Oct. 27, 1959 O. E. ROTHFUCHS ET AL 2,910,018

CAR ROOF SEAM STRUCTURE

Filed July 23, 1954 2 Sheets-Sheet 1

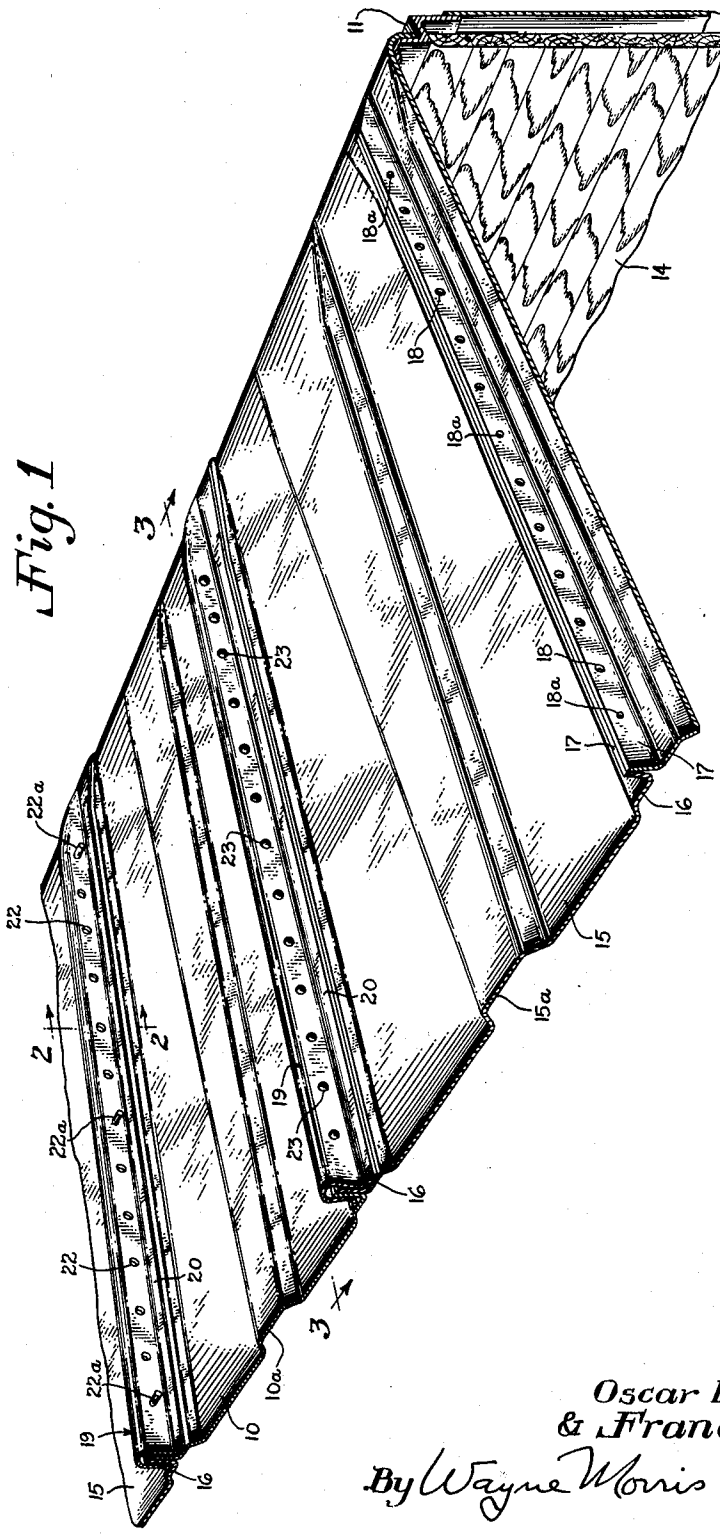


Fig. 1

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Fig. 3

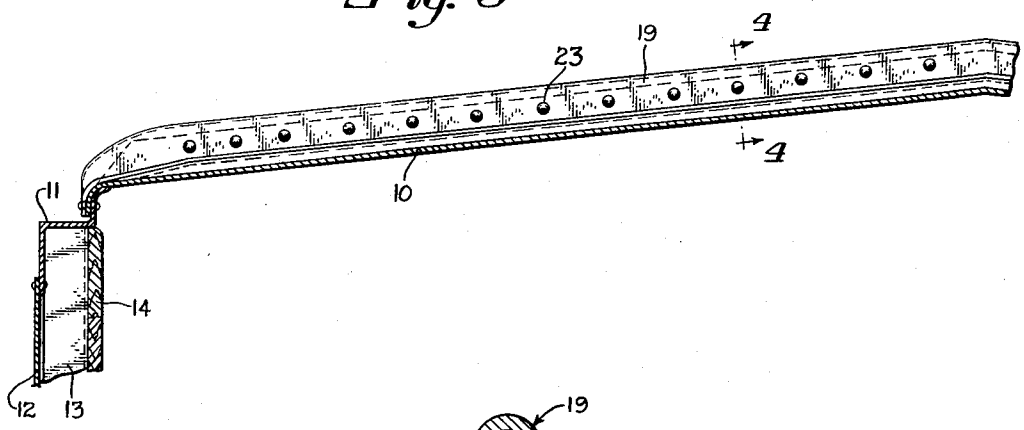


Fig. 2

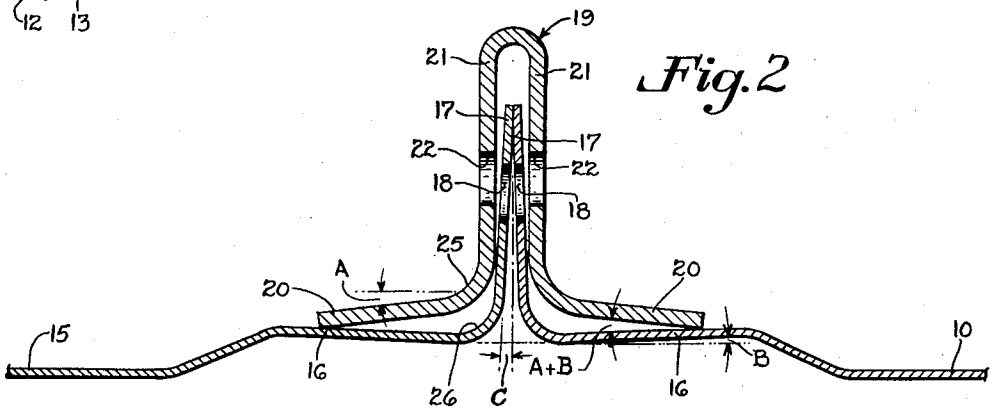
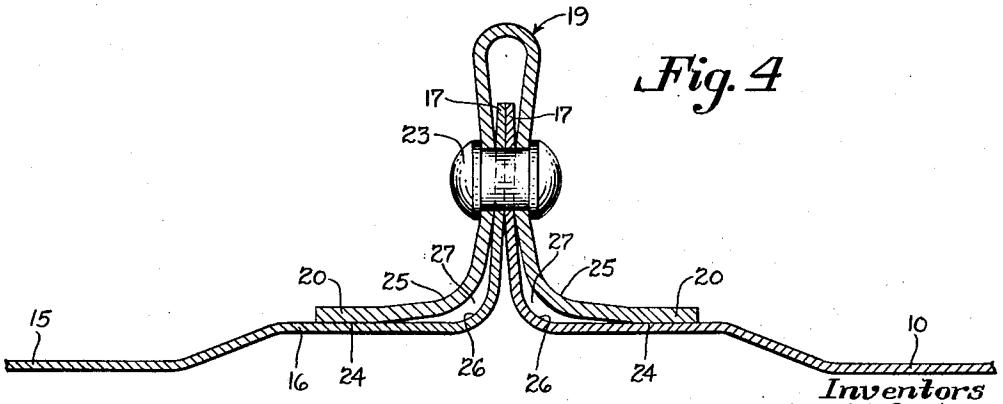


Fig. 4



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CAR ROOF SEAM STRUCTURE

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2 Claims. (Cl. 108—5.4)

This invention relates to metal roof constructions for railway freight cars wherein corrugated, transverse roof sheets having upstanding flanges along each side thereof are joined by seam caps to form a flexible weathertight roof.

Due to modern freight transportation methods where increasing emphasis is being placed on speed of freight movement, the ability of the freight car to withstand the increased strain thereon due to constant vibrations transmitted to all parts of the car must be constantly maintained and improved. With respect to freight car roofs, it has been found that increased flexibility of the roof structure is necessary if the roof is to withstand such fatigue stresses. For this reason, one improvement for roofs related to the change from a flat type of roof sheet to one of a corrugated type sheet, thereby increasing the flexibility of the roof as a whole.

