

April 14, 1942.

A. B. WERDEHOFF

2,280,016

VEHICLE FRAME

Filed Jan. 15, 1940

2 Sheets-Sheet 1

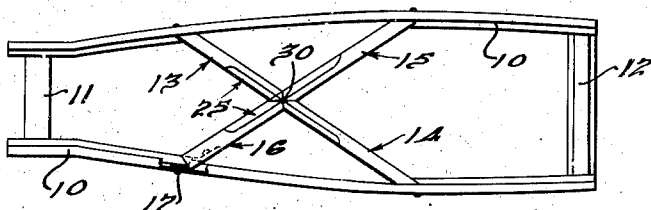


FIG. 1.

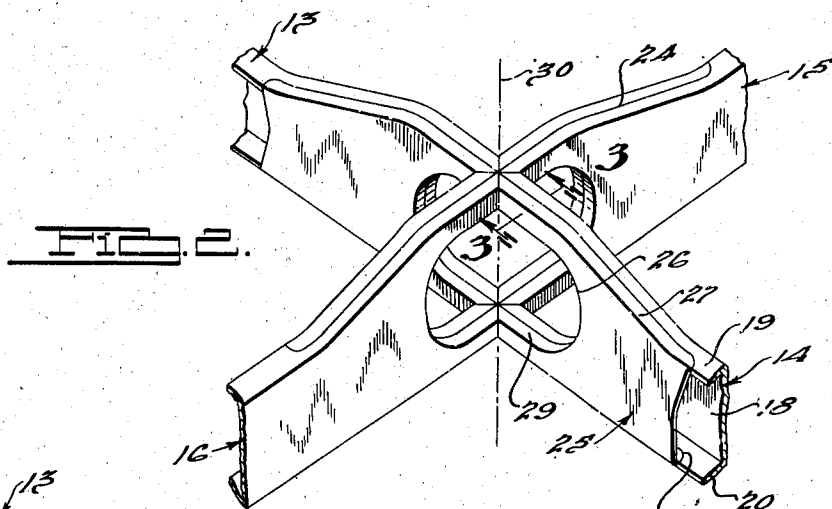


FIG. 2.

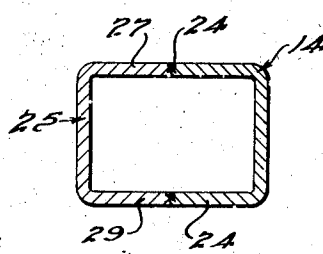
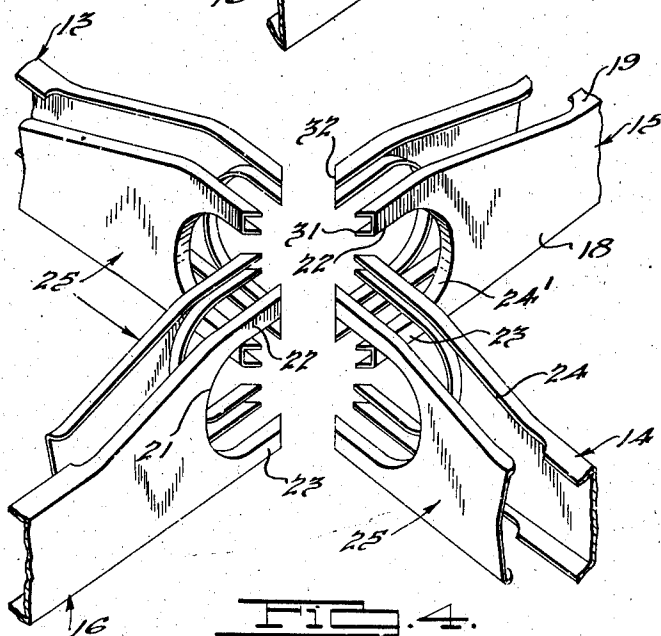


FIG. 3.

FIG. 4.

INVENTOR
ALBERT B. WERDEHOFF
BY *James, Lind, Peter Harris*
ATTORNEYS.

April 14, 1942.

