United States Patent [19]

Coutinho

[11] **3,828,941**

[45] **Aug. 13, 1974**

[54] **HYDRAULIC JIB**

[76] Inventor: **John Coutinho,** Chester Tnpk., Auburn, N.H. 03032

[22] Filed: **Apr. 10, 1973**

[21] Appl. No.: **349,765**

[52] **U.S. Cl.** ..... **212/144,** 182/2, 212/59 R

[51] **Int. Cl.** **B66c 23/68**

[58] **Field of Search** ..... 212/144, 59 R, 66, 67; 182/2

[56] **References Cited**

UNITED STATES PATENTS

3,099,358	7/1963	Clark	212/67
3,527,362	9/1970	Allen	212/59
3,542,068	12/1970	Prescott	182/2
3,554,395	1/1971	Dunbar	212/59
3,690,408	9/1972	Reske et al.	182/2

FOREIGN PATENTS OR APPLICATIONS

118,294	4/1958	U.S.S.R.	212/67

Primary Examiner—Richard A. Schacher
Assistant Examiner—Jeffrey V. Nase
Attorney, Agent, or Firm—Thomas N. Tarrant

[57] **ABSTRACT**

A dielectric jib at the end of a hydraulically operated boom in which the jib is slidably supported in a sleeve, the sleeve being connected to a rotatable bushing surrounding a shaft extending to the boom. The bushing is connected on the inside of the boom to a hydraulic actuator for rotation. The bushing is also drilled with hydraulic passages for providing hydraulic power to operate a winch for raising and lowering a hook on the end of the jib and also for powering an actuator such as a double acting hydraulic piston for sliding the jib back and forth in the sleeve.

10 Claims, 6 Drawing Figures

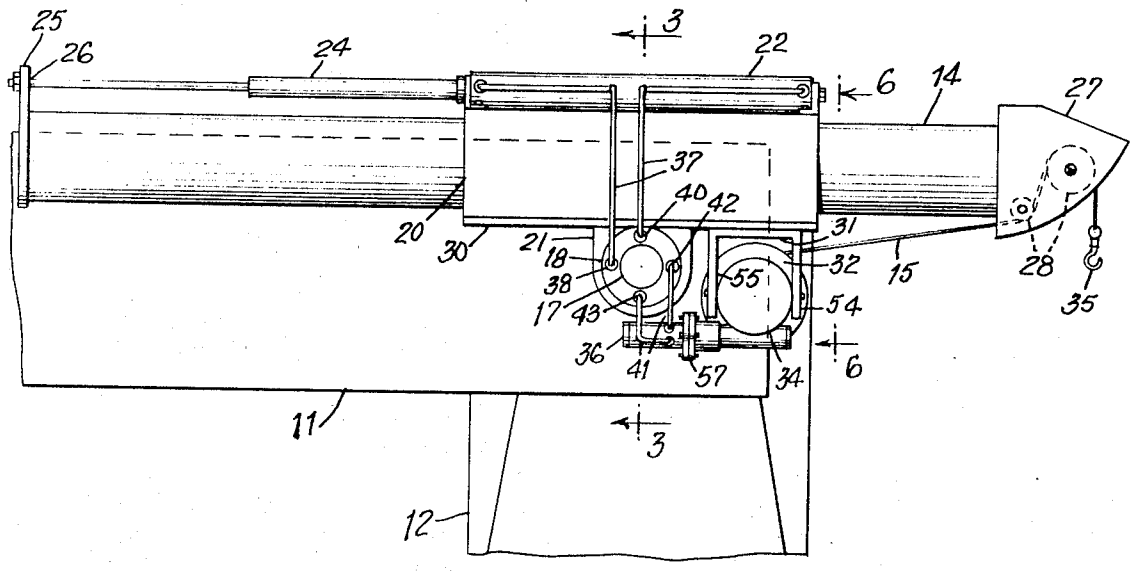


Fig. 1.

