

[54] FOLDABLE CRANE

3,554,395 1/1971 Dunbar 212/59 UX

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[58] Field of Search 212/46 R, 46 B, 55, 35,
212/59

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[57]

ABSTRACT

A foldable crane comprising a cradle, a swivel post rotatably mounted on said cradle and a plurality of booms pivotally connected to each other and adapted for mounting in a narrow space between a cab and a rear body of a vehicle such as a truck. Each of said booms can be rotated about each of connecting pins between an extended aligned position and a folded position in which folded position a part of said booms is housed in an opening in the cradle. The opening can be made in large dimensions, if necessary, so that the change of the track position from the transporting position to the working position or vice versa is effected easily and quickly.

1 Claim, 3 Drawing Figures

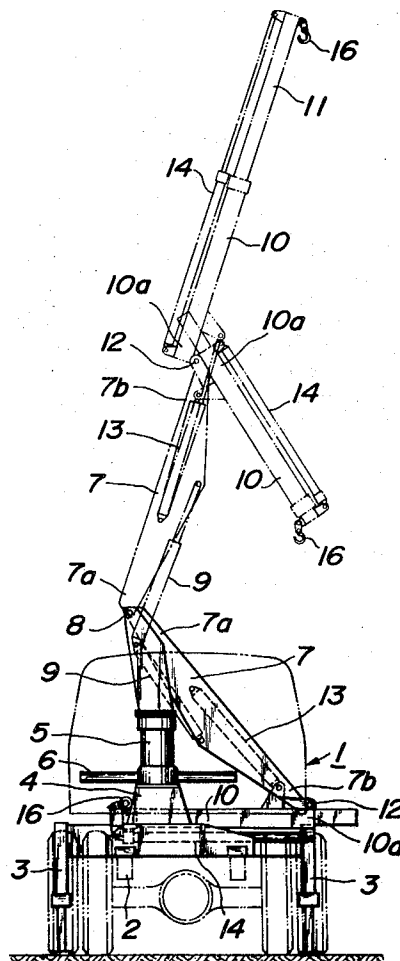


FIG. 1

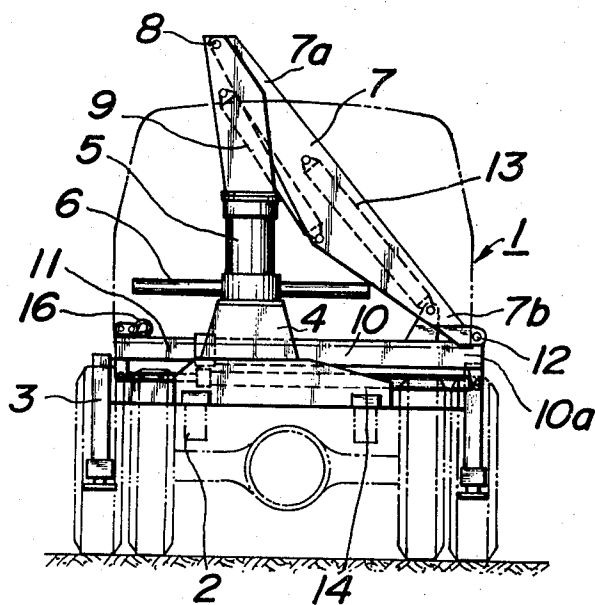
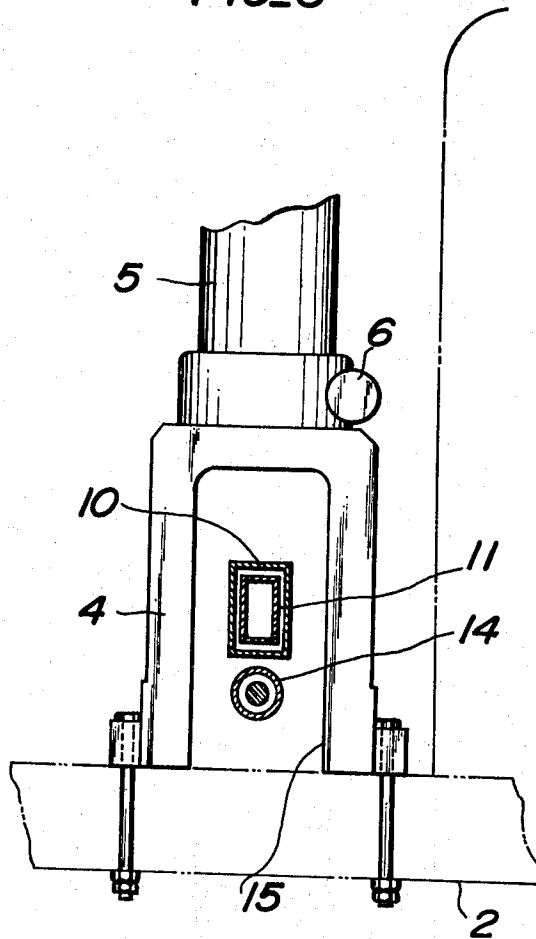


FIG. 3



FOLDABLE CRANE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improvement of a foldable crane adapted for mounting on a chassis frame between a rear body and a cab of a vehicle such as a truck in folded condition.

