METAL BUILDING DROP CEILING

Publication Classification

Abstract

An insulated drop ceiling is provided for a metal building having spaced apart metal purlins with conduit or other structure extending across the purlins. Plastic support members are clipped to the purlins, and have an upper channel to accommodate the conduit, and a lower channel to support ceiling panels from the purlins and below the conduit.
METAL BUILDING DROP CEILING

FIELD OF THE INVENTION

[0001] The present invention generally relates to a drop ceiling for a metal building, and more particularly, to a device for supporting a ceiling panel, with conduit running between the ceiling panel and the purlins.

BACKGROUND OF THE INVENTION

[0002] Metal buildings are common and can be constructed relatively quickly at a relatively low cost, and provide for low maintenance. However, the metallic components of these buildings produce high thermal conductivity. Thus, temperature control in such metal buildings raises problems of efficiency and effectiveness. Heating and cooling costs generally tend to run relatively high.

[0003] Conventional ceiling insulation in metal buildings normally is provided over the top of the roof purlins, after which the roof deck is attached to the purlins and over the insulation. The insulation is installed from the outside of the building, and involves relatively costly labor, in addition to the danger and difficulty in windy or wet conditions. The roof deck squeezes the insulation above each purlin, thereby reducing the R-value, and thereby increasing energy loss and increasing energy costs.

[0004] Applicant’s U.S. Pat. Nos. 6,330,799 and 7,107,732 provide advantages over conventional metal building roofs and insulation. More particularly, the purlin clip U.S. Pat. No. 7,107,732 allows ceiling panels to be secured to the purlins without the use of penetrating fasteners, such as screws, which otherwise reduce the R-value and increase the construction time and cost. However, the structure disclosed in this purlin clip patent will not accommodate roof structures having conduit running along the lower flange of the purlins, which is common in older metal buildings.

[0005] Therefore, a primary objective of the present invention is the provision of an improved drop ceiling structure for metal buildings.

[0006] Another objective of the present invention is the provision of a device for supporting ceiling panels from the purlins and below conduit extending across the purlins.

[0007] A further objective of the present invention is the provision of a method of building an insulated ceiling for a metal building having ceiling conduits.

[0008] Another objective of the present invention is the provision of an insulated ceiling for a metal building which attaches to the purlins without the use of penetrating fasteners.

[0009] Still another objective of the present invention is the provision of a method of building an insulated drop ceiling for a metal building which is inexpensive, yet energy efficient.

[0010] Yet another objective of the present invention is the provision of a method of providing an insulated ceiling in a metal building after the roof deck has been installed.

[0011] A further objective of the present invention is the provision of an improved drop ceiling for a metal building which quickly and easily attaches ceiling panels to purlins while accommodating for conduit in the roof structure.

[0012] These and other objectives will become apparent from the following description of the invention.

BRIEF SUMMARY OF THE INVENTION

[0013] The improved insulated drop ceiling of the present invention is useful in metal buildings having a plurality of spaced apart purlins with upper and lower flanges. A metal roof is attached to the upper flanges of the purlins, while insulated ceiling panels are connected to the lower flanges of the purlins, but beneath conduit running adjacent the lower flanges of the purlins. The ceiling panel support device of the present invention clips to the lower flange of the purlins, and defines a channel spaced below the purlins and the conduit for receiving an edge of ceiling panels, without the use of penetrating fasteners. The ceiling panels and the roof deck define a space therebetween in which additional insulation can be blown.

[0014] The method of constructing the metal building insulated ceiling according to the present invention includes the steps of supporting purlins in a spaced apart orientation, attaching a metal roof to the upper flange of the purlins, extending conduit along the lower flanges of the purlins, attaching clips and support devices to the lower flange of the purlins, and installing ceiling panels in the support device channels residing beneath the purlins and beneath conduit extending adjacent the lower flange of the purlins. Additional insulation can be supplied in the space between the roof and the ceiling panels.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a perspective view of a metal building roof and ceiling structure according to the present invention.

[0016] FIG. 2 is an enlarged side elevation sectional view taken along lines 2-2 of FIG. 1.

