April 12, 1966 J. A. RUSSELL 3,245,559

EXTENSION HOUSING FOR DIPPER-STICK OF BACKHOE

Filed Sept. 4, 1964 3 Sheets-Sheet 1

FIG. 1.

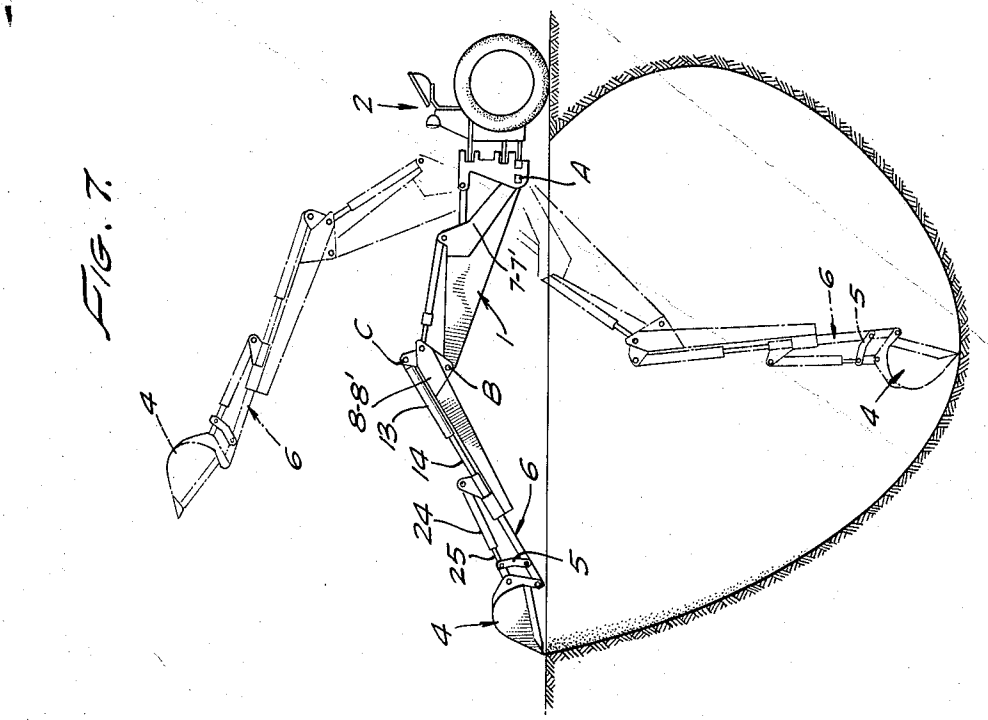
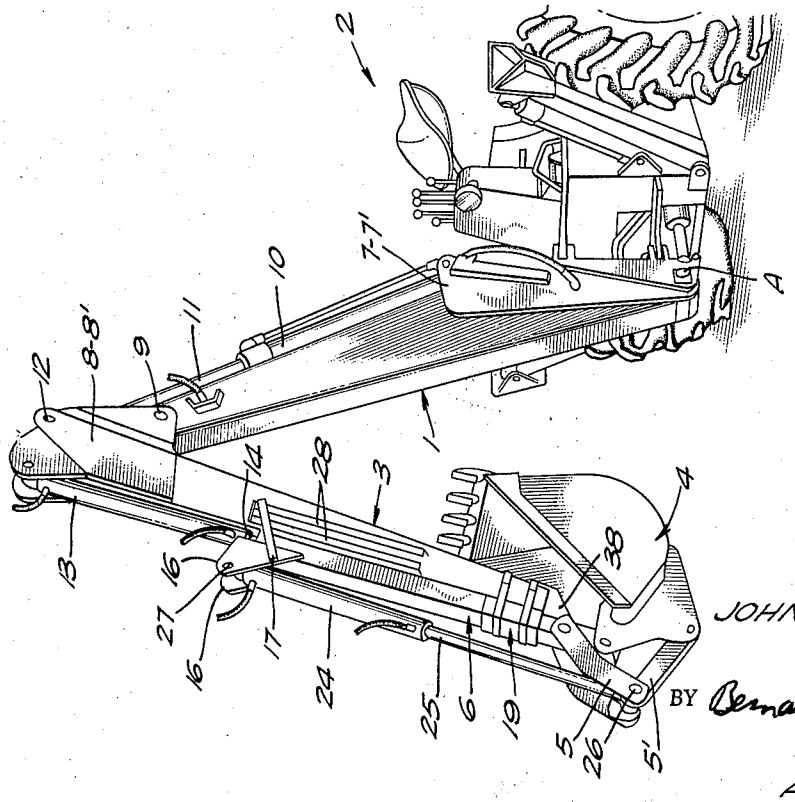


FIG. 2.



