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3,140,885

LAP JOINT FOR HIGHWAY GUARD RAIL

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2 Sheets-Sheet 1

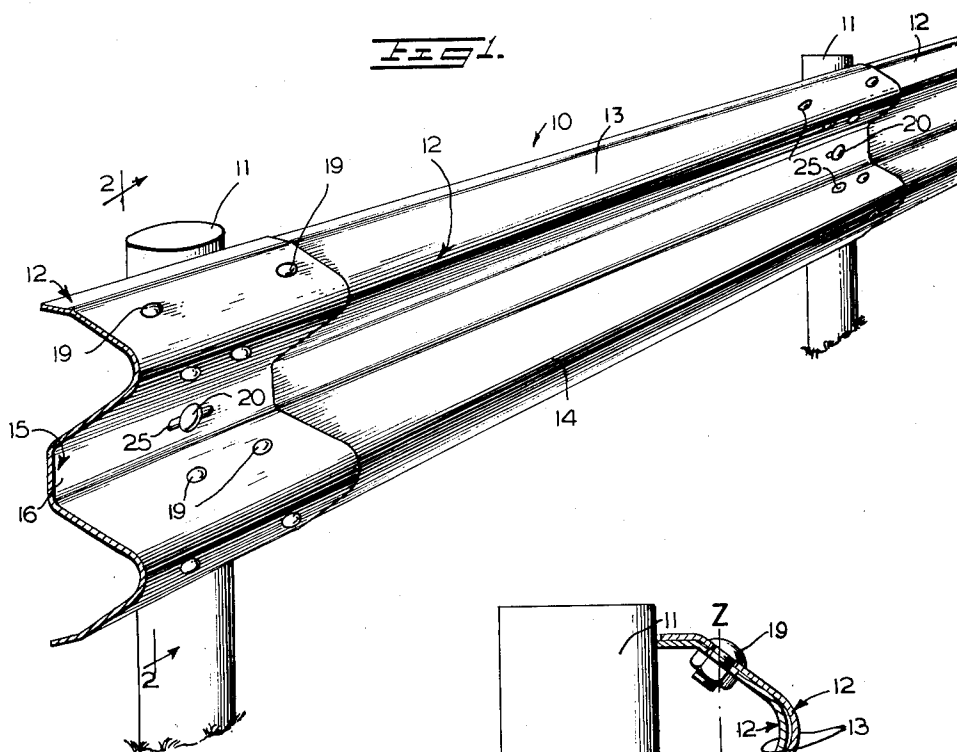
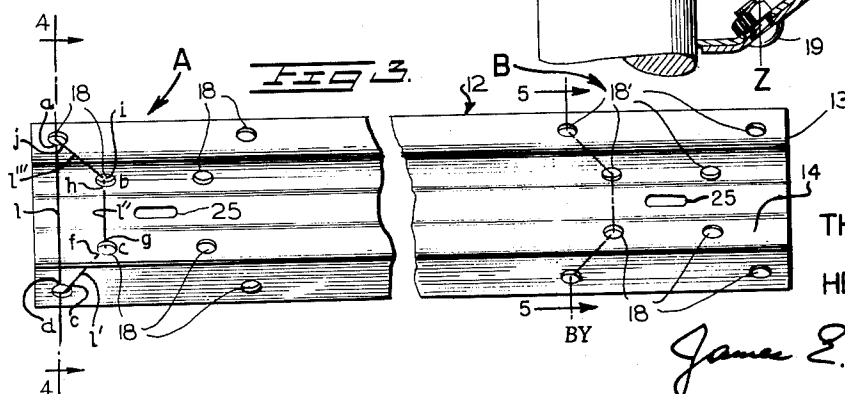
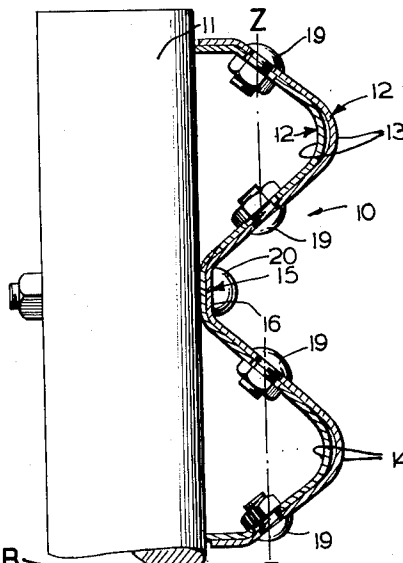


FIG. 2.



