

- [54] TELESCOPIC APPARATUS
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- [21] Appl. No.: 351,284
- [52] U.S. Cl. 212/55, 214/141
- [51] Int. Cl. B66c 23/06
- [58] Field of Search 214/141; 212/55, 144

[56] **References Cited**

UNITED STATES PATENTS

3,129,821	4/1964	Graham	212/55
3,112,035	11/1963	Knight	212/55
3,224,608	12/1965	Yadon	214/141

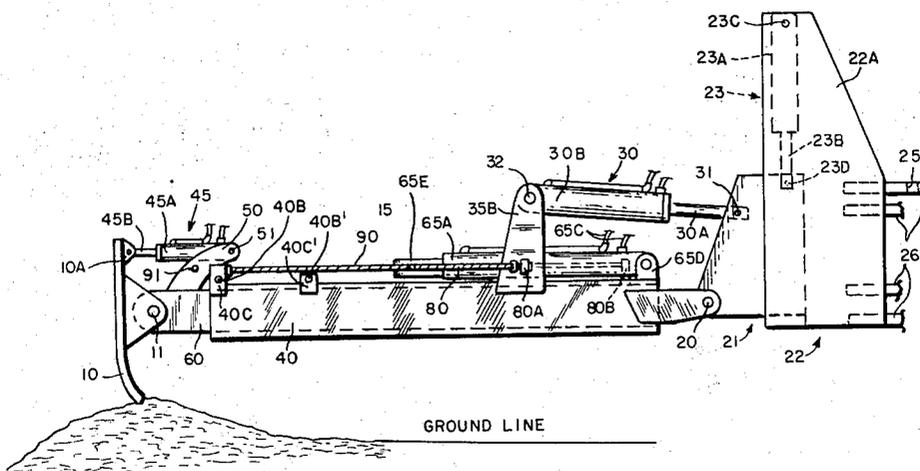
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[57] **ABSTRACT**
 Telescopic apparatus adapted for use with graders, trenchers or backhoes, loaders, lifters and the like which include an earth moving implement, dipperstick, hook or other tool, attachment or the like. The apparatus includes a first support which is adapted to be supported in relation to the ground. The boom includes a first longitudinally extending part which is pivotally associated with the first support for substantially vertical swinging movement relative thereto and a second longitudinally extending part which is slidable relative to the first part. It also includes longitudi-

nally reciprocable means, such as a hydraulic cylinder and ram, and means for connecting one end thereof to the first part. A first arcuate member, such as a sheave or sprocket is rotatably mounted on the other end of the longitudinally reciprocable means substantially in alignment with its longitudinal centerline and a second arcuate member is rotatably mounted on said first longitudinally reciprocating means in spaced longitudinal relationship from said first arcuate member and from said first longitudinally reciprocable means and substantially in alignment with the longitudinal centerline thereof. First elongate flexible means, such as a chain or cable, is passed over the first arcuate member, one end thereof is connected to the first part and the other end is connected to the second part adjacent to its inner end. Second elongate flexible means is passed over the second arcuate member, one end thereof is connected to the first part and the other end thereof is connected to the second part at a locality towards the outer end thereof. A device or tool of the type described above is associated with the outer end of the second part. The second part and the attached device or tool are moved longitudinally relative to the first part upon actuation of the longitudinally reciprocable means, thereby facilitating the grading, digging, loading and/or lifting with the device.

According to a preferred embodiment, the apparatus also includes another longitudinally reciprocable means for swinging the first part substantially vertically relative to the ground, one end of this means being pivotally connected to the first support and the other end being pivotally connected to the first part.