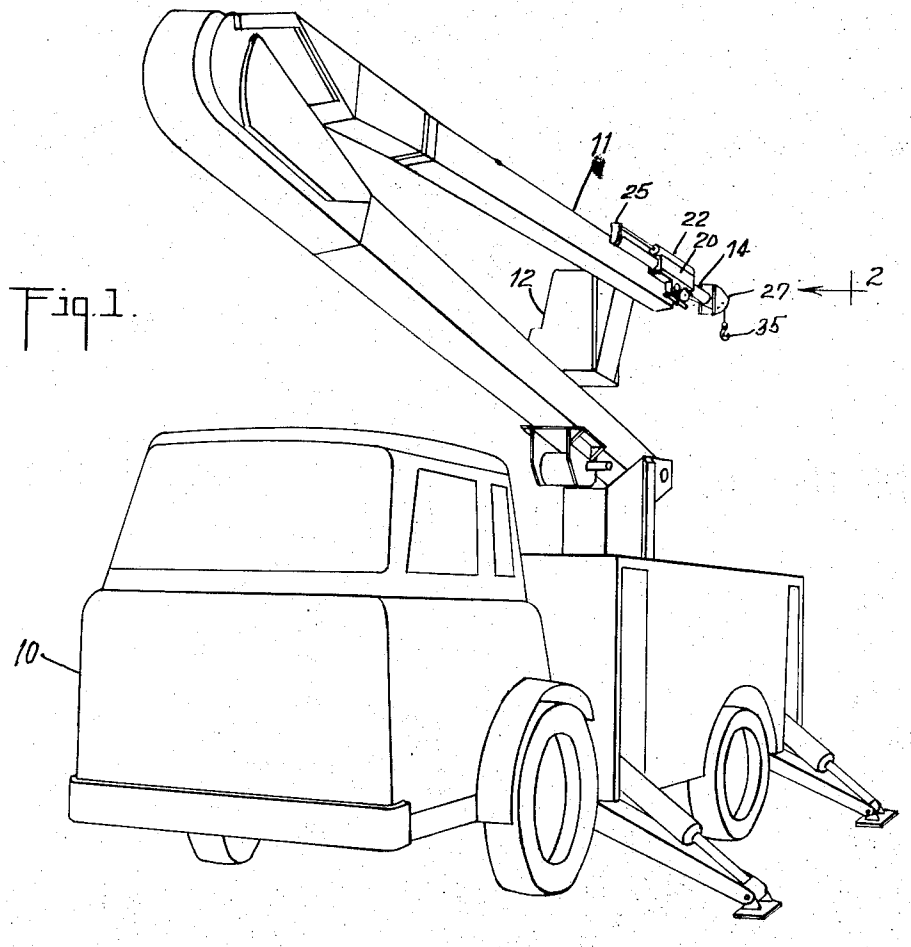

11
25
22
20
14
12
27
2
35
10

Fig. 2.

