United States Patent

Sung

[15] **3,690,742**

[45] **Sept. 12, 1972**

[54] CRANE BOOM

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[73] Assignee: **Grove Manufacturing Company**, Shady Grove, Pa.

[22] Filed: **Nov. 19, 1971**

[21] Appl. No.: **200,352**

Related U.S. Application Data

[63] Continuation of Ser. No. 90,373, Nov. 17, 1970, abandoned.

[52] **U.S. Cl.** ..... **308/3 R**, 212/55

[51] **Int. Cl.** **F16c 17/00**

[58] **Field of Search** ..... 308/3 R, 3 A; 312/332, 334, 312/335, 339, 340, 341 NR, 345; 92/57, 52, 53; 212/55; 182/2; 52/115, 116, 117, 118, 119, 121; 214/141

[56] **References Cited**

UNITED STATES PATENTS

3,481,490 12/1969 Eiler ..... 308/6 R

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[57] **ABSTRACT**

A telescoping crane boom includes interfitting box sections fabricated by welding from plate stock. The side webs of the individual box sections are spaced inwardly from the longitudinal edges of the top and bottom webs, to allow placement of bearing pads substantially directly over and under the side webs of each box section in a multiple section boom. As a result, the side webs of the box sections are utilized as columns to absorb the heavy stresses transmitted through the wear pads and transverse stressing and flexure of the top and bottom webs is greatly minimized. The arrangement allows considerably lighter sections to be employed for the top and bottom webs of the individual box sections without fear of excessive transverse bending.

9 Claims, 8 Drawing Figures

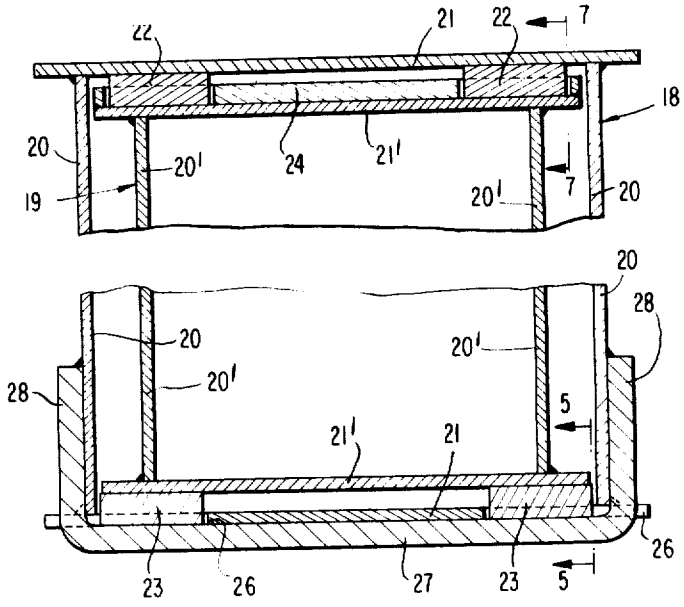
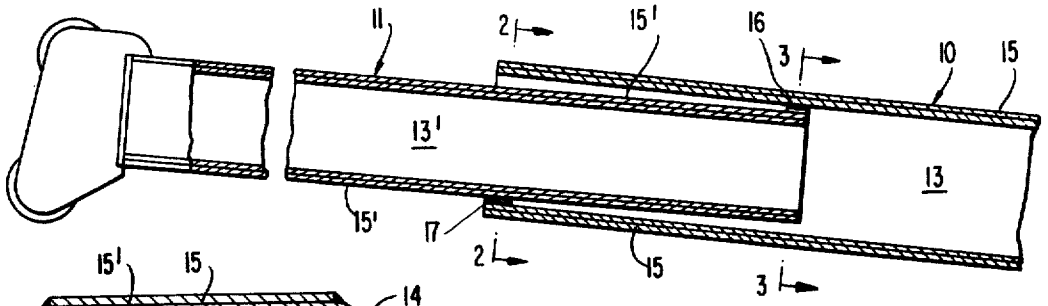


