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Grove

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[54] **AERIAL PLATFORM WITH SIDE TO SIDE ROTATABLE BASKET**

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[52] **U.S. Cl.** **182/2**

[51] **Int. Cl.** **B66f 11/04**

[58] **Field of Search** 182/2, 63, 141, 148

[56] **References Cited**

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Attorney, Agent, or Firm—Irvin A. Lavine

[57] **ABSTRACT**

An aerial platform is carried on an extensible boom which is mounted on a motor vehicle for swinging movement in horizontal and vertical planes: the platform is of rectangular planform, and is mounted for swinging movement through 180° on a vertical axis adjacent the end of the boom so as to be adjacent either side of the boom. The boom terminates with a connector, pivoted to the end of the boom fly section on a horizontal axis. At its free end, the connector has a vertical semi-cylindrical housing, in which is a rotary hydraulic motor. A platform support is fastened to the rotary motor and supports the platform outwardly of the semi-cylindrical end of the connector for movement by the motor through 180°, so that it may be positioned adjacent either side of the boom.

16 Claims, 5 Drawing Figures

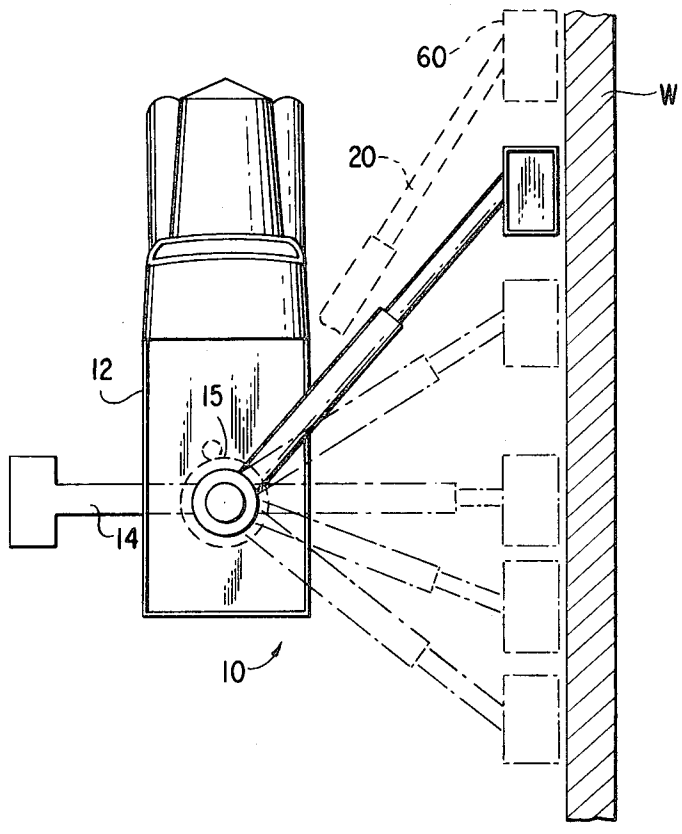
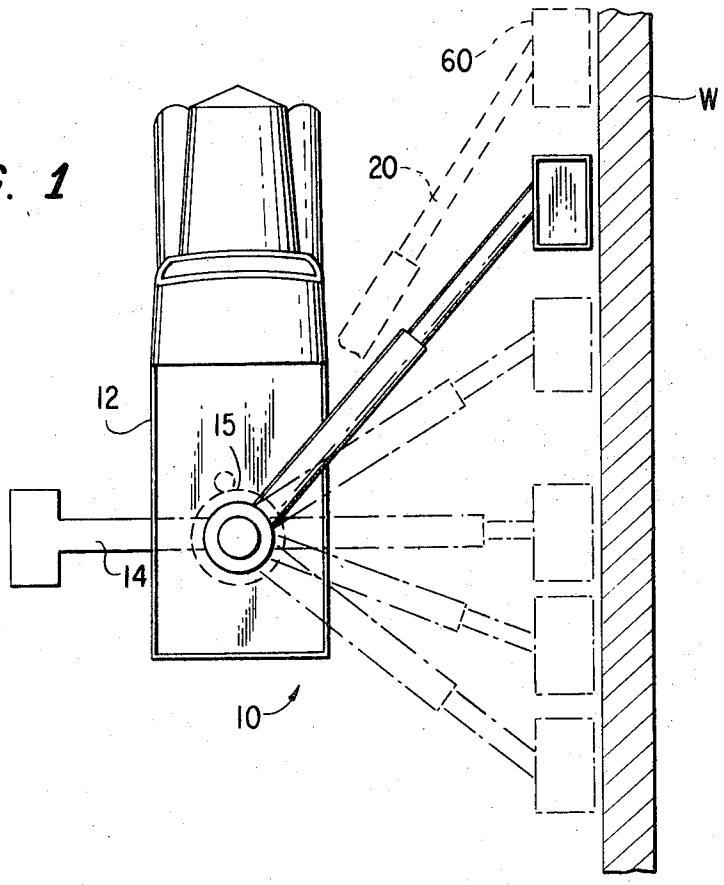