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EXTENSION HOUSING FOR DIPPER-STICK OF BACKHOE

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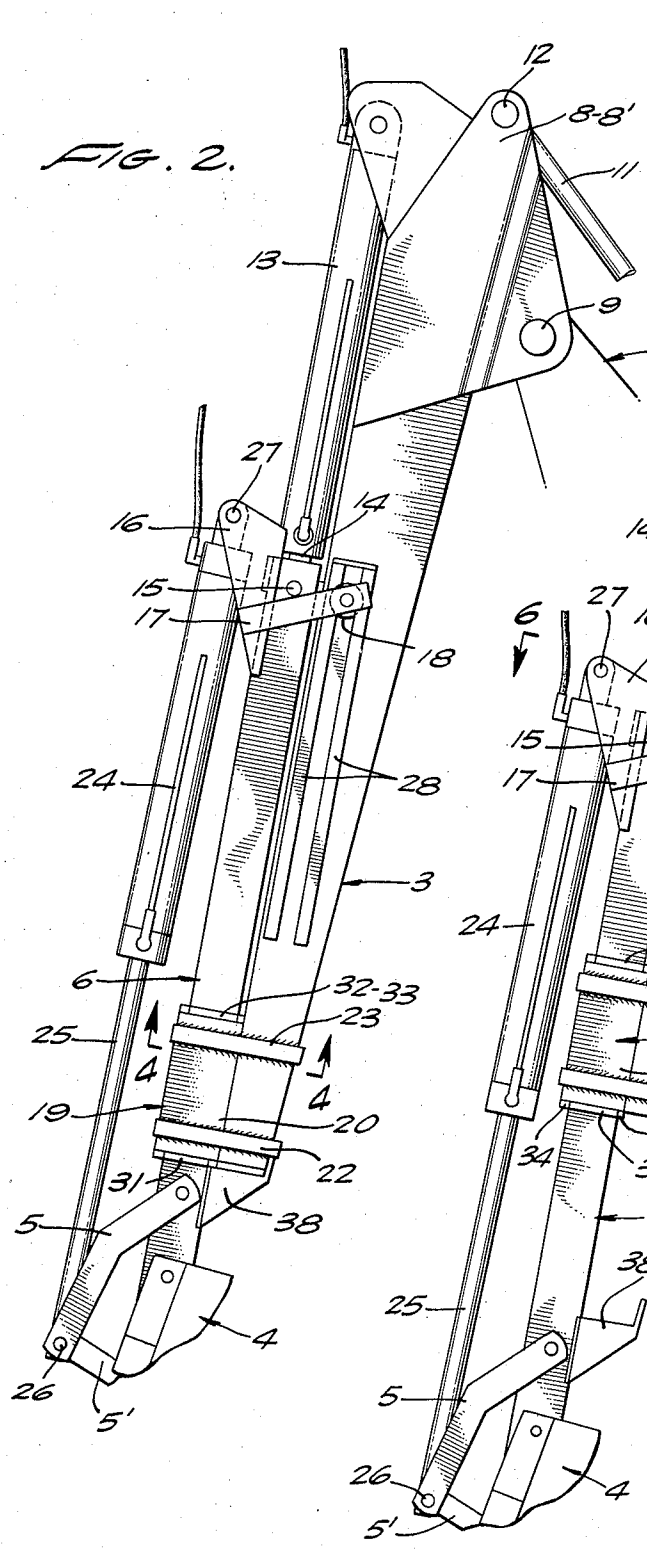
FIG. 2.