FIG. 1 PRIOR ART



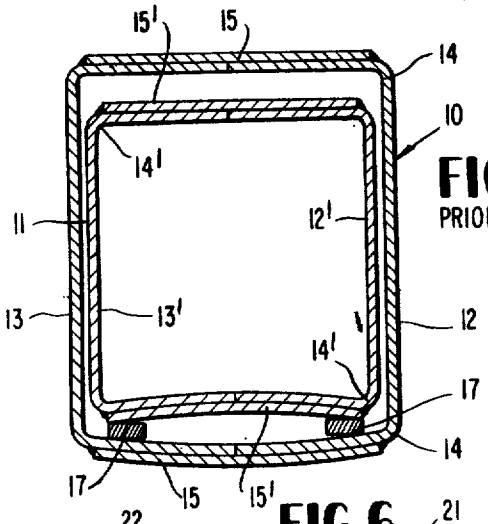


FIG. 2
PRIOR ART

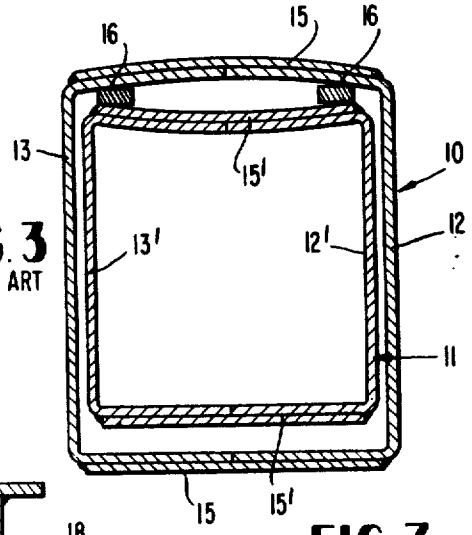


FIG. 3
PRIOR ART

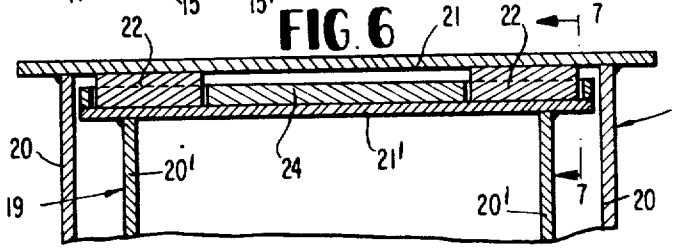


FIG. 6

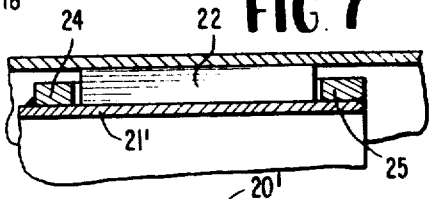
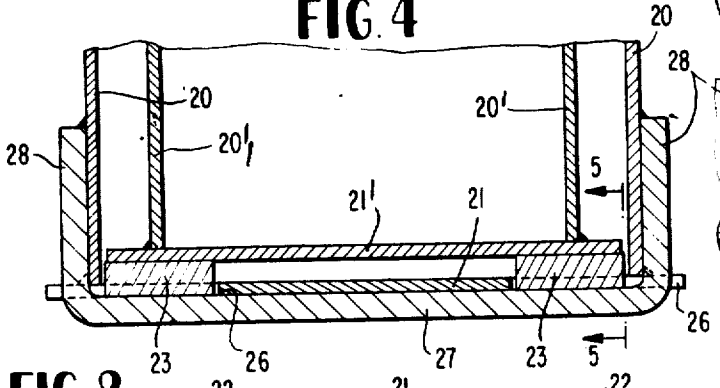