17 Claims, 11 Drawing Figures



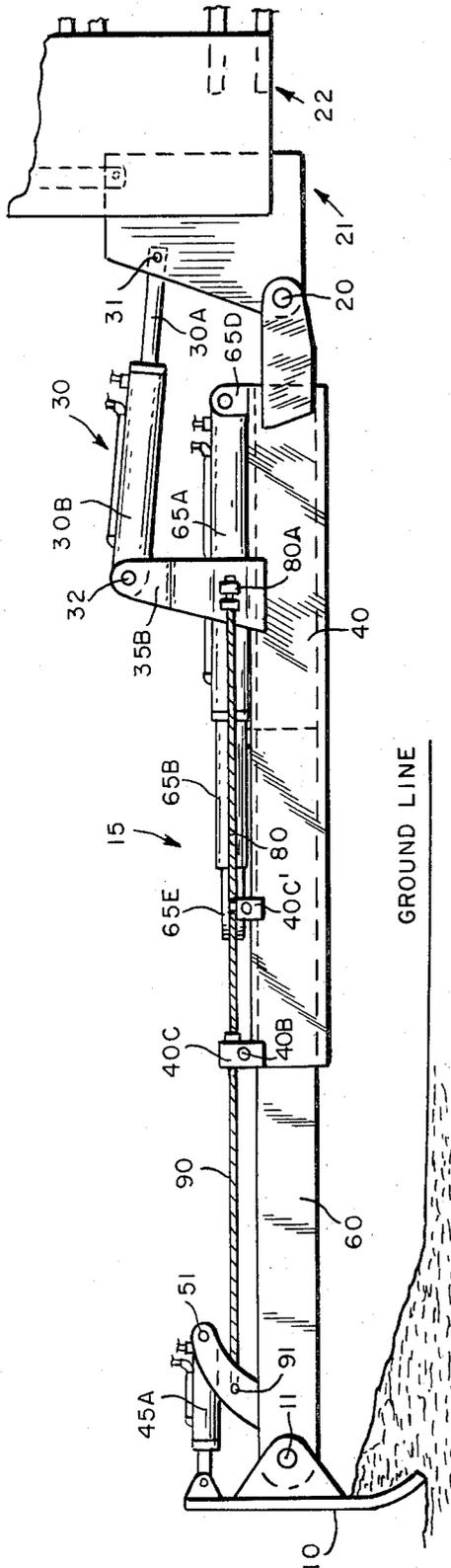


FIG. 3

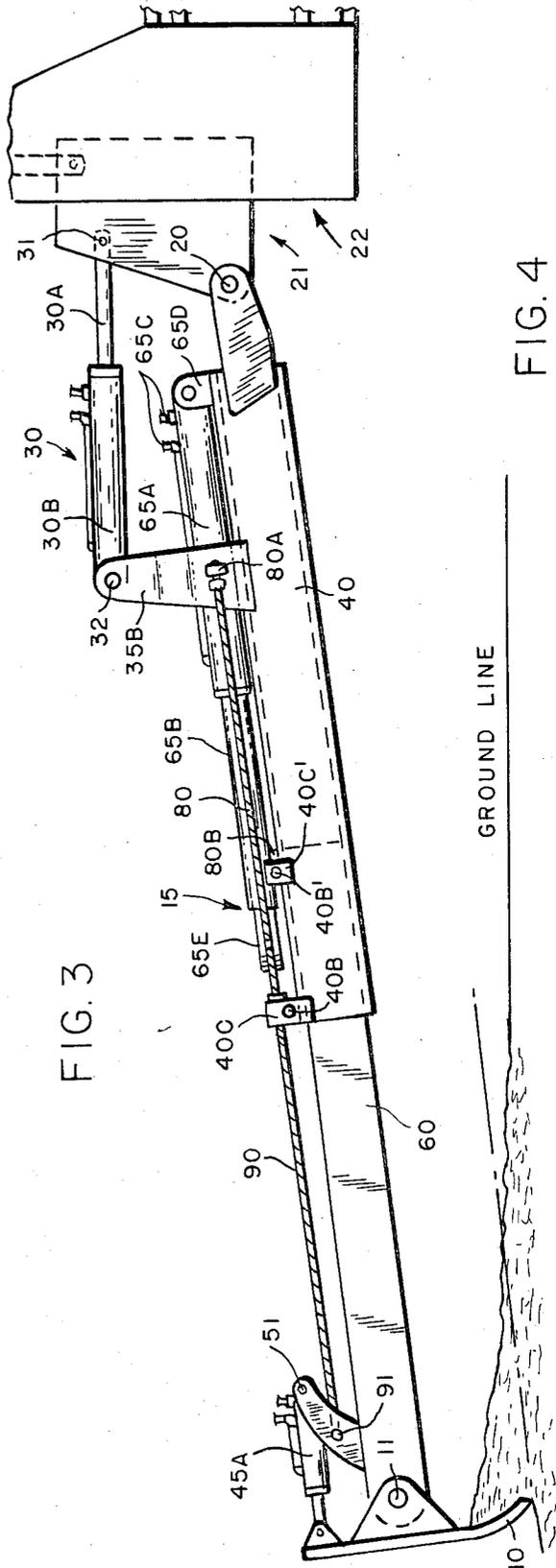


FIG. 4

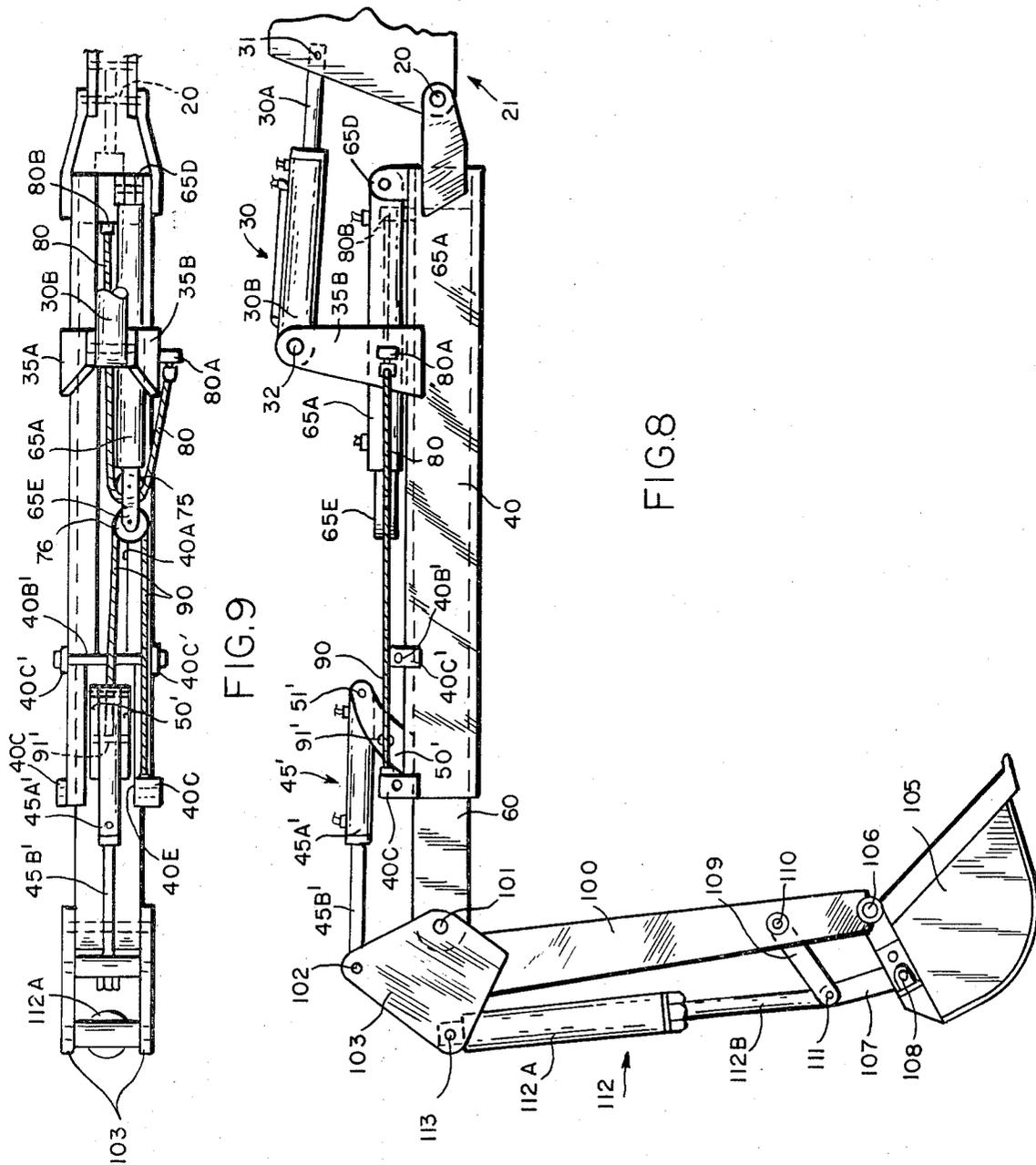


FIG. 8

FIG. 9

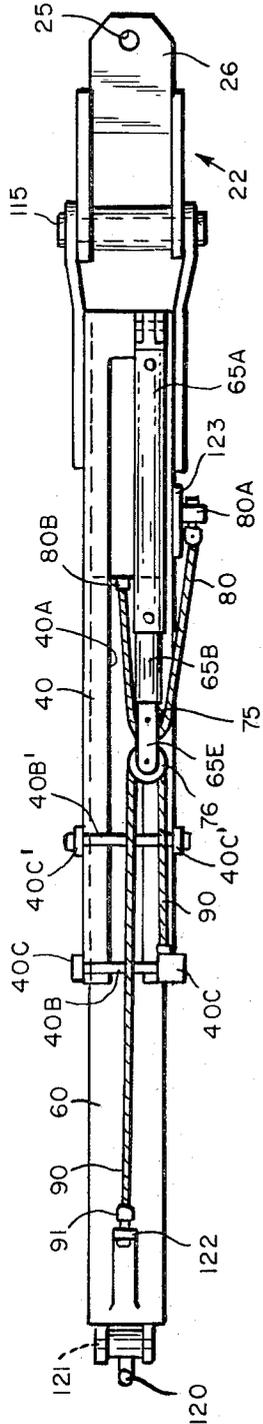


FIG. 11

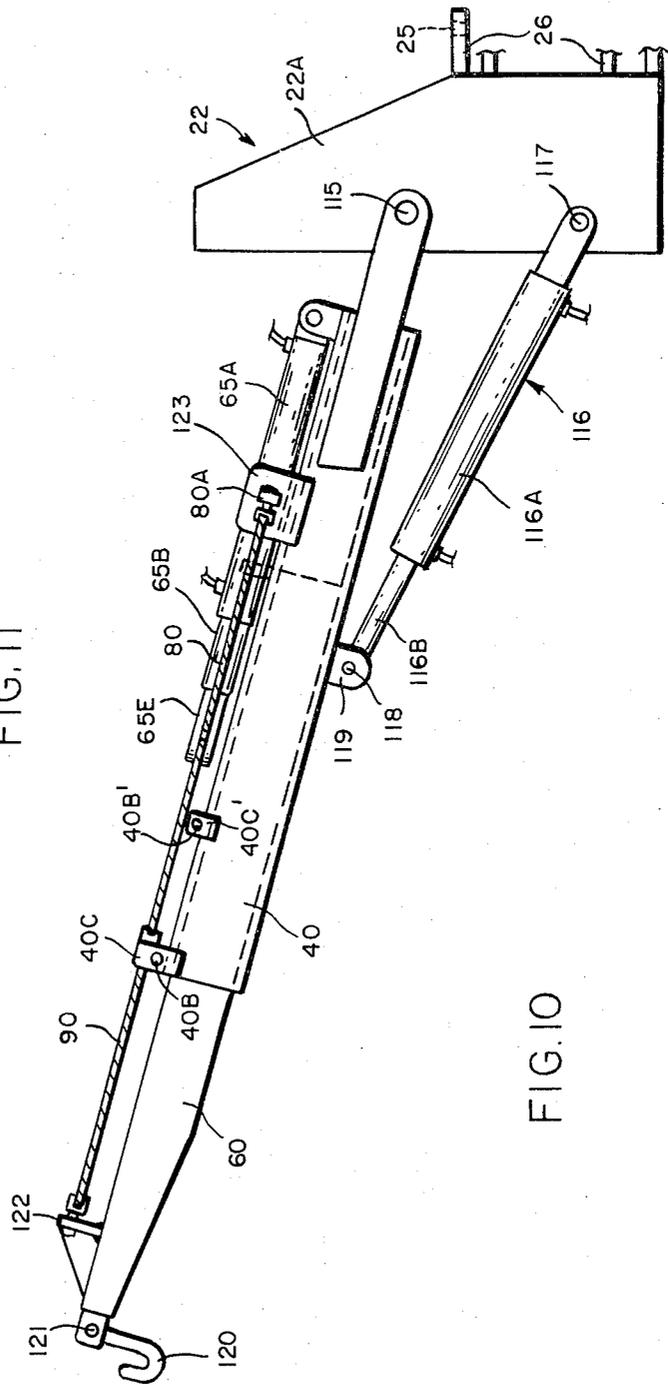


FIG. 10

TELESCOPIC APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to telescopic apparatus for use with graders, trenchers or backhoes, loaders, lifters or the like which include an earth moving implement, dipperstick, hook or other tool, attachment or the like associated with the remote end of a boom.

Certain embodiments of such apparatus have included a boom or dipperstick which includes two longitudinally extending parts which are slidable relative to each other and an earth moving implement associated with the outer end of one of those parts. In addition, means has been provided for causing one of said parts to be moved longitudinally relative to the other part to facilitate grading, digging and/or loading. Such apparatus are disclosed in my U.S. Pat. Nos. 3,140,000 dated July 7, 1964; 3,536,217 dated Oct. 27, 1970; and 3,653,131 dated Apr. 4, 1972 and also in the following U.S. Pat. Nos.:

Number	Date	Inventor
2,784,855	March 12, 1957	Acker
2,984,373	May 16, 1961	Przybylski
3,298,548	Jan. 17, 1967	Long et al.

The aforesaid patents do not disclose the combinations of apparatus elements which are used in the present invention.

One object of this invention is to provide a new and improved telescopic apparatus.

Another object of the invention is to provide such an apparatus in which the longitudinally extending parts of a boom, or the like may be moved relative to each other by a new and improved combination of elements.

A further object of the invention is to provide such an apparatus in which the boom may be swung vertically relative to the ground.

A further object is to provide such an apparatus which is economical to manufacture and which may be easily serviced.

Other objects and advantages of the invention will be apparent to persons skilled in the art from the following description taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

According to the present invention, the apparatus includes a first support which is adapted to be supported in relation to the ground.

The boom includes a first longitudinally extending part which is pivotally associated with the first support for substantially vertical swinging movement relative thereto and a second longitudinally extending part which is slidable relative to the first part. The boom also includes longitudinally reciprocable means, such as a hydraulic cylinder and ram, and means for connecting one end thereof to the first part.

A first arcuate member, such as a sheave, sprocket or the like, is rotatably mounted on the other end of the first longitudinally reciprocable means, substantially in alignment with its longitudinal centerline. A second arcuate member is rotatably mounted on said other end of the first longitudinally reciprocable means in spaced longitudinal relationship from the first arcuate member and from the first longitudinally reciprocable means

and substantially in alignment with the longitudinal centerline thereof.