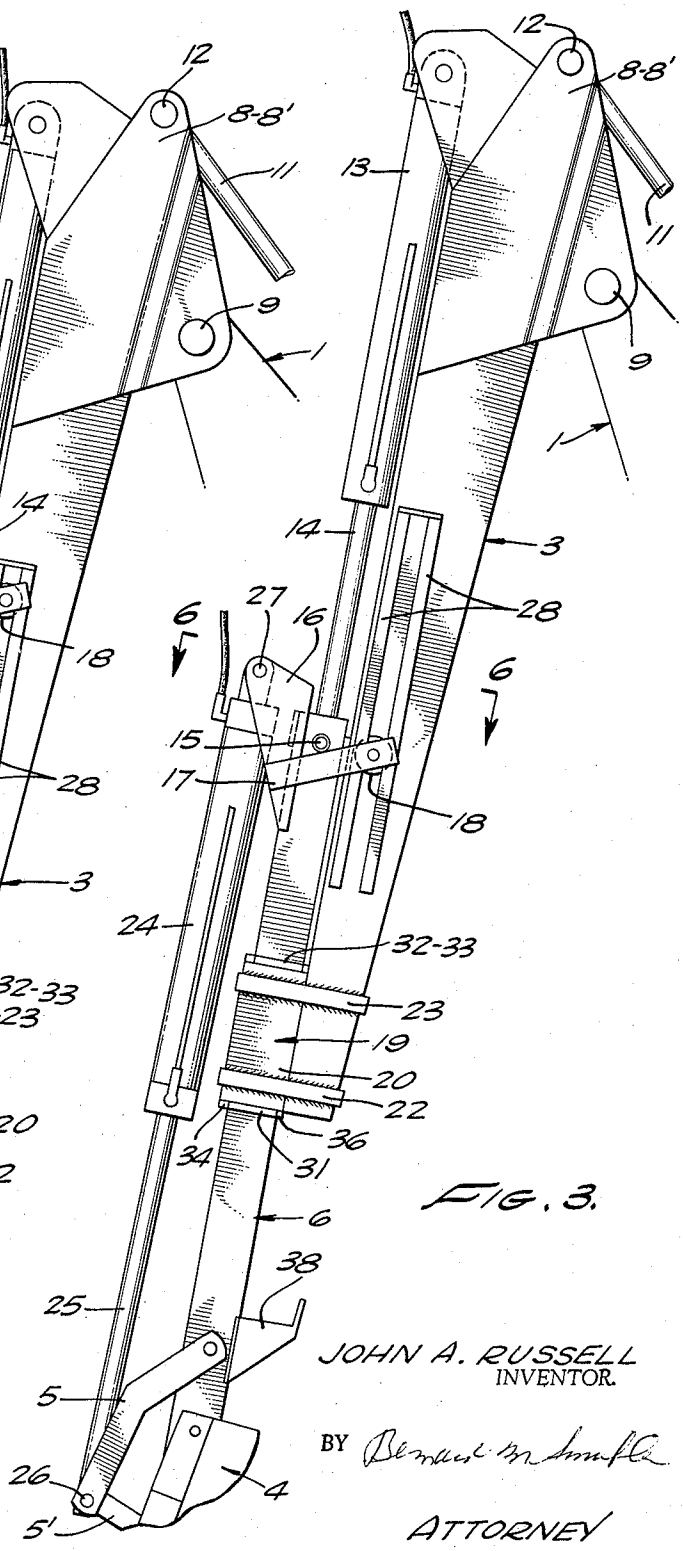


FIG. 3.

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EXTENSION HOUSING FOR DIPPER-STICK OF BACKHOE

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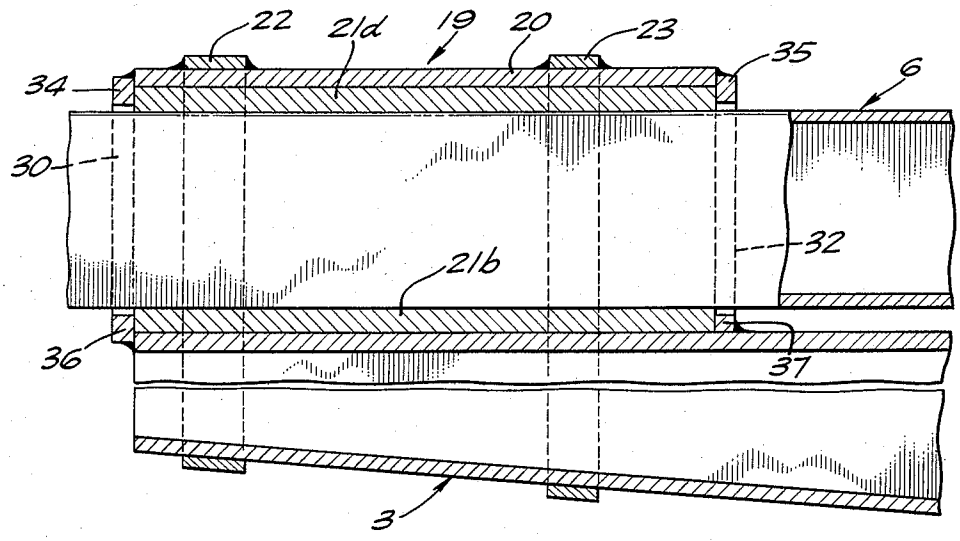