FIG. 7

FIG. 4



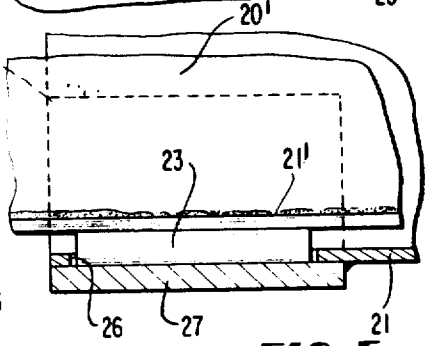
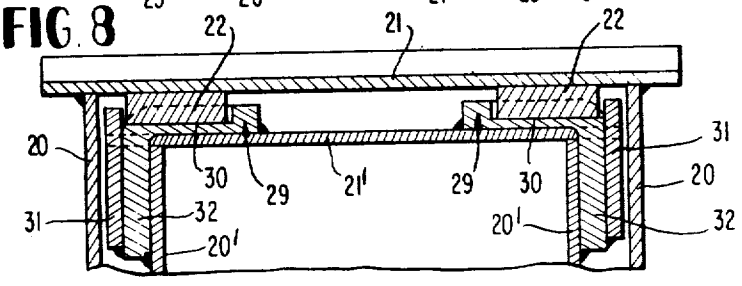


FIG. 5

FIG. 8



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CRANE BOOM

This is a continuation, of application Serial No. 90,373 filed Nov. 17, 1970.

In the prior art, as exemplified by the Grove U. S. Pat. No. 3,243,052, it has been customary to construct the box sections of multiple section telescoping crane booms from opposing channels whose open sides are welded together to produce a rectangular box. Customarily, the top and bottom webs of the box sections thus formed are heavily reinforced to resist transverse bending by plates welded thereto and extending for the full length of the box sections. Even with this heavy reinforcement, transverse flexure of the top and bottom webs of the box sections has not been successfully eliminated or reduced for the following reasons. The individual box sections produced in accordance with the prior art have relatively large radii at their corners and their top and bottom webs do not extend outwardly of the vertical side webs. Consequently, the usual wear pads or plates, which are intervened between telescoping box sections, must be located laterally inwardly of the vertical side webs, in the case of upper and lower wear pads. As a result of this, the heavy forces transmitted through the wear pads cannot be delivered directly to the vertical side webs so that the latter will act as columns to absorb the forces. Instead, a considerable transverse bending moment is delivered through the wear pads to the top and bottom webs of the box section which they surround, resulting in an undesirable amount of transverse flexure of these webs. This zone of flexure can extend as far as several feet on each side of a pair of wear pads and the geometry is such that the top and bottom webs of adjacent telescoping box sections are all subjected to excessive transverse bending in the conventional structure despite the reinforcement of the top and bottom webs.

The objective of the present invention is to overcome the above problem in the prior art in a simple manner and economically by fabricating the interfitting box sections in such a way that the intervening wear pads may be located substantially directly over the side webs of each box section so as to utilize the side webs in compression as columns to the maximum possible extent, thereby greatly relieving the top and bottom webs of bending moments and stresses. One result of this is that much thinner metal plate stock can be employed for the top and bottom webs and without the necessity for continuous reinforcement along the length of the boom section. Local reinforcement in the form of retainer means for the wear pads may still be employed. The individual box sections in the invention are fabricated by welding from plate stock and the side walls or webs are set inwardly from the edges of the top and bottom webs to achieve the desired placement of the wear pads in vertical alignment with the side webs. The corner radii present in the prior art box sections are eliminated.

While the prior art exhibits some teachings of fabricating structural box members from welded plate stock, no structure has been devised to allow intervening bearing or wear pads between telescoping box sections to be located substantially in vertical alignment with the box section side walls so that the latter may be utilized efficiently as columns to eliminate the transmission of transverse bending stresses to the top and bottom walls of the interfitting box sections.

Other features and advantages of the invention will be apparent during the course of the following detailed description.

BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. 1 is a fragmentary longitudinal vertical section through a crane boom embodying telescoping box sections made in accordance with the prior art;

FIG. 2 is an enlarged transverse vertical section taken on line 2—2 of FIG. 1;

FIG. 3 is a similar cross section taken on line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary transverse cross section through the lower portion of a telescoping crane boom constructed in accordance with the invention;

FIG. 5 is a fragmentary longitudinal vertical section taken on line 5—5 of FIG. 4;

FIG. 6 is a view similar to FIG. 4 taken through the upper portion of the crane boom according to the invention;