In addition to having flexibility in the sheets themselves, it has been found that to take maximum advantage of the flexibility, the seam joints between the sheets should also be of a flexible nature. It is not possible for prior seam joints to be flexible and yet maintain an efficient weatherseal between the sheets, for their construction is based entirely upon extreme rigidity. Thus, this invention is directed to the conception of a roof sheet joint which will serve not only as an improved weathersealing joint but also as a flexible joint for maintaining flexibility throughout the entire roof.

The type of roof in which this invention is embodied comprises a plurality of corrugated roof sheets laid transversely from one side plate to the other side plate. Each roof sheet, except the end sheets, has a flange upstanding from a raised panel along each transversely extending side, the flanges having rivet holes therein. When the roof sheets are in place, their flanges are adjacent each other to form a seam, then to secure the seam for weathersealing purposes, a U-shaped seam cap having rivet holes therein is placed in an inverted manner over the sheet flanges. The rivet holes of the seam cap and sheet flanges are aligned for the insertion and driving of rivets which completes the seam construction, thus forming not only a weatherseal joint but also an outside load carrying member or carline.

It has been found that by constructing the seam joint in such a manner as to form a tension joint, whereby a constant amount of tension exists between the seam cap and the sheet flanges, an improved weatherseal is maintained and that the flexibility of the roof sheets is supplemented, due to the tension joint having the ability to flex or breathe, thereby tempering the constant oblique shock and shear imposed upon the car roof by the car movement.

Thus, the principal object of this invention is to provide an improved seam construction for a railway car roof having transversely extending, corrugated roof sheets whereby the weathersealing quality of the seam joint is greatly enhanced due to the seam joint being under constant tension.

Another object of this invention is to provide an improved seam construction for a type of roof disclosed herein having flexible roof sheets, whereby the seam joint is capable of breathing or flexing thereby maintaining and supplementing the flexibility of the roof sheets, the seam joint being under constant tension.

And yet another object of this invention is to provide a tension type seam construction for a freight car roof as disclosed herein, whereby the parts of the seam joint may be economically mass produced and applied to mass produced freight cars in a manner insuring perfect assembly.

These and other objects will become more readily apparent by reference to the following description and the accompanying drawings, in which:

Fig. 1 is a fragmentary perspective view of a roof embodying the present invention wherein a section is taken through the ridge of the roof and wherein the upstanding flanges of adjacent roof sheets are shown in three production stages;

Fig. 2 is a vertical section similar to one taken along the line 2—2 in Fig. 1 but showing the seam cap loosely in place over the roof sheet flanges before the wedge pins are inserted;

Fig. 3 is a fragmentary vertical transverse section along line 3—3 in Fig. 1; and

Fig. 4 is a vertical longitudinal section along the line 4—4 in Fig. 3 and showing the seam cap and roof sheet flanges riveted together.

Referring to the drawings, the invention is shown embodied in a freight car roof having a plurality of elongated substantially rectangular metal roof sheets **10** extending with their lengths disposed transverse of the roof from one side plate **11** to the other and with the ends thereof secured over the side plates, the side plates **11** being connected to outer side sheets **12** and secured to vertical side posts **13**, to the inner faces of which an inner car lining **14** is fastened. The roof sheet **10** has formed therein a corrugation or raised panel **10***a* extending longitudinally thereof, and is higher at the center than at the side plate ends.

In Fig. 1, the roof sheet **10** is shown placed side by side with a similar roof sheet **15** having a corrugation **15***a* similar to the corrugation **10***a*, each sheet having a raised marginal portion **16** along a side edge thereof and an upstanding flange **17** extending therefrom, the flange having spaced rivet holes **18** punched therein. A U-shaped seam cap **19** having flared flanges or base sides **20** on the sides **21** of the cap body and with aligned rivet holes **22** in the body sides **21** located in correspondence to the spacing of the sheet flange holes **18**, is placed in an inverted manner over the adjacent roof sheet flanges **17**, whereby the seam cap flanges or base sides **20** rest on the marginal portions **16** and the rivet holes **18** and **22** longitudinally aligned, that is, centered in the same vertical plane transverse of the seam cap and sheet flanges.

In order to provide an improved weatherseal joint, three features are incorporated into the structure. First, the seam cap base sides **20** are, in the unsecured inverted position of the cap as shown in Fig. 2, depressed a predetermined angle A from the horizontal, in this instance from four to six degrees; second, the marginal portion **16** is also depressed a predetermined angle B from the horizontal, in this instance at least two degrees, so that the slope of the sides **20** is opposite to the slope of the portions **16**, and as the flange **17** is at right angles to the portion **16**, the flange **17** leans away from the vertical an angle C, which is equal to angle B; and third, the rivet holes **18** in the upstanding flanges are so located that before riveting, they will be slightly lower than the holes **22** in the seam cap. Fig. 2, illustrating these relationships, which should always be maintained irrespec-

tive of the size of the parts, shows the angles exaggerated for clearness.

