May 17, 1966 J. L. FRENCH ET AL 3,251,491

EARTH-WORKING IMPLEMENT

Filed May 7, 1964 3 Sheets-Sheet 1

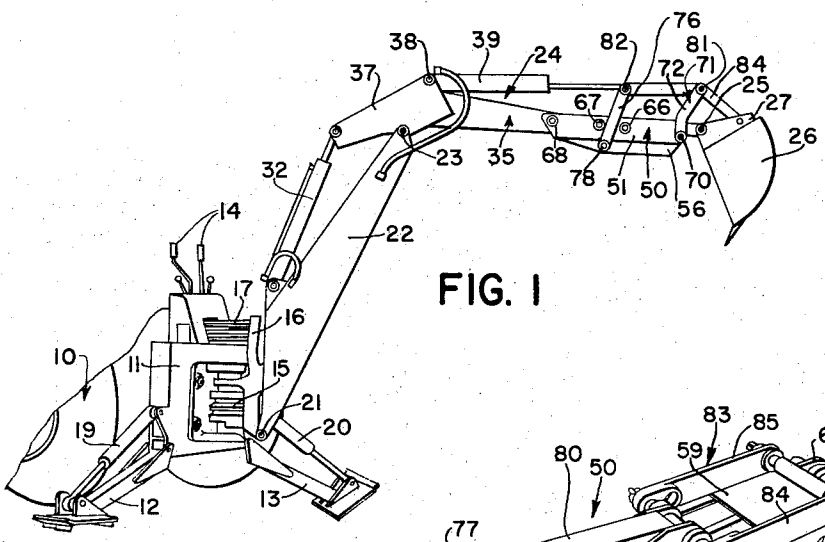


FIG. 1

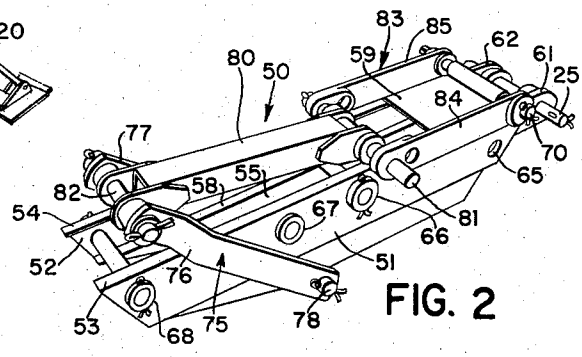


FIG. 2

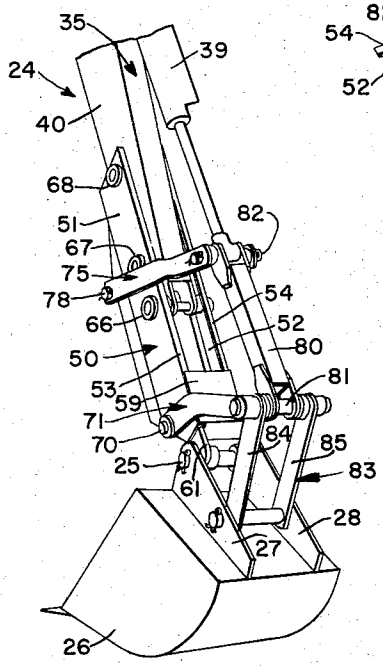


FIG. 4

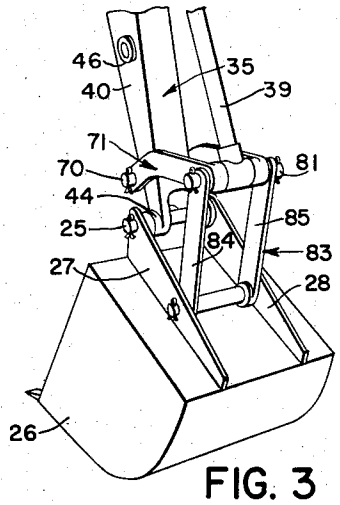


FIG. 3

INVENTORS
J. L. FRENCH, T. C. SCHRADER &
A. J. VAN AUWELAER

BY William A. Murray

ATTORNEY

May 17, 1966 J. L. FRENCH ET AL 3,251,491

EARTH-WORKING IMPLEMENT

Filed May 7, 1964 3 Sheets-Sheet 2

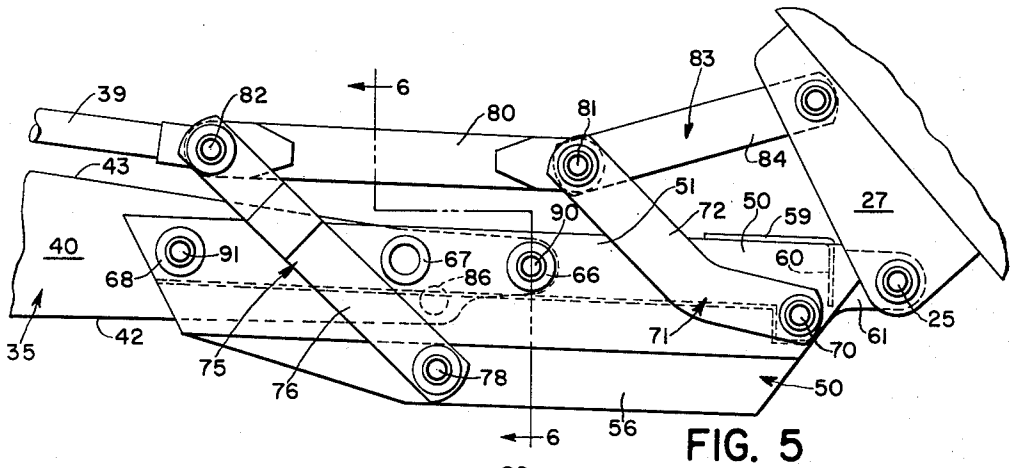


FIG. 5

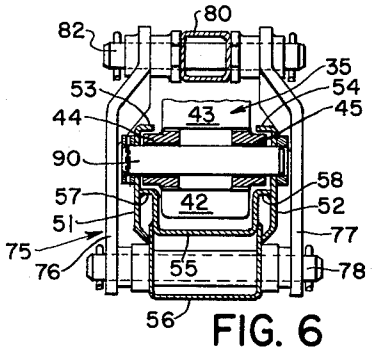


FIG. 6

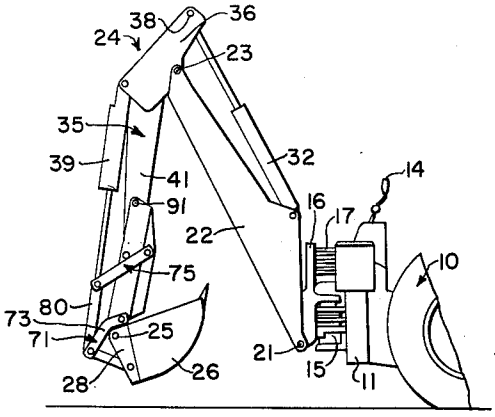


FIG. 7

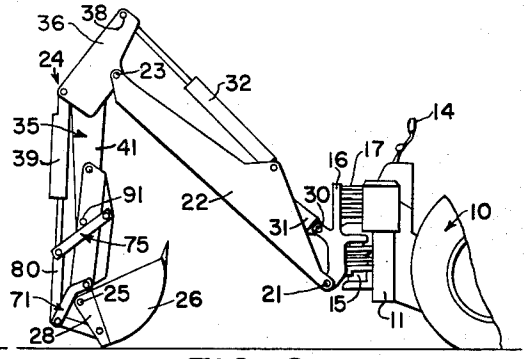


FIG. 8

INVENTORS
J. L. FRENCH, T. C. SCHRADER &
A. J. VAN AUWELAER

BY William A. Murray

ATTORNEY

May 17, 1966 J. L. FRENCH ET AL 3,251,491

EARTH-WORKING IMPLEMENT

Filed May 7, 1964 3 Sheets-Sheet 3

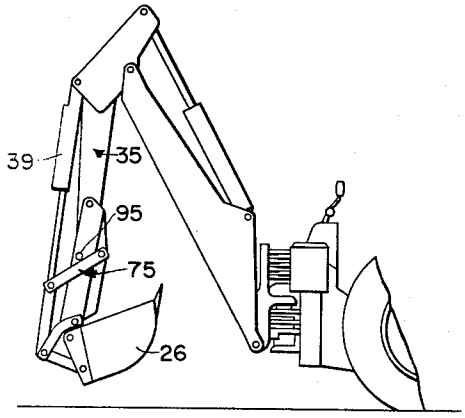


FIG. 10

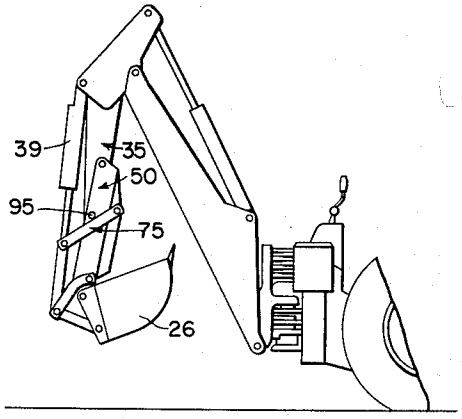


FIG. 11

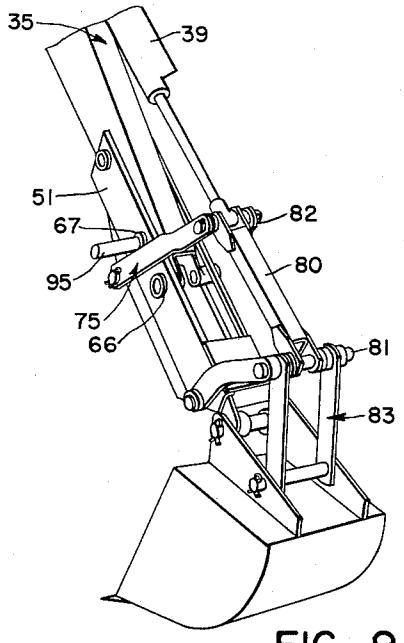


FIG. 9

INVENTOR.
J.L.FRENCH, T.C.SCHRADER &
A.J. VAN AUWELAER

BY William A. Murray

ATTORNEY

United States Patent Office 3,251,491
Patented May 17, 1966

3,251,491

EARTH-WORKING IMPLEMENT

John L. French, Moline, Thomas C. Schrader, Rock Island, and Albert J. Van Auwelaer, East Moline, Ill., assignors to Deere & Company, Moline, Ill., a corporation of Delaware

Filed May 7, 1964, Ser. No. 365,750
16 Claims. (Cl. 214—138)

This invention relates to earth-working implements and more particularly to an earth-working implement having a vertically movable boom structure carrying at its outer end a dipper stick, and the latter in turn carrying a bucket or other type of material-handling device. More particularly this invention relates to the aforementioned type of implement that utilizes an extensible and retractable dipper stick. Still more particularly this invention relates to a dipper stick extension.