FIG. 7 is a view similar to FIG. 5 taken on line 7—7 of FIG. 6; and

FIG. 8 is a fragmentary transverse vertical section through a boom constructed in accordance with a modification.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings in detail wherein like numerals designate like parts and referring first to FIGS. 1–3 depicting the prior art, the numerals **10** and **11** designate a pair of telescopically interfitting crane boom sections which are box-like or rectangular in cross section. Each section **10** and **11** comprises an opposing pair of channels **12** and **13** and **12'** and **13'** whose open sides abut to complete the box section. The channels have substantial corner radii **14** and **14'** in accordance with conventional practice. Stout reinforcing plates **15** and **15'** are welded to the tops and bottoms of the interfitting box sections in an effort to resist transverse flexure of the top and bottom walls, such flexure being indicated on an exaggerated scale in FIGS. **2** and **3** to emphasize the problem.

In the conventional structure, top and bottom pairs of wear pads **16** and **17** are placed between the top and bottom walls of the two telescoping boom sections and are positioned in any conventional manner, FIGS. **1–3** being diagrammatic in this respect. As shown clearly in FIGS. **2** and **3**, the wear pads **16** and **17** are located inwardly of the side webs of the particular box section which they surround and cannot be located directly above and below the side webs because of the presence of the corner radii and further because the top and bottom webs of the box sections do not project outwardly of the side webs under conventional prior art practice. As a result of this, when the boom is loaded, severe transverse bending moments and stresses are transmitted through the wear pads to the adjacent top webs and bottom webs of the interfitting box sections. The bowing or bending of these webs under the influence of the stresses adjacent to the top and bottom pairs of wear pads is depicted graphically in FIGS. **2** and **3**. If the wear pads **16** and **17** could be placed ideally directly above and below the side web of the boom sections, the latter would function as columns in compres-

sion and would absorb substantially the heavy stresses transmitted through the wear pads and the top and bottom horizontal webs would be relieved of their bending stresses. In the prior art, this ideal placement of the wear pads directly above and below the side webs has never been possible or practical for the reasons explained in connection with FIGS. 1–3.

Referring now to FIGS. 4 through 7 illustrating one preferred embodiment of the invention, the above defect in the prior art is substantially overcome in a practical manner without materially increasing the cross sectional size or weight of the boom and actually reducing the weight in some areas materially by eliminating the need for continuous reinforcement of the top and bottom webs of the boom box sections.

In FIGS. 4 through 7, a pair of interfitting box sections 18 and 19 are illustrated, each constructed from plate stock by welding. The sections 18 and 19 comprise vertical side walls or webs 20 and 20' having their top and bottom edges welded to top and bottom plates or webs 21 and 21'. The vertical webs 20 and 20', as shown, are spaced inwardly from the longitudinal edges of the top and bottom webs 21 and 21' for an important purpose. The radii 14 and 14' present in the prior art structure have been completely eliminated and the corners formed where the webs 20 and 21 and 20' and 21' are joined by welding are square. It may also be observed that the continuous reinforcing plates 15 and 15' have been eliminated.

As in the prior art, upper and lower laterally spaced pairs of wear pads 22 and 23 are provided between the adjacent telescoping box sections. However, the wear pads 22 are placed substantially directly over the vertical webs 20' and only slightly off-center inwardly thereof and the lower wear pads 23 can be located directly and symmetrically under the webs 20'. Consequently, the forces transmitted through these wear pads are almost completely absorbed by the vertical side webs 20' functioning in compression as columns and the transverse bending of the webs 21' and 21 is almost completely eliminated. The location of the vertical webs 20 and 20' inwardly of the longitudinal edges of the top and bottom webs and the elimination of corner radii makes it possible and practical to locate the upper and lower wear pads in substantial vertical alignment with the vertical webs of the box sections. This placement of the wear pads above and below the side vertical webs substantially eliminates the transverse bending forces on the top and bottom horizontal webs.

Means are provided to locate and retain the top pair of wear pads 22, such means comprising a local reinforcing plate 24 welded to the top web 21' around its margins and provided near opposite sides with retaining opening 25 for the upper wear pads 22 which are loosely placed therein. In a similar manner, the lower wear pads 23 are retained by notching the lower web 21 at 26 on opposite sides and placing a sturdy U-shaped local reinforcing and retaining strap 27 beneath the lower wear pads 23, the strap 27 including side vertical arms 28 which are welded to the vertical webs 20 of the outer box section.