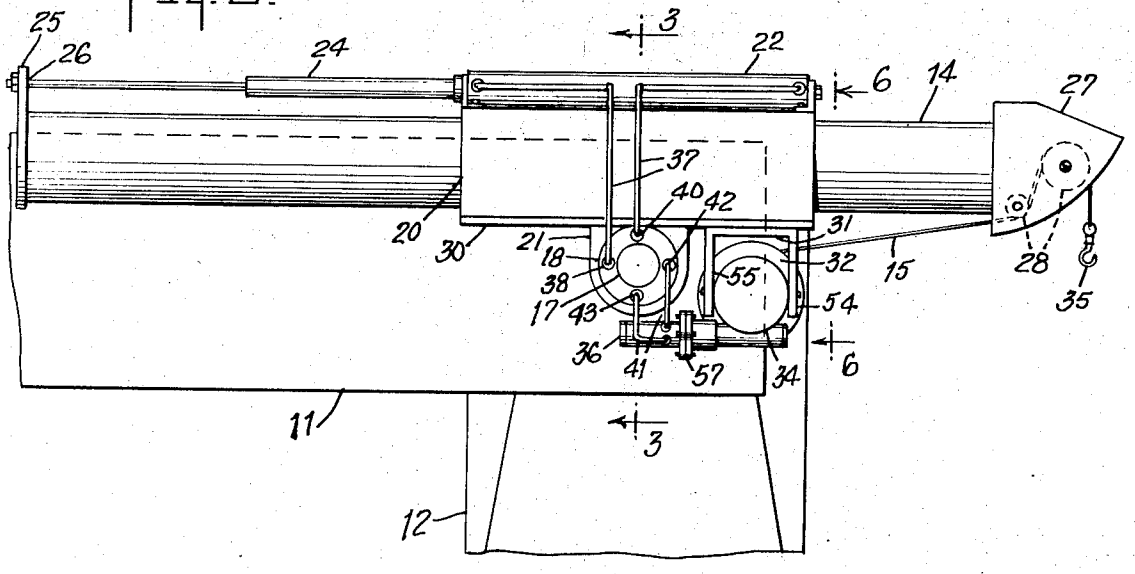
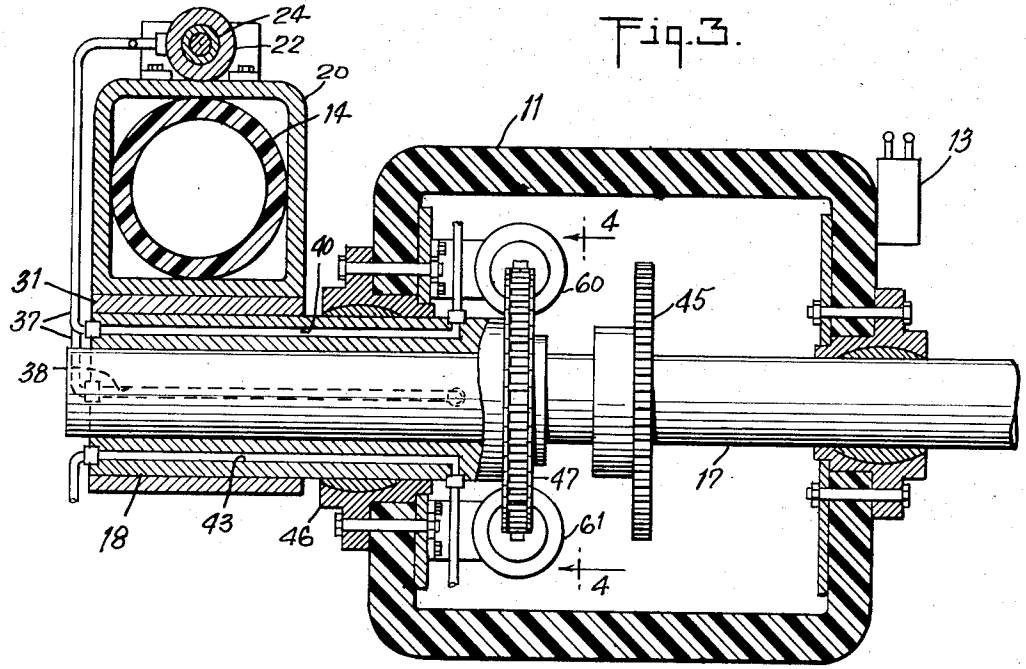

25
26
24
3
22
6
14
27
37
40
42
20
30
21
18
38
17
43
31
32
15
55
54
28
35
36
41
57
34
6
11
3
12

Fig. 3.



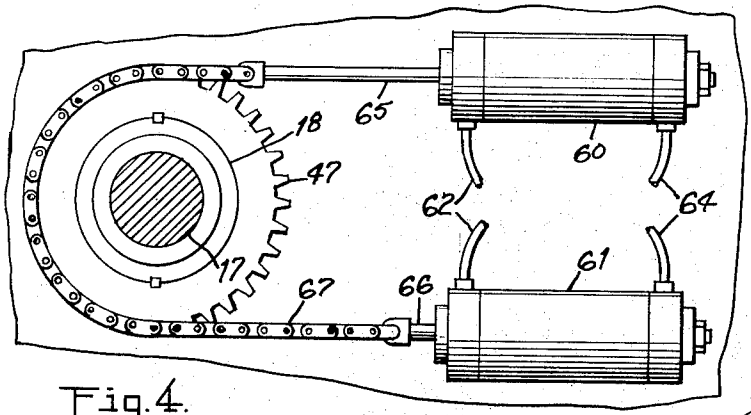


Fig. 4.

