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3,298,548

EXTENSIBLE BACKHOE ASSEMBLY

Filed Oct. 29, 1965

2 Sheets-Sheet 1

Fig. 1

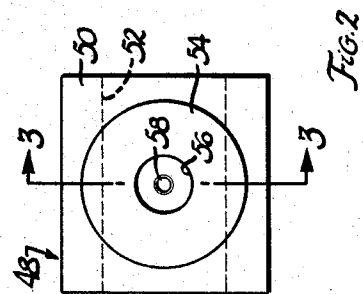
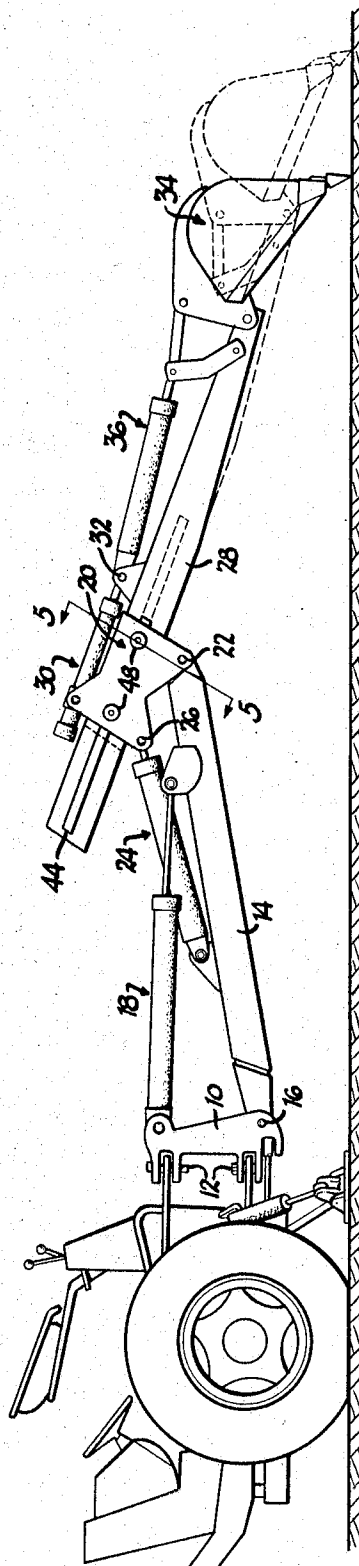


Fig. 2

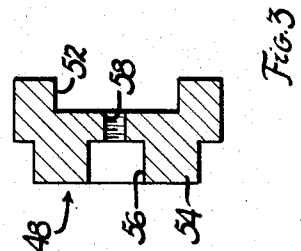


Fig. 3

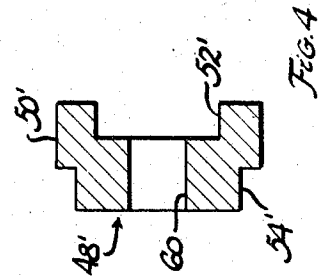


Fig. 4

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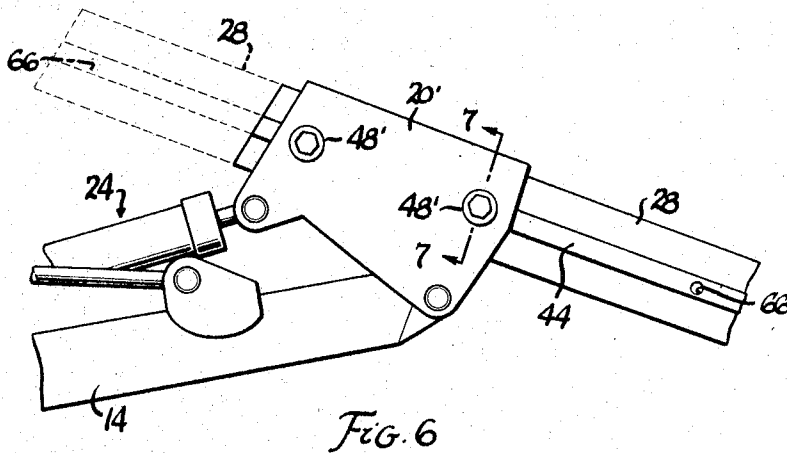


