

Dec. 20, 1949

T. K. ANDERSEN

2,491,793

TRENCH DIGGER

Filed Nov. 6, 1945

3 Sheets-Sheet 1

Fig. 1.

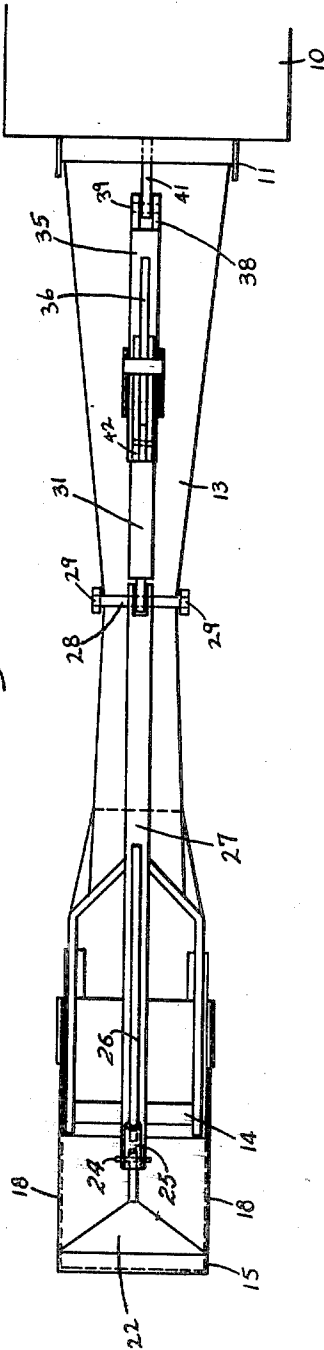
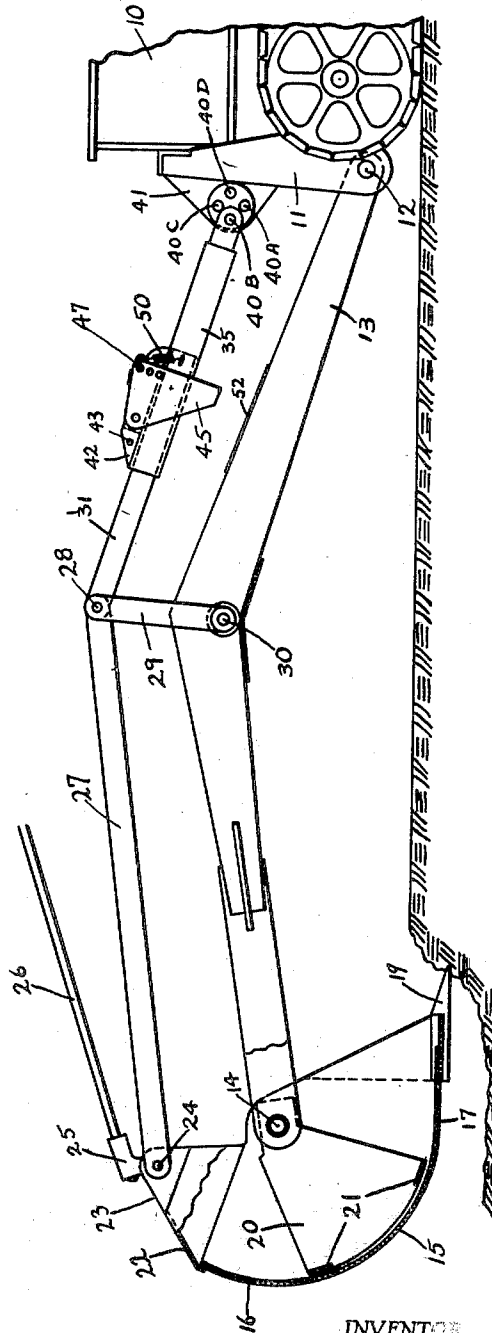


Fig. 2.



INVENTOR

Thomas K. Andersen

BY

Geo B Rawlings.

ATTORNEY.