FIG. 5.

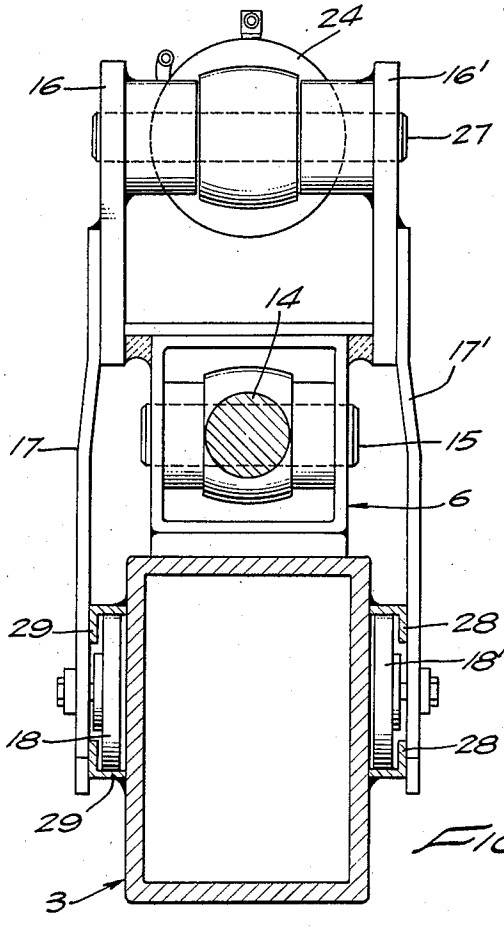

FIG. 6.

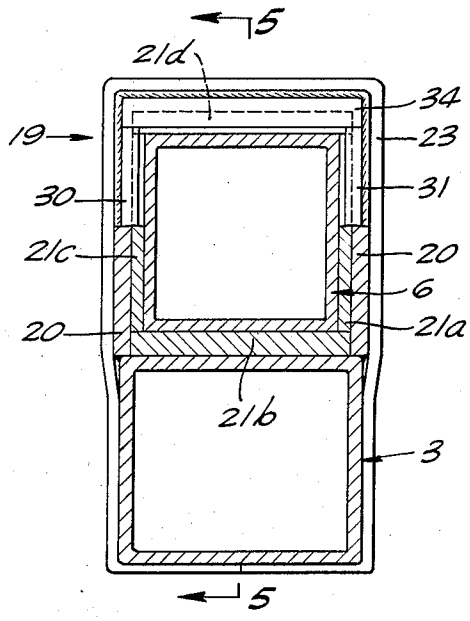

FIG. 4.

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3,245,559

EXTENSION HOUSING FOR DIPPER-STICK OF BACKHOE

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Filed Sept. 4, 1964, Ser. No. 394,417
7 Claims. (Cl. 214—138)

This invention relates in general to earth excavating devices, and more particularly to hydraulically maneuverable and operable backhoe equipment having an extendable dipper-stick attachment thereon, for use in conjunction with conventional mechanized transport means. In operation, the said equipment, among other things, excavates or scoops up various earth materials and discharges or dumps same from the trench created thereby.

In the rapidly expanding land development and construction industries of today, it is often required to quickly and easily excavate various materials from the earth or form tunnels in the earth so that utility pipes or other such improvements may be placed therein. As will hereafter become apparent, there are many other uses for such equipment.