FIG. 6

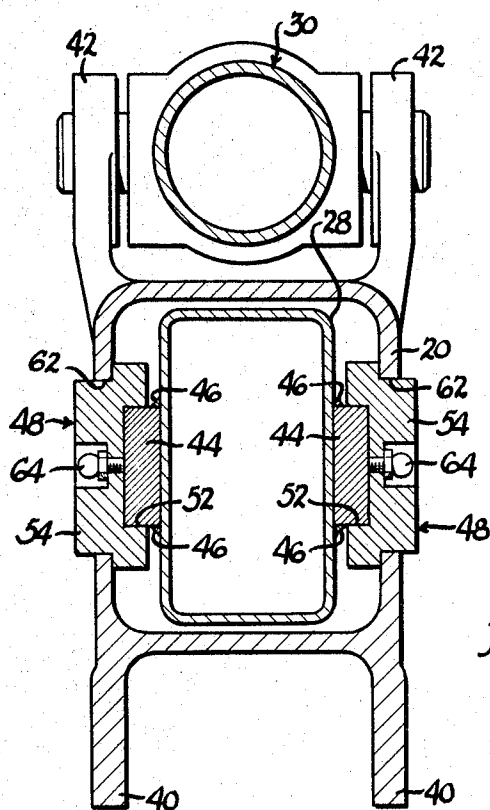


FIG. 5

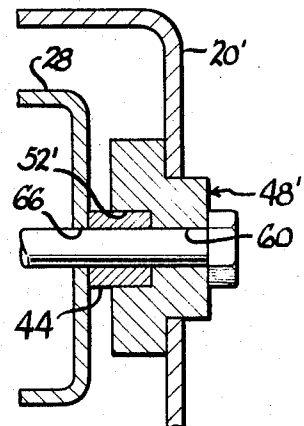


FIG. 7

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EXTENSIBLE BACK HOE ASSEMBLY

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5 Claims. (Cl. 214-138)

This invention relates to extensible backhoe assemblies, and more particularly to an improved form of extensible backhoe in which the dipper stick is mounted for longitudinal adjustment relative to its point of pivotal coupling to the backhoe boom.

In recent years, several versions of extensible backhoes have been placed on the market. The primary advantage of the extensible backhoe over the non-adjustable type is that the extensible backhoe can be extended to substantially increase the length or reach of the tool, thereby permitting the backhoe to dig deeper or in a more flexible manner. At the same time, the geometry of the backhoe is such that it operates at a reduced mechanical advantage when extended and, in the extensible backhoe, by shortening up on the extended part, increased digging power could be obtained with the backhoe at or near its minimum extension.

In substantially all cases, a telescoping arrangement of one type or another is employed. Problems which have been encountered are due in a large part to the fact that the substantial forces applied to the telescoping part have required a substantial degree of precision in fit, while at the same time because of the sheer magnitude of the forces encountered, the sliding parts are relatively massive. The sheer size and weight of some of the mating parts make machining operations extremely cumbersome and difficult, and distortion or binding is frequently encountered.

It is a primary object of the present invention to provide an improved form of extensible backhoe assembly in which a high degree of precision fit can be readily achieved between mating, relatively movable parts.

It is another object of the invention to provide an improved form of extensible backhoe in which a high degree of precision fit between sliding parts enables the mating sliding parts to be of relatively small size.

Other objects and features of the invention will become apparent by reference to the following specification and to the drawings.

In the drawings:

FIGURE 1 is a side elevational view showing a tractor mounted backhoe embodying the present invention;

FIGURE 2 is a side elevational view of a coupling block employed in the apparatus of FIGURE 1;

FIGURE 3 is a cross sectional view of the coupling block taken on line 3-3 of FIGURE 2;

FIGURE 4 is a transverse cross sectional view of a modified form of coupling block;

FIGURE 5 is a detail cross sectional view taken approximately on the line 5-5 of FIGURE 1;

FIGURE 6 is a detail side elevational view of a modified form of the invention; and

FIGURE 7 is a partial cross sectional view taken on line 7-7 of FIGURE 6.