First elongate flexible means, such as a chain or cable, is passed over the first arcuate member, one end thereof is connected to the first part and the other end is connected to the second part adjacent to its inner end. Second elongate flexible means is passed over the second arcuate member, one end thereof is connected to the first part and the other end thereof is connected to the second part at a locality towards the outer end thereof.

An earth moving implement, dipperstick, crane, hook or other tool, attachment or the like, hereinafter collectively referred to as a "device", is associated with the outer end of the second part. The second part and the attached device are moved longitudinally relative to the first part upon actuation of the longitudinally reciprocable means, thereby facilitating the grading, excavating, loading, or other action of the device.

According to a preferred embodiment, the apparatus also includes another longitudinally reciprocable means for swinging the first part substantially vertically relative to the ground, one end of this means being pivotally connected to the first support and the other end being pivotally connected to the first part.

In one embodiment, the first longitudinally extending part comprises an elongate slot extending through one wall thereof and one end of the first elongate flexible means is connected to a member which is attached to the second part and which extends through the slot.

In another embodiment, the first longitudinally extending part comprises a second elongate slot extending through one wall thereof, located towards the outer end of the first part from the end of the first elongate slot and with its longitudinal centerline substantially in alignment with the first elongate slot. This second slot is adapted to receive the means for supporting one end of means for rotating a dipperstick of a backhoe about its pivotal connection to the boom during at least a portion of the relative longitudinal movement of the first and second longitudinally extending parts. It may also receive the means for connecting the other end of the second elongate flexible means to the second part during a portion of said movement.

In the preferred embodiment, the first longitudinally reciprocable means and the first and second arcuate members are located exteriorly of the first longitudinally extending part.

In one embodiment, the longitudinally reciprocable means comprises a hydraulically operable cylinder and ram which are located adjacent to one wall of the first part.

The apparatus also preferably comprises another longitudinally reciprocable means for swinging the first part substantially vertically relative to the ground, means for pivotally connecting one end of this reciprocable means to the first support and means for pivotally connecting the other end of this means to the first part.

In one embodiment, the first longitudinally reciprocable means is positioned at least partially within the means for pivotally connecting said other end of the said other second longitudinally reciprocable means to said first part.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view showing a grader em-

bodying this invention with the longitudinal centerline of the parts which support the grader blade generally parallel to the ground line;

FIG. 2 is a plan view looking at the top of the elements shown in FIG. 1;

FIG. 3 is a side elevational view showing the parts which support the grader blade positioned with their longitudinal centerline moved downwardly towards the ground line and the parts which support the grader blade in an extended position from the position of FIG. 1;

FIG. 4 is a side elevational view showing the parts which support the grader blade positioned with their longitudinal centerline inclined at an angle to the ground line rather than generally parallel to it as shown in FIG. 3;

FIG. 5 is a section on the line 5—5 of FIG. 2;

FIG. 6 is a perspective view of portions of the longitudinally reciprocable means for moving the parts which support the grader blade longitudinally relative to each other;

FIG. 7 is a view looking at the end of the outer one of the parts which support the grader blade.

FIG. 8 is a side elevational view showing the outer end of the boom, the dipperstick and the bucket of a trencher or backhoe embodying this invention;

FIG. 9 is a plan view looking at the top of the elements shown in FIG. 8;

FIG. 10 is a side elevational view of a crane or lifter embodying this invention; and

FIG. 11 is a plan view looking at the top of the elements shown in FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The Embodiment Shown in FIGS. 1 to 7 of the Drawings

Referring now more particularly to the drawings, wherein similar reference characters designate corresponding parts throughout, the invention relates to telescopic apparatus adapted for use with graders, trenchers or backhoes, loaders, lifters and the like which include an earth moving implement, dipperstick, hook or other tool, attachment or the like associated with the remote end of a boom.

In FIGS. 1 to 7 of the drawings, a grader is shown in which the earth moving implement is a grader blade 10 pivotally connected at 11 to the remote end of a boom 15 which in turn is pivotally connected at 20 to a first support 21 for substantially vertical swinging movement relative to the ground.

The first support is slidably supported for movement up and down relative to a second support 22 by longitudinally reciprocable means 23 in a manner to be described in detail below.

The second support is supported by a third support (not shown) by substantially vertical pivots (not shown) which pass through orifices 25 in the plates 26 which are welded to the side plates 22A of the second support.

The second support is movable about said substantially vertical pivots in a substantially horizontal direction relative to the third support by a pair of hydraulically reciprocable means (not shown) as disclosed in my said copending application Ser. No. 235,262 filed Mar. 16, 1972 and in my U.S. Pat. No. 3,042,236 dated July 3, 1962 to which reference is made herein.

In addition to the plate members 26, the second support 22 comprises side members 22A and vertical guide members 22B which are welded thereto (FIG. 2).

