

SPECIFICATION

Welding Metal Skins to Frame Members

The present invention relates to a frame member for supporting a metal skin, and to the assembly formed when the skin is welded to the member.

Conventional welding of thin or light gauge (say, 5mm or less) metal skins or sheets to metal frame members may result in local distortions and/or discolouration of the skin or sheet. This is unsatisfactory in applications where outward appearances are of importance, for example when welding an outer skin to the frame members of a passenger rail car. The distortion and/or discolouration arises because conventional frame members have a relatively heavy section adjacent the skin to provide the required structural strength for the vehicle, and the heat required to achieve a weld between the frame member and the relatively thin skin is therefore sufficient to heat the exterior of the skin to a temperature at which discolouration occurs. Moreover, because the rigidity of the frame member is greater than that of the skin, any contraction during cooling of the weld tends to distort the skin rather than the frame member.

In United States Patent No. 3,115,572 there is proposed a method which avoids such distortion. However, this method involves using a skin especially made with external ribs and thus results in an uneven external face.

In accordance with one aspect of the present invention there is provided an assembly comprising a metallic skin welded to a metallic frame member, the frame member including at least one rib abutting the skin and at least one flange portion extending outwardly from an edge of the frame member into contact with the skin, the outermost edge portion of the flange portion being welded to the skin and at least a portion of the flange portion being spaced from the skin and having a reduced thickness whereby the flange portion is readily deformable under the heat of welding.

In such an arrangement the deformable flange portion of the frame member prevents distortion and/or discolouration of the skin during the welding of the skin to the frame. This is because the deformable flange portion absorbs the distortions rather than the skin, and because the reduced thickness of the flange reduces the heat required for the welding operation.

In one preferred arrangement, two such deformable flange portions are provided along opposite edges of a frame member, each of the flange portions being welded to the skin such that the skin between the welds acts as a strengthening flange supplementing the strength of the frame member and permitting a lightweight design.

In accordance with another aspect of the present invention there is provided an elongate frame member for supporting a metallic skin to be welded thereto, said frame member having a

longitudinal axis; a flange extending in the direction of said longitudinal axis and having an outwardly directed planar face delimited by a pair of lateral edges; a rib upstanding from said planar face adjacent one of said lateral edges and extending in the direction of said longitudinal axis said rib being positioned to abut said skin and maintain it in spaced relationship to said planar face; and a flange portion projecting laterally from said one lateral edge, said flange portion having a laterally outer edge for engagement with said skin and having at least a portion of thickness less than said flange whereby upon welding of said laterally outer edge to said skin, said skin is supported by said rib and said flange portion deforms to inhibit deformation of said skin.

By way of example only, two embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of one end of a metallic frame member according to one embodiment of the present invention;

Figure 2 is an end view of the frame member of Figure 1 welded against one face of a metallic skin;

Figure 3 is a perspective view of one end of a metallic frame member according to a second embodiment of the present invention; and

Figure 4 is an end view of the frame member of Figure 3 welded against one face of a metallic skin.

The assembly shown in Figure 2 comprises a thin metallic skin 1 such as of aluminium against one face of which is welded an elongate metallic frame member 2 preferably of extruded aluminium. The skin 1 is only a few millimeters thick and of uniform thickness throughout such that the outside face, on the other side relative to the frame member 2, is intended to be very uniform without any distortion. This is desired for instance for the skin of the new generation of railway passenger cars for urban transit system and could be applicable to other passenger vehicles such as buses, and elsewhere.

The elongate metallic frame member 2 has the general shape of a channel member including a pair of parallel flanges 3 and 4 and the interconnecting web 5. The flange 3 constitutes a main body portion and further includes a pair of ribs 6 and flange portions 7 preferably integrally extruded therewith. The ribs 6 and the flange portions 7 project a predetermined distance from the external face 8 of the flange 3 and extend lengthwise parallel to the elongate frame member 2.

Each flange portion 7 includes an outer longitudinal edge portion 9 contacting the inner face of the skin 1 against which the ribs 6 are also abutting. Each flange portion 7 also includes an inner longitudinal edge portion 10 transversely extending intermediate the corresponding outer longitudinal edge portion and the main body portion of flange 3. Each inner longitudinal edge portion 10 is spaced from the inner face of

the skin, and has a reduced thickness compared to the main body portion of the flange 3 so that it is readily deformed by the heat of welding. Thus, any distortions caused by the heat of welding will be absorbed by the flange portions 7 rather than by the skin 1.

The ribs 6 extend longitudinally along the opposite lateral edges respectively of the flange 3 and the flange portions 7 transversely extend edgewise outwardly from the same opposite lateral edges and relative to the ribs.

The outer longitudinal edge portions 9 are arc welded to the skin 1, preferably by chain staggered welds.