Typical of an earth-working implement having a boom and a dipper stick is a backhoe. When using such an implement, there are various advantages in having an extremely long reach, i.e., the maximum distance the backhoe bucket may extend from the backhoe frame as it penetrates the ground surface. The effectiveness of a backhoe is also measured by the depth of cut that a backhoe may reach. When designing a backhoe, there are several factors that may determine the length of the backhoe boom and the length of the backhoe dipper stick. One of these factors is the ability of the backhoe to be completely folded for transport, i.e., the boom is disposed in substantially a vertical position and the dipper stick depends from the upper end of the boom in a minimum angular realtion thereto so that the bucket is spaced from but relatively close to the ground. Therefore, one of the problems of providing an extension on the dipper stick is the inability of the backhoe to be transported without causing the bucket to contact or to be so close to the ground that in transport the bucket will contact the ground.

With the above in mind, it is the primary object of the present invention to provide a dipper stick construction utilizing a dipper stick extension capable of being extended and retracted longitudinally relative to the basic dipper stick. The dipper stick as well as the entire backhoe may, upon the extension being in its extended position relative to the dipper stick, obtain the maximum reach and the maximum depth of cut. However, being retractable, the extension may be moved longitudinally in a retracted relation to the dipper stick when it is desired to move the backhoe in transport.