[0017] FIG. 3 is a perspective view of the clip used to attach the ceiling panel support members of the present invention to the purlins.

[0018] FIG. 4 is a perspective view showing a ceiling panel support member clipped to a purlin, without the ceiling panel installed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] In FIG. 1, the reference numeral 10 generally designates a roof and insulated drop ceiling structure for a metal building according to the present invention. The structure 10 includes a plurality of spaced apart purlins 12 supported on I-beams or other structural framing 14. The purlins 12 typically have a Z-shaped cross-section, as seen in FIG. 1, or alternatively, a C-shaped cross-section. Each purlin 12 includes an upper flange 16 and a lower flange 18. A roof deck 20 is attached to the upper flange 16 of the purlins 12 using conventional fasteners (not shown). The deck 20 may be flat or corrugated metal. The purlins 12, I-beams 14, and roof deck 20 have conventional construction.

[0020] Insulated ceiling panels 22 are attached to the lower flange 18 of the purlins 12 using a plurality of purlin clips 24 and support members or devices 26. Penetrating fasteners, such as screws or bolts, are not used for mounting the panels 22 to the purlins 12. Conduit 23, or other structure, resides between the ceiling panels 22 and purlins 12.
The purlin clip 24 is shown and described in detail in Applicant's U.S. Pat. No. 7,107,732, which is incorporated herein by reference. As seen in FIG. 3 herein, each clip 24 includes a body 28, with an upper arm 30 and a pair of lower legs 32. An upper channel 34 is defined by the body 28 and the upper arm 30, and is adapted to receive the lower flange 18 of the purlin 12, as seen in FIG. 2 herein. A lower channel 36 is defined by the body 28 and the lower legs 32, and is adapted to slidably receive the support devices 26, as also seen in FIG. 2. The arms 30 and legs 32 are offset, as seen in FIG. 3. The arm 30 is resilient, so that the clip 24 can be quickly and easily installed on the lower flange 18 of the purlin 12. Preferably, each clip 24 is formed from a single piece of metal in a one-piece construction, though it is understood that the clip 24 may be made from multiple pieces and/or other materials.

As best seen in FIG. 2, each support member 26 includes an upper female portion 38 and a lower male portion 40. The upper portion 26 includes a vertical or central body 42. A pair of upper arms 44 extend outwardly at the upper end of the body 42. A pair of lower arms 46 extend outwardly from the body 42. The lower portion 40 has a pair of lower arms 48 extending outwardly therefrom. The lower end of the body 42 has a pair of legs 50 adapted to receive an upwardly extending leg 52 on the male portion 40. The legs 50 and 52 have mating ribs so as to retain the male portion 40 in the female portion 38.

The upper arms 44 and middle arms 46 define first or upper channels 54, while the middle arms 46 and lower arms 48 define lower channels 56 on each side of the body 42. Each lower channel 56 is adapted to receive the edge of one of the ceiling panels 22.

Preferably, the upper and lower portions 38, 40 of the support members 26 are made from plastic so as to have low thermal conductivity. The leg 52 is adapted to slide longitudinally between the legs 50. The upper arms 44 are adapted to slide longitudinally through the lower channel 36 of the clip 24. Thus, the clips 24 and the support members 26 attach the ceiling panels 22 to the purlins 12 without penetrating fasteners, without the use of adhesive or other bonding materials, and without tools. The lower arms 48 of the support members 26 form a trim piece which covers the mating edges of adjacent ceiling panels 22.

FIG. 4 shows an example of the purlin 12 having the conduit 23 running transverse to the lower flange 18 of the purlin. The support member 26 is attached to the flange 18 by a plurality of the clips 24 so as to extend parallel to the flange 18. The end of the support member 26 terminates adjacent the conduit 23. While only one support member 26 is shown in FIG. 4, it is understood that another support member 26 extends from the opposite side of the conduit 23 (that is, to the left in FIG. 4). The ceiling panels 22 are not shown in FIG. 4, for clarity. The panels 22 extend fully beneath the conduit 23 in the channels 56 of the support members 26.