The aforementioned spaces defined between the inner face of the skin 1 and the external face 8 and inner portions 10 are in the order of 1 mm for a 2 to 2.5 mm skin and of 1.5 mm for a 3 to 5 mm skin.

The skin 1 thus welded has a portion between and close to the welds which is effective as a flange in the resulting joint and whose original hardening is not annihilated.

The assembly illustrated in Figure 4 is adapted for a skin which is formed by a pair of metallic sheets 11, 12 which are positioned in butt joint relationship relative one to the other and separated edgewise from each other by a seam space or longitudinal gap 13. In this embodiment, an elongated frame member 14 is like the frame member 2, also preferably of extruded aluminium. The sheets 11, 12 are also preferably of aluminium and of uniform thickness throughout.

The elongate metallic frame member 14 has the general shape of a channel member but with an additional flange 15 relative to an otherwise channel shape defined by a pair of parallel flanges 16 and 17 and an interconnecting web 18. The flanges 15 and 16 are coplanar and project on the opposite sides respectively of the web 18. The frame member 14 includes a pair of ribs 6 and a pair of flange portions 7 as afore-described in relation to the first embodiment illustrated in Figures 1 and 2. However, in this second embodiment the ribs 6 and flange portions 7 project from the free outer edge of the pair of flanges 15 and 16 rather than from the opposite lateral edges of a sole flange 3, as in Figure 2.

The frame member 14 also includes a longitudinal ridge portion 19 laterally projecting from the external side defined by the flanges 15 and 16 and having an outer head portion 20 adapted to conceal the seam space on the external face of the thin metallic skin formed by the metal sheets 11 and 12. The longitudinal ridge portion 19 is of H shape transverse cross section defining an inner side 21 extending flat against the flanges 15 and 16, an outer side defining said outer head portion 20 and overlapping the adjacent edges of the metallic sheets 11 and 12 at the butt joint, and an interconnecting portion extending through the seam space between these adjacent edges.

It must be noted that the aforementioned reduced thickness of the inner longitudinal edge

portions 10 may be produced by these portions having either a uniform reduced thickness or one or more grooves longitudinally thereof.

Claims

1. An assembly comprising a metallic skin welded to a metallic frame member, the frame member including at least one rib abutting the skin and at least one flange portion extending outwardly from an edge of the frame member into contact with the skin, the outermost edge portion of the flange portion being welded to the skin and at least a portion of the flange portion being spaced from the skin and having a reduced thickness whereby the flange portion is readily deformable under the heat of welding.
2. An assembly according to Claim 1 wherein said frame member includes a flange, the flange having an internal face and an external face, said at least one rib and said outermost edge portion of said flange portion being connected to said external face and lying in a common plane spaced a predetermined distance from the external face.
3. An assembly according to Claim 1 or Claim 2 wherein the said frame member is elongate and includes two of the said ribs, the ribs extending longitudinally adjacent respective opposite edges of the member.
4. An assembly according to Claim 3 wherein each of the said edges has a deformable flange portion projecting laterally therefrom.
5. An assembly according to any one of the preceding claims wherein the metallic frame member comprises an elongate extrusion member having said rib and deformable flange portion integrally formed therewith.
6. An assembly according to Claim 5 wherein the metallic skin includes a pair of metallic sheets positioned in butt joint relationship relative to one another and separated edgewise from each other by a seam space, and the elongate extrusion member includes a ridge portion extending longitudinally thereof, projecting into said seam space, and having an outer head portion concealing the seam space on the outer face of the metallic skin.
7. An assembly according to Claim 6 wherein said ridge portion is of H-shaped transverse cross section.
8. An elongate frame member for supporting a metallic skin to be welded thereto, said frame member having a longitudinal axis; a flange extending in the direction of said longitudinal axis and having an outwardly directed planar face delimited by a pair of lateral edges; a rib upstanding from said planar face adjacent one of said lateral edges and extending in the direction of said longitudinal axis said rib being positioned to abut said skin and maintain it in spaced relationship to said planar face; and a flange portion projecting laterally from said one lateral edge, said flange portion having a laterally outer edge for engagement with said skin and having at least a portion of thickness less than said flange whereby upon welding of said laterally outer edge



the skin, and has a reduced thickness compared to the main body portion of the flange 3 so that it is readily deformed by the heat of welding. Thus, any distortions caused by the heat of welding will be absorbed by the flange portions 7 rather than by the skin 1.

The ribs 6 extend longitudinally along the opposite lateral edges respectively of the flange 3 and the flange portions 7 transversely extend edgewise outwardly from the same opposite lateral edges and relative to the ribs.

The outer longitudinal edge portions 9 are arc welded to the skin 1, preferably by chain staggered welds.

The aforementioned spaces defined between the inner face of the skin 1 and the external face 8 and inner portions 10 are in the order of 1 mm for a 2 to 2.5 mm skin and of 1.5 mm for a 3 to 5 mm skin.

