United States Patent [19]

Morris

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[54] **APPARATUS FOR ELEVATING CONSTRUCTION ELEMENTS**

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[21] Appl. No.: **256,724**

Related U.S. Application Data

[62] Division of Ser. No. 47,242, June 18, 1970, abandoned.

[52] **U.S. Cl.** **214/620**, 214/149

[51] **Int. Cl.** **B66f 9/00**

[58] **Field of Search** ..... 214/149, 620, 147 R, 214/147 G, 140 R, 130 R, 1 H, 1 SWB, 1 R; 29/426, 418, 493

[56] **References Cited**

UNITED STATES PATENTS

2,820,561 1/1958 Meagher 214/620

3,112,830 12/1963 Podlesak ..... 214/147 G X

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Jerold M. Forsberg
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[57] **ABSTRACT**

Apparatus for raising and lowering construction elements has a base on which there is means for raising and lowering a boom that is pivoted to the base. The base is provided with openings for receiving the forks of a fork lift truck so that the apparatus can be lifted and carried about. Pivoted to the outer end of the boom on a transverse axis is a support member for temporary attachment to a construction element. The support member can swing down beneath the boom to pick up a construction element on the ground and then swing it up to a position above the boom.

4 Claims, 9 Drawing Figures

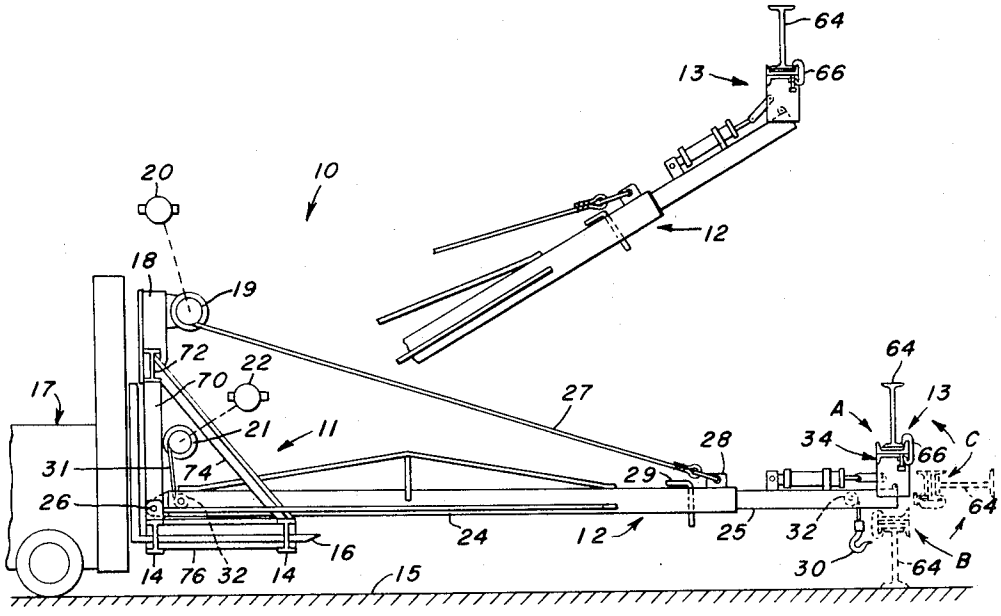


FIG. 1.