FIG. 1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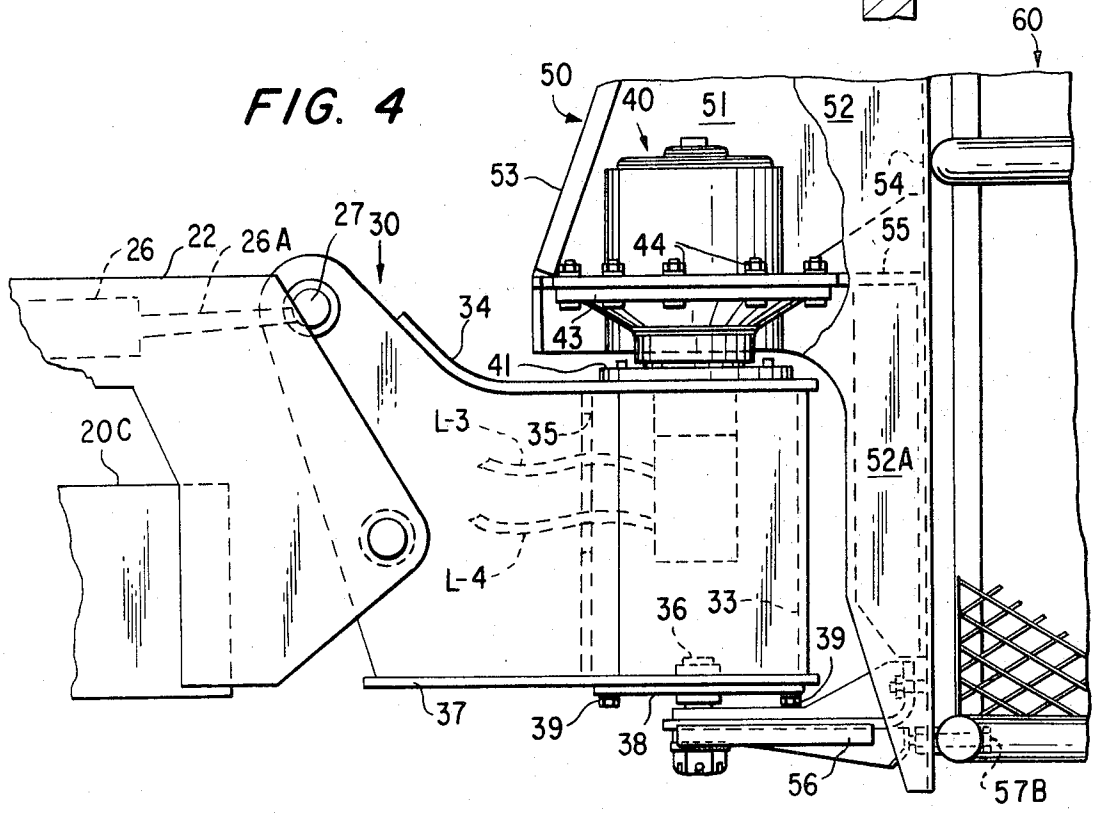
W
20
12
15
14
10

FIG. 4


60
50
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44
43
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20C
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L-4
36
33
39
37
38
56
57B