Various excavating devices, including both manual and various attachments to vehicular or transport means, have been employed in the past for digging, lifting, swinging and dumping work. Utilization of manual devices has resulted in a poor quality of trenching, in addition to being a slow and tedious operation. Apparently, this follows from the general physical limitations inherent in a human being whenever required to directly perform heavy construction work.

When excavating devices have been attached to various vehicular or transport means, including conventional construction tractors, a good quality of trenching has resulted with a considerable saving of time and human energy. However, several disadvantages evolve from such use which limit greater utilization of the equipment as well as its depth capabilities. The devices include a maneuverable boom member which is ordinarily attached to the transport means and carries a dipper-stick (digging device) that supports at one end an open-mouth backhoe digging bucket. Prior to the present invention, the length of the combined dipper-stick and bucket was restricted so as not to exceed the length of the boom member. Otherwise, a portion of the combination of dipper-stick and bucket would of necessity trail upon the ground causing damage to the equipment. If greater digging depth was required, the length of the dipper-stick would be increased provided the length of the boom member was correspondingly increased. However, this caused extremely cumbersome equipment. Several attempts have also been made to increase the length of the dipper-stick without increasing the standard length of the boom member, but such efforts resulted in a "T-shaped" or "hook" configuration at the joint of the dipper-stick and boom member so that the entrenching apparatus could not easily be placed within or extracted from a trench or excavation of relatively limited width or length because the non-bucket carrying end of the dipper-stick would hook at, and come in forced contact with, the edges of the excavation or trench. Such prior devices have therefore resulted in damage to the dipper-stick and boom member without accomplishing the primary purpose of substantially increasing a depth capacity of mechanized backhoe equipment.

It is therefore the primary purpose and object of this invention to provide a continuous action hydraulically operated backhoe, for use with conventional vehicular or transport means, and capable of digging at greater depths than heretofore accomplished.

A further object of this invention is to provide an extendable attachment to an ordinary dipper-stick adapted

for use with and affixed to all conventional backhoe equipment without the necessity of increasing the length of the boom member and/or without creating a "T-shaped" or "hook" configuration and/or without causing any portion of the backhoe equipment, including dipper-stick and bucket, to trail upon the ground.

Another object of this invention is to provide a backhoe adapted for attachment to conventional vehicular or transport means which can be easily moved into the desired position and speedily dig more feet of trench than heretofore known and efficiently swing and dump earth material from the trench or excavation created thereby.

An additional object of this invention is to provide backhoe equipment which can be easily placed within or withdrawn from narrowly dimensioned trenches or excavations.

Other and additional objectives and advantages of this present invention are to provide a durable extendable attachment for dipper-sticks of maximum simplicity and efficiency combined with safety, economy of manufacture and operation, and ease of operation, and such objectives, advantages and capabilities will be readily apparent and better understood by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a perspective view of the backhoe device including the present invention, together with an ordinary backhoe bucket, secured to conventional tractor means;

FIGURE 2 is a side view of the extendable modified dipper-stick in its retracted position;

FIGURE 3 is a side view of the extendable modified dipper-stick in a partially extended position;

FIGURE 4 is a vertical cross-sectional view taken along line 4—4 of FIGURE 2;

FIGURE 5 is a longitudinal cross-sectional view taken along line 5—5 of FIGURE 4;

FIGURE 6 is a partial cross-sectional view taken along line 6—6 of FIGURE 3; and

FIGURE 7 is a side elevational view of the backhoe equipment while in a trenching or excavating capacity, illustrating several positions of the boom member and extendable modified dipper-stick.

Referring to the drawings in detail, a maneuverable steel boom member **1** is shown in FIGURE 1 pivotly connected at one end thereof to conventional mechanized transport means **2**. A maneuverable and modified dipper-stick **3** is pivotly connected at one end at point B to the other end of the said boom member **1**, and a conventional steel backhoe bucket **4** is pivotly connected by linkage means **5** and **5'** and extension member **6** to the other end of the said dipper-stick **3**.

Flat triangularly shaped metal frames **7** and **7'** are weldably affixed to each side of the said boom member **1** in parallel fashion as shown in FIGURE 1, and the entire combination of boom member **1** and frames **7** and **7'** is pivotly connected at point A to the said transport means **2**. The said boom member is maneuverable in its vertical plane by means of a hydraulically operated cylinder (not shown) and its associated boom actuating rod (also not shown).