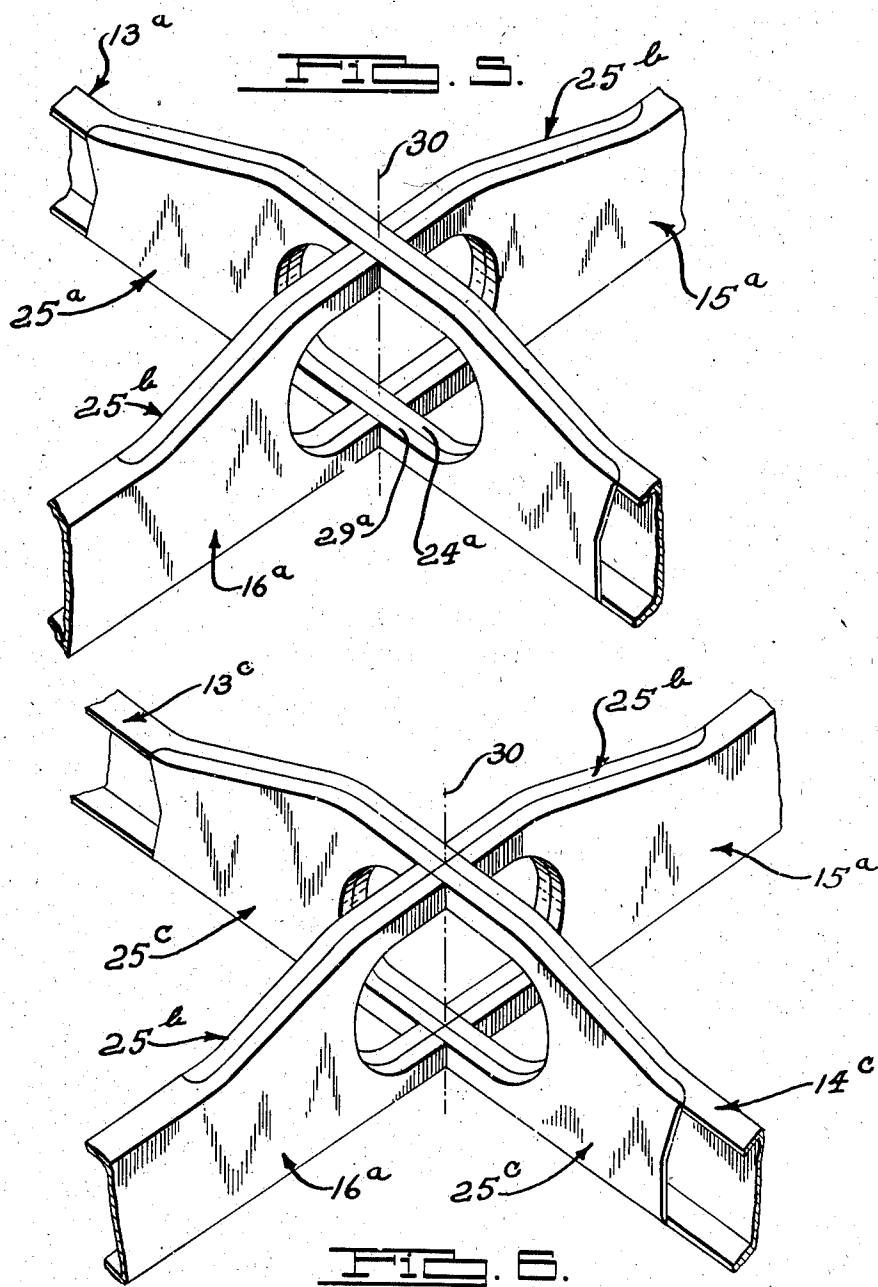
A. B. WERDEHOFF

2,280,016

VEHICLE FRAME

Filed Jan. 15, 1940

2 Sheets-Sheet 2



INVENTOR
ALBERT B. WERDEHOFF
BY
Harness, Lind, Pattee & Harid
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,280,016

VEHICLE FRAME

Albert B. Werdehoff, Detroit, Mich., assignor to
Chrysler Corporation, Highland Park, Mich., a
corporation of Delaware

Application January 15, 1940, Serial No. 313,908

14 Claims. (Cl. 280—106)

This invention relates to motor vehicles and refers more particularly to improvements in frame structures for such vehicles.

