WONG 2,728,595

RETAINING LATCH FOR LUMINOUS CEILING PANELS

Filed Sept. 14, 1954

FIG. 1

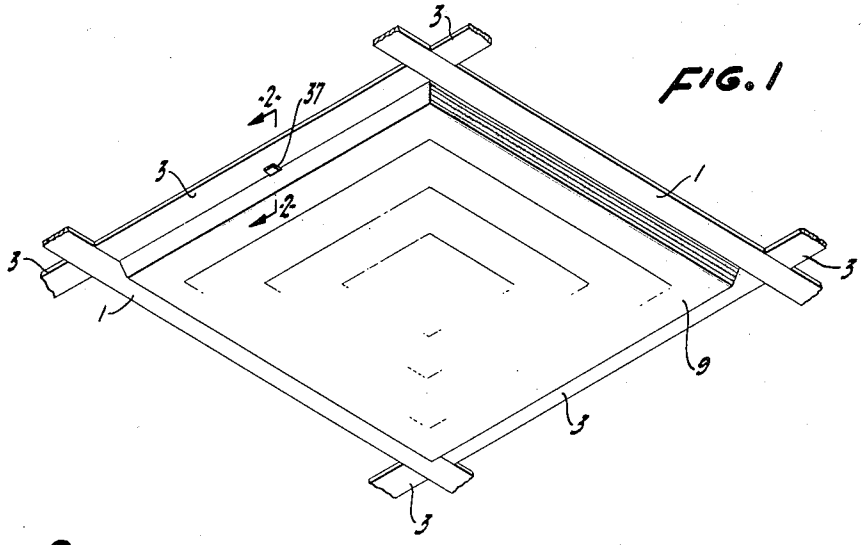


FIG. 2

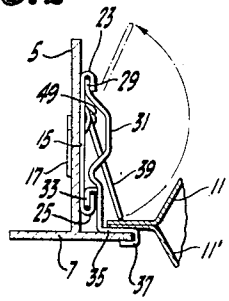
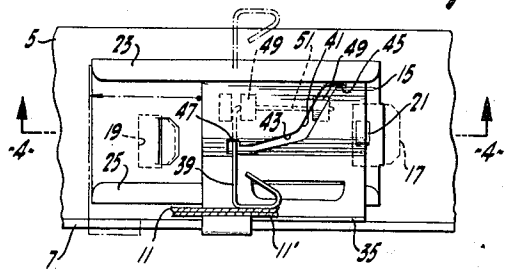


FIG. 3



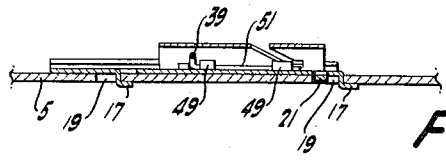


FIG. 4

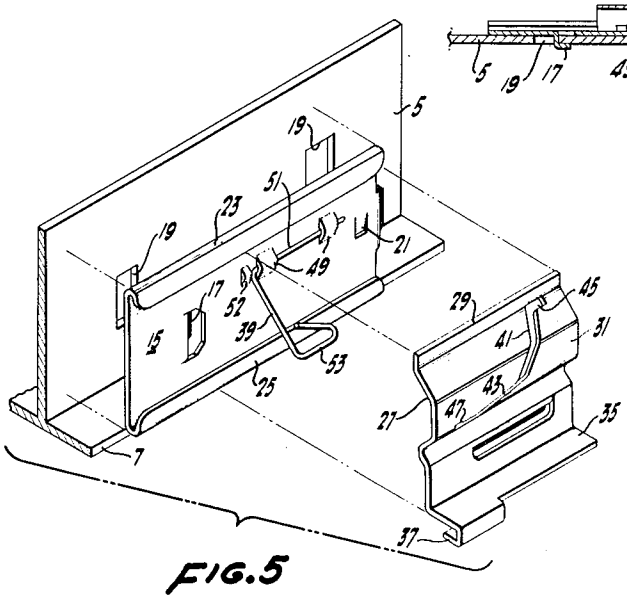


FIG. 5

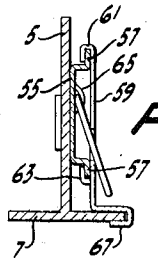


FIG. 6

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RETAINING LATCH FOR LUMINOUS CEILING PANELS

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Application September 14, 1954, Serial No. 455,994

8 Claims. (Cl. 292—197)

This invention relates to latches or retaining devices, primarily for securing in position the modular panels constituting ceilings and particularly such panels as are described in the copending application of the present inventor, Serial No. 328,717, filed December 30, 1952, now issued as United States Letters Patent No. 2,710,335 granted June 7, 1955, although it is not limited to panels of the type there disclosed and the same mechanism may, of course, be utilized for retaining opaque panels or for other purposes where the conditions of use are comparable to those for which the device is primarily designed.

