ABSTRACT: This rollover protective structure is fabricated of tubular members welded to specially designed castings which form the corners of a framelike structure and eliminate corner failures which occur in many such structures.
1 ROLLOVER PROTECTIVE STRUCTURE FOR TRACTORS
An extensive testing program of rollover structures, which included the actual rolling of vehicles over embankments, indicated that most failures experienced with structures constructed from tubing occurred at the corners where the ends of the tubes were welded together. The addition of stiff gussets to such corners was of some help but many failures still occurred where tubes pulled away from gussets or the gussets punctured the tubes. Inspection of structures where the corners are formed by bending the tubing revealed that the bending was often the cause of failure because the material on the outside radius of the bend was stretched and that on the inside radius was unduly compressed and microscopic cracks resulted which weakened the material.

The present invention provides a rollover structure with specially designed corner members for connecting tubing wherein stresses between the corner members and tubing which are welded together are distributed over relatively large areas.

A rollover structure which embodies the present invention is illustrated in detail in the accompanying drawings and will be fully understood from the following description wherein reference is made to the drawings.

In the drawings:
FIG. 1 is a view in side elevation of a track-type tractor mounted loader with a rollover structure embodying the present invention;
FIG. 2 is a rear view of the rollover structure illustrating only a portion of the tractor to which it is secured;
FIG. 3 is an enlarged exploded view of the corner structure to which the present invention is particularly directed;
FIG. 4 is a vertical sectional view of a support for a front vertical member of the structure taken on line IV—IV of FIG. 1;
FIG. 5 is a plan view of the support shown in FIG. 4;
FIG. 6 is a fragmentary view in rear elevation of a hinge member which may be used with the rollover structure;
FIG. 7 is a view in side elevation of the hinge member shown in FIG. 6;
FIG. 8 is a fragmentary detail showing a visor in end elevation which may be used with the structure and;
FIG. 9 is a plan view of the visor shown in FIG. 8.

Referring first to FIG. 1 of the drawings, the track-type tractor is shown as having a bucket and lift structure generally illustrated at 10 and supported by a pair of risers one of which is shown at 12 and which extends upwardly from the frame of the tractor. The operator's station is illustrated at 14 and is surrounded by the rollover protective structure of the present invention. The structure comprises a pair of front vertical, or substantially vertical, members one of which is shown at 16 in FIG. 1 and rear vertical members 18 also shown in FIG. 2. The vertical members are connected at their tops by longitudinal members 20 of which is shown at 20 in FIG. 1 and transverse members 22, one of which is shown in FIG. 2. One lower longitudinal members 24 in FIG. 1 complete the framework of a boxlike structure.

The forward vertical members 16 are received in sockets generally indicated at 26 in FIG. 1 and shown in greater detail in FIGS. 4 and 5 wherein a plate 28 with a lower supporting lip 30 is welded to the outside of the tower 12 and a retainer of U-shaped cross section 32 is secured as by cap screws 34 about the vertical support 16 clamping it in place. A lip 16a depends from vertical support 16 and projects under retainer 32 to retain support 16 in the socket formed by the retainer and plate 28.

The rear vertical members 18 are supported, as best illustrated in FIG. 6, on brackets 36 fastened to the rear of the tractor bevel gear housing 38 as by cap screws 40. A bracing plate 42 extends transversely between the brackets and fittings 44 fastened to the tops of the brackets to support the lower ends of the uprights 18. The ends of the vertical members 16 and 18 and longitudinal members 20 and the transverse members 22 come together in groups of three to form somewhat tetrahedric configurations. Castings which join the square tubular members 18, 20, and 22 are illustrated at FIG. 3 as being of two types, the first comprises a Y-shaped member 46 having an intermediate portion 48 secured between the ends of the diagonally cut members 18 and 22 which are welded to it, and two tongue portions 50 extending away from the intermediate portion 48 and adapted to be welded to the sides of the square tubular members 18 and 22. The tongues 50 taper outwardly toward their ends and are thus slightly flexible at their ends. This enables them to bend slightly with the tubular members and effects a distribution of stress throughout that portion of the tubes to which the tongues are welded.

A second casting shown generally at 54 is provided to form a connection between the longitudinal member 20 and the members 18 and 22 at substantially a right angle to both of the members 18 and 22. This casting comprises a three-arm member having a tubular portion 56 and two tongue portions 58 substantially normal to said tubular portion and to each other. Tubular portion 56 is fastened as by welding to the end of member 20 and the tongue portions 53 are fastened as by welding to members 18 and 22. These tongues are also slightly tapered so that their distal ends have some flexibility to distribute stresses lengthwise from the ends of the members 18 and 22.

While the castings 46 and 54 are of different configuration, each provides an area for an abutting connection of the end of one or more square tubular structural elements and each provides tapered tongues originating at said connection and lying alongside the tubular structural elements.

The tapered tongues of the two castings are so proportioned that those of one casting extend a greater distance along the beams 18 and 22 than those of the other. This displaces the welds at their ends on adjacent sides of the beams so that weakening of the beams by residual welding stresses is minimized.

FIGS. 6 and 7 illustrate a modification which enables the greater part of the protective structure to be hinged rearwardly. These views show hinge elements 60 and 62 welded with respect to the vertical members 18 and brackets 36 respectively and interconnected by a pintle in the form of a bolt 64. This serves as a reinforcing and aligning means and also enables the major portion of the structure to be swung rearwardly about the pinltes 64 when the connecting members 50 at the lower ends of the vertical parts 16 and 18 have been removed.

A protective plate covering the top of the structure is illustrated at 68 in FIGS. 1 and 2. In FIGS. 8 and 9 additional protection in the form of a laterally outwardly extending visor 70 is shown. Such a visor may be provided on either one or both sides of the structure depending upon the location of the operator's seat since they protect the operator from falling objects which are encountered in some types of work.

What is claimed is:
1. A vehicle rollover protective structure having an integrated corner assembly comprising:
   a. a vertical member,
   b. a longitudinal member,
   c. a transverse member, a longitudinal axis of each of said members positioned to intersect a longitudinal axis of each of said other members, and
   means securing adjacent ends of all of said members together comprising a Y-shaped member having an intermediate portion secured to opposed ends of said vertical and transverse members and a tongue portion secured to a side of each of said vertical and transverse members.
2. The invention of claim 1 wherein said means further comprises a three-arm member having a tubular portion secured directly to an end of said longitudinal member and a tongue portion secured to each of said vertical and transverse members.
3. The invention of claim 2 wherein the longitudinal axis of each of said vertical, longitudinal and transverse members is disposed at substantially a 90° angle with the longitudinal axis of each of said other members.
4. The invention of claim 2 wherein the tongue portions of said three-arm member are coplanar.
5. The invention of claim 2 wherein the tongue portions of said three-arm member taper toward their ends to permit flexing of their ends.
6. The invention of claim 2 wherein a longitudinal axis of said longitudinal member is substantially parallel to a longitudinal axis of the vehicle.
7. The invention of claim 1 wherein the tongue portions of said Y-shaped member are longer than the tongue portions of said three-arm member.
8. The invention of claim 2 wherein the Y-shaped member is welded to the vertical member and the transverse member and the three-arm member is welded to the vertical member and the transverse member and the longitudinal member.
9. The invention of claim 1 wherein the tongue portions of said Y-shaped member taper toward their ends to permit flexing of their ends.
10. The invention of claim 1 wherein the vertical member is clamped at its lower end by L-shaped clamp members at least one of which has a lip which projects under the vertical member, and wherein the vertical member has a depending lip which projects under at least one of said clamp members.