After the seam cap **19** has been placed over the adjacent upstanding flanges **17** (Fig. 2), wedge pins **22***a* (Fig. 1) are placed in three preselected pinup holes **18***a*, which have a slightly smaller diameter than the remaining flange rivet holes **18** and which are equal in size to the seam cap holes **22**, the wedge pins being inserted in order to perfectly align the remainder of the holes **18** and **22**. Once the rivet holes are all aligned, rivets **23** are inserted and driven. The greater size of rivet holes **18** provides tolerance to make drifting or reaming unnecessary. By referring to Fig. 4, it may be noted that the rivet **23** compresses the seam cap side walls **21** and roof sheet flanges **17** so as to apply tension to the free edges of the flanges **17**, and also that the marginal portion **16** and the base sides **20** have been vertically deflected so as to be locked together under tension, forming an improved weatherseal joint and also forming a joint which permits a certain amount of flexibility adjacent each side edge of each corrugated roof sheet, the improvement being due to the introduction of tension into the seam joint.

In addition to the improved tension joint, another feature is provided by the improved construction wherein a further safeguard against the entrance of foreign elements through the joint is available due to the provision of a space for the accumulation of car cement. By having the seam cap body-to-base bend **25** formed on a radius greater than the radius of the portion-to-flange bend **26** of the roof sheet, a trap or space **27** adjacent the base of the flange **17** is obtained after the riveting operation (Fig. 4). By this provision, a ribbon of car cement (not shown), spread adjacent the bend **26** before application of the seam cap, may collect in the space **27** upon the compression of the parts by the riveting operation, thus providing an additional sealing zone behind the sealing area **24**. By providing the space **27**, contraction and expansion of the metal adjacent thereto will not force car cement to bleed out the rivet joint, as is possible where no accumulation space is provided.

Thus, it may be seen that by providing a seam joint under tension, a strong, durable, and flexible seam construction is obtained in addition to an improved weathersealing joint. By the provision of such a tension joint, not only will the weathersealing function of a car roof be enhanced but also the entire roof will be more flexible, thus having a longer, more useful and more economical life.

What is claimed is:

1. The method of formig a vehicle roof having a pair of roof sheets extending transversely of the roof and a resilient protruding portion along a transverse edge of each roof sheet and each protruding portion being disposed at an angle below the horizontal and an upstanding flange extending from each protruding portion and each flange being provided with spaced holes therein and a U-shaped seam cap having spaced sides provided with spaced holes and resilient flanges on the sides of the cap

and the flanges on the cap being disposed at an angle slightly greater than ninety degrees with the sides of the cap comprising the steps of placing the roof sheets adjacent each other so that the flanges on the sheets contact each other, manipulating the seam cap so that the flanges of the sheets are disposed between the sides of the cap and the free edges of the flanges on the cap contact the protruding portions and so that the centers of the holes in the flanges of the sheets are spaced vertically below the centers of the holes in the sides of the cap, inserting wedging members in certain of the holes in the flanges of the protruding portions and the sides of the cap and forcing the protruding portions and their flanges toward the cap and the flanges of the cap toward the protruding portions so that the holes in the sides of the cap and in the flanges of the protruding portions are in registry, and placing securing elements in the holes in the sides of the cap and in the flanges of the protruding portions.

2. The method of forming a car roof having a pair of roof sheets extending transversely of the roof and a resilient raised portion along a transverse edge of each roof sheet and each raised portion being disposed at an angle below the horizontal and an upstanding flange extending from each raised portion and each flange being provided with spaced holes therein and a U-shaped seam cap having spaced sides provided with spaced holes and resilient flanges on the sides and the flanges being disposed at an angle slightly greater than ninety degrees with the sides of the cap comprising the steps of placing the roof sheets adjacent each other so that the flanges contact each other, placing the seam cap in an inverted position and disposing it over the flanges so that the flanges are disposed between the sides of the cap and the free edges of the flanges contact the raised portions and so that the centers of the holes in the flanges are below the centers of the holes in the sides of the cap, inserting wedge pins in certain of the holes in the flanges of the raised portions and the sides of the cap and forcing the raised portions and their flanges upwardly and the flanges of the cap downwardly so that the holes in the sides of the cap and the flanges of the raised portions are in registry, and placing rivets in the remainder of the holes in the sides of the cap and the flanges of the raised portions.

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