Luminous ceilings, as presently constructed, comprise reticulated frames, usually constructed of T-section or L-section structural members, usually of light, extruded aluminum. Such frames are suspended a suitable distance beneath the rafters of the structural ceiling, lighting fixtures being supported by the latter. The frames may be fabricated in a number of different ways, but usually consist of longitudinal stringers of the T-section described, with the cross-bar or flange of the T down. The stringers are connected at regular intervals by cross-bars of the same material, connected to the stringers by suitable joints and with the flanges of the cross-bars in the same plane as those of the stringers. Usually the cross-bars are spaced along the stringers by distances equal to their length, so as to form a network of square, modular units, although the units may be of rectangular or other geometrical shape in special circumstance. Fixtures for the lamps supplying the illumination are symmetrically arranged, with respect to the center of each unit opening above the frame.

A light diffusing panel is placed in each of the modular units, resting upon the dependent flanges of the T- or L-structure, the latter type being used at the edges of the frame where only the inwardly projecting flange would be of use. As has been shown in the copending application cited above, there is a great advantage in making these panels in a form of cells formed of light, translucent, flexible plastic sheets, this structure giving excellent light diffusion and also serving as an acoustic treatment for the ceiling. Obviously the panels must be removable in order to permit servicing of the lights, particularly where the entire area of a large ceiling is luminous.

One of the great advantages of ceilings of this character is their extreme lightness. Cellular panels utilizing two thicknesses of plastic weigh only about three ounces per square foot, while single panels weigh only one-half this amount. The only disadvantage to this lightness is that where the ceilings may be subjected to sudden powerful gusts or draughts, such as may be caused by opening an exterior door or window on a windy day, the panels may be displaced. While such displacement hardly ever occurs in the most usual type of installation, the fact that it is a possibility makes it desirable, if not necessary, that some form of retainer or latch be used to retain the panels in position.

Among the objects of the present invention are to

provide a panel retainer or latch for the purpose described which can be easily operated from below the ceiling; to provide a latch which is so inconspicuous as to be practically invisible, and which does not mar the appearance of the ceiling as a whole; to provide a latch which is positive in operation and which will not release unless it is purposely operated; to provide a latch which is so light in weight so as to constitute a negligible addition to the weight to the entire structure; and to provide a latch which is simple in construction, easily fabricated, and easily attachable to the frames which support the panels.

Considered broadly the latch or retainer of the present invention comprises an operating slide of sheet material, generally L-shaped, having a riser extending upwardly generally parallel to the web of the frame, and means for securing the riser slidably to the web so that it may be moved therealong in the direction parallel to that of the structural member on which the latch is mounted, and a foot which rests upon and extends parallel to the flange of the structural member, the foot including a tab which bends around the edge of the flange and extends back, toward the riser, parallel to the body of the foot. A pair of cam-surfaces is formed in the riser of the slide, these surfaces constituting the edges of a slot extending in a generally diagonal direction downward across the face thereof. Projecting outwardly through the slot is a retaining finger which is pivotally mounted for rotation around a horizontal axis behind the slide. The retaining finger is preferably of spring-tempered wire. By movement of the slide in one direction the cam surface rotates the retaining finger upwardly and substantially into contact with the web of the frame. Movement of the slide in the other direction brings the other edge of the slot to bear against the operating finger, rotating it downwardly and into contact with the panel which rests upon the frame flanges. Preferably the contour of the cam-surfaces is such that their downward slope is steeper in the upper portion of the cam and decreases as the retaining finger approaches its fully depressed position, in contact with the panel, the length of the finger being such that this contact occurs over the flange of the frame and not displaced materially outwardly therefrom, where the panel is unsupported from below. Preferably, also, the upper cam-surface is notched at its lower end, so that when the retaining finger is fully depressed the resilience of the retaining finger forces it up into the notch and prevents its accidental displacement, instead of the same resilience tending to force the cam backward into the unlatched position.