It is a further object of the present invention to provide structure permitting the hydraulic cylinders positioning the boom structure and the hydraulic cylinders positioning the dipper stick to be utilized in retracting and extending the extension on the dipper stick.

It is a further object of the invention to provide a method of retracting a dipper stick extension consisting of unlocking the extension so that it is in a condition for retraction, and positioning the boom and dipper stick so that the dipper stick is disposed substantially in a vertical position relative to the ground and the bucket on the end of the dipper stick contacts the ground. The method of retracting the backhoe further consists of lowering the boom so that the extension is forced to retract realtive to the dipper stick and then locking the extension in its retracted position. Extension occurs by raising the boom when the extension is unlocked and permitting the extension to slide along the dipper stick.

Other objects and advantages of the present invention will become apparent to those skilled in the art as the nature of the invention is better understood from the

following description and as shown in the accompanying drawings.

FIG. 1 is a rear and side perspective view of a backhoe incorporating the structure of the present invention and including a portion of a tractor.

FIG. 2 is a side and overhead perspective view of the dipper stick extension.

FIG. 3 is a side and front perspective view of the backhoe bucket and a portion of the dipper stick structure without an extension.

FIG. 4 is a view somewhat similar to FIG. 3 but showing the extension positioned between the dipper stick structure and the bucket.