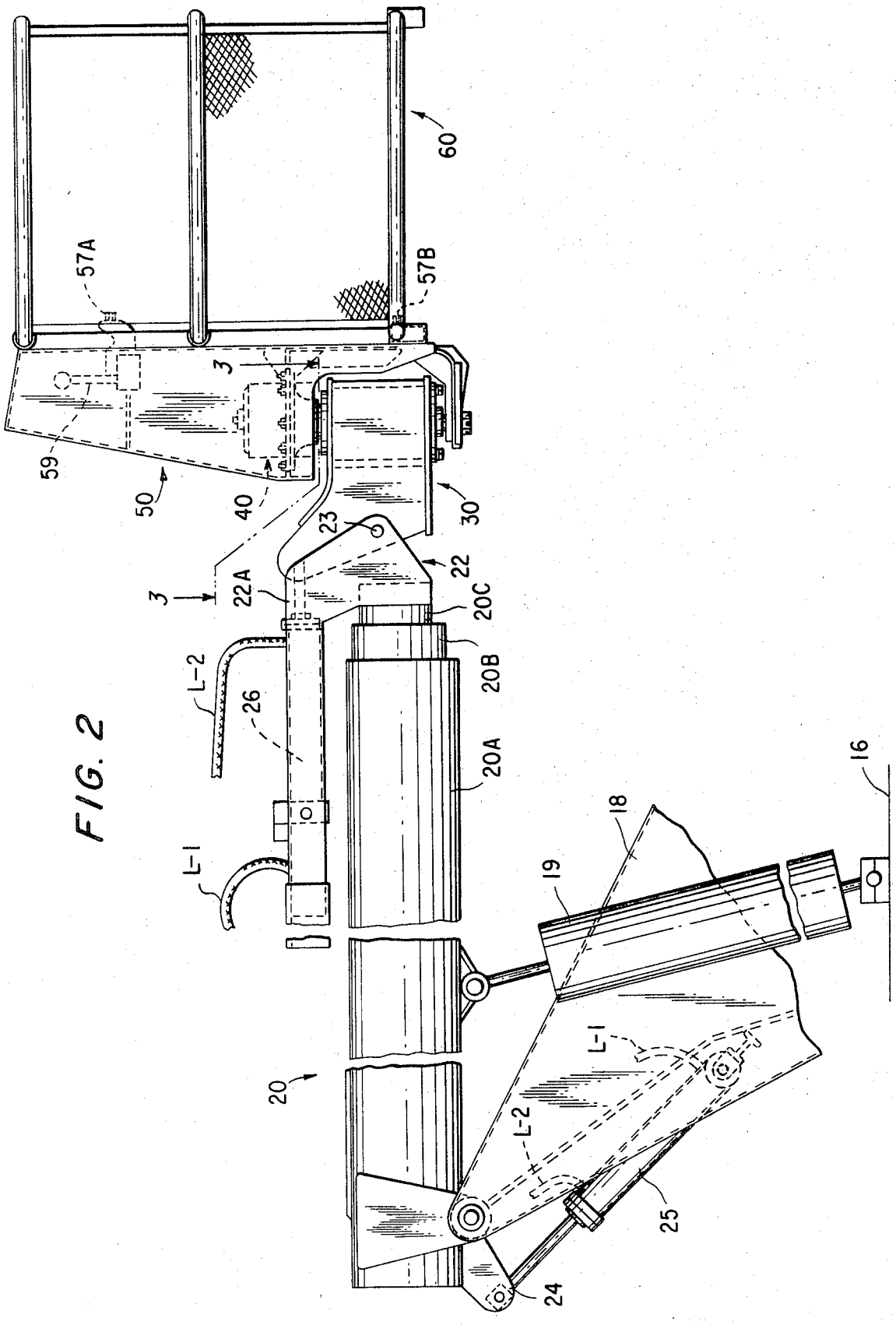
60
57A
57B
3
59
50
40
30
23
22
3
22A
20C
20B
L-2
26
20A
16
18
19
L-1
L-1
20
L-2
25
24