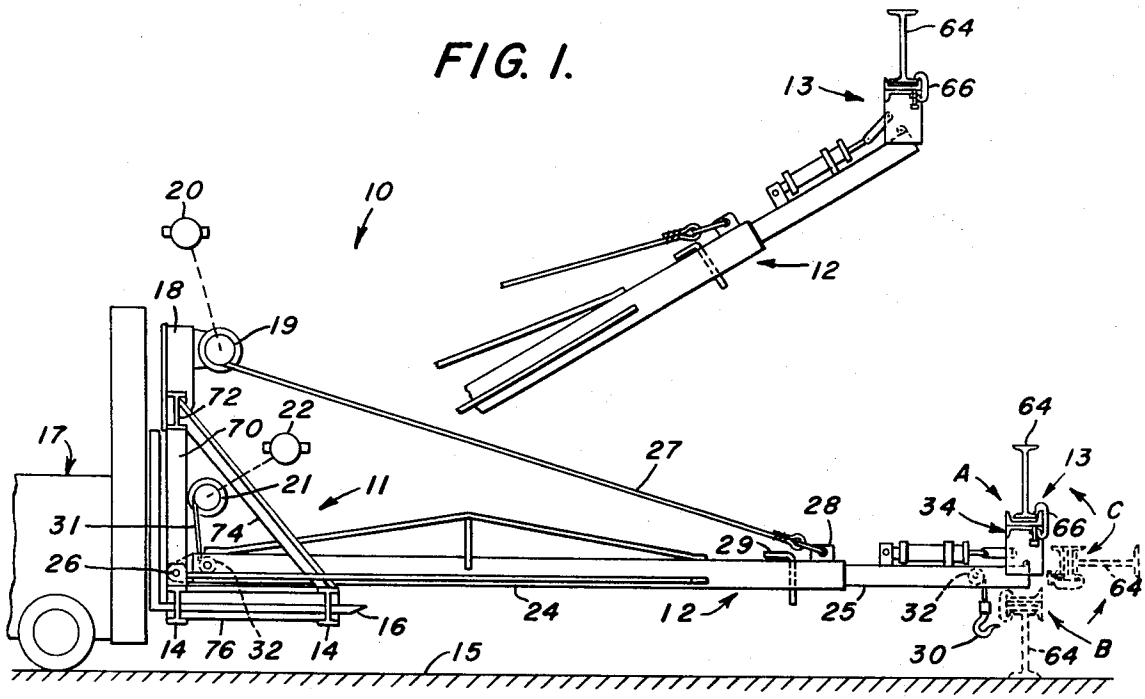


FIG. 2.

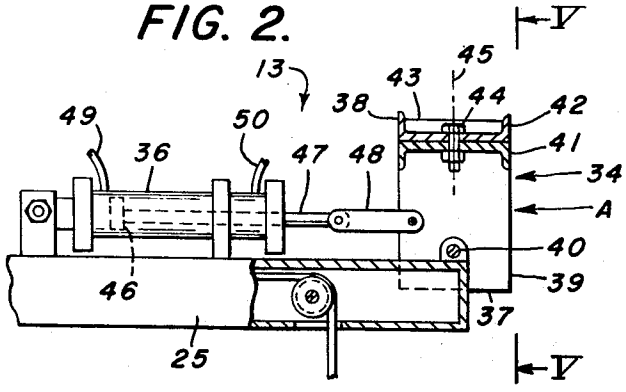
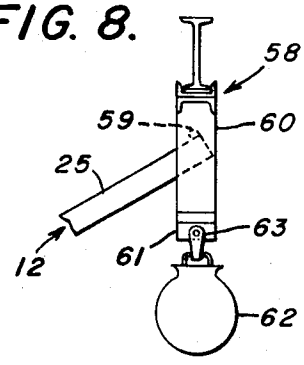


FIG. 8.



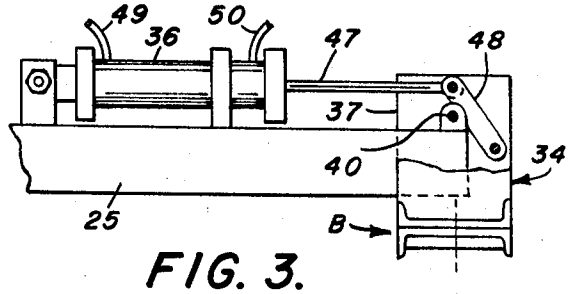
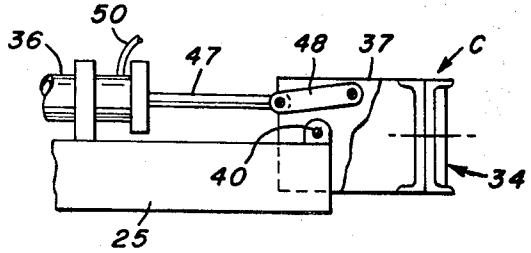


FIG. 3.

FIG. 4.



