Jan. 22, 1963 M. M. MONTGOMERY 3,074,563

FOLD-IN BOOM

Filed Dec. 13, 1961 3 Sheets-Sheet 1

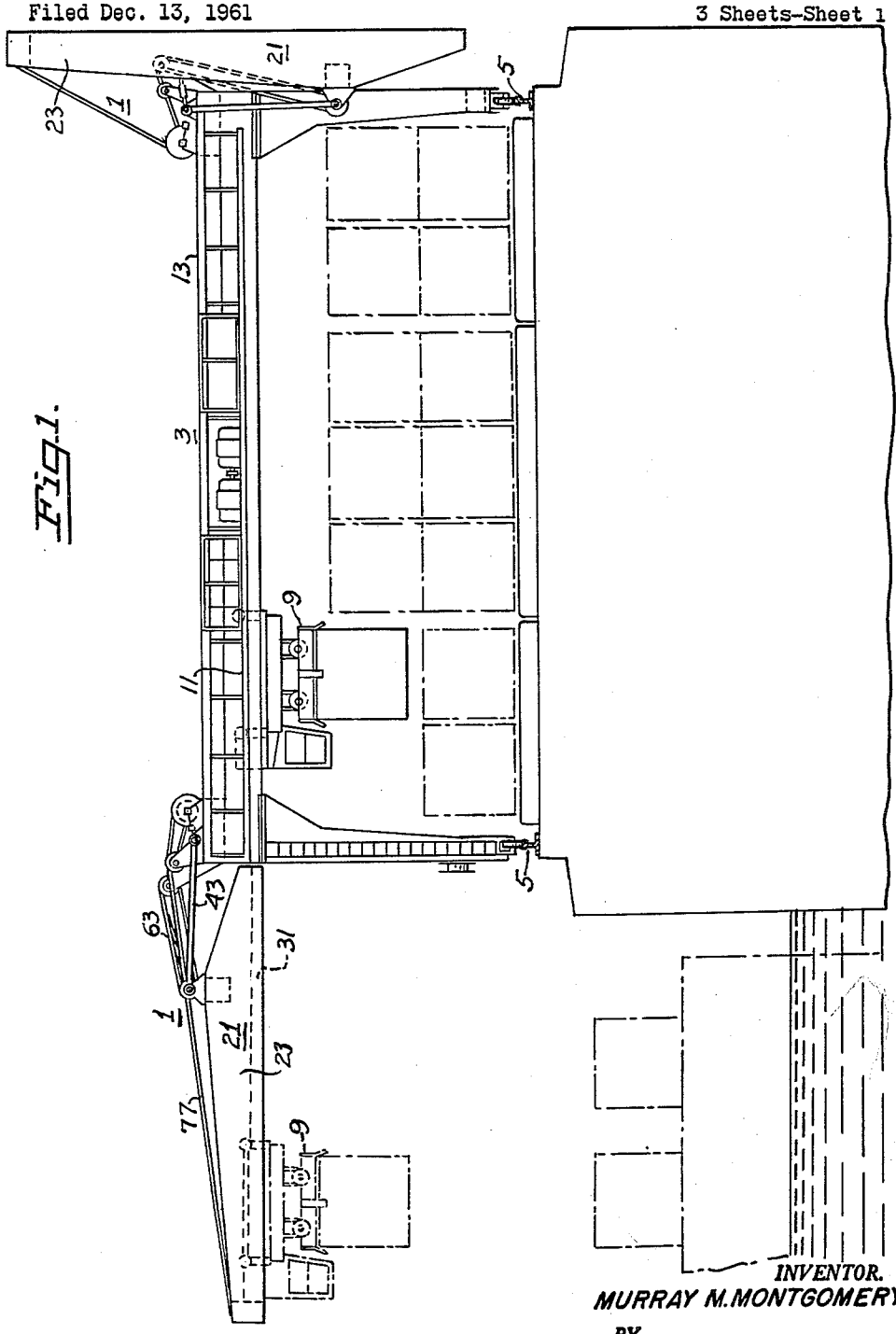


Fig. 1.