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FIG 4.

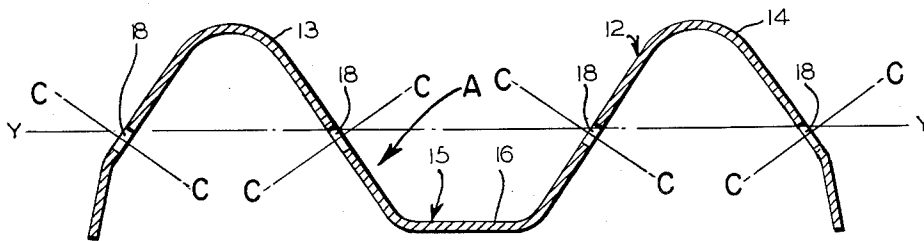


FIG 5.

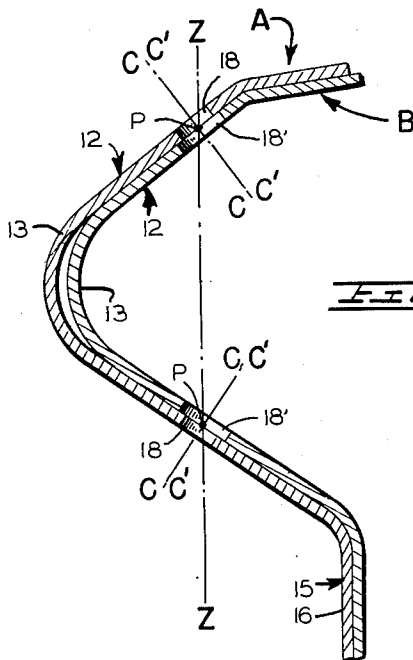
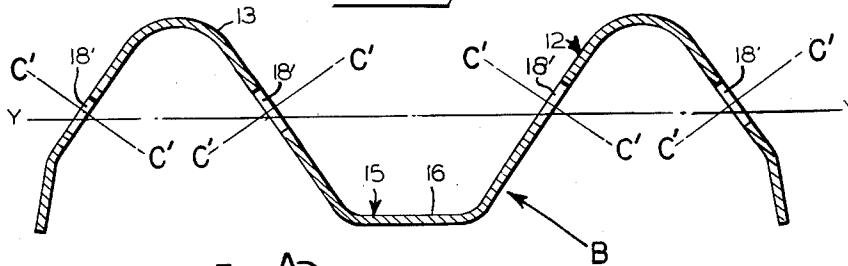


FIG 6.

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LAP JOINT FOR HIGHWAY GUARD RAIL

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This invention relates to a lap joint structure. More particularly, it is concerned with providing a novel high-strength lap joint for corrugated highway guard rail panels.

Accordingly, it is a primary purpose of this invention to provide an improved lap joint structure between adjacent corrugated rail panels making up a highway guard rail barrier such that the resistance to impact of the guard rail panels at their point of juncture is substantially equal to any given intermediate portion of an individual installed highway guard rail panel.

Other purposes and advantages of the instant invention will become more apparent from a review of the following detailed description when taken in conjunction with the appended drawings wherein:

FIG. 1 is a perspective view of a portion of a highway guard rail system embodying the present invention;

FIG. 2 is an enlarged detailed vertical sectional view generally taken along line 2-2 of FIG. 1;

FIG. 3 is an enlarged broken elevational view of an individual guard rail panel;

FIG. 4 is a vertical sectional view generally taken along line 4-4 of FIG. 3 and rotated approximately 90°;

FIG. 5 is a view generally taken along line 5-5 of FIG. 3 and rotated approximately 90°; and

FIG. 6 is an enlarged fragmentary view of certain overlapped portions of a pair of adjacent rail panels held in the position with respect to each other which they would normally occupy when installed.

In the present invention the accompanying drawings show an improved highway guard rail arrangement generally comprised of a series of similarly shaped guard rail panels 12 joined together to form a continuous longitudinal rail system 10 supported by spaced posts 11. The posts 11 can be of any suitable design and material, such as wood, metal or concrete. Ordinarily in a lap joint between two substantially identically shaped elongated and corrugated sheet metal members each of the members will have at least one corrugated portion intermediate its sides which is offset outwardly from the normal plane of the member and extends parallel to the sides of the said member, the offset or corrugation being provided with sloping walls whereby a neutral axis is established in the member. The depth of this offset or corrugation is sufficient ordinarily to cause an effective foreshortening of the sloping walls of the offset of the outer member with respect to the similarly sloped walls of the offset of the inner member and misalignment of the axis of any similarly disposed bolt holes in the members when the members are nested and lapped. The instant invention is intended to correct this situation.