FIG. 5 is a side view of the extension structure showing portions of the dipper stick and bucket.

FIG. 6 is a sectional view taken substantially along the line 6—6 of FIG. 5.

FIG. 7 is a side view of the backhoe and a portion of the tractor showing the backhoe in a position in which retraction of the extension is about to occur.

FIG. 8 is a view somewhat similar to FIG. 7 showing the extension in its retracted position.

FIGS. 9, 10 and 11 are views similar to FIGS. 4, 7 and 8 but showing a modified structure for and method of longitudinally adjusting the backhoe extension.

The backhoe is normally supported on one end of a tractor **10** and is composed of an upright main supporting frame **11** transversely disposed in relation to the tractor and having a pair of outwardly and downwardly extending stabilizer legs **12, 13**. The backhoe normally has an operator's station, not shown, but adjacent to a series of hydraulic control levers **14** that operate the various hydraulic units including hydraulic cylinders **19, 20** that raise and lower the stabilizer legs **12, 13**. The transverse frame **11** carries an upright swivel structure **15** adapted to swing the backhoe laterally about its upright axis. Details of the swivel structure **15** are not considered important relative to the present invention other than to recognize that this feature is present in this backhoe. Should, however, more detailed information relative to the swivel structure **15** be desired, such may be had by referring to U.S. Patent 2,994,446. A fluid manifold **16** receives fluid through hydraulic hoses **17** and discharges the fluid to various of the hydraulic devices on the backhoe. Should details of the manifold and its relation to the hydraulic mechanism on the backhoe be desired, such may be had by referring to U.S. Patent 3,120,897.

The swivel structure **15** carries at its forward side a horizontal pivot **21** carrying for vertical movement a forwardly extending main boom **22** having at its upper rear end a transverse pivot **23** receiving and carrying also for vertical movement, a dipper stick boom or structure, indicated in its entirety by the reference numeral **24**. The opposite end of the dipper stick boom **24** carries a transverse pivot pin **25** normally extending through a pair of upright plates **27, 28** rigid with the back plate of a material-handling device or bucket **26**. The swivel structure **15** also carries an upper horizontal pivot **30** carrying an hydraulic cylinder **31** having its rod end connected to the boom **22** for purposes of raising and lowering the boom **22** upon extension and retraction of the cylinder **31**. The boom **22** carries a hydraulic cylinder **32** having its rod end connected directly to the dipper stick structure **24** so that extension and retraction of the cylinder **32** will effect vertical movement of the dipper stick structure **24**.

The dipper stick structure **24** is composed of a main portion **35** that would normally be the entire dipper stick for a backhoe. The portion **35** has a pair of side plates rigidly joined and extending rearwardly from the pivot **23** to re-

ceive the dipper stick hydraulic cylinder **32**. A pivot **38** is provided on this portion to receive the rear end of a bucket tilt cylinder **39**. The forward part of the main portion **35** of the dipper stick **24** is of channel construction having a pair of upright side walls **40**, **41**, an underside **42**, and overside **43** interconnecting the side walls. The dipper stick portion **35** may be directly connected to the bucket **26** as shown in FIG. 3.

The extreme forward end of the dipper stick has an opening for receiving a pin and further has a pair of outwardly extending bosses **44**, **45** projecting outwardly from the sides **40**, **41** and about the pin opening. A second pair of bosses as indicated at **46** in FIG. 3 project outwardly from the side walls **40**, **41** and indicate the location of a second pin receiving opening. The bosses **44–46**, as will later become apparent, serve as guide means on the side of the dipper stick **35** to accommodate longitudinal movement of a dipper stick extension **50**.

The extension **50** is composed of a pair of upright side plates **51**, **52** disposed alongside and on opposite sides of the dipper stick portion **35**. The side plates **51**, **52** are provided with inwardly projecting upper edge flanges **53**, **54** disposed above the bosses **44–46**. The side plates **51**, **52** are cross braced by upper and lower U-shaped channels **55**, **56** disposed beneath the underside **42** of the dipper stick portion **35**. The vertical leg portions of the lower U-shaped channel **56** are welded to the vertical leg portions of the upper channel **55** and together the channels **55**, **56** form a box-like channel beneath the dipper stick portion **35**. The upper U-shaped channel **55** has outwardly projecting flanges **57**, **58** having their outer edges welded to the inner surfaces of the side plates **51**, **52**. The flanges **57**, **58** are normally disposed closely to and beneath the bosses **44–46**. As may be seen from viewing FIG. 6, the flanges **53**, **57** and the flanges **54**, **58** form tracks disposed above and below the respective bosses on the dipper stick portion **35** that permit longitudinal movement of the extension **50** relative to the dipper stick portion **35**. The flanges **53**, **54** are rigidly interconnected at their extreme forward end by an overhead plate **59** having a forward depending flange **60** extending between the side plates **51**, **52**. The plate **59** and flange **60** serve as a reinforcing or structural member rigidifying the forward end of the extension **50**. A pair of brackets **61**, **62** are welded to the internal surfaces of the side walls **51**, **52** and project outwardly beyond the depending flange **60**. The brackets **61**, **62** have transversely alined holes for receiving a pivot pin, normally the pivot pin **25**, that connects the forward end of the dipper stick structure to the bucket plates **27**, **28**.