Flat flanging metal side plates **8** and **8'** having an irregular configuration are weldably affixed to each side of the modified dipper-stick **3** as shown in FIGURES 1 and 2, and the entire combination of side plates **8** and **8'**, dipper-stick **3**, extension member **6** and bucket **4** is pivotly connected to and supported by the said boom member **1** at point B by pinion means **9**. A hydraulically operated cylinder **10** and its associated dipper-stick actuating rod **11** are pivotly connected at one end to the forward common corners of the said frames **7** and **7'**, and

pivotly attached at their other end to said side plates 8 and 8' at point C by pinion means 12.

A hydraulically operated cylinder 13 and its associated extension member actuating rod 14 are pivotly connected at one end to the upper common corners of side plates 8 and 8', and attached at their other end to the inner sides of the extension member 6 by pinion means 15 as shown in FIGURE 6. Flat triangularly shaped metal side plates 16 and 16' are weldably affixed to each side of the extension member 6 at the rod 14 supporting end thereof. Said plates 16 and 16' have metal bars 17 and 17' weldably attached thereto and extending downward from and perpendicular to the hypotenuses of the said plates 16 and 16', and each bar has a roller member 18 and 18', respectively, rollably affixed to one side thereof as shown in FIGURES 2, 3 and 6.

Securedly attached to the tapered end of the dipper-stick 3 are guide and support housing means 19 adapted to slideably receive and support the said extension member 6. Said means comprise a U-shaped casing 20 weldably attached to dipper-stick 3 along its longitudinal edges, four flat metal wear or bearing plates 21*a*, 21*b*, 21*c* and 21*d* disposed to lie flat within the double channel configuration created by the said casing 20 and the top side of dipper-stick 3 as shown in FIGURE 4, and two steel straps 22 and 23 rigidly fastening the said casing 20 and wear plates 21*a*, 21*b*, 21*c* and 21*d* about the said dipper-stick 3.

As mentioned above, the said bucket 4 is pivotly attached and connected to one end of the extension member 6, and is operable by means of a hydraulically operated cylinder 24 and its associated bucket actuating rod 25 which are pivotly connected at one end to common corners of the said side plates 16 and 16' by pinion means 26 and pivotly attached at their other end to links 5 and 5' by pinion means 27. Rigid guideways 28 and 29 are weldably affixed to each side of the intermediate portion of the dipper-stick 3 as shown in FIGURE 1, and are adapted to rollably or slideably receive therein the said roller members 18 and 18'. The entire apparatus, to wit: bars 17 and 17', associated roller members 18 and 18', guideways 28 and 29 and guide and support housing means 19, act and cooperate as aligning and support means for the reciprocating motion of the extension member 6. As a result thereof, any tendency toward wobble, angular displacement or capsizing of the said member 6 is eliminated. Further, the extension member 6 is adapted to slide within the said guide and support housing means 19 and just over one side of the dipper-stick 3. It may be seen that guideways 28 and 29 are so placed as to keep the associated sides of the extension member 6 and wearplate 21*b* in close relationship or contact. Thus, additional reinforcement of the equipment, particularly when the extension member 6 is in an extended position and carries a full bucket 4, is provided.

Three pairs of retaining members 30 and 31, 32 and 33, and 34 and 35 are weldably affixed to opposite ends of the three sides of the said casing 20 so as to restrict the motion of wearplates 21*a*, 21*c* and 21*d*, respectively.

A stop plate bracket 38 is weldably affixed to the bottom side of extension member 6 and is adapted to accommodate the tapered end portion of dipper-stick 3. Thus, the movement of the extension member 6 as it is retracted by the said cylinder 13 and actuating rod 14 is limited so that the said member 6 will not strike the said cylinder 13.