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Filed Dec. 13, 1961 3 Sheets-Sheet 2

Fig. 3.

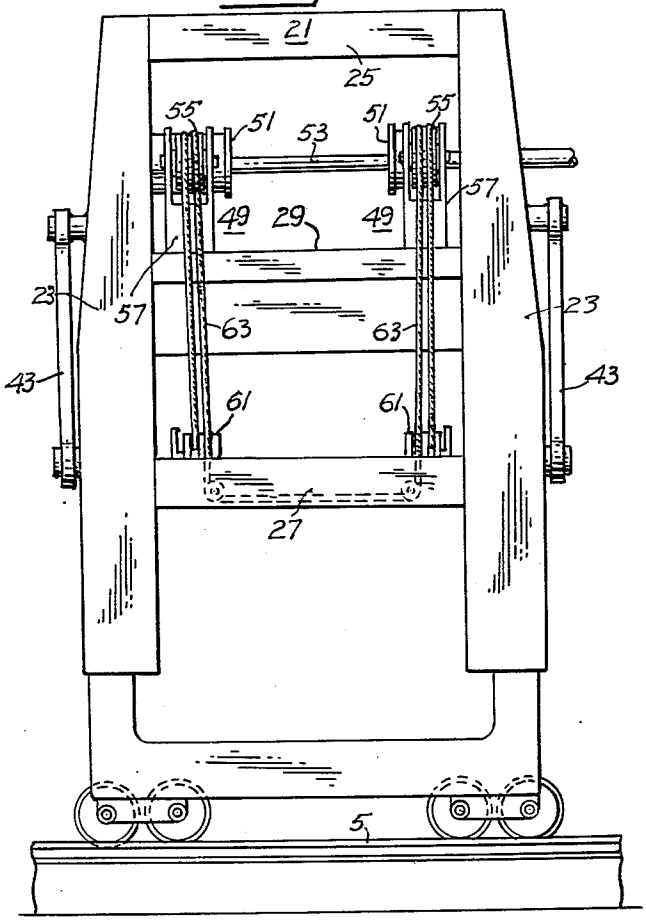


Fig. 2.

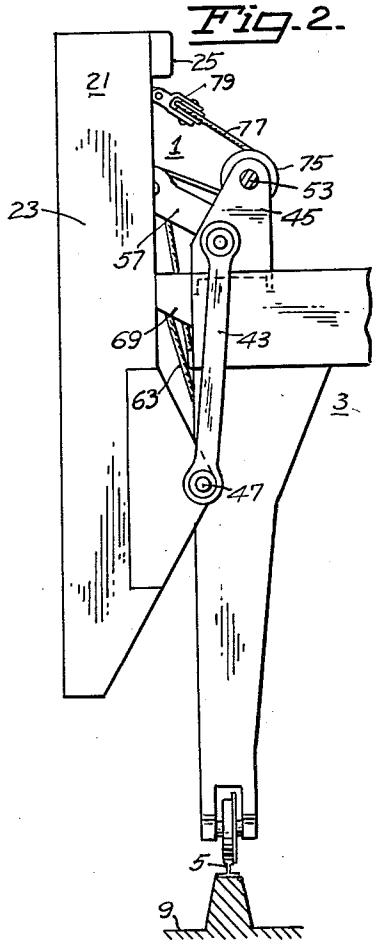
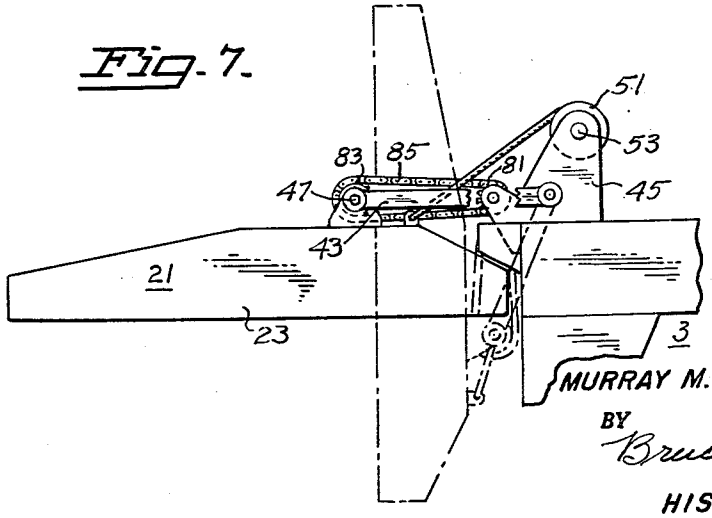


Fig. 7.