FIG. 2

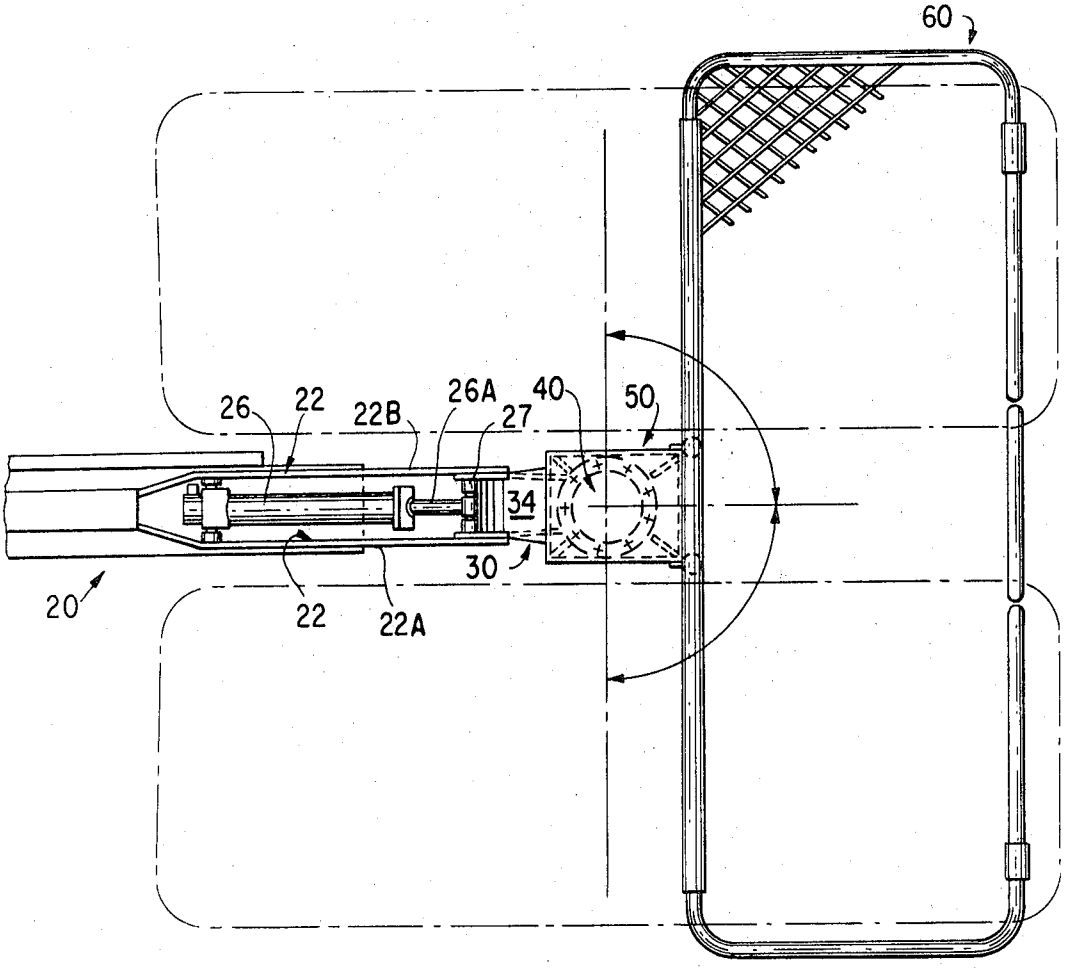
60
26
22
22B
26A
27
40
50
34
30
20
22
22A

FIG. 5

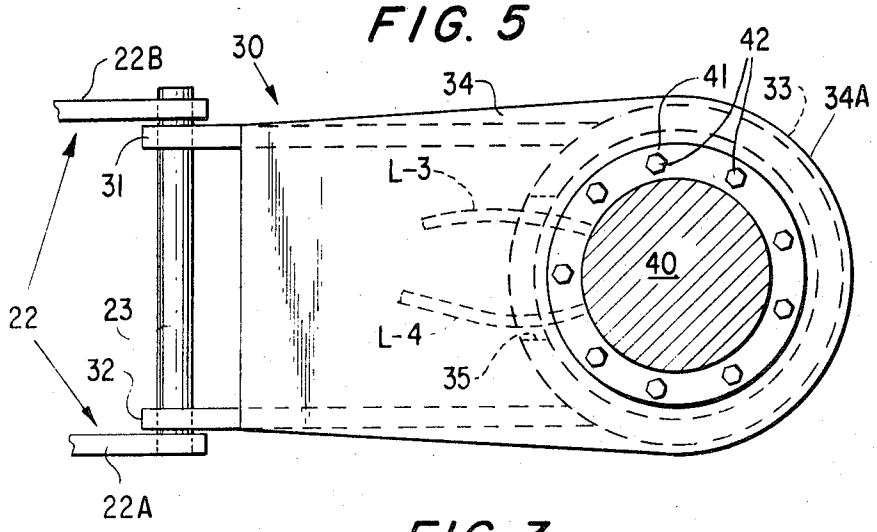
22B
30
34
42
41
33
34A
31
L-3
40
22
23
L-4
32
35
22A

FIG. 3

AERIAL PLATFORM WITH SIDE TO SIDE ROTATABLE BASKET

BACKGROUND OF THE INVENTION

The present invention relates to aerial platforms for supporting workmen at positions remote from a supporting vehicle.

Aerial platform apparatus has come into wide-spread use for supporting workmen at positions remote from the ground, usually at a position elevated substantially above ground level. Such apparatus have conventionally included a motor vehicle on which is mounted an extensible boom, the boom being rotatable about a vertical axis, and pivotable about a horizontal axis for luffing movement. Suitable power means were provided for effecting the rotational and luffing movements of the boom, as well as the extension and retraction of the boom, hydraulic cylinders being preferred for the boom luffing and extension movements. The operations of the boom, to thereby effect movement of the workmen in the platform, could be effected both from the platform, and at ground level. The platforms were provided with a floor, and upstanding walls in order to provide safety for the workmen carried on the platform.