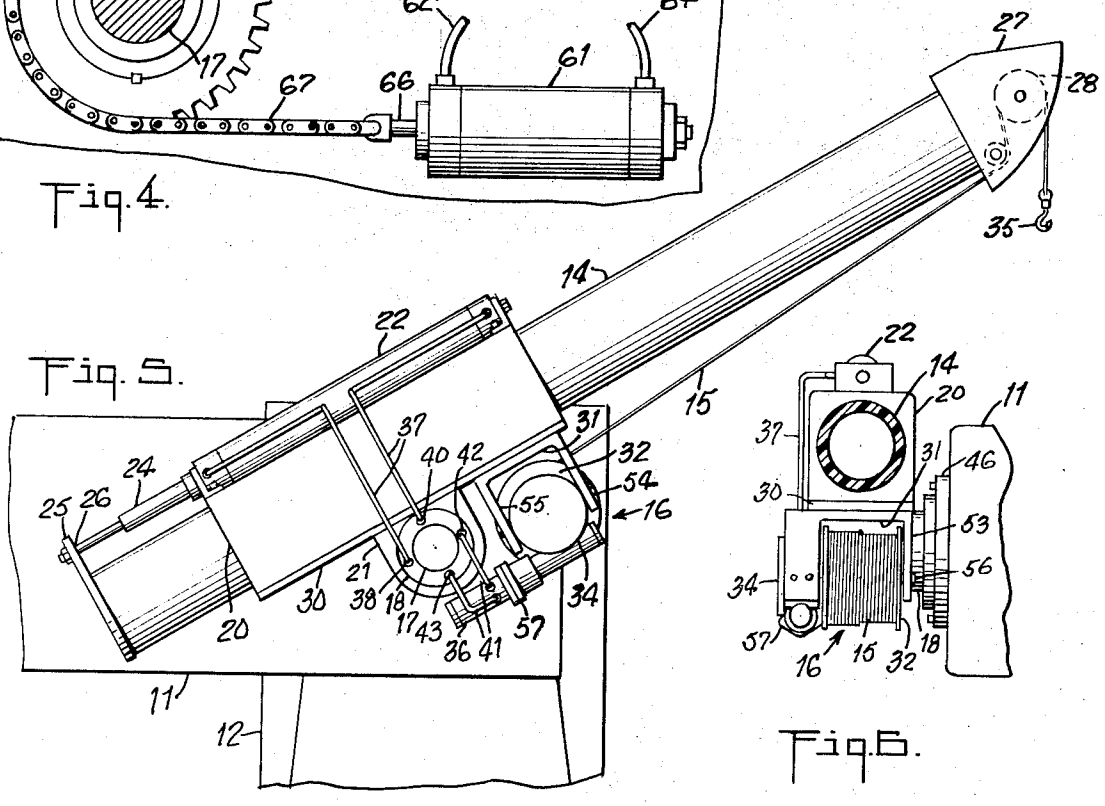


Fig. 5.

Fig. 6.

HYDRAULIC JIB

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to vehicles carrying extendable booms for raising or lowering men and/or materials to elevated portions of posts, towers, trees, etc. and particularly to jibs utilized on a boom end to facilitate manipulative control.