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Jan. 22, 1963 M. M. MONTGOMERY 3,074,563

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Filed Dec. 13, 1961 3 Sheets-Sheet 3

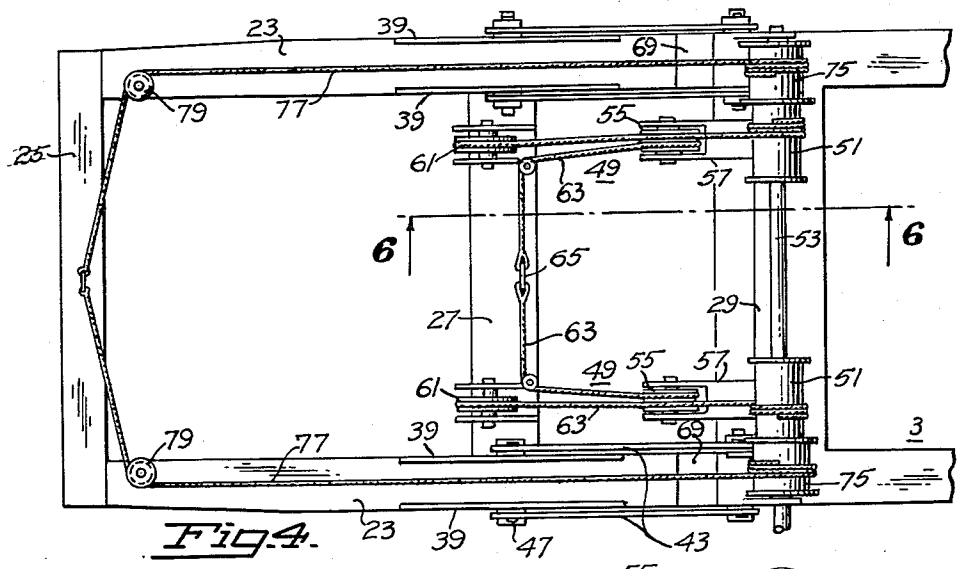


Fig. 4.

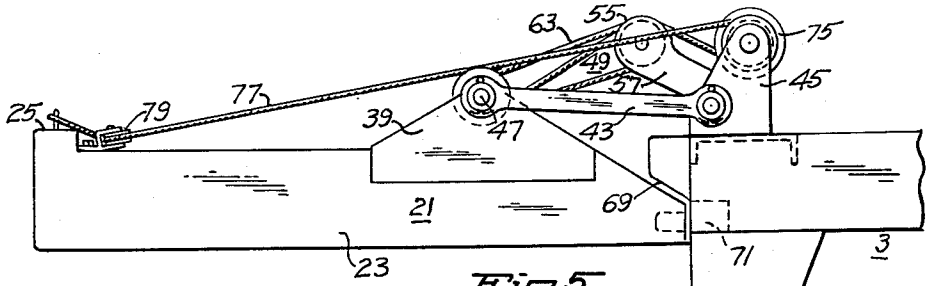


Fig. 5.