The first support 21 comprises a pair of plate members 21A which are provided with enlarged end portions 21B which are slidable between the guide members 22B.

The first support 21 is moved up and down substantially vertically relative to the second support 22 by the longitudinally reciprocable means 23 which comprises an hydraulic cylinder 23A and ram 23B, the cylinder being connected to an hydraulic system by conduits which are not shown. The upper end of the cylinder 23A is pivotally connected to the side members 22A by a pin 23C (FIGS. 1 and 2). The ram 23B is pivotally connected to the first support 21 by the pin 23D which passes through an extension of the ram and through the enlarged portions 21B of the support.

The first support is shown in an elevated position in FIG. 4, in one lowered position in FIG. 1 and in a further lowered position in FIG. 3.

The means for swingably moving the boom substantially vertically relative to the ground and to the first support comprise the longitudinally reciprocable means 30, the ram 30A of which is pivotally connected at 31 to the first support 21 and the cylinder 30B of which is pivotally connected by the pin 32 to the members 35A and 35B, the lower ends of which are secured to the first or outer longitudinally extending part 40 of the boom 15.

The grader blade is rotated about the pivot 11 by the longitudinally reciprocable means 45 which comprises the cylinder 45A and ram 45B. The cylinder is pivotally connected between the lugs 50 by the pin 51, the lugs being attached to the second or inner part 60 of the boom 15 near its outer end. The ram 45B is pivotally connected between the lugs 10A which are secured to the grader blade 10.

The second longitudinally extending part 60 of the boom is slidable within and relative to the first longitudinally extending part 40. The means for moving or sliding the second longitudinally extending part relative to the first longitudinally extending part comprises longitudinally reciprocable means, which in the embodiment illustrated, comprises the cylinder 65A and the ram 65B. The cylinder 65A is connected to the hydraulic system by hoses 65C. The cylinder 65A is mounted between the members 35A and 35B above the top wall of the first part 40 as shown in FIGS. 1 and 5. One end of the cylinder 65A is pivotally secured between the lugs 65D which are secured to the first part 40 of the boom. The end of the ram 65B is secured to a pair of spaced plates 65E as shown in FIG. 6.

A first arcuate member 75, which may be a sheave, sprocket or similar means, is rotatably mounted between the plates 65E by a pin 75A. It will be noted that it is substantially in alignment with the longitudinal centerline of the first longitudinally reciprocable means 65A, 65B.

A second arcuate member 76, which also may be a sheave, sprocket or similar means, is rotatably mounted between the plates 65E by a pin 76A. It will be noted that the arcuate member 76 is in spaced longitudinal relationship from the first arcuate member 75 and from the outer end of the ram 65B of the first longitudinally reciprocable means and substantially in alignment with the longitudinal centerline thereof.

First elongate flexible means **80**, which may be a cable, chain or similar means, passes over the first arcuate member **75**. It has one end connected to the lug **80A** which is secured to the first part **40** by means of the member **35B**. The other end of the flexible means **80** is connected to the lug **80B** which is secured to the top wall of the second part **60** near its inner end. The lug **80B** extends upwardly through the longitudinal slot **40A** (FIG. 2), provided in the top wall of first part **40**.

The side walls of the first part are held together in spaced relationship by the lugs **40C** and **40C'** and the bolts **40B** and **40B'**, **40C** and **40B** being located adjacent to the outer end of the first part and the lugs **40B'** and **40C'** being located inwardly from the outer end of the boom. The bolt **40B'** also serves to form one end of the slot **40A**. Consequently as the second part **60** of the boom **15** is moved outwardly relative to the first part **40** of the boom, the outward movement is arrested or stopped when the lug **80B** contacts the bolt **40B'** as shown in FIG. 4.

Second elongate flexible means **90**, which may be a chain, cable or similar means, passes over the second arcuate member **76**. It has one end connected to the outer member **40** by the longer lug **40C** and its other end connected to the second part **60** by the pin **91** which extends between the lugs **50** as shown in FIG. 2. It will be noted that the pin **91** is located at a locality towards the outer end of the second part.

A second elongate slot **40E** (FIG. 2) extends through the top wall of the first part **40** and its extends from the bolt **40B'** to the bolt **40B** with its longitudinal centerline substantially in alignment with the first elongate slot **40A**. This second elongate slot is for use in the embodiment shown in FIGS. 8 and 9 of the drawings as will be explained below.

The first longitudinally reciprocable means and the first and second arcuate members are located exteriorly of said first part so they are readily accessible for servicing.

In operation, the operator can control the hydraulic system of the vehicle to operate all of the hydraulically reciprocable means by means of control levers which are not shown.

In operation, when it is desired to slide or move the second part **60** longitudinally with respect to the first part **40**, the ram **65B** is retracted into the cylinder **65A** and the elongate flexible means in cooperation with the arcuate means pulls the second part **60** into the first part **40** and during such movement, the lug **80B** traverses the longitudinal slot **40A** in a direction from left to right looking at the drawings.