The prior art contains a number of proposals with regard to improvements on the basic aerial platform apparatus as described hereinabove. Thus, a number of proposals have been made for moving the work platform in a horizontal plane relative to the end of the boom. In one such proposal, a pair of platforms were mounted on opposite sides of the boom at the outer end thereof, and each platform could be moved through a substantial arc, in the case of one platform through an arc of substantially 90°, while in the case of the other platform, movement could be effected up to about 135°. With regard to this latter, side-mounted platform, it could move between a position at the front of or forwardly of the boom, in an arc towards the rear of the noted substantially 135°. However, in this construction, it was not possible to move one platform from a position on one side of the boom to a position on the other side of the boom.

In another construction, intended primarily for use as a crane in an orchard, the platform was mounted on a pivot lying forwardly of the end of the boom, which was non-extensible, and rotation of the platform relative to the boom was effected through an arc of approximately 90° by means of a hydraulic cylinder operating a cable trained over pulleys.

In another proposal of the prior art, intended primarily for use in picking fruit, the boom was provided with a pair of platforms mounted on vertical pivots, and capable of motion through approximately 45°, movement being effected by a crank provided on the platform for operating a gear system.

In another proposal intended for use primarily in connection with providing a support for a workman splicing cables, the platform was carried by an L-shaped arm or bracket having a horizontal arm underlying the workman's platform, and a vertical arm extending upwardly therefrom and being connected to a pivot pin extending horizontally to one side of the boom, and connected to a fitting at the end of the boom. In this construction, the basket could rotate through 180°, at one side of the boom.

In addition, there has been provided overhead maintenance apparatus providing a vertical column on which was mounted a platform rotatable about the axis of the column, or about an axis parallel to and to one side of the column, but in such construction, there was no boom which was capable of luffing motion.

All of the above prior art constructions, while providing some flexibility for the positioning of the platform and the workmen thereon, were nevertheless somewhat deficient in the degree of flexibility provided for the positioning of the platform and the workmen. This was particularly true where certain operations were to be performed. For example, it is now known to be desirable to utilize aerial platform apparatus for supporting workmen to perform work along the length of a structure, such as a building, of a substantial distance. Such work includes painting the side of a building, or even the installation of exterior wall panels, which may be provided in conventional size, such as four feet by eight feet. The prior art constructions of aerial platform apparatus were not suitable for such work, unless there was an undesirably large amount of movement of the vehicle, in order that the platform and the workmen carried thereby be placed in different operative positions relative to the building or other structure being worked on.

SUMMARY OF THE INVENTION

The aerial platform of the present invention includes a vehicle having an extensible boom mounted thereon for swinging movement in vertical and horizontal planes, at the free end of the boom fly section there being a connector which is pivoted at the end of the fly section on a horizontal pivot. The connector at its outer end is in the form of a semi-cylindrical housing having a vertical axis. A rotary hydraulic motor is carried in the housing, having a part fixed to the housing and a second part rotational relative to the first part extending above the housing, with a platform support structure attached to the latter part of the rotary motor. A shaft extends downwardly from the bottom of the housing, coaxial with the axis of the rotary motor, and a bracket arm extends from the support and is journalled on this shaft. The platform is carried by the support, and includes a floor which is of rectangular plan form. The support and platform may be rotated through substantially 180°, by the rotary motor, from extreme positions of the platform which are at either side of the boom. In the central or neutral position, the mid-point of one long side of the platform is forwardly or outwardly of the axis of the rotary motor, and is, like the axis of the rotary motor, on an extension of the boom longitudinal axis. The diameter of the semi-cylindrical housing is at least as great as the width of the connector. Movement of the connector in a vertical plane about its pivot causes similar movement of the platform, to thereby maintain the floor of the platform horizontal during luffing movement of the boom, this being accomplished by master and slave cylinders which effect simultaneous, equal and opposite movement of the connector as the boom is luffed.

Among the objects of the present invention are to provide an aerial platform apparatus having greater flexibility of the workman-supporting platform. A further object of the present invention is the provision of an aerial platform apparatus which provides a greater

operating range for the platform and the workmen thereon, without movement of the vehicle.

Yet another object of the present invention is provide an aerial platform apparatus of greater flexibility, which is of strong construction, while being economical, and not requiring either unusual materials or construction techniques.

Other objects and many of the attendant advantages of the present invention will be clearly understood from the following specification and claims, and the drawings appended hereto and forming a part hereof.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of an aerial platform apparatus in accordance with the present invention.