In operation, the transport means 2 is moved to and positioned over the region to be excavated or tunneled, and the operator thereof then approximately sets the boom member 1 over the designated area. If the required depth is within the capability of the dipper-stick 3 alone, without any extension, the operator simply excavates or tunnels the earth by means of manipulating the boom 1 by its hydraulic cylinder and associated actuating rod, the dipper-stick 3 by its hydraulic cylinder 10 and associated actuating rod 11 and the bucket 4 by its hydraulic cylinder 24 and associated actuating rod 25. If greater depth to the excavation or tunnel is necessary, or if the same must be extended in length without moving the transport means 2 to the new position, the operator would utilize the extension member 6 as hereinabove described. Thus, the dipper-stick 3, together with the extension member 6, provide a source of substantial additional length for ordinary backhoe equipment. Of course, the bucket 4 is operable by the said cylinder 24 and rod 25 regardless of whether or not the extension member 6 is being utilized. Any backhoe equipment having conventional dipper-sticks may be modified so as to incorporate this present invention. As may be seen, its use results in a substantial increase in the effective excavating depth of such equipment.

Although the present invention has been described and illustrated with a certain degree of particularity, it is to be expressly understood that the present disclosure was made only by way of example and that the only limitations to this present invention are those found in the following claims.

What I claim is:

1. An earth excavating device adapted for use in conjunction with transport means, said device comprising a maneuverable boom member mounted at one end thereof to transport means; a maneuverable dipper-stick pivotly connected at one end to the other end of said boom member; an extension member mounted on said dipper-stick and adapted to slide over one side of said dipper-stick; a backhoe bucket pivotly connected to the other end of said dipper-stick; means intercoupling said dipper-stick and said extension member and adapted to slideably advance or retract the said member longitudinally along the axis of the said dipper-stick guide means provided along opposite exterior sides of said dipper-stick and adapted to slideably receive means connecting said extension member and bucket actuating means to said dipper-stick; and means for operating said boom member, dipper stick, extension member and bucket.

2. A modified extendable dipper-stick device for use in connection with backhoe equipment, said device comprising a dipper-stick having guideways on opposite sides thereof; an extension member adapted to slide over the said dipper-stick and on a bearing plate securedly attached to the extension member supporting side of said dipper-stick; hollow U-shaped means attached to one side of said dipper-stick adapted to support and slideably receive said extension member; bearing plates securedly attached to the inner sides of the said U-shaped means for guiding and supporting said extension member longitudinally along the axis of said dipper-stick; and means intercoupling said extension member to said guideways of the said dipper-stick.

3. A modified extendable dipper-stick device for use in connection with backhoe equipment, said device comprising a dipper-stick having two guideways on opposite sides thereof; an extension member adapted to slide over said dipper-stick; a U-shaped bracket member attached to said dipper-stick so as to form a hollow enclosure therewith adapted to support and slideably receive said extension member; means securedly attached to the inner sides of said U-shaped bracket member for guiding and supporting said extension member longitudinally along the axis of said dipper-stick; and means intercoupling the said extension member to the said guideways of said dipper-stick.

4. An earth excavating device adapted for use in conjunction with transport means, said device comprising a maneuverable boom member mounted at one end thereof to transport means; a maneuverable dipper-stick pivotly connected at one end to the other end of said boom member, said dipper-stick having guideways on opposite exterior sides thereof; an extension member adapted to

slide over said dipper-stick; a U-shaped bracket member attached to said dipper-stick so as to form a hollow enclosure therewith and adapted to slideably receive said extension member; bearing plate means securedly attached to the inner sides of said U-shaped member for guiding and supporting said extension member longitudinally along the axis of said dipper-stick; and means intercoupling said extension member to the said guideways of said dipper-stick.

5. An excavating device as defined in claim 4 wherein bearing plate means are securedly attached to the extension member supporting side of said dipper-stick.

6. A modified extendable dipper-stick as defined in claim 3 wherein a bearing plate is securedly attached to the extension member supporting side of said dipper-stick.

7. An earth excavating device adapted for use in conjunction with transport means, said device comprising a maneuverable boom member mounted at one end thereof to transport means; a maneuverable dipper-stick pivotly connected at one end to the other end of said

boom member; an extension member mounted on said dipper-stick and adapted to slide over one side of said dipper-stick; a backhoe bucket pivotly connected to the other end of said dipper-stick, means intercoupling said dipper-stick and said extension member and adapted to slideably advance or retract the said extension member longitudinally along the axis of said dipper-stick; giudeway means provided along opposite nonbearing sides of said dipper-stick adapted to slideably receive means connecting said extension member to said dipper-stick; and means for operating said boom member, dipper stick, extension member and bucket.

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