2. Relation to the Prior Art

The last two decades have seen a sudden rise of vehicles carrying folding or telescoping booms terminating with crow's nests to facilitate and increase the safety of men working on elevated structures. These vehicles have proven a great asset to the power companies and telephone companies in installing and servicing wires, cables, transformers, and other components and materials supported on telephone poles or the like. Some of these materials, particularly components such as transformers, are too heavy to be handled manually and the end of the boom has insufficient facilities for manipulation to handle these components efficiently. A substantial hazard is also frequently present in the nature of high voltage electrical power. To increase the safety and efficiency of operation, a relatively small dielectric jib has been added to the end of the booms on some of these vehicles, the jib being capable of both back and forth and up and down movement and carrying a winch line and hook for connecting to, raising and lowering components up to several hundreds of pounds of weight. By making the jib of insulated material such as fiberglass and using nylon line on the winch, a considerable amount of the electrical hazard is avoided.

Up to the present time, these jibs have been operated almost entirely by manual effort. While hydraulic power is readily available at the end of the boom, it is difficult to connect it to perform the three desired operations without excessive exposure of flexible hydraulic lines raising the danger of rupturing hydraulic lines by snagging or abrasion. The three necessary operations are rotation of the jib to raise and lower its outer end, sliding and jib back and forth, and operation of the winch.

SUMMARY OF THE INVENTION

Now in accordance with the present invention, a dielectric jib for extendable boom vehicles is provided capable of complete hydraulic operation. A rotatable bushing fitted around a shaft extended through the end of the extendable boom supports a sleeve carrying the jib. The bushing is rotated by a hydraulic actuator coacting with the bushing on the interior of the boom. Hydraulic passages drilled through the bushing permit all flexing of hydraulic hoses due to rotation of the jib to be taken up by hoses enclosed in the end of the boom. The hydraulic passages drilled in the bushing are connected outside of the boom to nonflexing hydraulic lines connected to a winch actuator for raising and lowering a line and to a further hydraulic actuator for slidably retracting and extending the jib through its supporting sleeve.

Thus, it is an object of the invention to provide a completely hydraulically manipulated jib on the end of an extendable mobile boom.

It is a further object of the invetnion to provide hydraulic actuation for rotating and extending a jib on the end of an extendable boom as well as hydraulically operate a winch secured to said jib using hydraulic lines of which the only flexing portions are enclosed in the end of the boom.

It is a further object of the invention to provide a drilled bushing for both rotatably supporting a jib and for carrying hydraulic fluid to hydraulic actuators mounted on said jib.

Further objects and features of the invention will become apparent upon reading the following description together with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a vehicle carrying an extendable boom and jib in accordance with the invention.

FIG. 2 is a side elevation of the end of the boom in FIG. 1 showing the jib attached thereto.

FIG. 3 is a sectional view taken along 3—3 through the jib and boom of FIG. 2.

FIG. 4 is an interior view of the boom taken along line 4—4 of FIG. 3.

FIG. 5 is a front elevation similar to FIG. 2 showing the jib extended and rotated.

FIG. 6 is a front elevation partially in section taken along line 6—6 of FIG. 2 showing the winch and only a fragment of the boom.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The purpose of the present invention is to provide complete hydraulic operation of a jib attached to an extendable boom on a vehicle.

FIG. 1 depicts vehicle **10** carrying folding extendable boom **11.** Bucket **12** is supported at the end of boom **11** for carrying an operator. On the opposite side of boom **11** from bucket **12** is jib **14** for increasing manipulative capability. Mounted adjacent to bucket **12** on boom **11** are hydraulic control valves **13** (see FIG. 3) which are operable for hydraulically extending and rotating boom **11.** Included in these control valves are control valves for extending and rotating jib **14** and also raising and lowering line **15** by operation of winch **16** mounted with jib **14.**

Jib **14** and the end of boom **11** are depicted in more detail in FIG. **2.** Shaft **17** passes through boom **11** and supports bucket **12** on one end. As depicted in FIG. **2,** the other end of shaft **17** supports a rotatable bushing **18** upon which is mounted sleeve **20.** Sleeve **20** carries jib **14** so that jib **14** may slide back and forth therein. Sleeve **20** is suitably fashioned from sheet metal and is depicted as welded to collar **21** surrounding bushing **18.** Alternatively, sleeve **20** may be welded directly to bushing **18.** Mounted upon sleeve **20** is double acting hydraulic cylinder **22** having telescoping piston rod **24.** The end of jib **14,** which extends down boom **11,** carries fitting **25** for securing end **26** of piston rod **24.** The other end of jib **14** carries a further fitting **27** supporting one or more sheave **28.** Both the end of boom **11** and jib **14** are preferably made of fiberglass or similar electrically insulating material to reduce electrical hazard. Hydraulic cylinder **22** is depicted as being on top of sleeve **20.** However, it may be positioned on the side of sleeve **20** or even inside sleeve **20** provided a slot is made in jib **14** for passing around hydraulic cylinder **22.** Bearing rings made of nylon or other suitable bear-