FIG. 8 shows a modification of the construction in FIG. 6, wherein essentially L-shaped or right angular retainers 29 for the upper wear pads 22 are utilized in lieu of the plate 24. The retainers 29 are welded to the top and side webs 21' and 20', as indicated, and the upper horizontal portions of the locators 29 are recessed at 30 to receive the wear pads 22, the latter engaging beneath the top web 21 of the next outer box section as previously. Side wear plates or bearing plates 31 are welded to the vertical portions of locators or retainers 29 and serve the dual purpose of retaining the wear plates 22 in the side opening recesses 30 and centering the telescopic boom sections by functioning as side wear plates.

An advantage in the construction of FIG. 8 is that the top portions of the L-shaped retainers 29 further stiffen the top web 21' particularly immediately inwardly of side webs 20' and the vertical legs 32 of the L-shaped retainers being securely tied by welding to the vertical webs 20' resist any tendency for transverse deflection of the top web 21' due to the pad 22 being slightly off-center inwardly from the webs 20'. In other words, the L-shaped wear pad retainers 29 compensate for the fact that the pads 22 are not perfectly symmetrically placed above the webs 20' and the slight tendency to bend the web 21' transversely is resisted by the L-shaped retainers or locators being welded to the vertical webs 20'.

The terms and expressions which have been employed herein are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. In an extensible telescoping crane boom, a pair of telescopically interfitting rectangular box-like boom sections each having vertical side webs and top and bottom webs, and upper and lower pairs of wear pads interposed between the top webs of the two boom sections and the bottom webs thereof, the wear pads of the upper and lower pairs being substantially in vertical alignment and also located substantially directly above and below said vertical side webs of the interior boom section for transmitting forces directly thereto, the side webs functioning substantially as columns to absorb said forces, and means to retain the upper wear pads on the interior boom section and to retain the lower wear pads on the exterior boom section.

2. The structure of claim 1, and said means comprising a separate element to retain the upper wear pads on the top web of the interior boom section and another element to retain the lower wear pads adjacent to the bottom web of the exterior boom section.

3. The structure of claim 2, and the first-named element comprising a reinforcing plate secured to the top web of the interior boom section and having spaced openings to receive and retain the upper wear pads, the second-named element comprising a transverse reinforcer for the bottom web of the exterior boom section, said reinforcer underlying the lower wear pads, the bottom web of the exterior boom section notched to receive and retain the lower wear pads.

4. The structure of claim 1, and said means to retain the upper wear pads on the interior boom section comprising a pair of opposed substantially right angular

retainers for the upper bearing pads on the upper corners of the interior boom section including vertical portions which also function as side wear plates between the interior and exterior boom sections.

5. The structure of claim 4, and said right angular retainers recessed in their tops to receive the upper wear pads and having separate vertical side plate elements serving to close the outer ends of said recesses and lying immediately inwardly of the vertical webs of the exterior boom section.

6. The structure of claim 1, and each box-like boom section comprising upper and lower webs and substantially right angular vertical side webs which are spaced inwardly from the longitudinal edges of the upper and lower webs and secured thereto rigidly.

7. The structure of claim 6, and the upper and lower and side webs secured rigidly by welding.

8. In an extensible telescoping crane boom, a pair of telescopically interfitting boom sections each having side webs and a top and bottom web, and upper and lower pairs of wear pads interposed between and being substantially parallel with the top webs of the two boom sections and the bottom webs thereof, the improvement comprising the wear pads of the upper and lower pairs being located substantially directly above and below said side webs of the interior boom section for transmitting forces directly thereto, the side webs functioning substantially as columns to absorb said forces, and means to retain the upper wear pads on the interior boom section and to retain the lower wear pads on the exterior boom section.

9. An extensible telescoping crane boom as set forth in claim 8 in which said wear pads of the upper and lower pairs are respectively arranged in alignment with the planes of said side webs.

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