FIG. 2 is an elevational view, with parts broken away, of a portion of the apparatus shown in FIG. 1.

FIG. 3 is a cross-sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is an enlarged elevational view of a portion of the structure shown in FIG. 2.

FIG. 5 is a plan view of the end portion of the boom and platform of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, wherein like or corresponding reference numerals are used for like or corresponding parts throughout the several views, there is shown in FIG. 1 an aerial platform apparatus generally designated **10**, and including a wheeled vehicle **12** of conventional engine-powered and steerable construction. The vehicle **12** includes outriggers **14**, one of which is shown in FIG. 1, and gearing **15**, shown schematically and of conventional construction, for rotating a boom **20** about a vertical axis. At its outer end, the boom **20** carries a workman-supporting platform **60**. As shown in FIG. 1, the boom **20** may be rotated about a vertical axis, and may also be extended and retracted, so as to position the platform **60** at different places along a wall W. In the example herein illustrated, the wall W is a part of a building under construction, and it is necessary for the workmen to perform various tasks on the wall, or in connection with the construction of the wall, such as painting it or applying panels of wall-forming material to a basic structure. As is generally indicated by the showing in FIG. 1, the platform **60** may occupy a position somewhat forwardly of the front of the vehicle **12**, wherein one side of the platform is closely adjacent one side of the boom **20**, to an opposite position wherein that side of the platform is adjacent the opposite side of the boom **20**. As will be understood, in some instances it may be possible to position the vehicle **12** closer to the wall W, and in that instance a greater range of positions of the platform **60** along the wall W can be effected.

Referring now to FIG. **2**, there is shown a base **16** which is rotatable about a vertical axis, as by the aforementioned gearing system **15**. Extending upwardly from this base is a boom support **18**, typically in the form of a pair of spaced apart, generally vertically extending plates having between them a boom luffing cylinder **19** which is operated by hydraulic fluid from a suitable pump in conventional manner to raise and lower the boom **20**. At its upper rear end, the boom support **18** has pivotally connected to it about a horizontal pivot the boom **20** which is an extensible boom of known configuration, and having three telescopic sections **20** A, **20** B and **20** C. Telescopic movement of the sections relative to each other is effected by suitable power means, such as hydraulic cylinders, not shown. A support generally designated **22** is secured to the end of the fly section **20** C, and a horizontal pivot pin **23** pivotally connects a connector **30** to the support **22**, and hence to the boom **20**. The connector **30** carries a rotary hydraulic motor generally designated **40**, to which is connected a platform support structure **50**, which latter carries the platform **60**.

In order to maintain the platform **60** level during luffing movement of the boom **20**, the boom **20** is provided at its rear with an ear **24** to which is connected the piston rod of a master cylinder **25**, having the cylinder itself pivotally connected to the boom support **18**. The aforementioned support **22** has a portion thereof extending above the boom **20**, to carry a slave cylinder **26**. Hydraulic lines L–1 and L–2 interconnect the master cylinder **25** and the slave cylinder **26**, so that as the boom luffing cylinder **19** raises the boom, the master cylinder **25** will be actuated, and will in turn actuate the slave cylinder **26**, to impart simulatneous, equal and opposite rotational movement of the connector **30** about the pivot pin **23**, relative to the rotational movement of the boom **20** about its pivotal connection with the boom support **18**.

As may be seen in FIGS. **2** and **3**, the support **22** at the end of the fly section **20** C is in the form of a pair of spaced plates **22A** and **22B**, parallel to each other, and lying in vertical planes. The pivot pin **23** passes through the plates **22A** and **22B** forming the support **22**, and also through plates **31** and **32** forming parts of the connector **30**. The plates **31** and **32** are in vertical planes, and lie inwardly of the plates **22A** and **22B** of the support **22**. At the right hand or forward end, the connector **30** terminates in a housing **33** which has a vertical axis, and which is in the form of a cylinder, although a completely cylindrical housing is not required and is shown herein as being utilized for purposes of strength. In practice, a semi-cylindrical housing could be utilized. The plates **31** and **32** are joined to the housing **33**, and a plate **34** (see also FIG. **4**) lies along the top surfaces of the plates **31** and **32**, plate **34** terminating in a semi-cylindrical formation, or flange **34A** having a slightly greater radius than that of the housing **33**. A flange **41** of the motor **40** overlies the plate **34**, and bolts **42** secure the motor **40**, through flange **41**, to the plate **34**, and hence to the connector **30**. As will be seen, the diameter of the structure including the housing **33** and the flange **34A** of plate **34** is at least as large as the width of the connector **30**, as determined by the spacing of the plates **31** and **32**, to thereby permit full 180° rotation of the platform **60**, from one side of the boom and connector **30** to the other side thereof.