The invention will be more readily understood from the following description of two embodiments of the invention, differing slightly in construction but identical in principle, taken in conjunction with the accompanying drawings wherein:

Fig. 1 is an isometric view, from below, of one modular panel of a luminous ceiling in its supporting frame;

Fig. 2 is a cross-sectional view of the latch mechanism and the frame whereon it is mounted, the plane of section being indicated at 2—2 of Fig. 1;

Fig. 3 is a view of the assembled latch as seen in elevation;

Fig. 4 is a longitudinal, sectional view through the latch, the plane of section being that indicated at 4—4 of Fig. 3;

Fig. 5 is an exploded isometric view of the latch shown in Figs. 2 through 4; and

Fig. 6 is a sectional view, similar to Fig. 2, of a modified form of latch.

In Fig. 1 there is shown a general view of one panel of a ceiling of the type herein considered. A reticulated

frame comprising stringers 1 and cross-members 3, connected by suitable joints or fastenings, is suspended by hangers (which may be similar to those described in the application of Sherman H. Lee, Serial No. 126,991, filed November 14, 1949, now Patent No. 2,698,071, issued December 28, 1954) at a suitable distance below the structural ceiling.

The members constituting the frame are for the most part of T-shaped cross-section, although it is frequently convenient to use L-sections for the members constituting the outer periphery of the frame. As shown in the detailed views in Figs. 2, 3 and 5, the T-shaped members include a web 5 extending perpendicularly from the plane of the ceiling and a flange 7, perpendicular to the web, the webs of the stringers and cross-members lying in the same plane and effectively defining the plane of the ceiling. The meshes or reticulations of the frame are shown as square, this being the usual and most convenient arrangement, although they may be of other geometrical shapes if desired, non-equilateral rectangles, triangles, and even curvilinear forms having been used upon occasion for decorative purposes.

Supported upon the flanges in each module or mesh of the framework is a light-diffusing panel 9. In the drawing only translucent panels are shown, although, again for decorative purposes, it may be desired to use either colored panels or opaque panels in certain portions of the ceiling. The particular type of panel used is of no importance so far as the present invention is concerned.

The panels shown are of the cellular type, each comprising two embossed sheets of thin plastic, 11 and 11', cemented together at the edges as indicated at 13, the flat edges of the joints resting against the flanges in each mesh of the frame.

Preferably, a retaining latch of the type with which this invention is primarily concerned is mounted at the center of each of two opposite sides of each panel, although more may be used and they may if desired, be mounted in some other position. Experience has indicated, however, that two are adequate.

In a preferred form of the device each of the retainers or latches comprises a guide-plate 15, adapted to be secured to the web of a frame member, either a stringer or a cross-piece. The guide-plates may be riveted or spot welded to the web if desired; in the present case, however, the guide-plates are provided with Z-shaped clips 17, each of which may be inserted through an aperture 19 punched in the web and then slid into place longitudinally of the web, so that the lip of the Z grips the edge of the aperture. Disengagement is prevented by forcing a small loop 21, punched in the guide-plate for the purpose, outwardly to engage the opposite edge of the aperture.

The upper and lower edges of the guide-plate are each bent outwardly and downwardly to form U-shaped tracks 23 and 25, parallel to the edge of the web.

The tracks on the guide-plate are engaged by conjugate tracks on an operating slide 27. The slide is of sheet material, generally L-shaped in cross-section. At the top of the upright branch or riser of the L is a short planar flange 29, which fits within the U-shaped upper track of the guide. Immediately below the flange 29 the slide is bowed outwardly about an axis parallel to the track returning substantially to the plane of the flange 29 below the bowed portion 31. A Z-shaped tab 33, punched out of the body of the slide, engages the lower guide-plate track 25. On either side of the tab 33 the material bends outwardly around the track and down to the plane of the flange 7, where it is bent outwardly from the riser and the guide-plate to form the foot 35 of the L-shaped slide. The main body of this foot in this case extends outwardly only to the edge of the flange 7. An operating tab 37, however, is given a U-shaped bend around the edge of the flange and back beneath it toward the riser for a distance which is preferably of the order of one-eighth of an inch. This is the only portion of the mechanism which is visible to those in the room in which the ceiling is installed. If both the frame and the tab are of bright metal (as is usually the case) or if the frame and tab are the same color, the tab is unnoticeable. Even if the tab and the frame are strongly contrasting in color, however, the tabs are very difficult to see from the floor and do not detract in any way from the uniform appearance of the ceiling.