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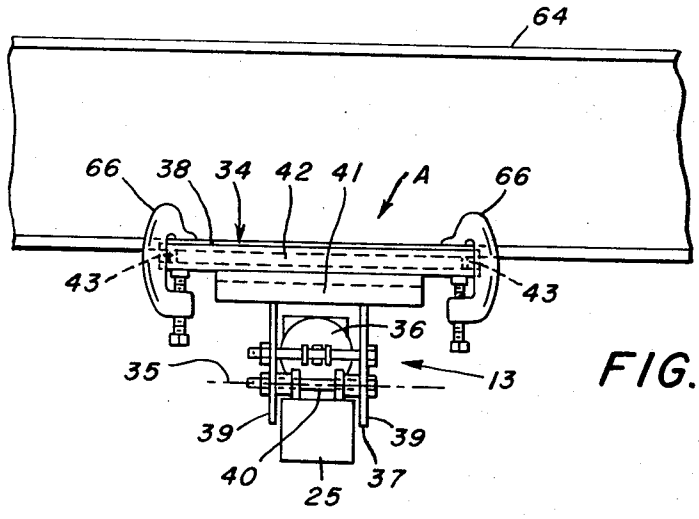


FIG. 5.

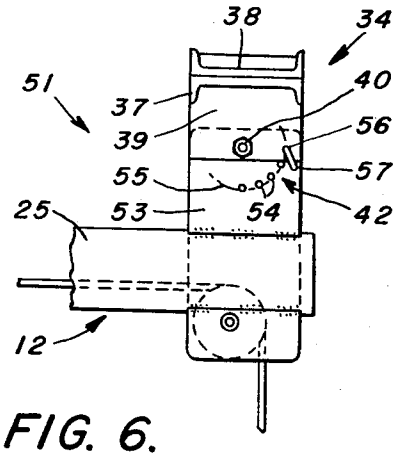


FIG. 6.

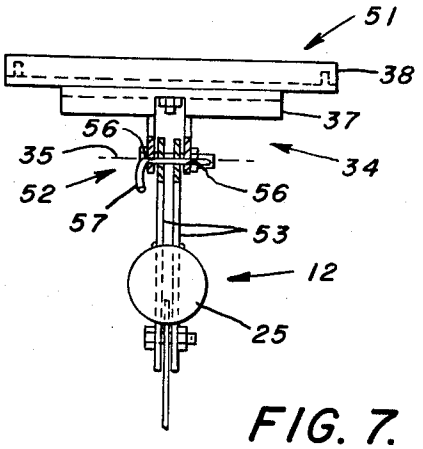


FIG. 7.

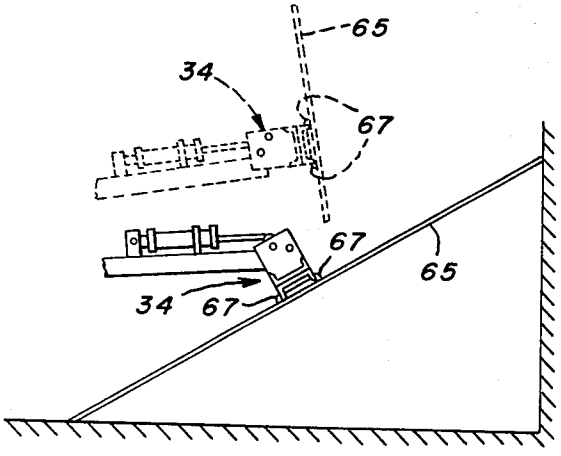


FIG. 9.

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APPARATUS FOR ELEVATING CONSTRUCTION ELEMENTS

This application is a division of my copending patent application, Ser. No. 47,242, filed June 18, 1970 which has been abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus for elevating and retaining construction elements in position for securement to a supporting structure, and more particularly, to such apparatus that can be picked up by a fork lift truck.

2. Description of the Prior Art

The prior art contains many examples of apparatus incorporating a boom-like member carrying a rotatable saddle at its free end. In most cases the boom-like member is an integral part of a truck or car and is swingable in vertical planes by hydraulic jack devices. It also has been proposed to pick up a vertically swinging boom by means of a fork lift truck, as in U.S. Pat. No. 3,294,262, but the construction of the apparatus has been such that the truck had to be modified and the driver or a helper had to drive a pin into place to complete the connection between the boom apparatus and the truck.