The rail panels 12 are preferably made of a light metal, such as aluminum, and they are of such a size whereby they can be readily manufactured, transported and assembled. The rail panels 12 are secured together in superposed relationship at their opposing ends by bolt means 19. The rail panels 12 are affixed to posts 11 by means of anchor bolts 20, and they are preferably of a corrugated form having two vertically spaced corrugations 13 and 14 which form continuous longitudinal impact-resisting ribs on the traffic side of the rail panel.

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Corrugations or ribs 13 and 14 are connected by an intermediate relatively flat portion 15 which forms a valley 16 between the corrugations.

A plurality of staggered bolt holes 18 are punched out in the end portion A of a rail panel 12 in such a fashion that they are slightly offset a predetermined distance below neutral axis Y-Y of the rail panel as indicated particularly in FIG. 4. These bolt holes can take a roughly X-shaped pattern. A similar plurality of staggered bolt holes 18' are punched out at the opposite end portion B of the same corrugated rail panel or member 12 such that they are slightly offset a predetermined distance above the neutral axis Y-Y of the rail member as indicated particularly in FIG. 5. Both of the aforesaid predetermined distances are substantially equal. At the juncture point of a pair of rail panels 12, as best viewed in FIGS. 2 and 6, the axis C-C of a hole 18 coincides with the axis C'-C' of a hole 18' aligned with the aforesaid hole 18 such that both sets of axes C-C and C'-C' intersect the common neutral joint axis Z-Z at the same point P. Neutral joint axis Z-Z in effect is located intermediate to the neutral axes Y-Y of each of the two lapped panels 12. The above-described offset relationship of the axes C-C and C'-C' with respect to their respective axes Y-Y permits the aligned intersection of axes C-C and C'-C' with the common neutral joint axis Z-Z at the point P. This prearranged offsetting of the group or series of holes 18 and the group or series of holes 18' advantageously provides for paired relationship of the holes of one series of holes with the holes of other series and for axial alignment of the sets or pairs of holes 18 and 18' when the end portion A of one corrugated rail panel 12 is overlapped with and secured to the opposing end portion B of a similarly configured panel.

When adjoining rail panels or members 12 having the different bolt patterns on their opposing end portions A and B are secured together in superposed relationship, the end portion A of the rail having the bolt holes positioned slightly below the neutral axis will constitute the upper lapping or traffic side member of the lap joint, while the end portion of the rail member having the bolt holes slightly above the neutral axis will constitute the lower or lapped rail member of the lap joint. Moreover, when one end portion of a corrugated rail panel or member 12 having a distinct bolt hole pattern, i.e., bolt holes below the neutral axis Y-Y, is overlapped and secured to the end portion of another rail member 12 having another distinct bolt hole pattern, i.e., bolt holes above the vertical axis Y-Y, misalignment of the bolt holes in the two patterns is prevented.

It has been found desirable to punch the perforations or holes 18 in the end A of a rail panel that will constitute the upper member of the lap joint about to the size of the bolts for the holes. The holes or perforations 18' in the other end of the rail that will constitute the lower rail member of the lap joint can be slightly greater than the bolt size. By keeping the bolt holes in the upper rail member of the joint almost to the size of the bolt, floating or relative movement of the panels 12 with respect to one another under the force of impact is minimized while field assembly of the panels is rendered easy because the holes in the lower rail panel of the joint are large enough to permit easy passage of the splice bolt 20 regardless of the degree of nest between the rail panels.

In a further advantageous embodiment of the invention and as indicated in FIG. 3, the bolt holes 18 are positioned with respect to one another such that the cross-sectional panel thickness area at line l extending along the contour of the panel between points a and d, or

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between the outer holes of the pattern is approximately equal to the cross-sectional panel thickness area defined by the sum of the following cross-sectional panel thickness areas represented by a line l' extending along the contour of the panel between points e and f , or between an outer and inner hole of the pattern; a line l'' extending along the contour of the panel between points g and h , or between inner holes of the pattern and a line l''' extending along the contour of the panel between points i and j , or between an inner and outer hole of the pattern. In other words, the arrangement of inner and outer holes in the pattern of holes 18, as well as a similar arrangement in the case of holes 18', is such that the lines of weakness normally existing as a result of the metal voids or bolt holes is fully compensated for. In other words, the uninterrupted cross-sectional area represented by line l is substantially equal to the sum of the interrupted cross-sectional areas represented by lines l' and l''' disposed at an angle thereto and line l'' which parallels line l .