Formed in the bowed portion 31 of the slide is a slot, extending in a generally diagonal direction downwardly from the top to the bottom of the bowed portion. The edges of this slot form cam-surfaces which operate a retaining finger 39. Preferably the downward slope of the slot, and hence of the cam-surfaces, is not uniform, being steeper in the upper portion 41 and more gradual in the lower portion 43. The upper end of the slot, closely adjacent to the track 23, may be given a short horizontal section 45. At the lower end of the slot there is preferably formed, in the upper cam-surface, a shallow notch 47.

The retaining finger 39 is preferably formed of spring-tempered wire, and is mounted for rotational movement around a horizontal axis centered behind the bowed portion 31 of the slide. As shown, the bearing for the finger is formed of a pair of shallow loops 49, "bumped up" from the body of the guide-plate through which the end 51 of the wire finger is inserted, forming the shaft about which the finger rotates. Beyond these loops the wire bends outwardly at right angles, and is prevented from coming out of the bearing loops by a shallow third loop 52, also "bumped up" from the body of the guide-plate, immediately beyond the bend. The finger proper extends out through the slot in the operating slide. Its distal end, remote from the bearing, is bent back parallel to the bearing-end to form a presser foot 53 which engages the panel which it is to hold. The length of the finger, between its bearing portion or shaft 51 and the presser foot 53 is such that when the finger is in its lower or depressed position it strikes the panel above the flange and not outwardly displaced therefrom, at least to any material degree.

It will be seen that when the slide is moved to the left, as shown in the drawings, the lower cam-surface of the slot in the slide will lift the finger to a substantially upright position as indicated by the dotted lines of Fig. 3, and hold it there if the slide is moved far enough so that the finger enters the horizontal portion of the slot. On the other hand, when the slide is moved to the right, the upper cam-surface engages the finger, moving it down into contact with the edge of the panel. The lesser slope of the lower end of the cam-surface gives an additional mechanical advantage in the portion of the movement wherein the presser foot is in contact with the panel surface, flexing the resilient finger slightly and holding the panel firmly in place. The slide should be moved far enough so that the flexed finger engages the notch, preventing the resilience of the finger from itself moving the slide back and releasing the latch. The notch 47 may be very shallow, no deeper than the thickness of the wire of the finger 39 itself, so that there is no difficulty in springing the finger out of the notch when it is desired to release the latch and remove the panel.

It should be clear that the latch thus described is capable of numerous mechanical modifications without departing from its general principles. For example, the guide-plate may be omitted and the tracks formed directly on the web of the supporting frame. Preferably the portion of the slide above the bearing for the finger should be displaced outwardly from the guide for a short distance, both to give room for the finger bearing and to provide a reasonable operating leverage for the cam-surfaces against the finger. The structure described shows a con-

venient way of doing this. Fig. 6, however, shows in section another structure which accomplishes the same purposes. In this case the upper and lower edges of a guide-plate **55** are given Z-shaped bends **57**, outward from the plane of the web, to form the guide-plate tracks. The upright of the L-shaped slide **59** can then be straight, as shown, its upper edge being given a U-bend **61** to engage the upper guide track while a tab **63** (corresponding to the tab **33** of the modification previously described) is reversed in direction to engage the lower guide track **57**. The Z bends **57** are made deep enough to displace the slide outwardly far enough from the guide-plate to permit the formation of the bearing loops **65** and give room for the desirable lever arm. In this case the operating tab **67** extends for the full width of the foot **69** of the slide. The only reasons for making the tab narrower than the foot are that the narrower tab is a little less conspicuous and that the bending operation is slightly easier, but neither of these factors is of primary importance.

Various other details of the invention may be modified in accordance with the ideas of any individual designer. The two forms illustrated are not, therefore, to be considered as limiting the scope of the invention, all intended limitations being specifically expressed in the following claims.

What is claimed is as follows:

1. Means for retaining a ceiling panel in a frame comprised of members having flanges upon which said panels are adapted to rest and stiffening webs perpendicular to said flanges, comprising a guide-plate of sheet material adapted to be secured against said web, an L-shaped operating slide of sheet material including a foot adapted to contact said flange and a riser substantially perpendicular thereto, means on said guide-plate and said slide for mutually engaging them in slidable relationship in a direction parallel to said flange, a tab on said foot bent downwardly and back toward said riser to engage slidably the edge of said flange, said riser including a portion displaced outwardly with respect to said guide-plate, a pair of cam-surfaces formed in said portion, said cam-surfaces comprising the edges of a slot extending in a generally diagonal direction downwardly across said portion, and a retaining finger pivotally mounted to said guide-plate behind said portion of said slide and projecting through said slot and of a length adapted to contact a panel to be retained at a point above said flange.