When it is desired to slide or move the second part **60** longitudinally outwardly relative to the first part **40**, hydraulic fluid is admitted to the cylinder **65A** so that the ram **65B** moves from right to left looking at the drawings and the elongate flexible means causes the lug **80B** to move from right to left in the slot **40A** and this causes the second part **60** to move from right to left.

Since the arcuate members are of the same diameter, the elongate flexible means remain tight at all times.

The right-hand portion of the boom **15** may be moved upwardly and downwardly relative to the second support **22** by controlling the flow of hydraulic fluid to the cylinder **23A**.

The boom may be swung substantially vertically relative to the ground by controlling the flow of hydraulic fluid to the cylinder **30B**.

The grader blade may be moved about the pivot **11** by controlling the flow of hydraulic fluid to the cylinder **45A**.

While the first support **21** has been shown as moveable up and down vertically relative to the second support **22** by the cylinder **23A** and ram **23B** such movement is not essential to this invention. The support **21** may be omitted, the right hand end of the first part **40** of the boom may be pivotally connected to the support **22** and the ram **30A** may be pivotally connected to the support **22**, thus eliminating the support **21** and the hydraulically reciprocable means **23** as is well known in the art and as is shown in my U.S. Pat. Nos. 3,042,236, 3,140,000 and 3,536,217. With such a construction the support **22** becomes the "first support" referred to in claims 1 and 16.

THE EMBODIMENT SHOWN IN FIGS. 8 AND 9 OF THE DRAWINGS

A boom, dipperstick and bucket of a trencher or backhoe are shown in FIGS. 8 and 9 of the drawings.

Most of the boom elements of this embodiment are similar to the corresponding elements of the boom of the first embodiment and corresponding numerals have been applied to such elements in FIGS. 8 and 9.

The trencher or backhoe comprises a dipperstick **100** which is attached to the member **103** which is pivotally connected at **101** to the outer end of the second part **60**. The longitudinally reciprocating means **45'** comprises a cylinder **45A'** and a ram **45B'** which are strong enough to rotate the dipperstick **100** about the pivot **101**. Because the cylinder **45A'** and ram **45B'** are longer than the cylinder **45A** and ram **45B** of the first embodiment the lugs **50'** are located farther inwardly from the outer end of the second part **60** and the bolt **40B** of the first embodiment is omitted. The ram **45B'** of the longitudinally reciprocable means **45'** is pivotally connected at **102** to the member **103** and the cylinder **45'** is pivotally connected to the pin **51'** which extends between the outer ends of the lugs **50'**. The bucket **105** is pivotally connected at **106** to the outer end of the dipperstick.

Link **107** is pivotally connected at **108** to the bucket. Link **109** is pivotally connected at **110** to the dipperstick.

The longitudinally reciprocable means **112** comprises an hydraulic cylinder **112A** and a ram **112B**. The cylinder **112A** is pivotally connected at **113** to the member **103** and the ram **112B** is pivotally connected at **111** to the links **107** and **109**. The cylinder **112A** is connected to an hydraulic system by conduits which are not shown.

The relative longitudinal movements of the first and second parts of the boom are effected by the cylinder **65A**, ram **65B**, arcuate members **75**, **76** and first and second elongate flexible means **80**, **90**. However because of the length of the cylinder **45A'** and ram **45B'** and the spacing of the lugs **50'** from the outer end of the second part **60** the bases of the lugs **50'** enter the second longitudinal slot **40E** when the second part is moved a substantial distance inwardly relative to the first part **40** as shown in FIGS. 8 and 9. Since the lugs **50'** support the pin **91'** to which one end of the second

elongate flexible means 90 is attached, the lower portions of these lugs form part of the means for connecting that end of said flexible means to the second part and the slot 45E is adapted to receive them during at least a portion of the relative longitudinal movement of the first and second parts.

The boom may be swung substantially vertically relative to the ground by the cylinder 30B and ram 30A as in the first embodiment.

The dipperstick may be swung about the pivot 101 by operation of the cylinder 45A' and ram 45B' and the bucket may be rotated about the pivot 106 by operation of the cylinder 112A and ram 112B as is well known in the art.

THE EMBODIMENT SHOWN IN FIGS. 10 AND 11 OF THE DRAWINGS

A boom and a hook of a crane or lifter are shown in FIGS. 10 and 11.

The boom elements are similar to the corresponding elements of the boom of the first embodiment and corresponding numerals have been applied to them.

However the boom is shown pivotally connected at 115 to the second support 22. In addition the third longitudinally reciprocable means 116 is located below the boom rather than above it. It comprises the hydraulic cylinder 116A and ram 116B, the hydraulic cylinder being connected to an hydraulic system by conduits which are not shown.

The cylinder 116A is pivotally connected at 117 to the second support 22 and the ram 116B is pivotally connected at 118 to lugs 119 which are secured to the first part 40 of the boom.