Referring first to FIGURE 1, a tractor mounted backhoe having one form of extensible dipper stick according to the present invention is shown in side elevational view. The backhoe assembly includes a swing tower 10 supported upon the tractor frame for pivotal movement about a vertical axis as by pins 12. A rigid boom 14 is mounted at one end upon the swing tower, as at 16, for pivotal movement about a horizontal axis and is raised and lowered about its pivot 16 by a hydraulic boom motor 18 controlled in a conventional manner.

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At the outer end of boom 14, a hollow sleeve member designated generally 20 is pivotally mounted by a pivot 22. Sleeve member 20 is driven in pivotal movement about its pivot 22 by a second hydraulic motor 24 having its cylinder pivotally mounted upon boom 14 and its piston rod pivotally coupled to sleeve 20 as at 26.

A dipper stick 28 is slidably supported within sleeve 20 by means to be described in greater detail below and is longitudinally positioned relative to sleeve 20 by a hydraulic motor 30 mounted upon sleeve 20 and having its piston rod connected to bracket 32 on dipper stick 28. A more or less conventional bucket assembly designated generally 34 is mounted at the end of dipper stick 28 for actuation in the usual manner by a hydraulic operating motor 36.

Referring now to the cross sectional view of FIGURE 5, sleeve 20 is shown as being of generally hollow tubular construction from which projecting ear-like lugs such as 40 and 42 project to receive the various pins which mount or couple the sleeve to other elements. Dipper stick 28 is also shown as being of hollow tubular construction with a substantial amount of clearance at each side between its side walls and the interior side walls of the central passage of sleeve 20. Along each side wall of the dipper stick, an elongate guide strip 44 is fixedly secured in position as by weldments 46, guide strips 44 extending longitudinally of the dipper stick as best seen in FIGURE 1.

Dipper stick 28 is supported for sliding movement within sleeve 20 by a series of four coupling blocks designated generally 48 whose construction is best shown in FIGURES 2 and 3. Each guide block 48 has a generally rectangular plate-like body portion 50 having a guide slot 52 cut into one face. A cylindrical mounting portion 54 projects outwardly from the opposite face of body portion 50 and a bore 56 extends partially through the block centrally of the cylindrical portion. A tapped bore 58 extends from the bottom of bore 56 through the block to open into the bottom of groove 52. Tapped bore 58 is employed to mount a grease fitting in the block in the form shown in FIGURES 2 and 3.

In FIGURE 4, a modified form of block 48' is shown having a slot 52' and a cylindrical portion 54' located on opposite sides of its rectangular body portion 50'. The embodiment of FIGURE 4 differs from the embodiment of FIGURES 2 and 3 in that an enlarged bore 60 passes entirely through the block of FIGURE 4 for purposes described in connection with the embodiment of FIGURES 6 and 7.

Returning now to FIGURE 5, a pair of blocks 48 are mounted in the opposed side walls of hollow sleeve 20 by seating the cylindrical portions 54 of the blocks in bores 62 formed in the side walls of sleeve 20. Bores 62 receive coupling blocks 48 with a sliding fit so that the blocks can rotate slightly to adjustably position themselves. Guide strips 44 on dipper stick 28 are slidably received within the slots 52 of the coupling blocks and grease fittings 64 enable the sliding surfaces of the guide strips 44 and walls of slots 52 to be lubricated. As indicated in FIGURE 4, a minimum of four coupling blocks 48 are desirable, the coupling blocks being mounted in opposed paired relationship with each other.

As best seen in FIGURE 5, the thickness of guide strips 44 is substantially greater than the depth of slots 52 so that the only sliding contact present in the assembly is that between the opposed surfaces of the guide strips and coupling block slot walls. In this manner, the engaged surfaces can be made to precisely fit each other since the only accurate machining required is that of the guide strips and the forming of the slots in coupling blocks 48. The guide strips and coupling blocks are relatively small and conveniently handled in the shop and

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can be much more readily machined than can the relatively massive structural members or castings from which sleeve 20 or dipper stick 28 are constructed. The sliding fit between the coupling blocks and guide strips is of importance because a looseness of fit will soon result in undue wear and looseness because of the heavy loads transmitted through the engaged sliding surfaces during operation of the backhoe.