The side plates **51**, **52** are provided with four longitudinally spaced and alined holes as indicated by the forward hole **65** and in their location by three longitudinally spaced and outwardly projecting bosses **66**, **67**, **68** that surround respective holes in the respective plates.

The forward hole **65** receives a transverse pivot pin **70** connecting the lower end of a link, as indicated in its entirely by the reference numeral **71**, composed of a pair of arms **72**, **73** lying adjacent the side plates **51**, **52**. Spaced longitudinally from the first link **71** is a second link **75**, composed of a pair of arms **76**, **77** disposed on opposite sides of the side plates **51**, **52** and pivotally mounted on the extension **50** by means of a transversely extending pin **78** that extends through the side walls of the lower channel **56**. The upper ends of the arms **72**, **73** and **76**, **77** are interconnected by a connecting link **80**, the specific connecting means being by transverse pivot pins **81**, **82** respectively. The pin **82** is further adapted for connection to the rod end of the hydraulic cylinder **39**. The pin **81** pivotally receives a bucket link **83** composed of a pair of parallel arms **84**, **85**. The opposite ends of the arms **84**, **85** are pivotally mounted to the bucket plates **27**, **28**. When the extension attachment **50** is not attached, the link **71** may be directly connected to the dipper stick portion **35** by the pin **70**, a suitable

opening **86** (FIG. 5), being provided at the end of the dipper stick to receive the pin **70**. The pin **81** is utilized to interconnect the links **71**, **83** and the rod end of the piston **39**.

As may be clearly evident from viewing FIGS. 1, 5, 7 and 8 the length of the links **71**, **75** and **80** and the respective location of the pivot pins **70**, **78**, **81** and **82** create substantially a parallelogram with the dipper stick portion **35**. This is particularly important since it is necessary to transfer the movement of the bucket tilt cylinder **39** through the parallel linkage and to the bucket. The linkage will effect a straight line movement from the cylinder **39** to the bucket substantially axially coextensive with the rod or axis of the hydraulic cylinder **39**.

Referring now to FIGS. 7 and 8 for explaining the method of operation of the invention, it should be recognized that with the extension on the dipper stick portion **35**, the bucket **26** will be either in contact with the ground or closely adjacent to the ground when the backhoe is moved into a transport position. For purposes of balance, the desired transport position is one in which the boom **22** is at its maximum upright position and the dipper stick structure **24** is closely adjacent to the boom. From viewing FIG. 7 it becomes apparent the bucket **26** would come closely adjacent the ground when approaching transport and should movement of the implement occur at this time, the bucket would contact objects on the ground and damage could occur to the bucket or to other portions of the backhoe. Therefore, it is desirable to retract the extension **50** for purposes of transporting the backhoe on the tractor **10**. From a position shown in FIG. 7, such may be done by operating the boom cylinder **31** and dipper stick cylinder **32** to move the boom and dipper stick to positions in which the dipper stick **35** is substantially vertical and the bucket is in contact with the ground. The pins **90**, **91** are then removed and the entire extension **50** is in a position to move longitudinally on the dipper stick portion **35** and to be guided by the flanges **53**, **57** and **54**, **58** contacting the boss portions **44–46**. By extending the boom cylinder **31** to lower the boom **22**, the bucket **26** will force retraction of the extension **50** lengthwise of the dipper stick portion **35**. At the same time that retraction occurs, it will be necessary to retract the bucket cylinder **39** to permit the links **71**, **75** to remain substantially in the same angular relation to the bucket **26**. Upon the boss portion **67** moving into registry with the boss portions **46** of the backhoe extension **35**, the pin **91** may be extended through the side plates **51**, **52** and the backhoe dipper stick portion **35** and the entire extension **50** will be held in its retracted position. To extend the extension **50**, the backhoe may be moved into the position shown in FIG. 8, the pin **91** removed and the boom **22** raised until the extension **50** is in its extended position. The pins **90**, **91** may then be placed in the proper alined holes.