The relative longitudinal movement of the first and second parts of the boom are effected in the same way as in the first embodiment by the cylinder 65A, ram 65B, arcuate members 75, 76 and first and second elongate flexible means 80, 90.

In this third embodiment the support 21 and the hydraulically reciprocable means 23 of the first embodiment have been omitted, the first part 40 has been pivotally connected to the support 22 at 115 and the hydraulically reciprocable means 116 has been pivotally connected to the support 22 at 117. Thus in this third embodiment the support 22 becomes the "first support" referred to in claims 1 and 16.

The hook 120 is pivotally secured at 121 to the end of the second part 60. The second elongate flexible means 90 is secured to the second part 60 at a locality near its outer end by the lug 122. One end of the first elongate flexible means 80 is secured to the first part by the member 123 and its other end is secured to the inner end of the second part by the member 80B as in the first embodiment.

While three desirable embodiments of the invention have been shown and described, it is to be understood that this disclosure is for the purpose of illustration only and that various changes in shape, proportion and arrangement of parts as well as the substitution of equivalent elements for those herein shown and described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. Telescopic apparatus comprising a first support adapted to be supported in relation to the ground,

a first longitudinally extending part pivotally associated with said first support for substantially vertical swinging movement relative thereto, a second longitudinally extending part which is slidable relative to said first part, first longitudinally reciprocable means, means for connecting one end of said first longitudinally reciprocable means to said first part, a first arcuate member, means for rotatably mounting said first arcuate member on the other end of said first longitudinally reciprocable means, substantially in alignment with its longitudinal centerline, first elongate flexible means passing over said first arcuate member, means for connecting one end of said first elongate flexible means to said first part, means for connecting the other end of said first elongate flexible means to said second part, a second arcuate member, means for rotatably mounting said second arcuate member on said other end of said first longitudinally reciprocable means in spaced longitudinal relationship from said first arcuate member and from said first longitudinally reciprocable means and substantially in alignment with the longitudinal centerline thereof, second elongate flexible means passing over said second arcuate member, means for connecting one end of said second elongate flexible means to said first part, means for connecting the other end of said second elongate flexible means to said second part and a device associated with the outer end of said second part, whereby said second part and said device are moved longitudinally relative to said first part upon actuation of said first longitudinally reciprocable means.

2. Apparatus according claim 1 wherein said first part comprises a first elongate slot extending through one wall thereof and said means for connecting the other end of said first elongate flexible means to said second part comprises a member which is attached to said second part and extends through said slot.

3. Apparatus according to claim 2 wherein said first part comprises a second elongate slot extending through one wall thereof, located towards the outer end of said first part from the end of said first elongate slot and with its longitudinal centerline substantially in alignment with said first elongate slot.

4. Apparatus according to claim 3 which also comprises a dipperstick, means for pivotally connecting the dipperstick to the outer end of said second part, second longitudinally reciprocable means, means for pivotally connecting one end of said second longitudinally reciprocable means to said dipperstick and means for pivotally connecting the other end of said longitudinally reciprocable means to said second part, wherein said second slot is adapted to receive said latter means during at least a portion of the relative longitudinal movement of said first and second parts.

5. Apparatus according to claim 3 wherein said second slot is adapted to receive said means for connecting the other end of said second elongate flexible means to said second part during at least a portion of the relative longitudinal movement of said first and second parts.

6. Apparatus according to claim 1 wherein said first longitudinally reciprocable means and said first and second arcuate members are located exteriorly of said first part.

7. Apparatus according to claim 1 wherein said first longitudinally reciprocable means comprises an hydraulically operable cylinder and ram which are located adjacent to one wall of said first part.

8. Apparatus according to claim 1 wherein said first arcuate means comprises a sheave.

9. Apparatus according to claim 1 wherein said second arcuate means comprises a sheave.

10. Apparatus according to claim 1 wherein said first arcuate means comprises a sprocket.

11. Apparatus according to claim 1 wherein said second arcuate means comprises a sprocket.

12. Apparatus according to claim 1 wherein said first elongate flexible means comprises a chain.

13. Apparatus according to claim 1 wherein said sec-

ond elongate flexible means comprises a chain.

14. Apparatus according to claim 1 wherein said first elongate flexible means comprises a cable.

15. Apparatus according to claim 1 wherein said second elongate flexible means comprises a cable.

16. Apparatus according to claim 1 which also comprises third longitudinally reciprocable means for swinging said first part substantially vertically relative to the ground, means for pivotally connecting one end of said third longitudinally reciprocable means to said first support and means for pivotally connecting the other end of said third longitudinally reciprocable means to said first part.

17. Apparatus according to claim 15 wherein said first longitudinally reciprocable means is positioned at least partially within said means for pivotally connecting said other end of said third longitudinally reciprocable means to said first part.

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