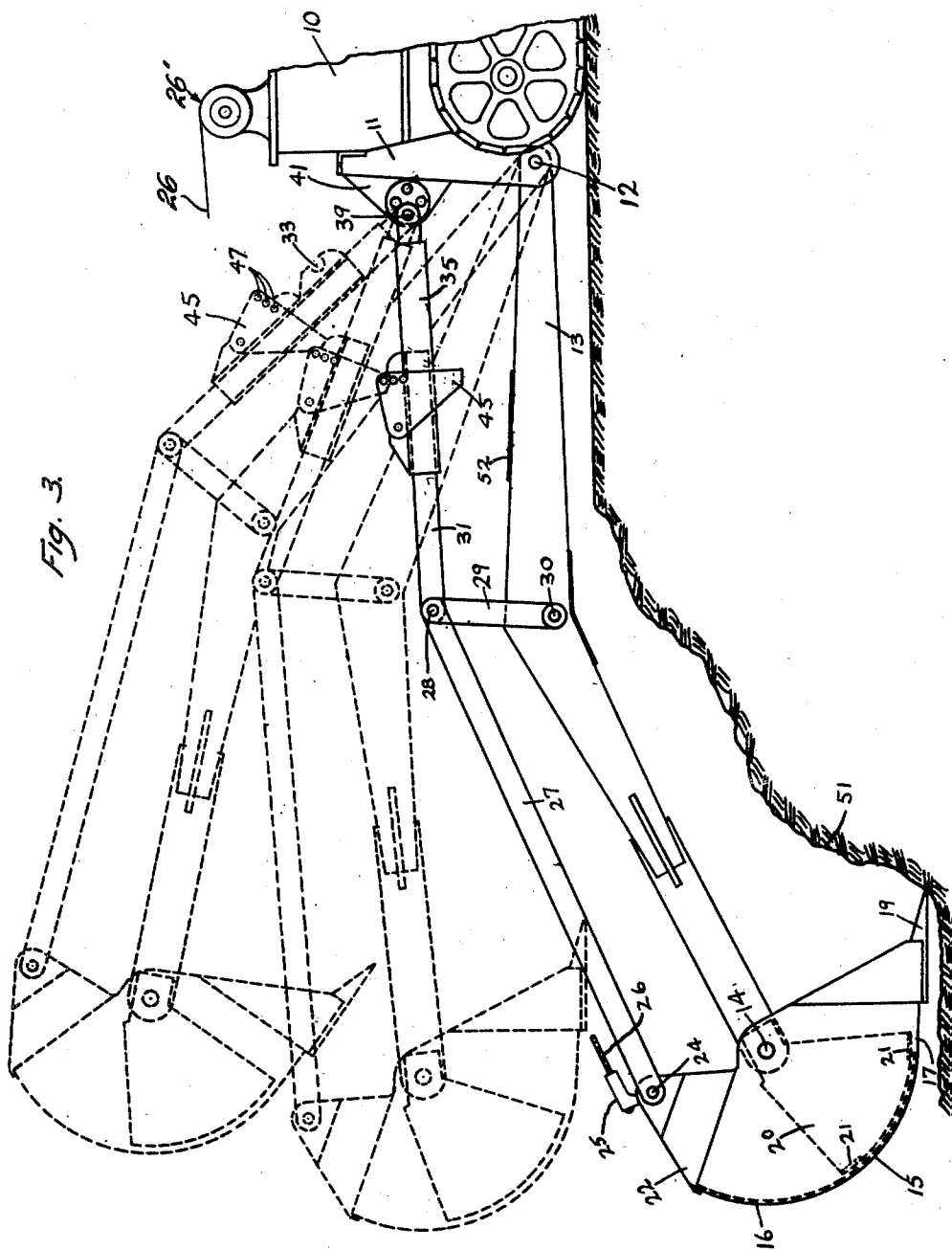
Dec. 20, 1949

T. K. ANDERSEN
TRENCH DIGGER

2,491,793

Filed Nov. 6, 1945

3 Sheets-Sheet 2



INVENTOR.

Thomas H. Andersen

BY

G. B. Rawlings.

ATTORNEY.

Dec. 20, 1949

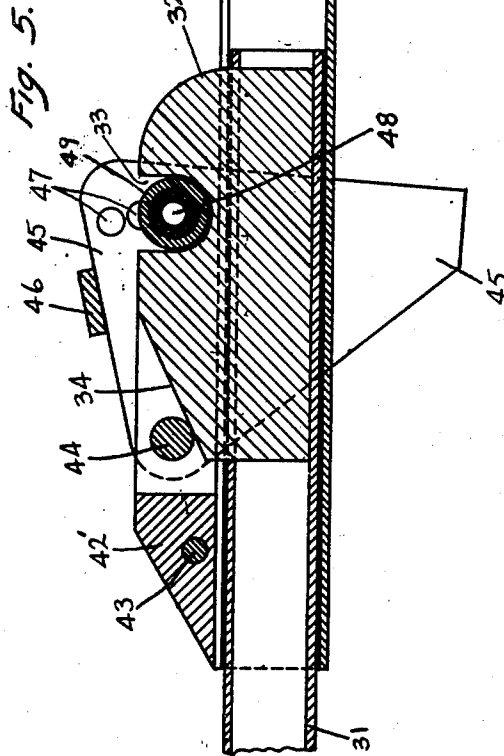
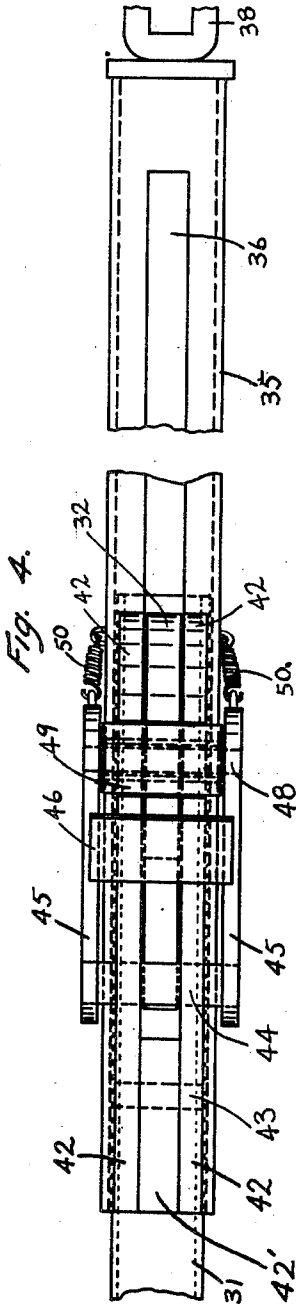
T. K. ANDERSEN

2,491,793

TRENCH DIGGER

Filed Nov. 6, 1945

3 Sheets-Sheet 3



INVENTOR.
Thomas H. Andersen
BY
Bro. B. Rawlings.
ATTORNEY.

UNITED STATES PATENT OFFICE

2,491,793

TRENCH DIGGER

Thomas K. Andersen, Staten Island, N. Y.

Application November 6, 1945, Serial No. 626,935

4 Claims. (Cl. 37-103)

1

The present invention relates to a trench digging or back-hoe device adapted for attachment to a tractor or other self-propelled vehicle, and is a further development of the apparatus shown and described in No. 2,365,164 patent granted to me on December 19, 1944.

In my present invention I have simplified the apparatus, particularly with regard to the means employed for controlling the tilting and positioning of the bucket with relation to the trench being dug, and for emptying the bucket when the same is brought to the unloading or dumping position. Also, the boom and the apparatus connected have been greatly simplified and improved.

The principal object of my invention is to provide a trench digging apparatus having a minimum of relatively simple parts, and adapted for attachment to a tractor or other vehicle, for the purpose of digging trenches or doing other similar excavating work, and which is relatively inexpensive in cost, sturdy in construction, and reliable in operation.

Other objects and advantages of my invention will appear as this description proceeds.

According to my present invention, I positively and automatically control the position of the digging bucket with reference to the boom from which it is pivotally suspended through the successive position of digging, filling, raising, and dumping and during return of the empty bucket to position to repeat the digging operation.

This control is achieved with the minimum manipulation of the tractor and enables the bucket to be adjusted through a wide range of digging angles consistent with digging conditions at any particular time in the excavation of the trench. It also avoids the necessity for using power means such as the hand brake disclosed in my aforesaid patent for tilting the bucket and yet enables the bottom of the bucket to be located in a fixed plane with relation to the ground regardless of the elevation or depression of the boom, that is to say, the bucket may be held in the same plane during the raising or lowering the boom as it occupied when the boom was level, or may be varied by a simple adjustment.

Moreover my bucket automatically dumps when the boom reaches a pre-determined point in its movement between level and elevated positions, which point may be adjusted at will by a simple manual operation.

In the accompanying drawings wherein I have shown a preferred embodiment of my invention:

Figure 1 is a plan view of a trench digger or

2

back-hoe secured in operative relation to a tractor of the crawler type.

Figure 2 is a side elevation of the apparatus shown in Figure 1.

Figure 3 is a side elevation of the apparatus shown in Figures 1 and 2, and in trench digging position, various positions of the bucket supporting boom and the operating mechanism being shown in dotted lines.

Figure 4 is a plan view of a portion of the operating mechanism of the bucket, and

Figure 5 is a sectional side elevation of the mechanism shown in Figure 4.