It should be recognized that other methods of retracting the extension **50** on the dipper stick portion **35** may be utilized. However, all methods will include the application of some force on the dipper stick portion **35** while the bucket **26** is bearing against an immovable object. The force may be applied by any of a number of the hydraulic cylinders on the backhoe, or, the force may be applied by the power source of the tractor by placing the bucket **26** against an object while the dipper stick is placed substantially horizontal and driving the tractor toward the bucket.

In the modified form of the invention shown in FIGS. 9–11, substantially identical structure is used and consequently similar numbers are used to denote similar structure.

In the modified form of the invention and for purposes of moving the extension **50** longitudinally, and particularly to its retracted position, a pin **95** is inserted in the boss **67** and projects outwardly sufficient to be disposed as an abutment in the path of swing of the

link 75. The pin 95 may or may not be one of the pins removed from the connections between the extension structure 50 and the dipper stick 35.

Referring now to FIGS. 10 and 11, the operation of retracting the extension 50 is by retracting the cylinder 39 until the link 75 contacts the abutment rod 95. The pins 90, 91 may then be removed. Further retraction of the cylinder 39 will then force the extension 50 to retract on the dipper stick 35 until boss 67 is aligned with boss 46 on the dipper stick and as shown in FIG. 11. The pin 95 may then be forced into the boss 46 into the opening of the boss 46 to thereby lock the unit in retracted position.

If it is desired to use one of the pins 90, 91 as the abutment pin it will be necessary to drop the bucket to the ground and remove the pins and place one in the boss 67. Then the cylinder 39 may be retracted in the manner previously described.

If it is desired to force extension of the extension structure 50, the pin 95 may be placed in an opening on the bucket side of the link 75. Extension of the cylinder 39 would then force extension.

It should be recognized that other forms and variations of the present invention will occur to those skilled in the art following review of the present disclosure. Therefore, while the present forms and methods were shown in detailed manner for the purpose of clearly and concisely illustrating the principles of the invention, it should be recognized that there was no intention to limit or narrow the invention beyond the broad concepts set forth in the appended claims.

What is claimed is:

1. On a backhoe including a frame, a boom pivoted for vertical movement on the frame, a dipper stick including a main portion pivoted on the end of the boom for vertical movement and an extension supported on the portion for longitudinal movement relative thereto between extended and retracted positions, power means for effecting vertical movement of the boom and dipper stick about the pivots, detachable locking means for retaining the extension in the extended and retracted positions, and a material handling device on the end of the extension, the improvement residing in a method of retracting the extension from its extended position comprising: positioning the boom and dipper stick whereby the dipper stick is vertically disposed and the material handling device engages a comparatively immovable surface; removing the detachable locking means between the main portion and extension on the dipper stick; lowering the boom to force retraction of the extension; and locking the extension in its retracted position.

2. On a backhoe including a frame, a boom pivoted for vertical movement on the frame, a dipper stick including a main portion pivoted on the end of the boom for vertical movement and an extension supported on the portion for longitudinal movement relative thereto between extended and retracted positions, power means for effecting vertical movement of the boom and dipper stick about the pivots, detachable locking means for retaining the extension in the extended and retracted positions, and a material handling device on the end of the extension, the improvement residing in a method of longitudinally positioning the extension in respect to the main portion comprising: positioning the boom and dipper stick whereby the dipper stick is vertically disposed and the material handling device is closely adjacent a comparatively immovable surface; removing the detachable locking means between the main portion and extension on the dipper stick; selectively lowering the boom to force retraction of the extension and raising the boom to cause extension; and locking the extension in its relocated position.

3. On a backhoe including a frame, a boom pivoted for vertical movement on the frame, a dipper stick including a main portion pivoted on the end of the boom for vertical movement and an extension supported on the portion for longitudinal movement relative thereto between extended and retracted positions, power means for effecting adjustment of the boom and dipper stick about the pivots, detachable locking means for retaining the extension in the extended and retracted positions, and a material-handling device on the end of the extension, the improvement residing in a method of longitudinally positioning the extension in respect to the main portion comprising: positioning the boom and dipper stick whereby the material handling device engages a comparatively immovable surface; removing the detachable locking means between the main portion and extension on the dipper stick; selectively adjusting the power means to extend or retract the extension; and locking the extension in its relocated position.

