United States Patent [19]

Yancey

[11] **3,882,654**

[45] **May 13, 1975**

[54] **STRESS-RELIEVED WELDMENT FOR BOX SECTIONS**

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[73] Assignee: **Caterpillar Tractor Company**, Peoria, Ill.

[22] Filed: **Apr. 9, 1973**

[21] Appl. No.: **348,926**

[52] **U.S. Cl.** ..... **52/758 B**; 52/731; 29/155 C

[51] **Int. Cl.** **E04c 3/00**

[58] **Field of Search** ..... 52/730, 731, 732, 758 B, 52/415, 433, 259, 632; 29/155 R, 155 C, 491; 138/171

[56] **References Cited**

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Primary Examiner—Frank L. Abbott
Assistant Examiner—Carl D. Friedman
Attorney, Agent, or Firm—Phillips, Moore, Weissenberger, Lempio & Strabala

[57] **ABSTRACT**

A structural member, such as an excavator boom, comprises four plates forming a box section secured together at each corner thereof by a weldment comprising an L-shaped angle bar disposed within the box section and a weld which penetrates into each adjacent pair of plates and into an apex of the angle bar.

4 Claims, 4 Drawing Figures

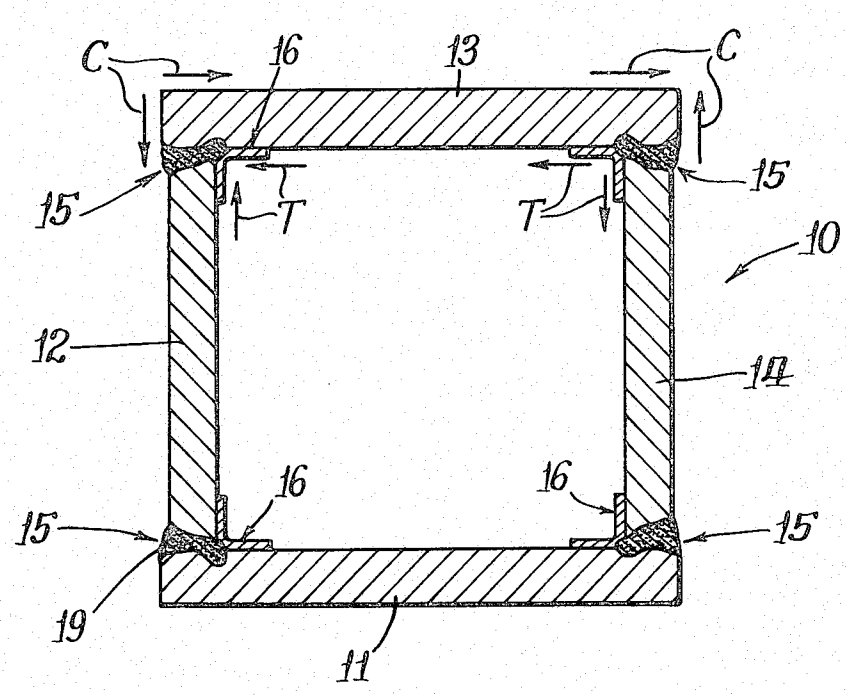


Fig. 1

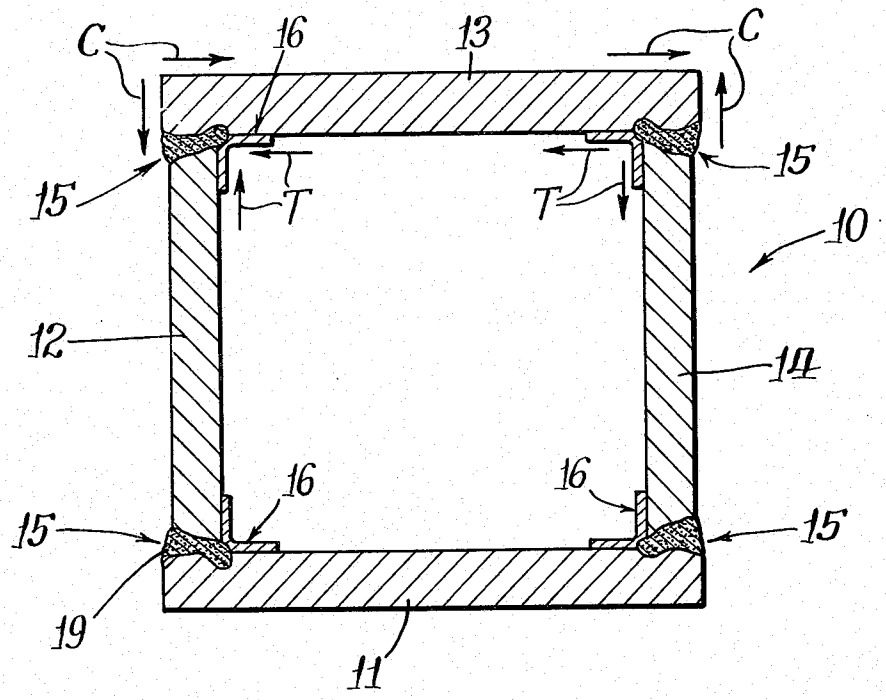


Fig. 2

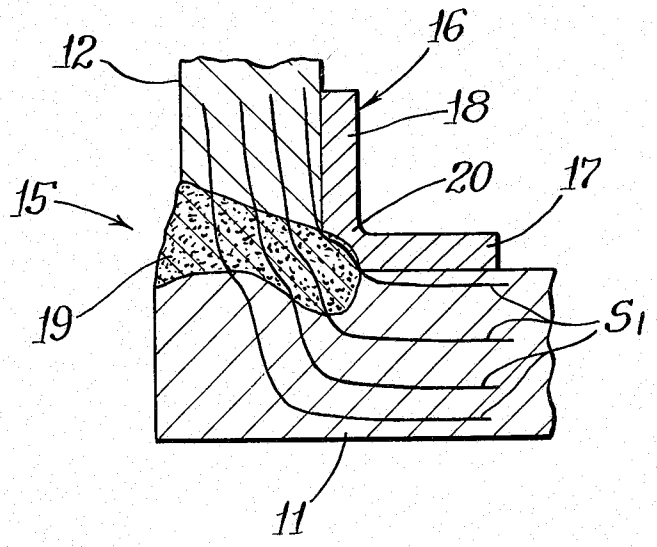