In most prior art machines, the saddle is, at all times, maintained in an upright position by parallelogram devices. See, for example, U.S. Pat. Nos. 2,570,383; 2,648,444; and 2,689,666.

In other prior art devices, the saddle is mounted on an adjustable support structure carried by a boom-like member. See, for example, U.S. Pat. No. 2,738,081. The support structure is oriented in a horizontal position by a hydraulic jack device. The saddle is movable longitudinally of the support structure.

In all such prior art structures, the element to be elevated must be moved from a storage location onto the saddle. Thereafter, the boom-like member elevates the saddle and the element to the desired location.

U.S. Pat. No. 3,112,830 shows a boom equipped with means for clamping onto a pole lying on the ground, but the clamping means have a limited movement that allows the pole to be raised only to a vertical position.

OBJECTS OF THE INVENTION

An object of this invention is to provide lifting-boom apparatus that can be picked up by a fork lift truck by simply properly manipulating the truck, without any further connection having to be made.

Another object of this invention is to provide a boom structure having an improved support which is tiltable into engagement with a construction element while the element is in a storage or ground location, thereby eliminating the need for extrinsic apparatus heretofore employed to elevate the element onto the saddle.

Another object of this invention is to provide an improved support assembly incorporating a hydraulic cylinder, wherein the support tilts through angles greater than 45° into all positions between and at an upright position and an upside-down position.

SUMMARY OF THE INVENTION

The present invention provides apparatus for moving construction elements, such as structural beams and steel plates, to a selected position. The apparatus is particularly suited for use within the confined space of an existing building, where it is desired to erect additional structural steel or to replace existing structural steel. The present apparatus may be employed to elevate the structural member from a ground location to an elevated erection location; or to lower the structural member from its installed position to ground level.

The present apparatus includes a base adapted to be raised and supported by a fork lift truck, thereby increasing the vertical reach and the mobility of the present apparatus. A boom is mounted on the base to swing in vertical planes. The boom may be telescoped to increase or decrease its longitudinal reach.

In accordance with the present invention, a support is pivotally mounted on the boom to tilt about a horizontal axis through angles greater than 45°. In the preferred embodiment, the support is tiltable by means of a hydraulic cylinder, through 180°; that is, from an upright position to an upside-down position. Thus, the support may be tilted into confronting engaged relation with construction elements above or below the boom.

In an alternative embodiment, the support is tiltable through 90°; that is, from an upright position to a horizontal position. Means is provided for manually adjusting the angular position of the support.

During an erection operation wherein the construction element is raised up against a supporting structure, the element is held in place by the present apparatus and is secured to the supporting structure. Thereafter, the support is disconnected from the element.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of the apparatus of this invention, illustrating a boom thereof in lowered and raised positions;

FIG. 2 is a fragmentary side view, partly in cross section, illustrating a preferred embodiment of the present support;

FIGS. 3 and 4 are fragmentary side views, similar to FIG. 2, illustrating the support in an upside-down position and a horizontal position, respectively;

FIG. 5 is an end view as viewed from the line V—V of FIG. 2, illustrating a structural beam secured to the present support;

FIGS. 6 and 7 are side and end views, respectively, illustrating an alternative embodiment of the present support;

FIG. 8 is a fragmentary side view, similar to FIG. 6, illustrating a further alternative arrangement of the present support; and

FIG. 9 is a side view, schematically illustrating the method of elevating steel plates from a ground or storage location.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates apparatus 10 of this invention. In brief, the apparatus 10 includes a base 11, a telescoping boom 12, and a support assembly 13 of this invention.

The base 11 includes parallel front and rear transverse beams 14 adapted to rest on the ground 15. The beams 14 are provided with longitudinally aligned openings (not visible) for receiving the forks 16 of a fork lift truck 17, as illustrated in FIG. 1. The vertical reach of the boom 12 is increased when the forks 16 are elevated. The base 11 also includes a vertical structure 18 which supports a boom winch 19 operated by a motor 20, and a hoist winch 21 operated by a motor

22. This vertical portion of the base is rigidly mounted on the rear beam 14 as shown.

The boom 12 comprises a pivotal boom section 24 and a telescoping boom section 25. The pivotal boom section 24 is pivotally mounted as at 26 on the base 11 to swing in vertical planes. A cable 27 extends from the boom winch 19 and is connected to a plate 28 extending from the free end of the pivotal boom section 24.