4. An extension for a dipper stick having a channel construction with a pair of oppositely disposed vertical sides and an underside and a horizontal pivot at its end with outwardly projecting boss portions adjacent the end and projecting from the respective sides, the extension comprising: an elongated structure including a pair of parallel upright longitudinally extending plate elements disposed alongside and outwardly of the respective sides and rigidly interconnected by laterally disposed structure beneath the underside of the dipper stick; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the dipper stick; means on the structure for interlocking the dipper stick and elongated structure in extended and retracted positions relative to one another; a pair of longitudinally spaced apart and substantially parallel links pivotally connected at lower ends to the structure; a link interconnecting the upper ends of the aforesaid links and forming with the latter end the elongated structure substantially a parallelogram type linkage, and means at the upper end of one of the links adapted for operative connection to a hydraulic power unit; and means at the upper end of the other link adapted for operative connection to a material carrying device.

5. An extension for a dipper stick having oppositely disposed vertical sides with outwardly projecting guide portions projecting from the respective sides, the extension comprising: an elongated structure including a pair of longitudinally extending plate elements disposed alongside and outwardly of the respective sides rigidly interconnected; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the guide portions whereby the structure may move and be guided longitudinally of the dipper stick; means on the structure for interlocking the dipper stick and elongated structure in extended and retracted positions relative to one another; a pair of longitudinally spaced apart and substantially parallel links pivotally connected at lower ends to the structure; a link interconnecting the upper ends of the aforesaid links and forming with the latter and the elongated structure substantially a parallelogram type linkage, and means at the upper end of one of the links adapted for operative connection to a hydraulic power unit; and means at the upper end of the other link adapted for operative connection to a material carrying device.

6. An extension attachment for a backhoe boom of rectangular cross section and having oppositely disposed vertical sides and pin receiving openings in the sides with boss portions formed about the openings projecting outwardly from the respective sides, the extension attachment comprising: an elongated structure including a pair of rigidly interconnected longitudinally extending plate elements disposed alongside and outwardly of the respective sides; pin openings in the plate elements; guide means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the boom; and detachable pin means on the structure adapted to seat in

the pin receiving openings and pin openings for interlocking the boom and elongated structure in an extended position.

7. A dipper stick structure comprising: a main elongated portion of channel construction with a horizontal pivot at its end with outwardly projecting boss portions adjacent the end projecting outwardly from opposite sides: an elongated extension structure including a pair of upright longitudinally extending plate elements rigidly joined and disposed alongside and outwardly of the respective sides; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the main portion; means for interlocking the main portion and extension structure in extended and retracted positions relative to one another; a pair of longitudinally spaced apart and substantially parallel links pivotally connected at lower ends to the structure; a link interconnecting the upper ends of the aforesaid links, and means at the upper end of the links adapted for operative connection to a hydraulic power unit; and means at the upper end of the other link adapted for operative connection to a material carrying device.

8. A dipper stick structure comprising: a main elongated portion of channel construction with a horizontal pivot at its end with outwardly projecting boss portions adjacent the end projecting outwardly from opposite sides; an elongated extension structure including a pair of upright longitudinally extending plate elements rigidly joined and disposed alongside and outwardly of the respective sides; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the main portion; and means for interlocking the main portion and extension structure in extended and retracted positions relative to one another.

9. A dipper stick structure comprising: a main elongated portion of channel construction with a plurality of horizontal pin receiving openings with outwardly projecting boss portions adjacent the openings projecting outwardly from opposite sides; an elongated extension structure including a pair of upright longitudinally extending plate elements rigidly joined and disposed alongside and outwardly of the respective sides; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the main portion between extended and retracted positions; pin openings in the elongated extension structure adapted for registry with the pin receiving openings of the main portion when in extended and retracted positions; and removable pin means adapted for insertion in the openings when in registry.

10. A boom structure comprising: a main elongated portion of rectangular-shaped channel construction with a plurality of horizontal pin receiving openings and having opposite upright sides; an elongated extension structure including a pair of upright longitudinally extending plate elements rigidly joined and disposed alongside and outwardly of the respective sides; longitudinally extending track and guide means between the upright sides and the plate elements adapted for cooperation whereby the extension structure may move and be guided longitudinally of the main portion between extended and retracted positions; pin openings in the elongated extension structure adapted for registry with the pin receiving openings of the main portion when in extended and retracted positions; and removable pin means adapted for insertion in the openings when in registry.