ing material are secured inside sleeve **20** as bearings for jib **14.**

In FIG. **2** the bed plate **31** of winch **16** is depicted as welded to support plate **30** of sleeve **20.** However, bed plate **31** can be welded or otherwise secured directly to bushing **18.** Winch **16** carries windlass **32** for reeling and unreeling line **15** which is commonly and preferably nylon or a similarly strong synthetic dielectric fiber line which extends around sheave **28** in fitting **27** and conveniently terminates with hook **35** or other fastening means. Winch **16** also includes hydraulic motor **36** driving windlass **32** through worm and spur gears enclosed in gear box **34.** Hydraulic lines **37** for operation of hydraulic cylinder **22** are supplied through drilled connecting lines **38** and **40** in bushing **18.** Similarly hydraulic lines **41** for operation of hydraulic motor **36** are connected to connecting lines **42** and **43** drilled in bushing **18.**

FIG. **3** is a cross sectional view showing shaft **17** passing through the end of boom **11.** Bucket **12,** although not depicted in FIG. **3,** would be mounted on shaft **17** extending beyond the right of the figure. Gear **45** mounted on shaft **17** is connected with further gears and shafts (not shown) inside boom **11** for the purpose fo maintaining bucket **12** level. Bushing **18** is mounted on shaft **17** to the left as depicted and is freely rotatable on shaft **17** on bearings that are not shown. Bushing **18** is further supported by bearing **46** mounted on boom **11.** A portion of bushing **18** extends inside boom **11** and is secured to a sprocket **47** for rotation.

Windlass **32** having axle **56** is mounted coaxially with gear box **34.** One end of axle **56** is supported by gear box **34** and the other end by a bearing in flange **53.** Flange **53** depends downwardly from bed plate **31** and is suitably secured thereto by a weld. Gear box **34** is supported by metal straps **54** and **55** depending downwardly from bed plate **31** with their wide surfaces perpendicular to flange **53.** Straps **54** and **55** are suitably welded to bed plate **31** and bolted or screwed to gear box **34.** Hydraulic motor **36** is bolted to gear box **34** by pair of flanges **57.**

Bushing **18** is rotatable by two hydraulic cylinders **60** and **61** as can be seen in FIGS. **3** and **4.** Hydraulic supply lines **62** are connected to cylinders **60** and **61.** Hydraulic drain lines **64** are connected to the opposite ends of cylinders **60** and **61.** Piston rods **65** and **66** of cylinders **60** and **61** are connected to opposite ends of chain **67** passing around sprocket **47.** Thus operation of cylinder **60** rotates jib **14** up as shown in FIG. **5** and operation of cylinder **61** rotates jib **14** down.

FIG. **5** depicts the operation of the jib showing the jib extended by action of hydraulic cylinder **22** and tilted up by rotation of bushing **18.**

FIG. **6** shows the details of windlass **32.**

Control valves **13,** shown in FIG. **3** as mounted on boom **11,** are desirably mounted on a sector plate secured to shaft **17** between boom **11** and bucket **12.** This would permit control valves **13** to rotate with the bucket. Additional valves are mounted behind those shown.