The telescoping boom section 25 is provided with pairs of diametrically opposed openings (not visible) spaced along its length. The pivotal boom section 24 is provided with a pair of diametrically opposed openings (not visible) adjacent the plate 28. A locking pin 29 extends through the opposed openings in the pivotal boom section 24 and a selected pair of opposed openings in the boom telescoping section 25 to lock the sections 24, 25 together in the desired telescoped condition.

The boom 12 may be provided with a hoist comprising a hook 30 connected to the hoist winch 21 by a cable 31 passing around pulleys 32, 32. The pulleys are housed within the boom 12.

Referring to FIGS. 2 and 5, the support assembly 13 includes a support 34 pivotally mounted on the telescoping boom section 25 to tilt about a horizontal axis indicated by the dash-dot line 35 in FIG. 5, and means, which in the preferred embodiment, comprises a hydraulic cylinder 36 for retaining the support 34 in a selected orientation and for tilting the support 34 about the horizontal axis 35.

The support 34 includes a bracket 37 and a platform 38. The bracket 37 may comprise spaced-apart side plates 39 pivotally mounted on the telescoping boom section 25 by a pivot connection 40, and an inverted channel 41 secured to the upper end of the side plates 39. The platform 38 may comprise a channel 42 having supporting plates 43 secured at its opposite ends. The channel 42 is rotatably connected as at 44 (FIG. 2) to the bracket 37 for rotation about a vertical axis indicated by the dash-dot line 45 (FIG. 2).

The hydraulic cylinder 36 is secured to the telescoping boom section 25 and has a line of action parallel with the longitudinal axis of the boom 12. The cylinder 36 includes a piston 46 and a piston rod 47. The piston rod 47 is pivotally connected to the bracket 37 by a link arm 48. The hydraulic cylinder 36 receives pressurized working fluids from a source (not shown) through conduits 49, 50.

The overall arrangement is such that the support 34 may be tilted from the upright position A illustrated in FIGS. 1, 2 and 5, to an upside-down position B illustrated in FIGS. 1 and 3, and to selected positions therebetween, for example, the horizontal position C illustrated in FIGS. 1 and 4.

An alternative embodiment of the present support assembly is illustrated in FIGS. 6 and 7 and is generally designated by the numeral 51. Corresponding numerals will be employed to identify corresponding parts heretofore described.

In this embodiment, the support assembly 51 includes a support 34 (bracket 37 and platform 38) and means 52 for retaining the support in a selected orientation. A pair of spaced plate members 53 is secured to the telescoping boom section 25. The bracket 37 is pivotally mounted on the plate members 53 at the pivot connection 40, to tilt about the longitudinal axis 35 (FIG. 7).

The retaining means 52 comprises plural first openings 54 (FIG. 6) provided in the plate members 53. The first openings 54 are arranged along an arc segment of a circle, indicated by the dash-dot line 55, wherein the center of the circle 55 corresponds with the horizontal axis 35. The side plates 39 are provided with aligned second openings 56 (FIG. 7). Pin means 57 extend through the second openings 56 and selected ones of the first openings 54 to retain the support 34 in a selected orientation, for example, the upright orientation illustrated in FIGS. 6 and 7. In this embodiment, the support 34 is capable of tilting through 90° from the upright position to a horizontal position (not illustrated). It will be appreciated that in this embodiment, the angular position of the support 34 is adjusted manually.

It should be evident that as an alternative arrangement, the first openings may be provided in the side plates 39 of the support 34 whereas the second openings may be provided in the plate members 53.

FIG. 8 illustrates a further alternative arrangement wherein a support 58 is pivotally mounted at 59 on the telescoping boom section 25. The support 58 includes a bracket 60 having a lower bracket end 61 extending below the telescoping boom secton 25. A weight 62, for example, in the range of 500 to 1,000 pounds, is pivotally connected at 63 to the lower bracket end 61. In this arrangement, the weight 62 maintains the support 58 in an upright position regardless of the inclination of the boom 12 with respect to the ground.