Referring now to FIGS. **2** and **4**, a platform support structure **50** is provided, which is generally in the form of a hollow, somewhat pyramidal housing including spaced side plates **51** and **52**, the latter of which is shown broken away in FIG. **4**, an inclined rear plate **53** and a front plate **54**. A horizontal plate **55** extends between the aforesaid plates forming the pyramidal platform support structure **50**, and is provided with opening in which is positioned the rotary fluid motor **40**. The motor **40** is provided with a second flange **43** which underlies the plate **55**, and is secured to it by an annular series of bolts **44**. The flange **43** is rotational

relative to the flange 41, so that when fluid is supplied to the rotary motor 40, the upper part thereof, including the flange 43, will rotate about the axis of the motor 40, which is coincident with the housing 33, while the part of the motor 40 to which the flange 41 is connected remains stationary. It will thus be seen that the rotary motor 40 provides power for rotating the platform 60. As will be seen in FIGS. 3 and 4, the left hand portion of the housing 33 is provided with an opening 35 through which pass hydraulic lines L–3 and L–4 for supplying hydraulic fluid to the motor 40, which is of known construction. As will be understood, the controls for the motor 40 are provided on the platform 60, and duplicate controls may also be provided at ground level.

The platform support 50 will be seen to have the side plates 51 and 52 thereof terminate at a level somewhat below the horizontal plate 55, and above the flange 41, except for portions of these plates lying adjacent to the front plate 54, which portion is designated 52A in FIG. 4 and which may be seen to extend downwardly to a point below the bottom of the connector 30. A bracket 56 extends rearwardly from the lower portion of the platform support 50, being journalled on a shaft 36 which is coaxial with the motor 40. The shaft 36 is carried by a lower plate 37 of the connector 30 and by an annular plate 38 which is secured to the plate 37 by fasteners 39.

Referring again to FIG. 2, it may be seen that the platform support 50 has the platform 60 secured thereto at connecting points 57A and 57B, which may take the form of bolts or the like. Mounted within the platform support structure 50, and accessible to workmen on the platform 60 are the aforementioned controls, designated 59, for control of the platform, including the boom, by the workmen on the platform 60.

Referring now to FIG. 5, there may be seen the support 22 including the spaced plates 22A and 22B, with the slave cylinder 26 therebetween, having the piston rod 26A thereof pivotally connected to a pivot pin 27 secured in the connector 30, which apparatus serves to transfer motion from the slave cylinder 26 to the connector 30, for maintaining the platform 60 level. The plate 34 at the upper part of the connector 30 may be seen, we well as the platform support structure 50. As is clearly shown in FIG. 5, the platform 60 is preferably of rectangular plan form, and in the central or neutral position shown in full lines in FIG. 5, the platform support 50 is connected to the mid-portion of a long side of the rectangular platform 60 and an axis of the platform is in line with the axis of the boom 20. Preferably, the length of the platform is something over 8 feet, so as to accommodate certain building materials which have a length of 8 feet, on the platform. As is further shown in FIG. 5, the platform 60 may be moved between two extreme positions relative to the boom 20, one position having a side of the platform adjacent the left side of the boom 20, and substantially parallel thereto, and the other position being substantially adjacent the right side of the boom 20, and substantially parallel thereto. Thus, the axis of the platform, referred to above, will be substantially perpendicular to the axis of boom 20 in the two positions shown in phantom lines in FIG. 5. It will be appreciated, however, that with the construction shown, slightly more than 180° of rotation in the horizontal plane, about the axis of the motor 40, may be accomplished. As will be appreciated, the axis of rotation of the platform 60 is external of the platform, being the axis of the rotary hydraulic motor 40, and shaft 36.

In use, equipment to be used by the workmen may be placed on the platform, and the workmen may then board the platform, after the vehicle 12 has been positioned adjacent the location of the work, such as the wall W in FIG. 1. Assuming that the task to be performed is the placing of facing panels on an exterior wall, the vehicle 12 will have been maneuvered as close as possible to the wall W, and with a number of panels carried on the platform 60, the initial positioning of the platform 60 may be such that it lies substantially adjacent the right side of the boom 20. As panels are assembled onto the building structure, the boom 20 and platform 60 are moved, but not the vehicle 12, until a position is reached where the platform 60 is substantially adjacent the left side of the boom 20. In that event, relative to the boom 20, the platform will have moved through substantially 180°, from one side of the boom 20 to the other side thereof, while at all times the workmen on the platform 60 will have been in position to perform their work of assembling the facing panels to the building.