It has been found that the hole system described above has an advantageous result not normally regarded as a beneficial result flowing therefrom—namely, that the strength of the joint structure is measurably enhanced as a result of minimizing the eccentricity of the joint parts. By minimizing eccentricity between the parts of the rail panels making up the joint, these parts are disposed in a position whereby when the rail panels are subjected to impact, all parts of the rail panels, including the parts forming the joints between the panels, are subjected primarily to tensile stresses in a direction substantially normal to the usual force of impact or in a direction wherein the stresses exerted on the rail members are most efficiently resisted.

As viewed in the FIGS. 1, 2 and 3, each of the end portions A and B of a rail panel 12 is provided with an elongated opening 25 positioned medially of the corrugations and more specifically in the valley 16 of the intermediate portion 15 of a rail panel. These openings 25 are the means by which a bolt 20 secures the nested ends of a pair of rails to the upright posts 11. The elongations of the openings 25 compensate for any possible longitudinal misalignment between the nested rails and the preformed holes in the posts 11. The normal erection procedure of the continuous rail system 10 is usually achieved by the joining of a series of individual rail panels 12 while they are resting on the ground and at certain intervals the joined rails 12 are raised into position to be secured to the previously set posts 11. Posts 11 provided with suitable holes for receiving the bolts 20 may understandably acquire a minor degree of misalignment at the time of their installation. This error factor is compensated for by means of the above-mentioned slotted openings 25. From the above, it will be seen that an efficient guard rail system may be installed with a minimum of alignment problems.

The gauge of the material used in a specific rail panel may vary, and the particular gauge of material will be selected on the basis of the specific joint strength desired. In any event, it has been found by using the novel joint system proposed that the impact resistance of the rail

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panels in a highway guard rail system is significantly and measurably increased over those previously used and while still using conventional materials.

An advantageous embodiment of the invention has been shown and described. It is obvious that various changes and modifications may be made therein without departing from the spirit and scope thereof as defined in the appended claims, wherein what is claimed is:

1. In a lap joint between two substantially identically shaped elongated sheet metal members wherein each member has at least one portion intermediate its sides offset outwardly from the normal plane of the member and extending parallel to said sides of the said member, and wherein said offset is provided with sloping walls whereby a neutral axis is established in said member and the depth of said offset is sufficient to cause an effective fore-shortening of the sloping walls of the offset of the outer member with respect to the similarly sloped walls of the offset of the inner member and misalignment of the axes of any similarly disposed bolt holes in said members when said members are nested and lapped, one end portion of one member being provided with a series of staggered holes in the offset thereof with the axes of said holes all being positioned a predetermined distance from and slightly below the neutral axis of said member, the opposing end portion of the second member being provided with a series of similarly disposed holes in the offset thereof, the axis of said last mentioned holes all being positioned a predetermined distance from and slightly above the neutral axis of said second member, both of said predetermined distances being substantially equal, such that when the opposing end portions of the two members are overlapped, each series of holes is aligned in paired relationship and the axes of the holes in each pair of aligned holes coincide and intersect at the same point with the common neutral axis of the lap joint formed by the overlapped members, said common neutral axis of the lap joint also being located intermediate to the neutral axis of each of the two lapped members, and bolt means projecting through the holes in both series of holes and securing said members together.

2. In a lap joint of the type set forth in claim 1 wherein the opposing end portion of the second member is provided with a series of similarly disposed holes of slightly greater size than the holes of said first mentioned series of holes.

3. In a lap joint of a type set forth in claim 1 wherein each of the said series of holes forms a roughly X-shaped pattern.

References Cited in the file of this patent

UNITED STATES PATENTS

1,361,428	Whiteman	Dec. 7, 1920
1,849,167	Bente	Mar. 15, 1932
2,047,436	Shepherd	July 14, 1936
2,152,521	Lindsay	Mar. 28, 1939
2,536,760	Martin et al.	Jan. 2, 1951

FOREIGN PATENTS

800,231	Great Britain	Aug. 20, 1958
1,200,741	France	July 6, 1959