11. An extension for a dipper stick, the dipper stick having a channel construction with a pair of oppositely disposed vertical sides and an underside and a horizontal pivot at its end with outwardly projecting boss portions adjacent the pivot and projecting from the respective sides, the extension comprising: an elongated structure including a pair of parallel upright longitudinally extending plate elements disposed alongside and outwardly of the respective sides and rigidly interconnected by laterally disposed structure beneath the underside of the dipper stick; longitudinally extending track means on the inner surfaces of the plate elments adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the dipper stick; means on the structure for interlocking the dipper stick and extension structure in extended and retracted positions relative to one another; two pair of longitudinally spaced apart and substantially parallel links pivotally connected at lower ends to the structure; a link interconnecting the upper ends of the aforesaid links, and means at the upper end of the links adapted for operative connection to a hydraulic power unit; means at the upper end of the other link adapted for operative connection to a material-carrying device; and an abutment element on the structure adapted for positioning in the path of movement of at least one of the links whereby when in contact with the link, the hydraulic unit is capable of retracting the structure to its retracted position.

12. An extension for a dipper stick, the dipper stick having a channel construction with a pair of oppositely disposed vertical sides and an underside and a horizontal pivot at its end with outwardly projecting boss portions adjacent the pivot and projecting from the respective sides, the extension comprising: an elongated structure including a pair of parallel upright longitudinally extending plate elements disposed alongside and outwardly of the respective sides and rigidly interconnected by laterally disposed structure beneath the underside of the dipper stick; longitudinally extending track means on the inner surfaces of the plate elements adapted for cooperation with the boss portions whereby the structure may move and be guided longitudinally of the dipper stick; means on the structure for selectively interlocking the dipper stick and extension structure in extended and retracted positions relative to one another; vertical link means pivotally connected at its lower end to the structure; means at the upper end of the link means adapted for operative connection to a hydraulic power unit and to a material carrying device; and an abutment element on the structure and adapted for positioning in the path of movement of the link means whereby when in contact therewith, the hydraulic unit is capable of retracting the structure to its retracted position.

13. A dipper stick comprising an elongated channel; an elongated extension structure on the channel; longitudinally extending track and guide means between the extension structure and channel whereby the structure may move and be guided longitudinally of the channel; means on the structure for selectively interlocking the channel and extension structure in extended and retracted positions relative to one another; vertical link means pivotally connected at its lower end to the structure; means at the upper end of the link means adapted for operative connection to a hydraulic power unit and to a material-carrying device; and an abutment element on the structure adapted for positioning in the path of movement of the link means whereby when in contact therewith, the hydraulic unit is capable of moving the structure longitudinally.

14. A dipper stick comprising an elongated channel; an elongated extension structure longitudinally movable in respect to the channel; means for selectively interlocking the channel and extension structure in extended and retracted positions relative to one another; vertical link means pivotally connected at one end to the structure; means on the link means adapted for operative connection to a hydraulic power unit and to a material carrying device; and an abutment element on the structure adapted for positioning in the path of movement of the link means

whereby when in contact therewith, the hydraulic unit is capable of moving the structure longitudinally in respect to the channel.

15. On a backhoe a method of adjusting the effective length of a telescoping two-member boom construction interlocked by locking means, the backhoe including a frame, a main boom pivoted at one end for movement on the frame and at the opposite end to a dipper stick boom, one of the latter booms being of the aforesaid telescoping two-member boom construction, a material handling device pivoted on the end of the dipper stick boom, and power means for effecting pivoting of the main boom, dipper stick boom, and material handling device, the method comprising: positioning the main boom and dipper stick boom whereby the material handling device bears against a comparatively immovable surface; unlocking the locking means between the two members of the two-member boom; adjusting the power means to effect longitudinal adjustment in length of the two-member boom; and relocking the locking means to prevent further longitudinal adjustment.

16. A boom structure comprising: a main elongated portion of channel construction with horizontal pin receiving openings and boss portions formed about the openings and projecting outwardly from opposite sides of the structure; an elongated extension structure including a pair of longitudinally extending plate elements rigidly joined and disposed alongside and outwardly of the opposite sides of the main portion; longitudinally extending guide means between the boss portions and the plate elements adapted for cooperation whereby the extension structure may move and be guided longitudinally of the man portion on the boss portions between extended and retracted positions; pin openings in the elongated extension structure adapted for registry with the pin receiving openings of the main portion; and removable pin means adapted for insertion in the openings when in registry and for preventing relative longitudinal movement between the main portion and extension structure.

References Cited by the Examiner

UNITED STATES PATENTS

1,650,255	11/1927	Bannister	214—134
2,575,564	11/1951	Rinkel	212—55
2,784,855	3/1957	Acker	214—138
2,802,584	8/1957	Przybylski	214—138
2,989,198	6/1961	Broadley	214—138
3,140,000	7/1964	Pilch	214—138

FOREIGN PATENTS

677,645	1/1964	Canada.

HUGO O. SCHULZ, *Primary Examiner.*