2. Description of the Prior Art

Loading and unloading operation in a place where a load handling machine such as a crane and a forklift is not available requires a lot of labor so that it is desired to carry the load handling machine by the truck for carrying out the loading and unloading operation by the machine.

However, when a large load handling machine such as a large crane is carried by the truck with the load or goods, the amount of the load to be transferred is limited by reason that the crane occupies a large space on the truck.

SUMMARY OF THE INVENTION

In accordance with the present invention, a foldable crane comprises a cradle, a swivel post rotatably supported on said cradle, a first boom pivotally connected at the base portion thereof to the top of said post, a second boom pivotally connected at the base portion thereof to the top of said first boom, and hydraulic cylinders connected between said post and said first boom and between said both booms, respectively, for elevating each of said booms from a folded position to an extended aligned position.

In the preferred embodiment of the invention the foldable crane comprises a cradle having an opening horizontally extending therethrough, a swivel post supported rotatably on said cradle, a first boom pivotally connected at the base portion thereof to the top of the post, a hydraulic cylinder connected between said post and said first boom for elevating said first boom, a second boom pivotally connected at the base portion thereof to the top of said first boom, a hydraulic cylinder connected between said first and second booms for elevating said second boom and a third boom slidably fitted into said second boom and operatively connected to the second boom by means of a further hydraulic cylinder, said booms and said opening of the cradle are arranged such that the second and third booms are housed in said opening when the first boom is rotated downwardly after the second boom is rotated in an acute angle to the first boom.

It is an object of the present invention to overcome the above mentioned problems in the prior art and to provide an improved foldable crane comprising a plurality of booms pivotally connected to each other and adapted for folding compactly said booms from an extended aligned position to a folded position in which position the outer one of said booms is also positioned in the same plane with the other of the booms and housed in an opening in the cradle.

The invention will be more fully understood by referring to the following detailed specification and claims taken in connection with the accompanying drawings disclosing one embodiment of the foldable crane according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation of a crane constructed in

accordance with the invention, shown in a folded position;

FIG. 2 is a front elevation similar to FIG. 1, but shown in an operating position; and

FIG. 3 is a sectional view showing a detailed construction of a part of the crane.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a body of the truck 1 comprises a chassis frame 2, on which a foldable crane is mounted, and conventional outriggers 3 provided at the opposite sides of the frame.

The foldable crane includes a cradle 4 securely mounted on the chassis frame 2 between a cab and a rear body by means of bolts (FIG. 3). The cradle 4 is provided with an upstanding swivel post 5 supported thereon and rotatable about the vertical axis by means of a swivelling hydraulic cylinder.

The crane further includes a first boom 7 pivotally connected at the base portion 7a thereof to the top of the post 5 by means of a connecting pin 8 and operatively connected to the post 5 by means of an elevating hydraulic cylinder 9, a second boom 10 pivotally connected to the top of the first boom 7 and a third boom 11 slidably inserted into the second boom 10.

The first boom 7 is U-shaped in section so as to receive the elevating hydraulic cylinder 9 which includes a piston rod therein and extends between a pivot pin secured to the post 5 beneath the pin 8 and a pivot pin secured to the boom 7 at the intermediate of its length in such a manner that when the hydraulic cylinder is actuated to extend the piston rod, the boom 7 rotates upwardly about the pin 8 from a lower position shown in FIG. 2 to an upstanding position shown by chain line in FIG. 2.

The second boom 10 is pivotally connected at its base portion 10a to the top 7b of the first boom 7 by means of a pin 12 and is operatively connected to the first boom 7 by means of an elevating hydraulic cylinder 13 for elevating the second boom 10 in the same manner as the first boom 7. The second boom 10 is also operatively connected to the third boom 11 by means of a third hydraulic cylinder 14 connected at the bottom end thereof and at the top end of a piston rod of the cylinder to the bottom end of the boom 10 and to the outer end of the boom 11, respectively, for causing the cylinder 14 to extend the third boom 11 from the second boom 10.