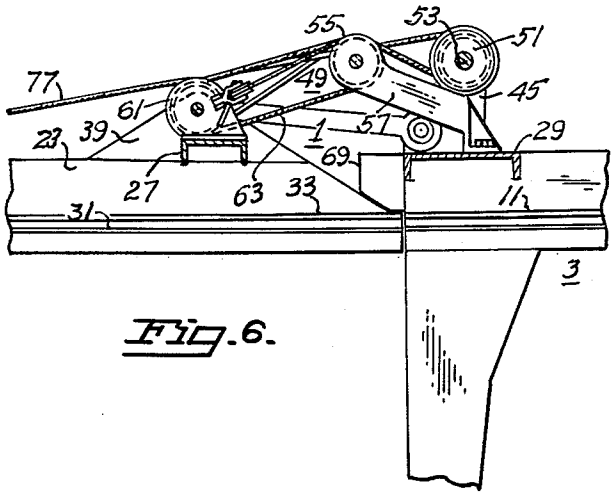
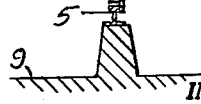


Fig. 6.



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3,074,563

FOLD-IN BOOM

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Filed Dec. 13, 1961, Ser. No. 158,963
7 Claims. (Cl. 212—15)

My invention relates to cargo handling apparatus and more particularly to a boom anchored to a supporting structure and adapted to the handling of cargo with respect to such supporting structure. In its preferred form, the invention will be described as part of a shipboard installation, for the handling of cargo between ship and shore.

It is conventional practice in this connection to install on the deck of a ship, a crane of the gantry type, which is disposed transversely of the ship's deck on rails, and thereby adapted to travel over the many loading compartments in the ship's hold. A boom hinged to the crane at each end thereof is adapted, in its functioning position, to bridge the gap between ship and shore, and carries rails adapted to align with corresponding rails on the main beams of the crane to permit of moving of cargo between the ship and the shore.

In its stowed position, the boom hangs down from its hinged connection to the gantry crane structure. If the gantry crane be constructed to a reasonable height, the boom will inevitably rest against the rail or side of the ship which is of course undesirable in such an installation, not only by reason of the fact that the boom extends beyond the side of the ship, but in so doing, impedes movement along the deck.

To eliminate such obstruction, the crane would necessarily have to be constructed to a height which will permit passageway under the lower end of the boom in its hanging or stowed position, and such height would be quite objectionable, as it would not only interfere with visibility, but would serve to raise the center of gravity of the ship, thereby adversely affecting its stability.

Among the objects of the present invention are:

(1) To provide a novel and improved boom installation;

(2) To provide a novel and improved boom installation which is particularly applicable for shipboard use;

(3) To provide a novel and improved boom installation in which the boom may be stowed in a vertical position without requiring excessive vertical height in the supporting structure;

(4) To provide a novel and improved boom installation in which movements of the boom between its stowed position and its functioning position are substantially outside the confines of the supporting structure and therefore permit of its use not only as part of a gantry crane construction on shipboard, but for land use as well, as where a building may constitute the supporting structure.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a view depicting a boom installation of the present invention as installed on a shipboard crane of the gantry type;

FIG. 2 is a side view in elevation of a boom assembly of the present invention, showing the boom in its stowed position;

FIG. 3 is a front view in elevation of the boom assembly of FIG. 2;

FIG. 4 is a plan view of the boom assembly of FIG. 2, with the boom in its extended or functional position;

FIG. 5 is a side view in elevation of the boom assembly of FIG. 4 with the boom in its extended or functional position;

FIG. 6 is a view in section taken in the plane 6—6 of FIG. 4; and

FIG. 7 is a view depicting a modification of the boom assembly of the preceding figures.

Referring to the drawings for details of my invention in its preferred form, the same as previously indicated, has been illustrated as part of a shipboard installation wherein the boom assembly 1 is mounted at each end of a gantry type crane 3 disposed on rails 5 transversely of the deck of a ship 7, enabling a cargo container carrier 9 supported on rails or tracks 11 along the main beams or girders 13 of the crane, to be positioned over any one of a number of hold compartments of a ship. In such an installation, the boom assembly 1 is mounted at each end of the crane, for movement with the crane, such boom assembly including a boom 21 adapted for movement between its vertical or stowed position as depicted to the right in FIG. 1, to a horizontally extended or functional position, shown to the left in FIG. 1 as extending to a point over a loading dock on shore.