Fig. 3.

(PRIOR ART)

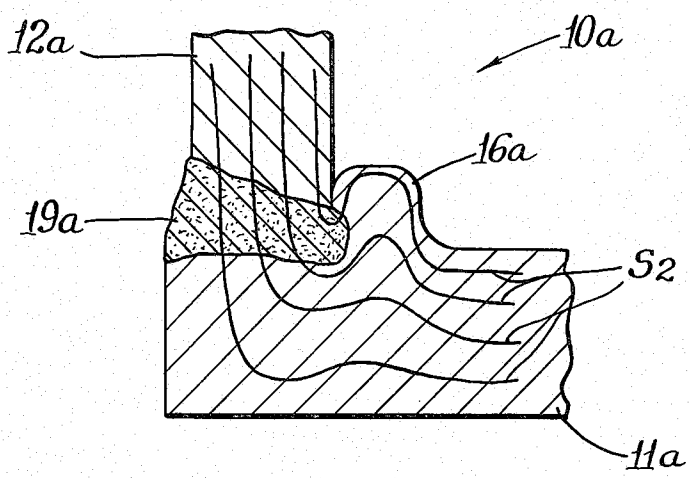
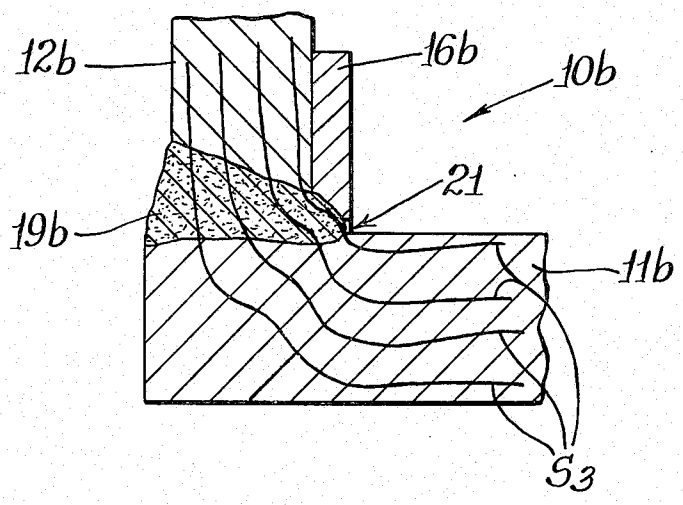


Fig. 4.

(PRIOR ART)



STRESS-RELIEVED WELDMENT FOR BOX SECTIONS

BACKGROUND OF THE INVENTION

Box sections employed in the structural members for heavy duty construction machines, such as the boom for a hydraulic excavator or the track roller frame for a track-type tractor, are subjected to torsional and bending loads of high magnitude. The box sections are normally fabricated from four load-bearing plates which are secured together at their corners by weldments. Due to the thickness of the plates and further due to the large weld areas required, backup means are oftentimes provided in the weldment to insure increased structurally integrity thereat.

Such conventional backup means are illustrated in hereinafter more fully described FIGS. **3** and **4** of applicant's drawings which disclose a roll-formed backup bridge **16***a* and a single backup plate **16***b*, respectively. Such conventional backup means induce high stress concentrations at the weldment and/or allow the weld to "blow through" the weldment, thus resulting in premature failure of the structural member.