It will be shown in FIG. 3, the cradle 4 has a rectangular opening 15 horizontally extending therethrough, said opening 15 may be provided by forming the lower portion of the cradle 4 in the form of a fork and securing the legs of the fork at the lower ends to the chassis frame 2 of the truck.

The dimension of the opening 15 in the cradle 4 is such that the second boom 10 and the third boom 11 can be smoothly inserted and housed in the opening 15 without interfering with the peripheral edges of the opening 15 at the ends of the booms when the first boom 7 and the second boom 10 are rotated about their pins 8 and 12 by the hydraulic cylinders 9 and 13 folded such that the second boom 10 is located at an acute angle relative to the first boom 7 after the third boom 11 has been retracted from the extended position into the second boom 10. The post 5 may be provided with a forked top portion for permitting the first boom

7 to rotate relative to the post 5 in a large rotating angle and for receiving a part of the first boom 7 therein.

The third boom 11 may be provided with a hook 16 at the outer end thereof.

In operation, first the third hydraulic cylinder 14 is retracted from a position shown in FIG. 1 to a position shown in FIG. 2 to prevent the third boom 11 from interfering with the edges of the opening 15 and then the hydraulic cylinder 9 of the first boom 7 is extended. Thus, the truck is changed into a working position shown by a chain line in FIG. 2 from a travelling position shown in FIG. 1 in which position the crane is folded.

When the hydraulic cylinder 9 is extended, the first boom 7 is rotated in the counterclockwise direction about the pin 8 to stand upon on the top end of the post 5 and then the second and third booms 10 and 11 which were housed in the opening 15 of the cradle 4 are also drawn out and lifted by the first boom 7.

In that state, the elevating hydraulic cylinder 13 for the second boom 10 is extended to raise the second boom on the top end of the first boom and then the hydraulic cylinder 14 is actuated to extend the third boom 11 from the second boom 10.

In order to change the truck from the working position into the running position by folding the crane so as to insert the booms into the opening, the third boom 11 is retracted into the second boom 10 by means of the hydraulic cylinder 14 and then the hydraulic cylinder 13 is retracted completely to rotate the second boom 10 downwardly about the pin 12 so as to fold the second boom 10 in an acute angle relative to the first boom 7 as shown in FIG. 2.

After the second boom 10 is folded in the above manner, the elevating hydraulic cylinder 9 for the first boom is retracted completely.

As the result of the above retraction of the hydraulic cylinder 9, the first boom 7 is rotated downwardly about 45° relative to the horizontal while the third boom 11 and the second boom 10 are inserted into the opening 15 of the cradle 4 from one end thereof and housed in the opening 15 as shown in FIG. 2.

The length and the elevating angle of each of the booms may be designed in such a manner that the first, second and third booms do not extend over the opposite sides of the truck when the ends of the booms are in their folded position.

It will be seen from the above description, the foldable crane according to the invention has various ad-

vantages such that by forming the opening for housing the booms in the cradle on which the swivel post is mounted and which is fixed to the chassis frame, the opening can be made in large dimension and in lower position than the base of the swivel post so that the change of the track position from the transporting position to the working position or vice versa is effected easily and quickly and large dimension booms can be used and then the capacity of the crane is increased while the crane can be mounted in a narrow space of minimum width between the cab and the rear body. Furthermore, since each of the booms can be extended in alignment with each other, lateral moment to which each of the booms is subjected less than the case of the booms interconnected parallelly, so that high strength is obtained in use.

While I have described my invention in detail in its preferred embodiment, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope thereof.

What is claimed is:

1. A foldable crane, comprising: a cradle having opposed side walls and a top wall connecting the upper ends of said side walls which walls define an opening extending horizontally through the length of the cradle; a swivel mechanism mounted on the top wall of said cradle; a swivel post rotatably supported by said swivel mechanism; a first boom having a U-shaped cross-section, pivotally connected at the base portion thereof to the top of the post which also has a U-shaped cross-section; a hydraulic cylinder connected between said post and first boom for elevating said first boom; a cylindrical second boom pivotally connected at the base portion thereof to the top of said first boom; a hydraulic cylinder connected between said first and second booms for elevating said second boom; a cylindrical third boom slidably fitted into said second boom, and a hydraulic cylinder for actuating the third boom extending parallel to and along the outer side of the third boom, said crane being foldable from a working position in which said booms extend generally upwardly in alignment with each other, to a folded position in which said second boom said third boom and its associating hydraulic cylinder are housed in the opening of said cradle after the first boom has been rotated downward after the second boom has been rotated to an acute angle relative to the first boom.

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