The boom comprises a pair of side beams 23 connected by a plurality of cross ties, one 25 of which connects the outboard ends of the side beams, while another, 27, connects the side beams at an intermediate point thereof, to not only stabilize the boom structure, but to provide for the mounting of elements and components of the boom assembly.

Each side beam 23 is formed with an inturned flange 31 adapted to mount a rail 33, which in the functioning position of the boom, will align itself with the corresponding rails 11 running along the main girders of the gantry crane.

With the boom thus linked to the gantry crane, means imity to the center of gravity thereof, the boom is preferably provided with upright hinge plates 39, for anchoring one end of a link 43, which at its other end, connects to a vertical bracket 45 mounted on each proximate corner of the gantry crane, the link connections at the boom end of the links being in alignment and providing a pivot axis 47 for the boom.

With the boom thus linked to the gantry crane, means is provided for use in conjunction with the links for bodily raising and lowering of the boom. Such means may take the form of a hoist system 49 for each side of the boom and anchored to the crane, each such hoist system involving a drum 51 mounted on a power driven cross shaft 53, journalled in the upright brackets 45 on the end of the gantry crane, and such sheaves as may be required to achieve the necessary mechanical advantage in effecting such lifting. This may involve for example, a sheave 55, carried by a yoke 57 mounted on the crossbeam 29 at the end of the gantry crane, and an aligned sheave 61 supported on the intermediate cross tie 27 of the boom and with its axis in proximity to the pivot axis of the boom, which in turn lies in proximity to the center of gravity of the boom. A cable 63 wound around and anchored at one end to a drum 51, is wrapped around the sheaves associated with such drum, and then at its other end is anchored to a common eye 65 affixed at the midpoint of the cross tie 27. Power applied to the cross shaft on which the drums 51 are mounted, will enable lifting of the boom bodily, and permit lowering of the boom at a controlled rate.

With the weight distribution of the boom, such that the weight thereof will lie predominately outboard of the pivot axis, the boom will, in the absence of other factors, tend to rotate about the pivot axis toward its horizontal functional position, with the inboard end of the boom riding up the proximate leg of the gantry crane, and to bring a halt to such rotation of the boom

about its pivot axis when it approaches its horizontal position, and preferably just prior to reaching such position, a pair of abutment stops 69 are provided on the proximate leg of the gantry crane, each in line with the inboard end of its associated side beam 23 for abutment thereby. When halted by such abutment, the boom may be locked in its functioning position by a latch 71, such as a solenoid operated latch, mounted below each abutment and adapted to latch with the inboard end of the proximate side beam of the boom.

It may not be desirable, however, in raising the boom, to permit the inboard ends of the side beams to ride the leg of the gantry crane, and might be deemed preferable to elevate the boom while maintaining the inboard end of the boom in spaced relationship to the leg of the gantry crane.

Toward this end, I provide a hoist system including a pair of drums 75, which may be mounted on the cross shaft 53, preferably one at each end of the shaft, and connect a cable 77 from each of said drums, about a guide pulley 79 at the outboard end of each side member, to a point on the cross tie 25 at the outboard end of the boom, and preferably a common midpoint on this cross tie.

With a common power source relied on, to rotate all of the drums, the rate at which the outboard end of the boom is permitted to lower while elevating the boom, may be so adjusted as to preclude the inboard end of the boom from engaging the leg of the gantry crane during movement of the boom from its vertical inboard position to its substantially horizontal functioning position. With the rates of movement thus determined, it will be apparent that by reversing the applied power to the drums, the boom may be lowered at a controlled rate, and in lowering, will execute a reverse movement.

It will be noted that in executing its movements, the direction of rotation of the boom on its pivot axis will always be counter to that of the pivot axis in moving between the two extreme positions of the boom.

With a boom installation as thus described, the boom, in its stowed position, can provide sufficient passageway beneath, without necessitating the construction of a gantry crane beyond a reasonable height.