SUMMARY OF THIS INVENTION

An object of this invention is to overcome the above, briefly described problems by providing an economical and non-complex stress relieved weldment for the corners of a box section which exhibits a high degree of structural integrity when subjected to heavy-duty use. The weldment comprises an L-shaped angle bar having a pair of legs each abutting inner surfaces of a respective member of the box section. Common weld means secure the members and the angle bar together.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of this invention will become apparent from the following description and accompanying drawings wherein:

FIG. **1** illustrates a box section, such as the transverse cross-section through an excavator boom, a track roller frame or the like;

FIG. **2** is an enlarged view of a weldment employed at each corner of the box section with stress concentration lines superimposed thereon; and

FIGS. **3** and **4** are views similar to FIG. **2**, but illustrating conventional weldments.

DETAILED DESCRIPTION

FIG. **1** illustrates a box section **10** of a structural member such as a boom employed on a hydraulic excavator, a track roller frame for a track-type tractor or the like. As illustrated, the corners of the metallic box section are each subjected to compressive and tensional forces C and T, respectively, when torsional or bending loads are imposed thereon. The torsional loads would normally tend to "rack" the box section whereas the bending loads would normally tend to induce the sides of the box section to "bulge out."

In order to counteract such tendencies, structural members or plates **11–14** of the box section are provided with a stress relieved weldment **15** at each corner thereof. As shown in FIG. **2**, the weldment comprises an L-shaped angle bar **16** having a first leg **17** abutting inner surfaces of first plate **11** and a second leg **18** abutting inner surfaces of transversely disposed and adjacent second plate **12.** The edge of the second plate, for example, is disposed in edge facing relationship relative to the inner surfaces of the first plate.

The angle bar may be initially tack-welded to one of the plates to provide for the weld backup function upon application of a common weld means **19** thereto. In the preferred embodiment of this invention, the legs of the angle bar are solely secured to the plates by the weld means and are not otherwise secured to the plates to aid in the hereinafter more fully described stress relieving function. The weld means is applied exteriorly of the box section to have its root penetrate generally downwardly through the lower end of plate **12,** through an apex **20** of the angle bar and substantially into plate **11** (preferably to a depth of from one-eighth to one-third of the thickness of plate **11**).

Since apex **20** of the angle bar provides a relatively large mass of material thereat, a weld arc of high amperage will not tend to burn through the weldment, beneath leg **17** of the angle bar. In addition, the substantial length of each leg **17** and **18** (preferably at least one-half of the thickness of an adjacent plate) eliminates weld "blow-through" even though a slight gap may form between leg **17** and plate **11.** In the preferred embodiment of this invention, the thickness of each leg **17** and **18** is preferably selected from the range of from one-eighth to one-third of the thickness of each adjacent plate.

Such construction, in addition to the above described non-securance of substantial portions of legs **17** and **18** to the plates, provides some flexibility at the weldment to aid in reducing stress concentrations S_1 thereat. Otherwise stated, an abrupt change in stiffness and geometric shape at the weldment would substantially increase such stress concentrations thereat.

FIG. **3** illustrates a corner of a conventional box section **10***a* wherein plates **11***a* and **12***a* are secured together by a weld **19***a*. Backup means, comprising a longitudinally extending ridge **16***a* is roll-formed on plate **11***a* to induce relatively high stress concentrations S_2.

FIG. **4** illustrates a corner of a second conventional box section wherein a pair of plates **11***b* and **12***b* are secured together by a weld **19***b* and by a single backup plate **16***b*. The theoretical stress concentrations are illustrated at S_3. A gap **21** is formed at the base of plate **16***b* to induce weld "blow-through" through the gap upon application of weld **19***b*.

It should be noted that the FIGS. **3** and **4** weldments inherently provide lesser degrees of structural integrity than applicant's weldment, illustrated in FIGS. **1** and **2.** It should be further noted that during fabrication of the FIG. **1** box section, that the lower end of weldment **19** will tend to notch downwardly into plate **11,** due to the low heat sink capability of angle bar **16.**

What is claimed is:

1. A stress-relieved weldment comprising a pair of trasversely disposed first and second plates, with an edge of said second plate being disposed in edge facing relationship relative to the inner surfaces of said first plate,

an L-shaped angle bar having first and second legs abutting inner surfaces of said first and second plates, respectively, the thickness of each of the legs of said angle bar being from one-eighth to one-third of the thickness of a respective one of said plates and

common weld means securing said plates and said angle bar together wherein said weld means pene-

trates through said second plate and has a root that penetrates through an apex of said angle bar, joining the first and second legs thereof together, and into said first plate.

2. The weldment of claim **1** wherein the root of said weld means penetrates into said first plate at a depth which is from one-eighth to one-third of the thickness of said first plate.

3. The weldment of claim **1** wherein the length of each of said legs is at least one-half of the thickness of a respective underlying member.

4. The weldment of claim **1** wherein four of said plates form a rectangular box section have four corners therof each secured by a said, L-shaped angle bar and a said weld means.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,882,654

DATED : May 13, 1975

INVENTOR(S) : John W. Yancey

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the Title Page, Item [73], change the spelling of the assignee's corporate name from "Caterpillar Tractor Company" to ---Caterpillar Tractor Co.---.

Signed and Sealed this

twenty-eight Day of *October 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks