United States Patent

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[54] **BACKHOE HAVING AN ARTICULATED GOOSENECK BOOM**
9 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **214/138,** 37/103
[51] **Int. Cl.** **E02f 3/74**
[50] **Field of Search** ..... 214/132, 138, 147, 147 G; 37/103, 117.5, 118

[56] **References Cited**

UNITED STATES PATENTS

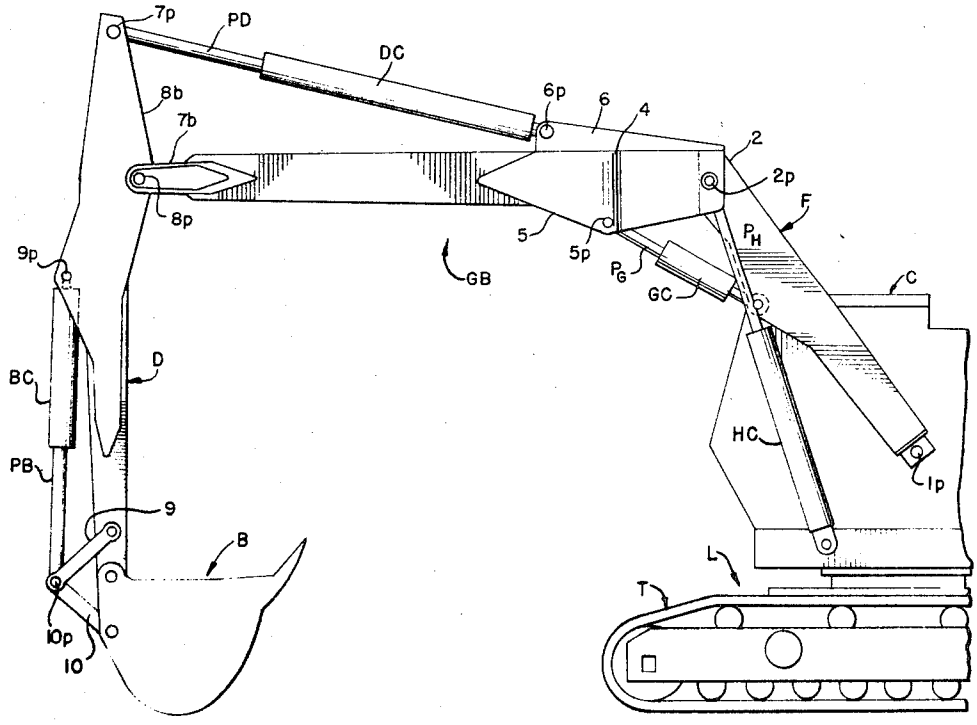
3,197,049	7/1965	Schwing	214/138
3,249,244	5/1966	Ellerbroer et al.	214/138
3,465,904	9/1969	Pensa	214/138

FOREIGN PATENTS

1,049,927	11/1966	Great Britain	37/118 (R)

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Frank E. Werner
Attorney—Shoemaker & Mattare

ABSTRACT: A backhoe having a boom with an articulated gooseneck, said articulated gooseneck enabling the boom to be retracted and extended to a greater extent than is possible with either a straight boom or a fixed gooseneck boom and, in fact, possessing all of the advantages of each thus achieving a much larger digging profile than is possible with either.

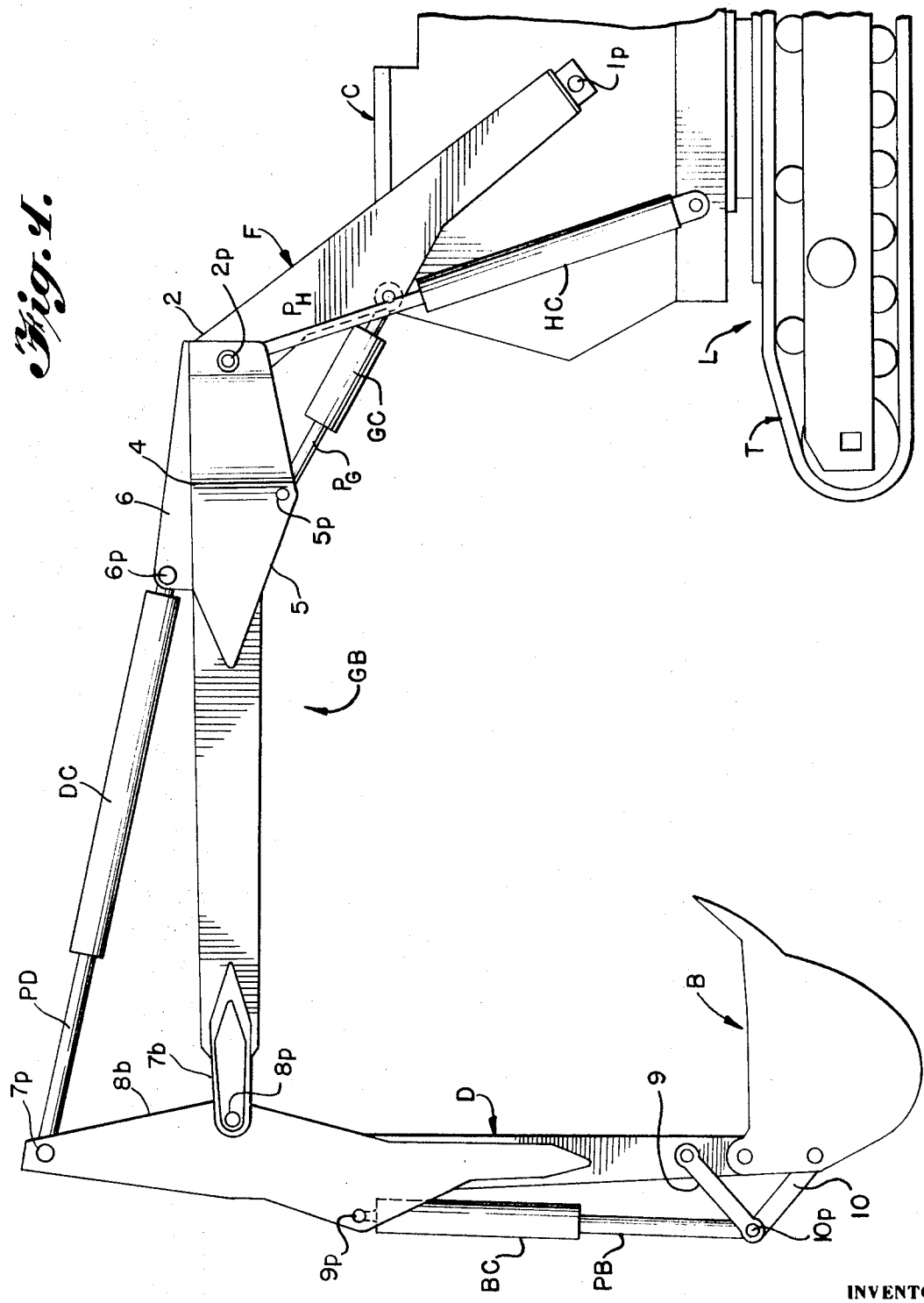


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Fig. 1.

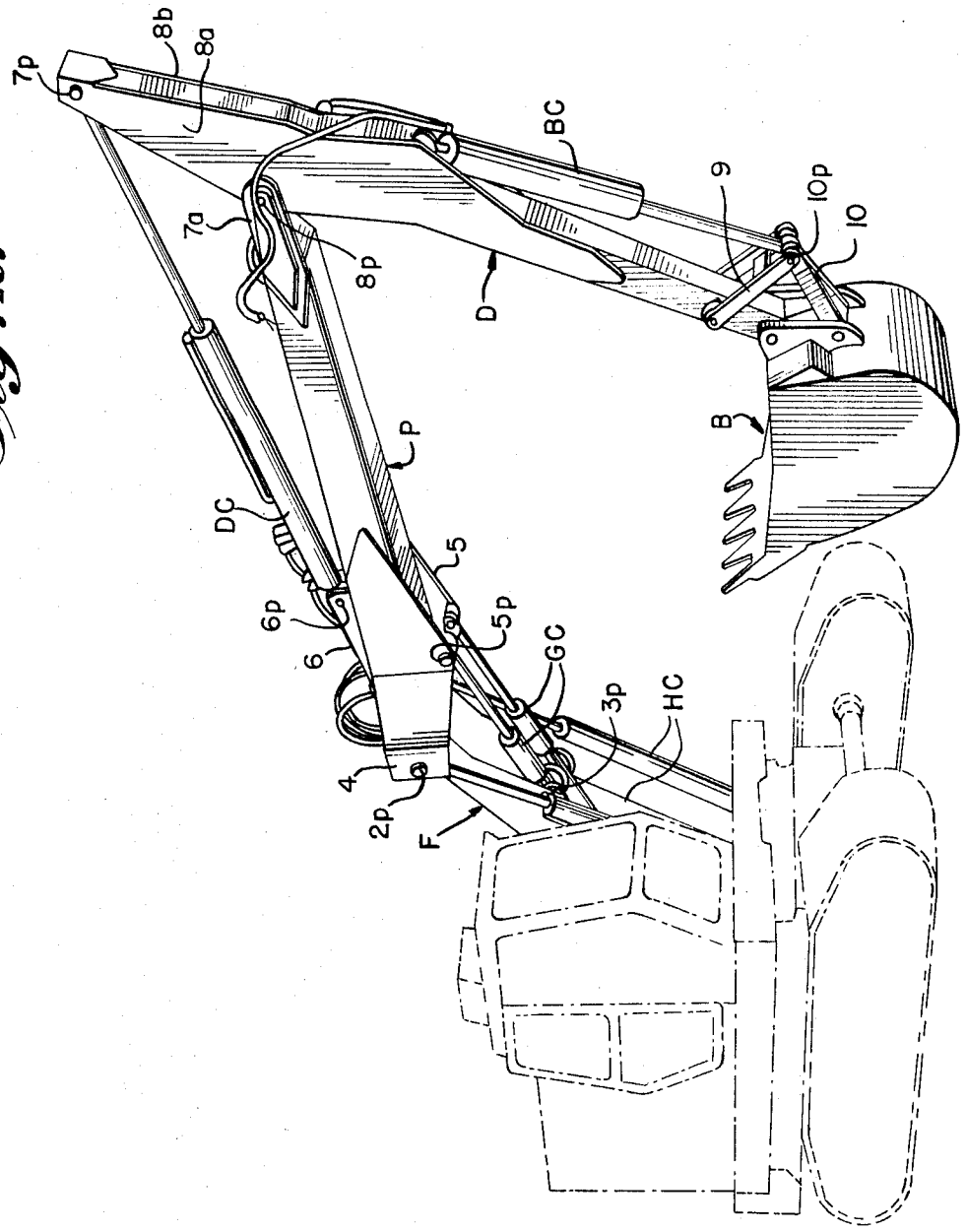


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Fig. 2.



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Fig. 3.

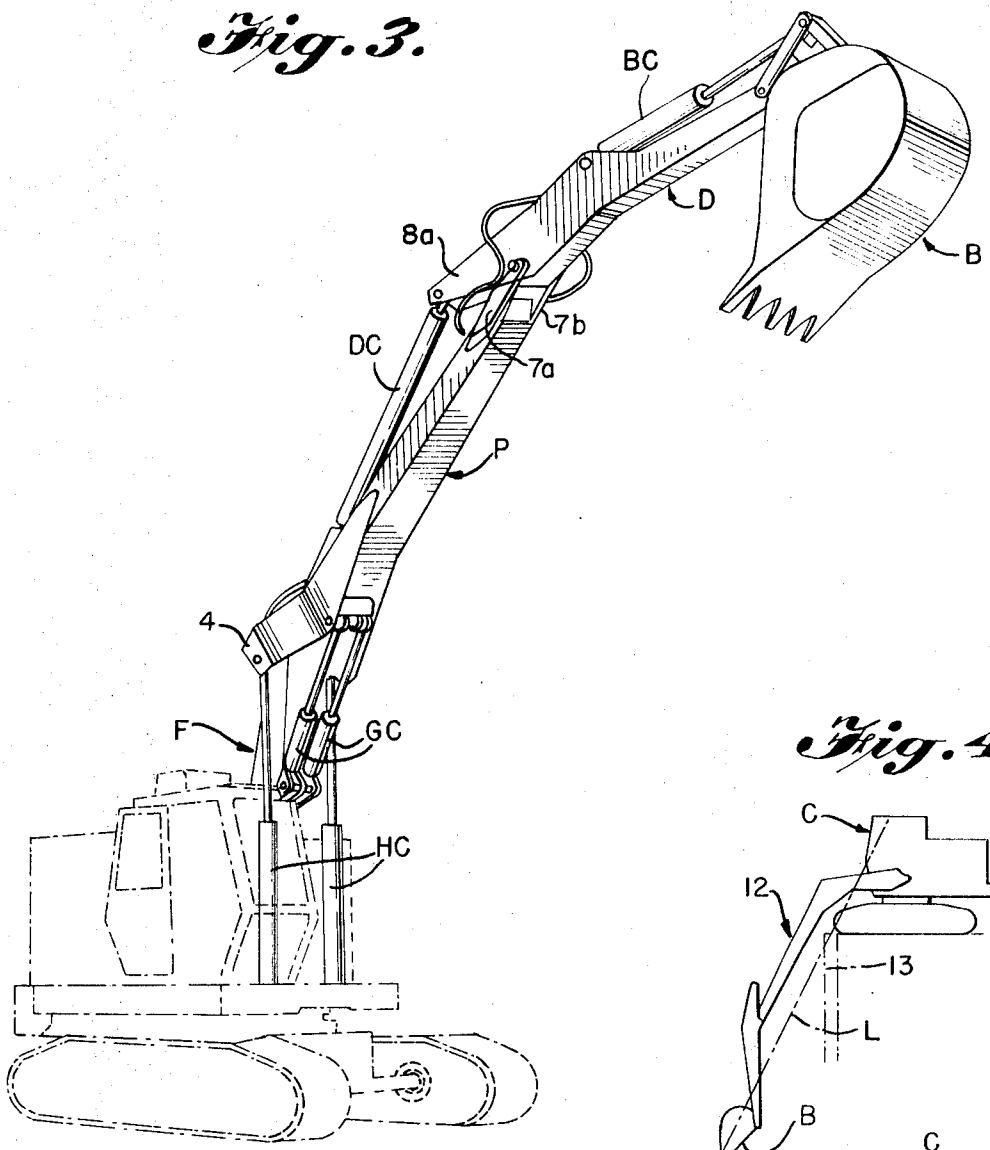
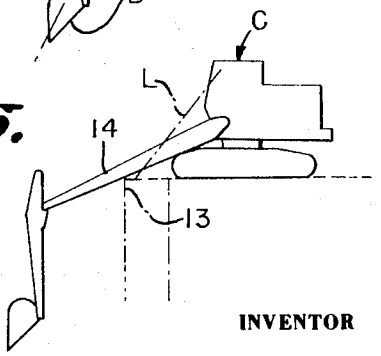


Fig. 4.

Fig. 5.



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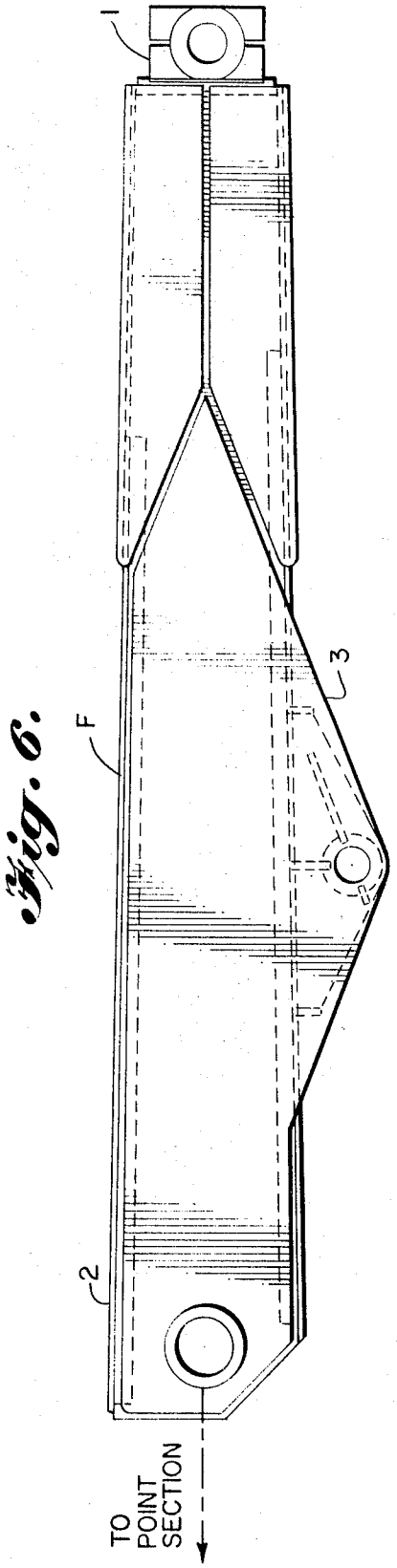


Fig. 6.

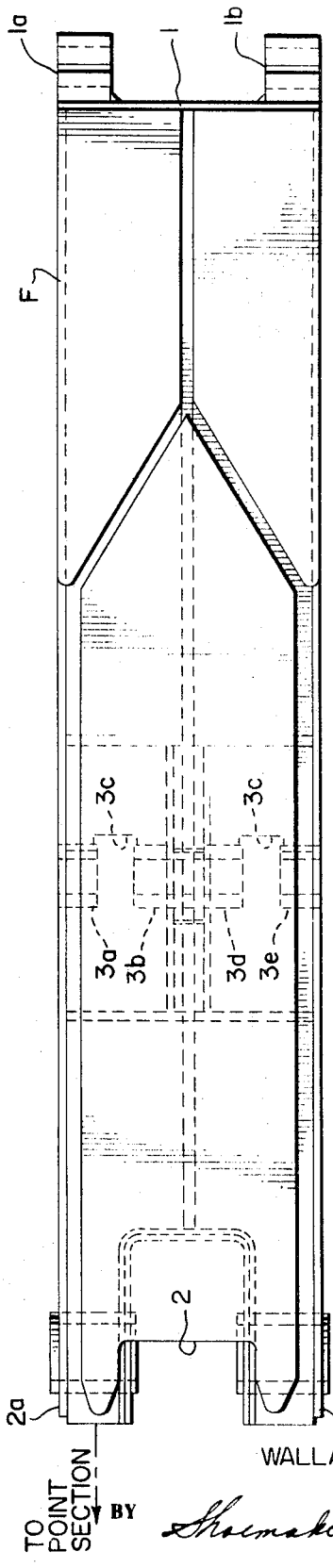


Fig. 7.

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Fig. 8.

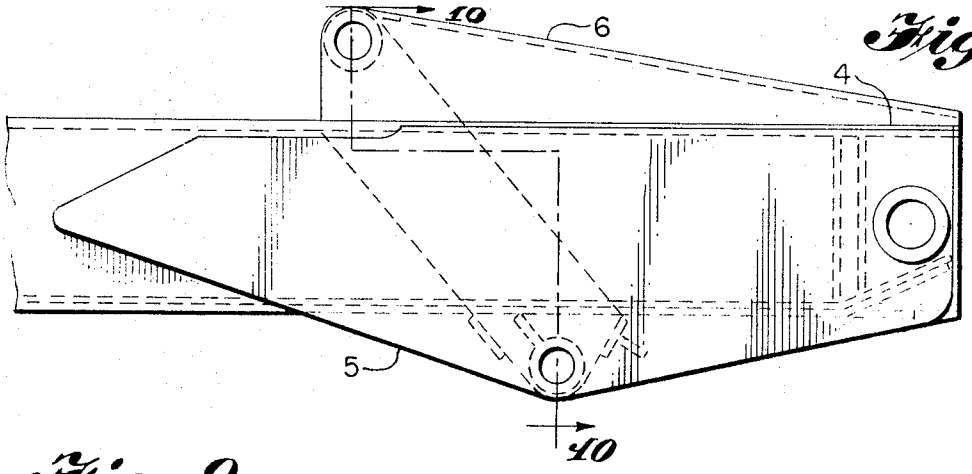


Fig. 9.

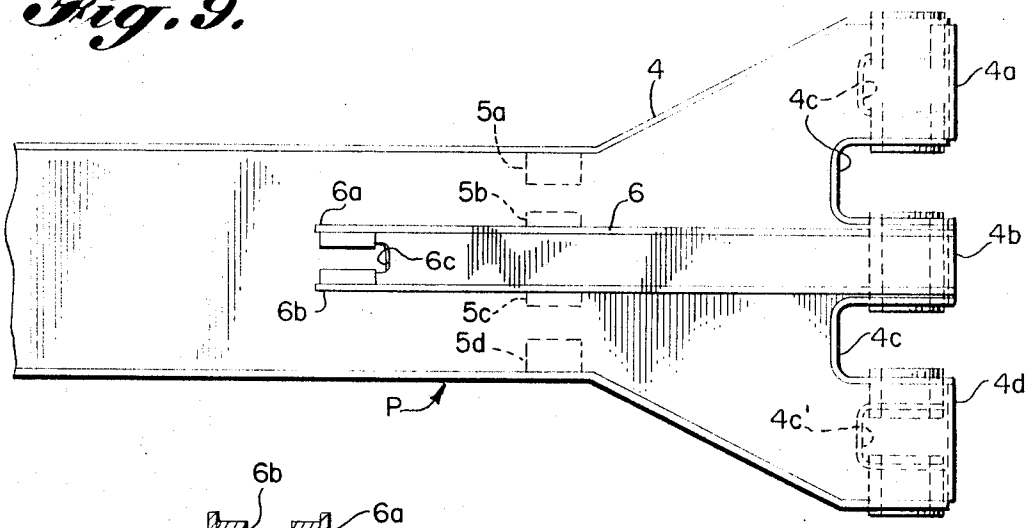
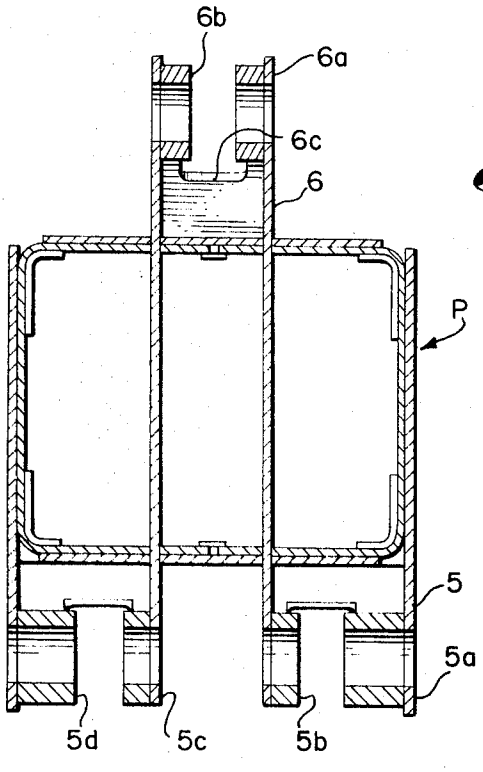


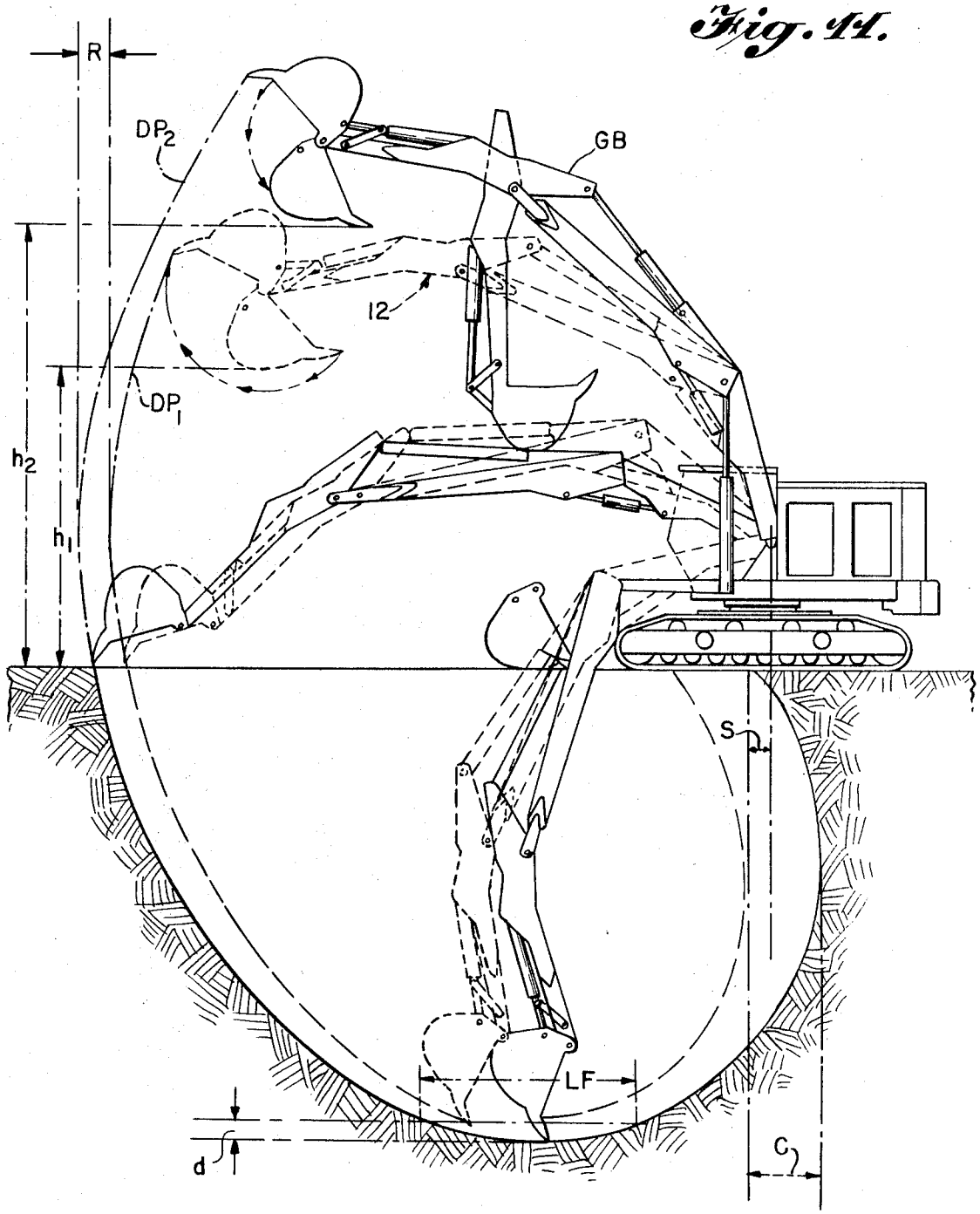
Fig. 10.



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Fig. 11.



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BACKHOE HAVING AN ARTICULATED GOOSENECK BOOM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to earth-working equipment and more particularly to an excavator of the type commonly referred to as a backhoe, which device is generally used for trenching or digging ditches. The backhoe of the present invention has an articulated gooseneck boom structure which results in greater dumping height, greater reach, greater digging depth, and the ability to dig much closer to the machine than prior art devices.

2. Prior Art

Earth excavators have progressed from devices utilizing cable-operated boom structures to devices utilizing hydraulic cylinders for operating the boom. Additionally, the type of earth excavator known as a backhoe has evolved from apparatus wherein the boom was of straight construction to apparatus wherein the boom was provided with a gooseneck section. Each of these types of backhoe had unique advantages. The straight boom-type backhoe had exceptional dumping height, long reach and deep dig ability. Backhoes having a gooseneck-type boom, on the other hand, afforded better operator vision, were capable of digging much closer to the machine and had a lower overall height. In general, backhoes having a gooseneck boom are capable of greater production and possess certain other inherent advantages and today practically all backhoes employ this type of boom construction.

The present invention, wherein the boom has an articulated gooseneck, is a marriage of the straight boom and gooseneck boom concepts and possesses all of the advantages of each and has a production yield approximately one-third greater than backhoes having a fixed gooseneck boom.

One important advantage afforded by the articulated gooseneck boom construction is the ability to dig much closer to the machine before it is necessary to reposition the machine for another digging cycle. Although the fixed gooseneck boom enables much closer digging to the machine than does the straight boom-type backhoe, as soon as earth is removed from the trench as far back as possible, determined by the bottoming of the hoist cylinders, it is necessary to move the machine and repeat the cycle. With the articulated gooseneck boom, however, as soon as this limit is reached, the articulated gooseneck is merely retracted thus enabling the operator to dig another 6 or 7 feet closer to the machine without repositioning. When the total reach of the machine is considered, only two-thirds as many moves are thus required and more production is accordingly assured. Moreover, the articulated gooseneck boom construction enables the boom to be retracted thus resulting in lesser overall travel dimensions.

It is therefore an object of this invention to provide a new and improved type of backhoe boom construction.

It is a general object of this invention to provide a backhoe possessing all the advantages of heretofore known backhoes having either a straight boom or a gooseneck boom.

It is a specific object of this invention to provide a backhoe having an articulated gooseneck boom.

Still another object of this invention is to provide a backhoe having an articulated gooseneck boom which has greater dumping height, greater reach, deeper digging depth, and the ability to dig much closer to the machine than heretofore known backhoe constructions.

It is yet another object of this invention to provide a backhoe having an articulated gooseneck boom, which is capable of one-third more production than heretofore known backhoes because of its ability to dig much closer to the machine thereby requiring only two-thirds as many moves as previous backhoe constructions.

These and other objects will become apparent from a study of the following detailed description and of the drawings appended thereto wherein like reference numerals refer to like parts throughout the several views and:

FIG. 1 is a side view in elevation of a backhoe having an articulated gooseneck boom according to the present invention;

FIG. 2 is a perspective view of a backhoe having an articulated gooseneck boom according to the present invention wherein the boom is partially retracted;

FIG. 3 is a perspective view of a backhoe having an articulated gooseneck boom according to the present invention wherein the boom is in an extended position;

FIG. 4 is a schematic view showing a backhoe having a fixed gooseneck boom construction and illustrating the line of sight of the operator to the bucket over the edge or lip of a ditch being dug;

FIG. 5 is a schematic view of a backhoe having a straight boom construction and illustrating the line of sight of the operator to the bucket over the edge or lip of a ditch being dug;

FIG. 6 is a side view in elevation of the foot section of the articulated gooseneck boom;

FIG. 7 is a plan view of the foot section of the articulated gooseneck boom;

FIG. 8 is a partial side view in elevation of the point section of the articulated gooseneck boom;

FIG. 9 is a partial plan view of the point section of the articulated gooseneck boom;

FIG. 10 is a cross-sectional end view in elevation of the point section of the articulated gooseneck boom and is taken along line 10–10 of FIG. 8;

FIG. 11 is a schematic side view of a backhoe showing the different digging profiles or capabilities of a backhoe having an articulated gooseneck boom, shown in the solid lines, and a backhoe having a fixed gooseneck boom, shown in phantom lines.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1, a backhoe according to the present invention is shown comprising a vehicle V having a pair of spaced propelling tracks T and a cab C. Pivotally attached to the vehicle in a usual and well-known manner is an articulated gooseneck boom GB. The articulated gooseneck boom GB comprises a foot section F attached to the vehicle, a point section P attached to the foot section and defining an obtuse angle therewith, a dipstick section D attached to the point section, and a bucket B attached to the dipstick.

The foot section F is attached to the vehicle V at one end 1 in the usual manner as by a pivot pin 1*p* passed through rearwardly extending side flanges 1*a* and 1*b* on the end 1 of foot section F. The point section P is connected to the other end 2 of the foot section through an articulated joint comprising forwardly extending spaced side flanges 2*a* and 2*b* on end 2 of foot section F received in rearwardly extending flange-receiving channels 4*c* on one end 4 of point section P. Channels 4*c* are defined by rearwardly projecting flanges or attaching plates 4*a*, 4*b* and 4*d*. Flanges 4*a* and 4*d* are formed to define therein rearwardly extending actuator receiving channels 4*c'* which receive ends of piston rods P_H of a pair of hoist cylinders HC for effecting raising and lowering of the boom. The articulated joint is pinned by a pivot shaft 2*p* extending through flanges 2*a*, 2*b*, 4*a*, 4 *b* and 4*d* and the ends of piston rods P_h. Interconnected between foot section F and point section P for effecting changes in angular disposition therebetween are a pair of gooseneck cylinders GC. The gooseneck cylinders GC are attached at one end thereof to foot section F at attachment plate 3 by said one end of the gooseneck cylinders being received in actuator-receiving channels 3*c* defined by downwardly projecting flanges or attaching plates 3*a*, 3*b*, 3*d* and 3*e*, disposed intermediate the ends of foot section F and through which a pivot shaft 3*p* is passed to pin the connection. Piston rods P_G at the other end of the gooseneck cylinders GC are attached to point section P intermediate the ends thereof at attachment plate 5 by being received between flanges 5*a* and 5*b* and flanges 5*c* and 5*d* respectively, through which a pivot shaft 5*p* is passed to pin the connection. A pair of attachment plates 8*a* and 8*b* are

rigidly carried on one end of a dipstick D and are pivotally connected intermediate their ends between attachment plates 7*a* and 7*b*, rigidly carried on the other end of point section P, by a pivot shaft 8*p*.

Interconnected between point section P and dipstick D to effect movement of dipstick D about pivot shaft 8*p* is a dipstick cylinder DC, one end of which is received in channel 6*c* defined by flanges 6*a* and 6*b* on attaching plate 6 rigidly carried by point section P. A piston rod P_p at the other end of dipstick cylinder DC is attached between attaching plates 8*a* and 8*b* at one end thereof by means of a pivot shaft 7*p*. Connected at the opposite end of dipstick D is a digging tool such as bucket B or the like which is connected through a pair of pivoted links 9 and 10 by a floating knee shaft 10*p* to piston rod P_p of bucket cylinder BC which is fixed at its other end between attaching plates 8*a* and 8*b* by a pivot shaft 9*p*.

FIGS. 4 and 5 illustrate schematically the advantage to the operator of the backhoe of having a gooseneck boom 12 over straight boom 14 with respect to line of sight L to bucket B over edge 13 of a ditch.

FIG. 11 depicts diagrammatically the advantages of an articulated gooseneck boom GB, shown in full lines, over a fixed gooseneck boom 12, shown in dotted lines. As can be seen, the digging profile DP_1 for the fixed gooseneck boom 12 is substantially smaller than the digging profile DP_2 of the articulated gooseneck boom GB. Not only is the dumping height h_2 of the articulated gooseneck boom GB substantially greater than the dumping height h_1 of the fixed gooseneck boom 12 but the reach R is greater, digging depth *d* is greater, the amount of level floor LF capable of being dug at a given depth is greater, and the articulated gooseneck boom is capable of digging closer to the machine than the fixed gooseneck boom by an amount C.

By way of specific example, the following comparisons are made between a backhoe equipped with an articulated gooseneck boom according to the present invention and a comparably sized backhoe equipped with a fixed gooseneck boom. The backhoe with an articulated gooseneck boom has a dumping height of 24 feet, 9 inches; a reach of 37 feet, 4 inches; a maximum digging depth of 27 feet, 9 inches with a 2-yard bucket; can dig an 8-foot level bottom at a depth of 26 feet, 4 inches; and can dig 6 feet or 7 feet closer to the machine during a digging cycle than a fixed gooseneck boom equipped backhoe before it is necessary to reposition the machine. The backhoe with a fixed gooseneck boom, on the other hand, has a dumping height of only 16 feet, 9 inches; a reach of only 35 feet, 4 inches; and a maximum digging depth of only about 26 feet. The overall length in travel position of a backhoe having an articulated gooseneck boom is approximately 37 feet. With respect to the closer digging ability of an articulated gooseneck boom equipped backhoe, one example of a backhoe according to the present invention has a minimum surface reach S for digging of 1 foot, 4 inches and has an undercutting capability or the ability to dig back under the machine between the tracks nearly 11 feet.

The backhoe of the present invention may be provided with a modified hydraulic circuit to boost both the speed of operation and the power of the backhoe, as more fully described in copending application Ser. No. 702,755. Further, the track width may be made adjustable so that it is variable between about 9 feet, 10 inches in travel position and 11 feet, 2 inches in operating position, for example.

A backhoe equipped with an articulated gooseneck boom according to the present invention is capable of significantly greater production than a backhoe equipped with either a straight boom or a fixed gooseneck boom due to the substantially larger digging profile of a backhoe so equipped. This increased production is primarily due to the fact that a backhoe with an articulated gooseneck boom can dig much closer to the machine thus requiring only two-thirds as many moves as a conventional backhoe during a given amount of digging time. In addition, although a backhoe according to the present invention is capable of significantly more production than prior art backhoes and can dig a much larger trench or ditch during a digging cycle, it has smaller travel dimensions due to the fact that the gooseneck in the boom can be retracted.

While I have herein described a specific embodiment of my invention in detail, it is to be understood that various changes and modifications may be made to the structure without departing from the spirit and scope of the invention.

I claim:

1. A backhoe including a supporting vehicle and an articulated gooseneck boom comprising: a boom having a foot section pivotally connected to one end to said vehicle and extending upwardly therefrom, a point section pivotally connected at one end to the other end of said foot section and defining with said foot section a downwardly facing obtuse angle, a dipstick section pivotally connected intermediate its ends to the other end of said point section, a digging tool on one end of said dipstick, boom actuating means connected between said support vehicle and the point of pivotal interconnection of said foot section with said point section, gooseneck-actuating means connected intermediate the ends of each of said foot section and said point section, and dipstick-actuating means operatively connected between said point section and the other end of said dipstick.

2. A backhoe as in claim 1, wherein said boom-actuating means comprises hydraulically operated cylinder means.

3. A backhoe as in claim 2, wherein said gooseneck-actuating means and said dipstick-actuating means comprise hydraulically operated cylinder means.

4. A backhoe as in claim 3, wherein hydraulically operated actuating means is connected between said point section and said digging tool for actuating said digging tool.

5. A backhoe as in claim 1, wherein each of said actuating means comprises hydraulically operated cylinder means.

6. A backhoe as in claim 5 wherein attachment means are provided on said two sections and said dipstick for pivotal interconnection thereof and for connection of said hydraulic cylinder means thereto.

7. A backhoe including a supporting vehicle and an articulated gooseneck boom comprising: a boom movably attached at one end to said vehicle and extending upwardly therefrom; said boom having an articulated gooseneck formed intermediate its ends; and a dipstick attached intermediate its ends to the other end of said boom, said dipstick including a digging tool movably attached to one end thereof; said articulated gooseneck boom being in two sections interconnected through articulated joint means, hydraulically operated cylinder means connected between said two sections, said dipstick, and said bucket, respectively, for actuation thereof, attachment means on said two sections and said dipstick for pivotal interconnection thereof and for connection of said hydraulic cylinder means thereto, said articulated gooseneck boom comprising a foot section and a point section; said foot section pivotally attached at one end thereof to said supporting vehicle and said point section pivotally attached at one end thereof to the other end of said foot section; said dipstick pivotally attached intermediate its ends to the other end of said point section, said foot section comprising an elongate member and said attachment means comprising a pair of longitudinally extending side flanges at each end thereof, and a widened portion intermediate the ends thereof on the underside of said foot section defining a pair of spaced downwardly extending actuator receiving channels bounded on their sides by attaching flanges; said longitudinally extending flanges at said one end of said foot section being pinned by a pivot shaft to the support vehicle; said longitudinally extending flanges at said other end of said foot section being received in and pinned to the attachment means on said point section by a pivot shaft; and said hydraulically operated cylinder means being connected between said point section and said actuator-receiving channels on said foot section, said articulated gooseneck resulting in said backhoe having a substantially larger digging profile than is possible with either a straight boom or a fixed gooseneck boom and having a particularly greater undercutting ability.

8. A backhoe as in claim 7 wherein said attachment means on said point section comprises a pair of spaced rearwardly extending flange receiving channels formed in said one end of said point section and receiving said longitudinally extending side flanges on said other end of said foot section; a rearwardly extending flange outwardly of each of said channels and having formed therein a first pair of actuator-receiving channels in alignment with said flange-receiving channels; downwardly extending flanges on the underside of said point section spaced from the end thereof, said flanges defining a second pair of actuator-receiving channels; said hydraulically operated cylinder means comprising a pair of hydraulically operated gooseneck cylinders attached between the foot section and point section with opposite ends thereof received in the actuator-receiving channels on said foot section and the

second actuator-receiving channels on the point section; and a pair of hydraulically operated hoist cylinders connected between said support vehicle and said first pair of actuator receiving channels on said point section.

9. A backhoe as in claim 8 wherein said attachment means on said point section includes an upstanding attachment plate or flange spaced from said one end of said point section and having a third actuator-receiving channel formed therein; and a hydraulically operated dipstick cylinder connected between said third actuator-receiving channel and the other end of said dipstick, said dipstick being pivotally connected intermediate its ends between a pair of attaching plates carried by said other end of said point section.