In the modified form of the boom installation depicted in FIG. 7, control of the rotating movement of the boom about its pivot axis, is effected by means other than the drum and cable connection to the outboard end of the boom as described above. In this embodiment, a sprocket 81 is mounted against rotation on each of the upright brackets 45 on the end of the gantry crane, while a second sprocket 83, is mounted, also against rotation, on each of the side beams 23 of the boom, with the axis of these latter sprockets on the pivot axis 47 of the boom. The sprockets at each side of the boom are connected by a sprocket chain 85.

As the boom is elevated from its stowed position, each sprocket chain will "walk" about that sprocket which is mounted on the upright bracket 45 of the gantry crane, and this in turn will cause the chains to rotate the boom about its pivot axis, as the boom is being elevated, and the direction of such rotation, like previously, will be counter to that of the movement of the pivot axis from the stowed position of the boom to the functioning position thereof. In other words, if the movement of one is clockwise, then the movement of the other is counter-clockwise.

From the foregoing description of my invention, it will be apparent that the same fulfills the objects attributed thereto, and while I have illustrated and described the same in considerable detail, it will be apparent that the invention is susceptible to further modification and alteration without departing from the underlying principles involved, and I accordingly do not desire to be limited in my protection to the specific details illustrated and described, except as may be necessitated by the appended claims.

I claim:

1. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom to provide a pivot axis at that point,
and means for controlling movement of said boom between a substantially vertical stowed position and a substantially horizontal functioning position.

2. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom to provide a pivot axis at that point,
and means for controlling movement of said boom between a substantially vertical stowed position and a substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
and means for rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis.

3. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom to provide a pivot axis at that point,
and means for controlling movement of said boom between a substantially vertical stowed position and a substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
said last means including a hoist system anchored to said supporting structure and having a lift cable connected to said boom in the vicinity of said pivot axis,
and means for rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis.

4. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom inboard of the center of gravity of said boom to provide a pivot axis at that point, whereby said boom in the absence of other factors, will normally tend to swing from a substantially vertical stowed position with said links extending downwardly from their pivotal connections to said supporting structure, toward a substantially horizontal functioning position,
and means for controlling movement of said boom be-

tween its stowed position and its substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
and means for simultaneously rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis.

5. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom inboard of the center of gravity of said boom to provide a pivot axis at that point, whereby said boom in the absence of other factors, will normally tend to swing from a substantially vertical stowed position with said links extending downwardly from their pivotal connections to said supporting structure, toward a substantially horizontal functioning position,
and means for controlling movement of said boom between its stowed position and its substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
said last means including a hoist system anchored to said supporting structure and having a lift cable connected to said boom in the vicinity of said pivot axis,
and means for simultaneously rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis,
said means including a hoist system anchored to said supporting structure and having a cable connecting to said boom at its outboard end in combination with said boom having its center of gravity outboard of said pivot axis.

6. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other

end to an intermediate point on said boom to provide a pivot axis at that point,
and means for controlling movement of said boom between its stowed position and its substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
and means for simultaneously rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis,
said means including a sprocket non-rotatably supported on said supporting structure, with its axis coinciding with said points of elevation,
a second sprocket non-rotatably supported on said boom and with its axis coinciding with said pivot axis,
and a sprocket chain encircling said sprockets.

7. A fold-in boom assembly comprising
a supporting structure,
a boom,
means supporting said boom on said supporting structure,
said means including a pair of parallel spaced links,
each pivotally secured at one end to a point of elevation on said supporting structure and at its other end to an intermediate point on said boom to provide a pivot axis at that point,
and means for controlling movement of said boom between its stowed position and its substantially horizontal functioning position,
said means including means for bodily lifting said boom from its stowed position to impart arcuate movement to said pivot axis about said point of elevation,
said last means including a hoist system anchored to said supporting structure and having a lift cable connected to said boom in the vicinity of said pivot axis,
and means for simultaneously rotating said boom about said pivot axis and in a direction counter to the direction of the arcuate movement of said pivot axis,
said means including a sprocket non-rotatably supported on said supporting structure, with its axis coinciding with said point of elevation,
a second sprocket non-rotatably supported on said boom and with its axis coinciding with said pivot axis,
and a sprocket chain encircling said sprockets.

No references cited.