In the embodiment of FIGURES 1 through 5 the dipper stick is extended or retracted by operation of motor 30 and the stick may be slidably positioned at any selected location within the entire range of possible positions relative to sleeve 20.

In FIGURES 6 and 7, an alternative form of the invention is disclosed which, as mentioned above, employs a slightly modified form of guide block 48'. As compared to the hydraulically operated embodiment previously described, the embodiment of FIGURES 6 and 7 discloses a more or less permanent adjustment in which the dipper stick can be set at any one of a limited number of preselected positions.

In FIGURES 6 and 7, the structure of the boom, dipper stick and sleeve are substantially the same with the exception that the sleeve is not provided with ears 42 since there is no dipper stick extending motor to be mounted upon it. Dipper stick 28 is formed with a series of spaced bores 66 which pass directly through the guide strips and wall of the stick.

In the embodiment of FIGURES 6 and 7, the stick is initially positioned within the sleeve 20' by resting the bucket of the backhoe on the ground and raising or lowering the boom until sleeve 20' is located at the desired longitudinal position along the dipper stick with a bore 66 in the stick aligned with a bore 60 in a coupling block 48'. When the stick is located at the desired position a pin or bolt is inserted through the bore 60 in the coupling block and inwardly through the bore 66 in the stick to lock the stick in the desired position. Preferably, bores 66 are located in accurately aligned positions on opposite sides of the stick and a relatively long bolt can be passed through the bores in the opposed sides of the stick and the opposed coupling blocks and may be locked in position, if desired, by threading a nut on the projecting portion of the bolt.

While two embodiments of the invention have been described in detail, it will be apparent to those skilled in the art that the disclosed embodiments can be modified. Therefore, the foregoing description is to be considered exemplary rather than limiting, and the true scope of the invention is that defined in the following claims.

We claim:

1. In a tractor mounted backhoe or the like having a boom mounted at one end upon a tractor and a dipper

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stick assembly mounted on the opposite end of said boom; the improvement wherein said dipper stick assembly comprises a hollow sleeve member having a passage there-through pivotally mounted upon said other end of said boom, an elongate dipper stick member projecting longitudinally through said passage of said sleeve member, a plurality of coupling blocks each having a cylindrical portion at one side thereof and means defining a guiding groove in its opposite side extending radially of said cylindrical portion, a pair of elongate guide strips each complementary in transverse section to the guiding grooves in said blocks and adapted to be slidably received therein, one of said members having bores therethrough at opposite sides of said passage receiving said cylindrical portions of said blocks with the grooves of said blocks in facing relationship to the other of said members, and means fixedly mounting said guide strips on the other of said members with said strips slidably received in said guiding grooves to guide said dipper stick in longitudinal movement within said sleeve.

2. The invention defined in claim 1 wherein each coupling block comprises a generally rectangular plate, said guide groove in said plate having parallel side walls and a flat bottom and extending laterally across one side of said plate, the depth of said groove being less than the corresponding dimension of the guide strip.

3. The invention defined in claim 2 further comprising hydraulic motor means coupled between said sleeve and said dipper stick for driving said dipper stick in longitudinal movement relative to said sleeve.

4. The invention defined in claim 2 wherein each of said coupling blocks has a bore extending therethrough coaxially of said cylindrical portion, and means defining a plurality of longitudinally spaced bores extending through said guide strips and the side walls of said dipper stick, said bores in said coupling blocks and said guide strips being adapted to receive a locking pin to lock said dipper stick at selected positions of longitudinal adjustment relative to said sleeve.

5. The invention defined in claim 2 further comprising a tapped bore extending through each coupling block coaxially of said cylindrical portion, and a grease fitting threadably received in said tapped bore for applying lubricant to the engaged surfaces of the guide slot and guide strip.

References Cited by the Examiner

UNITED STATES PATENTS

3,140,000	7/1964	Pilch	214-138
3,245,559	4/1966	Russell	214-138

HUGO O. SCHULZ, *Primary Examiner*.