Referring to the drawings, and particularly to Figures 1, 2, and 3, there is shown at 10 a tractor of the crawler type having secured to the framework thereof, in any suitable manner, a vertically arranged support 11, at the lower end of which is arranged a horizontal shaft 12 on which is pivotally mounted the forward end of a boom 13. Boom 13 is disposed in the fore and aft line of the tractor. It is rigid with the tractor so as to swing laterally with the tractor when the tractor is swung laterally, and is also adapted to be swung through a vertical arc of considerable length relative to the tractor from a digging position on the ground to a dumping position at a considerable distance above the ground.

The forward end of the boom is constructed of suitable structural steel, and extends generally upwardly and rearwardly from the pivot shaft 12 and thence downwardly and rearwardly. At the rear end of the boom is arranged a transverse pivot shaft 14 on which is rotatably mounted a digging implement, as the bucket 15.

The bucket 15 is in the general form of an open front, closed back scoop having a substantially vertical back 16 merging into a substantially horizontal bottom wall 17, and spaced side walls 18 connecting said back and bottom walls. On the forward edge of the bottom wall 17 is arranged a horizontal row of digging teeth 19.

Fixedly secured to the rear end of boom 13, between the side walls 18 of the bucket 15, and adjacent to the inner faces of the spaced side walls 18 are arcuate plates 20. Secured to plates 20 adjacent to their outer edges are cross plates 21. The curve of the lower edges of the arcuate plates 20 approximates the curve of the rear of the bucket 15, with the result that as bucket 15 rotates on shaft 14, the material that may be in the bucket is separated from the bucket by the scrapers 20 and 21 and thus is more easily dumped from the bucket.

Secured to or formed on bucket 15 at its upper

3

end is a pyramidal hood 22 having thereon, at its upper end 23, a pivot shaft 24, and a cable anchor 25. Secured to the cable anchor 25 is the rear end of a lifting cable 26 for raising and lowering the boom 13 and bucket 15. The forward end of the cable 26 is made fast to any suitable winch, or equivalent mechanism, shown diagrammatically at 26'. Where a winch is employed, it is preferably driven from the tractor motor (not shown) under the control of the operator thereof, through a suitable clutch and clutch lever (not shown). By this construction the boom 13 may be lowered to move the bucket 15 to digging position, and upwardly preparatory to being dumped.

The rotary movement of the bucket 15 to bring the same into digging position and filling the same, and for dumping the content thereof when filled is controlled by the mechanism now to be described.

Pivotally mounted on shaft 24 is the rear end of a link 27, the forward end of which is pivoted on a shaft 28 secured to the upper end of a vertically disposed pair of links 29 arranged on the sides of and preferably near the middle of the boom 13. The lower ends of links 29 are secured to the ends of a pivot shaft 30, rotatably mounted in the boom 13.

Also pivotally mounted on pivot shaft 28 is the rear end of a link section 31. This link section is bifurcated at its forward end, and in a slot formed in this end is secured a latch member 32 in which is formed a latch socket 33, (see Fig. 5) while at the rear end is a bevel face 34. The bifurcated end of link section 31 is slidably mounted in the open rear end of a link section 35, and the upper face of such link section 35 is slotted, as at 36, to permit passage of the latch member 32. Within link section 35, at its extreme forward end, is housed a coiled buffer spring 37, against which may abut the forward end of the link section 31.

Link section 35, at its forward end, is provided with a forked member 38, and is pivotally mounted on a shaft 39, which may be inserted in any one of a plurality of holes 40a, 40b, 40c and 40d formed in a vertical plate 41 mounted on or forming part of the support 11. The holes 40a, 40b, 40c and 40d are used in conjunction with the link sections 35, 31 and 27 to control the tilt of bucket 15, as will be more fully explained hereinafter.

Welded to the rear end of link section 35, on either side of slot 36, and separated by a spacer 42', are plates 42. A bolt 43, passing through plates 42, and spacer 42' holds the link section against distortion. Aligned bearings are formed in plates 42, and in such bearings is rotatably mounted a shaft 44. This shaft extends outwardly through the plates 42 and has secured thereto a pair of latch plates 45. The latch plates 45 are substantially wedge shaped, with the apex ends thereof extending downwardly to a point below link section 35 for contact with the upper surface of boom 13. The upper ends of plates 45 are secured together in any suitable manner, as by a transverse bar 46.