It is an object of my invention to provide a frame of improved simplicity and increased strength especially in resisting torsional stresses in the frame.

Another object is to provide a frame structure having component members thereof structurally assembled in an improved manner free from objectionable eccentric loading and arranged to provide improved localized strength where the stresses are most severe.

Further objects and advantages of my invention will be more apparent from the following illustrative embodiment thereof, reference being made to the accompanying drawings in which:

Fig. 1 is a plan view of a frame showing my invention in the form of an X-bracing therefor.

Fig. 2 is a detail perspective view of the central portion of the Fig. 1 X-brace.

Fig. 3 is a section through a portion of one of the X-brace arms.

Fig. 4 is a view similar to Fig. 2 illustrating the component arm portions separated prior to their structural assembly.

Fig. 5 is a perspective view of the central region of an X-frame of modified construction.

Fig. 6 is a view similar to Fig. 5 illustrating a further modification.

Referring to the drawings, I have illustrated the principles of my invention in conjunction with an X-bracing for a vehicle frame in which the longitudinally extending side rails 10 are transversely connected by cross-braces 11, 12. Frames of this general character are usually provided with an X-brace intermediate the length of the frame for stiffening the frame torsionally and otherwise. Because of the requirement for passage of the usual propeller shaft through the central region of the X-brace and because of the concentration of forces at the center of the X-brace, this central region has received much attention in the past. However, in an effort to meet the problems, the prior structures, in contrast with my invention, either fail to provide the desired characteristics of strength or else involve such complication of assembly and cost of manufacture as to be undesirable if not impracticable.

In carrying out my invention I provide an X-brace comprising the main channeled arms, pairs of the arms 13, 14 and 15, 16 being obliquely aligned when assembled, and suitably rigidly secured as at 17 to the opposite side rails 10.

Each main channel arm has a vertical web 18

and upper and lower horizontal flanges 19, 20 which extend in the same direction from web 18. At its inner end each main arm has its web 18 inwardly recessed at 21 in the direction of its length, thereby forming the vertically spaced terminal cantilever portions 22, 23 for each arm. Each web 18 is deflected to form a flange 24' bounding recess 21 and extending in the same direction as flanges 19, 20.

Adjacent the central region of the X-brace, each main arm has its flanges 19, 20 similarly cut away at 24 or otherwise formed such that the inner end portion of each main arm has narrower flanges than at the outer end portion, preferably about one-half the width of the flanges adjacent the outer end.

Associated with the cut-away portion of each main arm is an auxiliary arm 25 recessed at 26 and flanged at 27, 28 and 29 to abut the respective edges of flanges 19, 20 at cut-away portion 24 and flange 24' at recess 21. Each auxiliary arm 25 is thus formed like the inner end portion of a main arm, the corresponding flanges extending toward each other so that when these flanges abut each main arm will be formed with a hollow boxed-in terminal portion including the cantilever portions 22, 23. By recessing flanges 19, 20 for half their width and providing flanges 27, 28 of the same narrow width, each auxiliary arm 25, when assembled with a main arm as in Fig. 2, will have its web flush with the edges of flanges 19, 20 and the relatively narrow flanges adjacent the edges 24 will together equal the width of flanges 19, 20 at the outer end portions of the main arms.

If desired, the vertical dimension of main and auxiliary arms may be greater adjacent the vertical axis 30 of the X-brace. In assembling the structure, the pre-fashioned main and auxiliary arms are matched in pairs and secured together preferably by welding along their abutting flanges. This will result in the provision of four structural sub-assembly units each comprising a main arm having a boxed-in or hollow terminal inner end portion including the cantilever portions 22, 23. Preferably prior to the said welding operation, the paired main and auxiliary arms are formed V-shaped at their inner cantilever ends by the oppositely directed bevels 31, 32 such that when the structure is fully assembled as in Fig. 2, the bevels of one sub-assembly will engage those of adjacent sub-assemblies and the critical region at and adjacent to axis 30 will be formed fully boxed-in or hollow.