The aerial platform apparatus herein disclosed provides great flexibility for positioning of an aerial platform relative to the work, or to a structure on which work is to be performed. Further, the apparatus herein disclosed provides for the maintenance of the work platform in level condition, no matter what is the angle of inclination of the boom. The construction herein disclosed is strong, yet is economical and does not require any special materials or assembly techniques.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

I claim:

1. Aerial platform apparatus comprising:
   a. a vehicle,
   b. a linearly extensible and retractable boom having a length when extended substantially greater than the length thereof when retracted,
   c. means mounting said boom on said vehicle for swinging movement in vertical and horizontal planes,
   d. means for extending, retracting and swinging said boom,
   e. load support means having a neutral position in which an axis thereof is in line with the boom axis, and
   f. means at the free end of said boom for supporting said load support means for pivotal movement between two positions in each of which the rear portion of the load support means is substantially adjacent a side of the boom and in each of which said positions said load support means axis is substantially perpendicular to the boom axis,
   g. whereby the portion of the load support means opposite said rear portion has access to an extensive area of a wall without movement of the vehicle by positioning said opposite portion near a wall with the rear portion adjacent a side of said boom and said boom extended, then swinging said boom and said load support means and retracting said boom,

and after the boom reaches a plane perpendicular to said wall, continuing to swing said boom and said load support means until the rear portion of the load support means is substantially adjacent the opposite side of said boom.

2. The aerial platform apparatus of claim 1, said last mentioned means comprising means for supporting said load support means for rotary movement through substantially 180°.

3. The aerial platform apparatus of claim 1, said boom at the free end thereof comprising a semi-cylindrical housing having a diameter at least equal to the width of the boom at the end thereof.

4. The aerial platform apparatus of claim 3, and a rotary motor having a part thereof secured to said housing and a second part rotational relative to said first part connected to said load support means.

5. The aerial platform apparatus of claim 4, and a support connected to a said part of said rotary motor and supporting said load support means, a shaft extending axially downwardly from said housing, and said support comprising an arm journalled on said shaft.

6. The aerial platform apparatus of claim 1, wherein said load support means comprises an aerial platform having a floor and wall means, said floor having a substantially rectangular platform.

7. The aerial platform apparatus of claim 6, wherein a long side of said platform is adjacent the free end of said boom.

8. The aerial platform apparatus of claim 1, wherein said means for supporting said load support means comprises connector means pivotally connected to said boom for movement in a vertical plane.

9. The aerial platform apparatus of claim 8, and means for rotating said connector means simultaneously, equally and oppositely to swinging movement of said boom in a vertical plane.

10. The aerial platform apparatus of claim 8, said connector means outwardly of the pivotal connection thereof comprising a vertically extending housing, and rotary motor means carried by said housing for rotating said load support means.

11. The aerial platform apparatus of claim 8, said connector means outwardly of the pivotal connection thereof comprising a semi-cylindrical vertically extending housing having a diameter at least equal to the width of the boom at the end thereof.

12. In an aerial platform apparatus comprising a vehicle having a linearly extensible and retractable boom having and extended length substantially greater than the retracted length mounted on said vehicle for horizontal swinging and vertical luffing movements, and a platform carried at the end of said boom,

the improvement comprising means mounting said platform for horizontal movement between two positions in each of which the rear of the platform is substantially adjacent a side of said boom and in each of which an axis of said platform which is in alignment with the boom axis in the neutral position of the platform is substantially perpendicular to the boom axis,

whereby the portion of the platform opposite siad rear portion has access to an extensive area of a wall without movement of the vehicle by positioning said opposite portion near a wall with the rear portion adjacent a side of said boom and said boom extended, then swinging said boom and said platform and retracting said boom, and after the boom reaches a plane perpendicular to said wall, continuing to swing said boom and said platform until the rear portion of the platform is substantially adjacent the opposite side of said boom.

13. The aerial platform apparatus of claim 12, said boom having at the end thereof vertically extending pivot means, and means for supporting said platform in spaced relation to and carried by said pivot means.

14. The aerial platform apparatus of claim 13, wherein said pivot means comprises a housing, and a rotary motor carried by said housing for rotating said platform.

15. The aerial platform apparatus of claim 12, and means for maintaining said platform level during luffing of said boom.

16. The aerial platform apparatus of claim 1, wherein said pivotal movement is about a substantially vertical axis and said last mentioned means comprises means for supporting said load support means with the rear thereof spaced from said axis.

* * * * *