2. Panel retaining means as defined in claim 1 wherein said retaining finger is formed of spring wire.

3. Panel retaining means as defined in claim 1 wherein said cam-surfaces slope downwardly more steeply adjacent to the upper part of said bowed portion of the riser than adjacent to the lower part thereof.

4. Panel retaining means as defined in claim 1 wherein the upper of the cam-surfaces is provided with a notch at the lower end thereof engaging said retaining finger when said finger is fully depressed.

5. In combination with a frame adapted to support a light-diffusing panel of a luminous ceiling and comprising structural members having webs for surrounding such panel and flanges substantially normal to said webs whereon the panel rests, means for retaining the panel in position on said flanges comprising an operating slide of generally L-shaped configuration having a riser portion extending generally parallel to said web and a foot portion extending generally parallel to and in contact with said flange, an operating tab on the end of said foot portion folded around the edge of said flange, means for mounting said slide on said web in slidable relation thereto in a direction longitudinal of said web, a pair of cam-surfaces on said slide comprising the edges of a slot extending diagonally downward across the riser of said slide, and a retaining finger pivotally mounted for rotational motion about a horizontal axis behind said slot and including an arm extending through said slot and thereby engaging the cam-surfaces comprising the edges thereof so as to be moved upward out of engagement with said panel by motion of said slide in one direction and downward into engagement with said panel by motion of said slide in the opposite direction.

6. Means for retaining a ceiling panel in a frame comprised of members having flanges upon which said panels are adapted to rest and stiffening webs perpendicular to said flanges, comprising a guide-plate of sheet material adapted to be secured against said web, an L-shaped operating slide of sheet material including a foot adapted to contact said flange and a riser substantially perpendicular thereto, means on said guide-plate and said slide for mutually engaging them in slidable relationship in a direction parallel to said flange, a tab on said foot bent downwardly over the flange edge for slidable engagement therealong, said riser including a portion displaced outwardly with respect to said guide-plate, a pair of cam-surfaces formed in said portion, said cam-surfaces comprising the edges of a slot extending in a generally diagonal direction downwardly across said portion, and a retaining finger pivotally mounted to said guide-plate behind said portion of said slide and projecting through said slot and of a length adapted to contact a panel to be retained at a point above said flange.

7. In combination with a frame adapted to support a light-diffusing panel of a luminous ceiling and comprising structural members having webs for surrounding such panel and flanges substantially normal to said webs whereon the panel rests, means for retaining the panel in position on said flanges comprising an operating slide of generally L-shaped configuration having a riser portion extending generally parallel to said web and a foot portion extending generally parallel to and in contact with said flange, an operating tab on the end of said foot portion folded over the edge of said flange to depend therefrom, means for mounting said slide on said web in slidable relation thereto in a direction longitudinal of said web, a pair of cam-surfaces on said slide comprising the edges of a slot extending diagonally downward across the riser of said slide, and a retaining finger pivotally mounted for rotational motion about a horizontal axis behind said slot and including an arm extending through said slot and thereby engaging the cam-surfaces comprising the edges thereof so as to be moved upward out of engagement with said panel by motion of said slide in one direction and downward into engagement with said panel by motion of said slide in the opposite direction.

8. A panel retaining component for use in combination with a structural member adapted to support a light diffusing panel of a luminous ceiling, the structural member having a vertical web and at least one horizontal flange which comprises an operating slide of generally L-shape configuration having a riser portion adapted to extend generally parallel to the web of the structural member and having a foot portion adapted to extend generally parallel to and to be substantially in contact with the flange of the structural member, a depending operating tab at the outer end of said slide foot folded over in a direction adapted to extend, when positioned adjacent to the flange of the structural member, over the flange edge, means adapted for mounting the slide adjacent to the web portion of the structural member in slidable relation thereto in a longitudinal direction relative to the web, a pair of cam-surfaces on the slide formed as the edges of a slot extending diagonally downward across the slide riser, and a retaining finger pivotally mounted for rotational movement about an axis behind said slot and including an arm extending through said slot thereby to engage the cam surfaces provided by the slot edges to be movable in an upward direction away from the slide foot by motion of the slide in one direction and movable downward into substantial engagement with the slide foot and any thereby supported panel by motion of the slide in the opposite direction.

No references cited.