The skin 1 thus welded has a portion between and close to the welds which is effective as a flange in the resulting joint and whose original hardening is not annihilated.

The assembly illustrated in Figure 4 is adapted for a skin which is formed by a pair of metallic sheets 11, 12 which are positioned in butt joint relationship relative one to the other and separated edgewise from each other by a seam space or longitudinal gap 13. In this embodiment, an elongate frame member 14 is like the frame member 2, also preferably of extruded aluminium. The sheets 11, 12 are also preferably of aluminium and of uniform thickness throughout.

The elongate metallic frame member 14 has the general shape of a channel member but with an additional flange 15 relative to an otherwise channel shape defined by a pair of parallel flanges 16 and 17 and an interconnecting web 18. The flanges 15 and 16 are coplanar and project on opposite sides respectively of the web 18. The frame member 14 includes a pair of ribs 6 and a pair of flange portions 7 as afore-described in relation to the first embodiment illustrated in Figures 1 and 2. However, in this second embodiment the ribs 6 and flange portions 7 project from the free outer edge of the pair of flanges 15 and 16 rather than from the opposite lateral edges of a sole flange 3, as in Figure 2.

The frame member 14 also includes a longitudinal ridge portion 19 laterally projecting from the external side defined by the flanges 15 and 16 and having an outer head portion 20 adapted to conceal the seam space on the external face of the thin metallic skin formed by the metal sheets 11 and 12. The longitudinal ridge portion 19 is of H shape transverse cross section defining an inner side 21 extending flat against the flanges 15 and 16, an outer side defining said outer head portion 20 and overlapping the adjacent edges of the metallic sheets 11 and 12 at the butt joint, and an interconnecting portion extending through the seam space between these adjacent edges.

It must be noted that the aforementioned reduced thickness of the inner longitudinal edge

portions 10 may be produced by these portions having either a uniform reduced thickness or one or more grooves longitudinally thereof.

Claims

1. An assembly comprising a metallic skin welded to a metallic frame member, the frame member including at least one rib abutting the skin and at least one flange portion extending outwardly from an edge of the frame member into contact with the skin, the outermost edge portion of the flange portion being welded to the skin and at least a portion of the flange portion being spaced from the skin and having a reduced thickness whereby the flange portion is readily deformable under the heat of welding.
2. An assembly according to Claim 1 wherein said frame member includes a flange, the flange having an internal face and an external face, said at least one rib and said outermost edge portion of said flange portion being connected to said external face and lying in a common plane spaced a predetermined distance from the external face.
3. An assembly according to Claim 1 or Claim 2 wherein the said frame member is elongate and includes two of the said ribs, the ribs extending longitudinally adjacent respective opposite edges of the member.
4. An assembly according to Claim 3 wherein each of the said edges has a deformable flange portion projecting laterally therefrom.
5. An assembly according to any one of the preceding claims wherein the metallic frame member comprises an elongate extrusion member having said rib and deformable flange portion integrally formed therewith.
6. An assembly according to Claim 5 wherein the metallic skin includes a pair of metallic sheets positioned in butt joint relationship relative to one another and separated edgewise from each other by a seam space, and the elongate extrusion member includes a ridge portion extending longitudinally thereof, projecting into said seam space, and having an outer head portion concealing the seam space on the outer face of the metallic skin.
7. An assembly according to Claim 6 wherein said ridge portion is of H-shaped transverse cross section.
8. An elongate frame member for supporting a metallic skin to be welded thereto, said frame member having a longitudinal axis; a flange extending in the direction of said longitudinal axis and having an outwardly directed planar face delimited by a pair of lateral edges; a rib upstanding from said planar face adjacent one of said lateral edges and extending in the direction of said longitudinal axis said rib being positioned to abut said skin and maintain it in spaced relationship to said planar face; and a flange portion projecting laterally from said one lateral edge, said flange portion having a laterally outer edge for engagement with said skin and having at least a portion of thickness less than said flange whereby upon welding of said laterally outer edge



of said skin, said skin is supported by said rib and said flange portion deforms to inhibit deformation of said skin.

- 5 9. An elongate frame member according to claim 8 wherein said flange portion is of uniform thickness and includes a jog to place said laterally outer edge and said rib in a common plane.

- 10 10. An elongate frame member according to claim 8 or 9 wherein a complementary rib and flange portion is located adjacent the other of said later edges, said skin thereby being supported by said frame member at spaced locations upon welding of said laterally outer edges to said skin.

- 15 11. An elongate frame member according to claim 10 wherein a ridge member projects from said planar face intermediate said lateral edges, said ridge member including a pair of recesses, each to receive an edge of a skin and thereby conceal the joint of two skins.

- 20 12. An assembly according to Claim 1 and substantially as herein described with reference to Figs. 1 and 2 of the accompanying drawings.

- 25 13. An assembly according to Claim 1 and substantially as herein described with reference to Figs. 3 and 4 of the accompanying drawings.