While the invention has been described with relation to a specific embodiment numerous variations therefrom are contemplated as within the inventive concepts. For example, double acting hydraulic cylinder **22** exposes considerable electrically conductive surface. Various approaches for reducing this include: insulated housing; dielectric piston rod **24;** or instead of a hydraulic cylinder, use of a second winch mounted on sleeve **20** carrying a stretch-resistant dielectric line such as polypropylene attached to opposite ends of jib **14.** Other hydraulic arrangements for rotation of jib **14** are contemplated and may be either inside or outside boom **11.** For example, a single double acting hydraulic cylinder may be connected to bushing **18** by a lever. The chain and sprocket arrangement described has the advantage of adaptability to any desired degrees of rotation by increasing the length and throw of the cylinders.

It is also contemplated that, while flexible hoses inside boom **11** are well suited to accommodate usual rotation of bushing **18,** a rotating collar may be used with complete elimination of flexible lines. In such an arrangement the entrance apertures to the drilled passages in bushing **18** would be situtated spaced along the axis of bushing **18.** The rotating collar would have matching spaced apertures for external connection. Internal 360° grooves would permit flow between the matching apertures at any rotational position. Thus it will be recognized that the disclosed embodiment is only a presently preferred example and it is intended to cover the invention within the full scope of the following claims.

I claim:

1. In a vehicle carrying a hydraulically operated boom and a jib secured to the end of said boom, the combination with said jib for manipulating said jib and loads supported thereby comprising:

a. A rotatable shaft passing through the end of said boom;

b. an independently rotatable bushing around said shaft where it passes through one side of said boom;

c. a sleeve mounted externally to said boom on top of said bushing;

d. a jib supported slidably in and extending through both ends of said sleeve;

e. hydraulic actuating means for rotating said sleeve and said jib about said shaft; and,

f. a sheave mounted at the end of said jib supporting a line for securing a load.

2. The combination according to claim **1** wherein said bushing is rotated to effect rotation of said jib and a personnel bucket is mounted on said shaft at the other side of said boom, said bucket being independently rotatable by said shaft to maintain attitude.

3. The combination according to claim **2** in which said hydraulic actuating means is mounted on the interior of said boom.

4. The combination according to claim **3** in which said bushing is rotated by a chain and sprocket driven by two hydraulic cylinders.

5. The combination according to claim **1** wherein said bushing is drilled for hydraulic lines and supply lines for hydraulic devices associated with said jib exterior to said boom pass from the interior of said boom and through said bushing for connection to said devices.

6. The combination according to claim **5** wherein said devices include second hydraulic means for extending and retracting said jib relative to said boom.

7. The combination according to claim **6** in which said second hydraulic means is a double acting cylinder mounted on said sleeve with its piston rod connected

to said jib at the opposite end from that carrying said sheave.

8. In a vehicle (**10**) carrying an hydraulically controllable boom (**11**) and a jib (**14**) secured to the end of the boom. (**11**) the combination with said jib (**14**) comprising:

A. First hydraulic actuator means (**60–61**) mounted within the end of said boom (**11**) and connected to drive a rotatable support (**18, 20**) directly supporting said jib (**14**);

b. second hydraulic actuator means (**22**) secured to said rotatable support (**18, 20**) and connected to said jib (**14** at **25**) for extending and retracting said jib (**14**) relative to said boom (**11**); and,

c. third hydraulic actuator means (**36**) mounted on said rotatable support (**18, 31**) connected to and driving a winch (**16**) mounted on said rotatable support, (**18, 31**) said winch (**16**) carryihg a line (**15**) passing over a sheave (**28**) on an end of said jib (**14**) for raising, lowering and supporting loads from the end of the said jib (**14**), all whereby said jib (**14**) may be remotely and precisely controlled to facilitate manipulations at the end of said boom (**11**).

9. The combination according to claim **8** wherein said jib is mounted on a bushing rotatable about a shaft passing through said boom, said bushing containing drilled passages for hydraulic supply lines passing from the interior of said boom to devices associated with said jib.

10. The combination according to claim **9** wherein said first hydraulic actuator rotates said jib through a chain and sprocket, said second hydraulic actuator is a double acting hydraulic cylinder mounted on a sleeve integral with said bushing and slidably supporting said jib and said third hydraulic actuator is an hydraulic motor geared to drive said winch.

* * * * *