In constructing the roof and ceiling structure 10 of the present invention, the purlins 12 are supported and attached to the beams 14 in spaced apart, parallel orientation. The roof deck 20 is then attached to the upper flange 16 of the purlins 12 using screws or other conventional fasteners. The purlin clips are mounted on the lower flanges 18 of the purlins 12. The upper and lower portions 38, 40 of the support members 26 are assembled, and the support members are then slidably received in the lower channels 36 of the clips 24, either before or after the clips are mounted on the purlins 12. The ceiling panels 22 are then installed in the channels 56 of the support members 26, so as to be effectively secured to the purlins 12. The upper channels 54 provide a space between the ceiling panels 22 and the purlins 12 through which the electrical conduit 23, wiring, or other structure may extend. Preferably, the upper channel 54 of each support member 26 is approximately one inch in height to accommodate the conduit 23, or other structures. The upper channels 54 also provide an extra inch of insulation 60 in the space 58 between the ceiling panel 22 and the roof deck 20.

Thus, the extended support members 26 with the upper channel 54, accommodates the conduit 23 or other structures extending along the purlins 12. The support members 26 also allow the ceiling panels 22 to be retrofit under an existing roof structure having conduit or other structure extending along the purlins.

The invention has been shown and described above with the preferred embodiments, and it is understood that many modifications, substitutions, and additions may be made which are within the intended spirit and scope of the invention. From the foregoing, it can be seen that the present invention accomplishes at least all of its stated objectives.

What is claimed is:

1. An insulated drop ceiling for a building, comprising:
   a plurality of spaced apart metal purlins having upper and lower flanges;
   a metal roof attached to the upper flanges of the purlins;
   at least one conduit extending adjacent and beneath the lower flanges of the purlins;
   a plurality of clips clipped onto the lower flanges of the purlins;
   panel support members attached to the clips; and
   ceiling panels supported by the support members so as to be attached in spaced relation to the bottom flanges of the purlins;
   a first space between the metal roof and the panels to receive insulation; and
   a second space between the purlins and the panels through which the conduit passes.

2. The insulated ceiling of claim 1 wherein the support members each include upper, middle and lower arms, and wherein the upper arms are connected to the clip, the upper and middle arms define the second space, and the middle and lower arms defining a channel there between to receive an edge of one of the panels.

3. The insulated ceiling of claim 2 wherein the channel is below the second space.

4. The insulated ceiling of claim 1 wherein each support member includes a female portion and a male portion joined to form a channel for receiving an edge of the panel.

5. The insulated ceiling of claim 1 wherein the panel is mechanically attached to the purlin without the use of penetrating fasteners.

6. The insulated ceiling of claim 1 wherein the second space is at least one inch in height.

7. A method of building an insulated drop ceiling, comprising:
   supporting purlins in a spaced apart orientation, each purlin having upper and lower flanges;
   extending a conduit adjacent the lower flanges of the purlins;
   attaching a metal roof to the upper flanges of the purlins;
mounting ceiling panels to the lower flanges of the purlins and below the conduit, without the use of penetrating fasteners, so as to define a space between the roof and the ceiling panel; and
adding insulation in the space.
8. The method of claim 7 further comprising attaching panel support members to each purlin to support the panels between adjacent purlins.
9. The method of claim 7 further comprising supporting opposite edges of each panel with a support member attached to the lower flange of the purlins.
10. The method of claim 9 further comprising clipping the support member to the lower flange of the purlins.
11. The method of claim 9 wherein the support member spaces the panel below the conduit.
12. A device to support a ceiling panel in a building having roof purlins with upper and lower flanges and a conduit adjacent the lower flanges, the device comprising:

   a first arm attachable to a lower flange of the purlins;
   a second arm spaced downwardly from the first arm;
   a third arm spaced downwardly from the second arm;
the second and third arms defining a channel adapted to receive an edge of the ceiling panel so as to support the panel beneath the conduit.
13. The device of claim 12 wherein the first and second arms are formed in an upper portion and the third arm is formed in a lower portion connected to the upper portion.
14. The device of claim 12 wherein the second arm is spaced at least one inch beneath the first arm.
15. The device of claim 12 wherein the first and second arms define a space to accommodate the conduit between the purlin and the ceiling panel.

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