The apparatus 10 is employed to move a construction element, such as an I-beam 64 (FIG. 1) or a steel plate 65 (FIG. 8) between spaced-apart locations during erection operations or dismantling operations. For example, to erect the I-beam 64, the support 34 is tilted about the horizontal axis 35 into confronting engagement with the I-beam 64 while the I-beam 64 is positioned on the ground 15 (FIG. 1). The I-beam 64 is secured to the platform 38 of the support 34, for example, by service clamps 66 (FIGS. 1 and 5). The support 34, with I-beam 64 attached, is elevated to a raised position, such as illustrated in FIG. 1, and tilted about the horizontal axis 35 to move the I-beam 64 up against a support structure (not illustrated). The I-beam 64 is then secured to the support structure while the apparatus 10 retains it firmly against the support structure. Thereafter, the support 34 is disconnected from the secured I-beam.

The apparatus 10 may also be employed to move steel plates. It will be observed in FIG. 9, that the support 34 is secured to a steel plate 65 by tack welds 67. The support 34 with steel plates 65 attached, may then be elevated and tilted to a position such as illustrated in dotted outline.

One important feature of the invention is due to the fact that the base 11 need not be fastened to the fork lift truck, nor does it require any modification of the fork lift truck. The boom is self-supporting on the forks 16; and any fork lift truck can be used. The operator simply drives the forks through the openings in the beams 14 when it is desired to pick up the boom, or simply lowers the assembly onto the ground and backs away from it. This is possible by virtue of the fact that the base includes the vertical structure 18. It is formed from upright supports 70 interconnected at their tops by a cross beam 72. The beam 72, in turn, is connected to the front beam 14 through inclined braces 74. The beams 14 are interconnected by means of a central,

lower beam **76.** Beams **14** and **76** form the bottom portion of the base **11.** The motors **20** and **22** and their associated winches are supported on the supports **70.** Any bending moments, therefore, are taken by the forks **16.**

The apparatus disclosed herein is self-contained and can be picked up as a unit by a fork lift truck as just described. Since the apparatus is self-contained, it is unnecessary to make any connection between it and the truck in addition to the engagement of the forks with the base **11.** Therefore, the driver of the truck does not have to leave his truck to complete any such additional connection before the apparatus can be lifted and moved, or to disconnect the apparatus from the truck before the truck can be backed away from it. Likewise, no hleper is required for such purposes in case the truck driver does not want to leave his seat. A complete connection is made by simply driving the truck forks through the base openings, and separation is effected by merely backing the truck away from base **11.**

Although the invention has been shown in connection with certain specific embodiments, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

I claim:

1. Apparatus for raising and lowering construction elements, comprising a base having a horizontal bottom portion with front and rear ends and a vertical back portion extending upwardly from the rear end of the bottom portion, there being laterally spaced inclined braces connecting the front end of the bottom portion with the upper part of the back portion, a boom pivotally connected to the rear end of said bottom portion on a horizontal axis and extending forward between said braces, a cable connected to the boom in front of said base and extending rearwardly therefrom, means supported by the upper part of said vertical portion of the base for pulling on the cable to swing the front end of the boom upwardly, a support member pivotally connected to the front end of the boom on a transverse axis for temporary attachment to a construction element, the support member being tiltable relative to the boom through an arc of at least 90°, and means carried by the boom for retaining the support member in a selected position, said bottom portion of the base being provided with front and rear openings therethrough for receiving the forks of a fork lift truck, whereby the apparatus can be lifted and carried solely by such forks without any other connection to the fork lift truck.

2. Apparatus according to claim **1,** in which said bottom portion of the base includes spaced parallel front and rear beams provided with said fork-receiving openings.

3. Apparatus according to claim **2,** in which said vertical portion of the base is rigidly mounted on the rear beam.

4. Apparatus according to claim **2,** in which said vertical portion of the base is rigidly mounted on the rear beam, and said braces are rigidly connected to the front beam.

* * * * *