After welding the auxiliary arms 25 to the

respective main arms, the arms 13, 14 and 15, 16 are obliquely aligned and brought inwardly together and welded at the engaging bevels 31, 32. The oblique arms 13, 14 have their boxed-in portions merging at axis 30 so as to in effect provide obliquely structurally continuous boxed-in or hollow arms. The resulting X-brace has its central region symmetrically constructed without vertical overlapping of the obliquely aligned flanges and webs and a uniform depth is preserved for all of the boxed-in or hollow arms. The recesses 26 form two intersecting obliquely elongated openings for accommodating the usual propeller shaft.

Referring to the Fig. 5 embodiment of my invention, there is provided a long main arm 13^a which extends obliquely across the X-brace. This arm has the auxiliary arms 25^a associated therewith as before although now the auxiliary arm likewise extends as a unit across the center of the X-brace and the flanged openings 24^a and 25^a are now formed complete in the respective arms 13^a and 25^a rather than in half portions as in Fig. 4.

In the Fig. 5 structure I employ three main arms comprising the long arm 13^a and the short arms 15^a and 16^a which, along with their associated auxiliary arms 25^b are substantially the same as the corresponding pairs of arms 16, 25 and 15, 25 in Fig. 4. However, in Fig. 5 the inner cantilever boxed ends of these pairs of arms are not bevelled but terminate for contact flush with the webs of arms 13^a, 25^a to which they are welded. In this arrangement the center of the X-brace is, after the welding assembly, much like Fig. 2 as to its stress-taking characteristics.

The Fig. 6 embodiment differs from the Fig. 5 embodiment in that the main member 13^a is now formed in two pieces 13^c and 14^c formed with abutting inner end portions welded together at the joint axis 30. The auxiliary members 25^a are likewise formed in two parts and welded together to complete the central boxed-in structure for the inner ends of the main arms 13^c and 14^c.

I claim:

1. An X-brace for a motor vehicle frame comprising four arm members, each having a pair of spaced hollow termini, said termini being brought together in abutting relation at the center of the X-brace.

2. An X-brace for a motor vehicle frame comprising component arm members each provided with a pair of V-shaped hollow termini, said termini being brought together in nested relation centrally of the X-brace with pairs of the arm members in longitudinal alignment, the termini of one pair of the arm members respectively abutting and being secured to the termini of the other pair of members.

3. An X-brace for a motor vehicle frame comprising component main channelled arms each having upper and lower flanges recessed, and an auxiliary channelled arm secured to each of the main arms, each of the auxiliary arms having upper and lower flanges fitting the recesses of the upper and lower flanges of an associated main arm and secured thereto in abutting relation, the webs of the associated main and auxiliary arms being spaced from each other, end portions of the associated main and auxiliary arms being terminally bevelled V-shaped, the V-shaped termini being clustered about the central vertical axis of the X-brace.

4. An X-brace for a motor vehicle frame comprising a channel arm extending continuously

across the vertical axis of the X-brace, an auxiliary arm secured to said channel arm to box-in the latter at said axis, and a pair of hollow arm structures aligned with each other and extending transversely of said channel arm, each of said hollow arms having a hollow inner terminus secured to the boxed-in portions of said channel and auxiliary arms.

5. An X-brace for a motor vehicle frame comprising a pair of aligned channel arms secured together with their inner ends abutting each other at the vertical axis of the X-brace, an auxiliary arm secured to each of said channel arms, said auxiliary arms being aligned one with the other and secured together with their inner ends abutting each other at said axis, said auxiliary arms cooperating with said channel arms to provide a hollow boxed-in structure at said axis, and a pair of hollow arm structures aligned with each other and extending transversely to said boxed-in structure, each of said hollow arm structures having a hollow inner terminus secured to a side of said boxed-in structure.

6. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising aligned arms channel-shaped in cross section extending obliquely between and having their non-adjacent ends respectively secured to said rails, means closing each of the channelled arms in the region of the center of the X-shaped brace to form a closed box in cross section, the webs and channel forming flanges of said channelled arms being respectively disposed in longitudinal alignment throughout the channel cross section of said arms.

7. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising aligned arms extending obliquely between said rails, each of said arms having a pair of spaced flanges and a connecting web, structural channelled means having spaced flanges abutting and secured to the flanges respectively of each of said arms to box-in the latter in the region of the center of said X-shaped brace, the web of each of said arms and the flanges thereof being respectively disposed in a common plane throughout the length thereof.

8. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising a plurality of main component arms radiating outwardly from the central vertical axis of the X-brace, at least two main component arms being aligned one with the other and having the outer ends thereof secured to a respective rail and having the inner ends thereof abutting another of said arms adjacent the vertical axis of said X-shaped brace, the said aligned arms and said other arm each including spaced flanges and a connecting web therebetween, the said webs of said aligned arms being aligned longitudinally one with the other at the vertical axis of said X-shaped brace, and an auxiliary channelled arm associated with each of said main arms and cooperating therewith to form a closed box in cross section in the region adjacent the vertical axis of said brace, each of said auxiliary arms having spaced flanges secured to respective flanges of the associated main arm.

9. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising a plurality of pairs of aligned arms channel-shaped in cross section extending obliquely between said rails, each pair of aligned arms opening in the same direction adjacent the center of the X-shaped brace, and a channelled

auxiliary arm secured to and cooperating with each of said main arms to form a closed box in cross section at the center of said X-shaped brace, each associated main and auxiliary arm being recessed to provide spaced hollow cantilever terminal portions, said portions being brought together centrally of said X-shaped brace with the arms of each pair aligned and abutting each other.

10. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising a plurality of pairs of aligned arms channel-shaped in cross section extending obliquely between said rails, each pair of aligned arms opening in the same direction, and a channeled auxiliary arm secured to and cooperating with each of the main arms to form a closed box in cross section at the center of said X-shaped brace, each of the associated main and auxiliary arms being recessed to provide spaced hollow cantilever terminal portions, the end of each of said portions being terminally beveled V-shaped, the V-shaped termini being clustered about the central vertical axis of the X-shaped brace.

11. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising a plurality of pairs of aligned arms channel-shaped in cross section extending obliquely between said rails, each pair of aligned arms opening in the same direction, and a channeled auxiliary arm secured to and cooperating with each of said main arms to form a closed box in cross section at the center of said X-shaped brace, each associated main and auxiliary arm being recessed to provide spaced hollow cantilever terminal portions, said portions being brought together centrally of said X-shaped brace, the terminal portions of the associated main and auxiliary arms constituting one of said pairs abutting each other and extending between the terminal portions of the associated main and auxiliary arms constituting the other of said pairs, said last mentioned terminal portions abutting a respective side face of the terminal extending therebetween.

12. In a motor vehicle frame including laterally spaced side rails, an X-shaped brace for said frame comprising a channeled arm extending obliquely between said rails and a pair of aligned channeled arms extending obliquely between said

rails, the flanges of said pair of arms being directed to the same side of the web in the region of the center of said X-brace, and a channeled auxiliary arm secured to and cooperating with each of said arms to form a closed box in cross section at the center of said X-brace, the first mentioned arm and the auxiliary arm associated therewith being recessed to form spaced upper and lower beam portions at the centre of said X-shaped member, and each arm of said pair and the auxiliary arm associated therewith being recessed to form spaced upper and lower hollow terminal portions, the upper and lower terminal portions being respectively aligned, the said aligned terminal portions abutting and being secured to a respective beam portion at the center of said X-shaped member.

13. An X-brace for a motor vehicle frame comprising a channel arm extending continuously across the vertical axis of the X-brace, an auxiliary arm secured to said channel arm to box-in the latter at said axis, the channel arm having the flanges thereof directed to the same side of the web throughout the length thereof, and a pair of hollow arm structures aligned with each other and extending transversely of said channel arm, each of said hollow arms having a hollow inner terminus secured to the box-in portions of said channel and auxiliary arms, each of said hollow arm structures including a main channel member, the webs of said channel members being aligned with each other throughout the length of said structures.

14. An X-shaped brace member comprising diagonal arms arranged in radiating relation and channel-shaped in cross section adjacent the region of intersection, at least one pair of those arms which are arranged in longitudinal alignment having terminal inner end portions structurally connected adjacent the vertical axis of the X brace and having their channels opening in the same direction with the webs and the corresponding channel forming flanges thereof respectively aligned longitudinally whereby to provide substantially straight line force transmitting portions through said region, and structural means cooperating with the channel-shaped arms to form a box formation at said region.

ALBERT B. WERDEHOFF.