At the forward ends of latch plates 45 is arranged a series of aligned holes 47, these being arcuately arranged. In these aligned holes is removably mounted a shaft 48, on which, and between the latch plates 45, is rotatably mounted a latch roller 49, which cooperates with latch socket 33 to hold link sections 31 and 35 in the relation shown in Fig. 5. By varying the position of shaft 48 in the series of holes 47, the

4

projection of the latch plates 45 below link 35 may be varied.

Springs 50, secured at one end to the latch plates 45, and at their other end to link section 35, tend to hold the roller 49 in the socket 33 in the locked position shown in Fig. 5, and to return such members to the position shown after the link sections 31 and 35 have been telescoped and are again returned to their original position.

The operation of the apparatus is as follows:

In Figure 3, the apparatus is shown in full lines in the digging position to which it has been lowered by the operator in control of cable 26. When thus positioned the operator moves the tractor forward, digging the teeth 19 into the earth 51, thus filling the bucket 15.

When the bucket 15 is filled, the operator, by means of the cable 26, lifts the bucket 15 upwardly clear of the trench being dug, as shown in the dot or dash line figure immediately above the full line position shown in Figure 3. It will be noted that no rotary movement of the bucket 15 has taken place, and therefore the bottom 17 of the bucket 15 lies practically horizontal, thus retaining the load in the bucket.

The operator will now, by swinging the tractor, swing the boom 13 laterally until the bucket 15 is over the position where it is desired to deposit the load. As the bucket is lifted, the downwardly projecting latch plates 45 contact the top part of the boom 13, which may carry a wear plate 52 at this point. Such contact lifts latch plates 45 and roller 49 and permits link 31 to telescope into link 35 until its forward end contacts buffer spring 39. The telescoping of the links 31 and 35 permits the bucket 15 to rotate about its pivotal mounting 14, such rotation being caused by the weight of the material in the bucket and the pull of the cable 26. This position of the bucket is shown in the topmost dash or dot line position in Fig. 3. It will be noted that the bucket 15 is now in dumping position, and the load therein has been deposited at the required spot. The dumping operation is facilitated by the rotary movement of the bucket 15 about the fixed scrapers 20 and 21.

In order to return the empty bucket to its original position, the operator first releases the cable 26 which permits the bucket to drop until teeth 19 contact the ground.

The operator then backs up the tractor a short distance. This causes link section 31 to be pulled rearwardly away from link section 35 and roller 49 to be lifted by cam surface 34 into position to be again returned into socket 33 by the action of springs 50.

If the bifurcated end of link section 35 is connected to plate 11 at hole 40b and the bottom 17 of the bucket is in the same plane as the ground, then as bucket 15 is lifted the bottom 17 will stay in the same plane as the ground throughout its cycle.

If digging conditions are such that the bottom 17 being in the same plane as the ground will not permit the bucket to dig, then the bifurcated end of link section 35 may be connected in hole 40d. This will incline the front edge of bucket bottom 17 downwardly with relation to the ground which gives it greater digging ability. When in hole 40d, the relation of the bucket bottom 17 to the ground is also maintained throughout its lifting cycle.

If the bifurcated end of link section 35 is connected to hole 40c, the front edge of bucket bottom 17 will be somewhat downwardly inclined

5

with relation to the ground but as the bucket is lifted throughout its cycle this relationship will change until at the top of the cycle the front edge of the bucket bottom will be upwardly inclined with relation to the ground. This action would be of considerable advantage in digging and handling materials, such as sand or loose gravel, which flow easily.

If the bifurcated end of link section 35 is connected to hole 40a, the reverse of the action just described will take place.

Although I have shown my digging apparatus applied to a tractor, it obviously may be used with vehicles other than tractors. The design of the bucket or other digging implement will likewise depend upon the nature of the work to be performed. Where trenches are to be dug, such implement will take the form of a digging bucket, such as is shown in the present application. Where other excavating work is to be performed, the digging implement will be appropriately designed to best perform such work.

Various other modifications in construction and design may obviously be resorted to without departing from the spirit and scope of my invention as defined by the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent is:

1. A digging apparatus for attachment to a vehicle, comprising a boom pivotally mounted at one end upon one end of the vehicle, a digging implement pivotally mounted upon the outer end of the boom, a collapsible linkage having one end pivotally attached to said digging implement and the other end pivotally attached to one end of said vehicle, means forming part of the linkage for holding it in selected extended position, means for swinging the boom in a vertical plane about its connection to the vehicle, and means connected to said holding means and actuated by

6

said boom for releasing said holding means and to collapse and shorten said linkage when said boom is positioned at a predetermined vertical angle with respect to said vehicle.

2. A digging apparatus as set forth in claim 1, in which the linkage comprises two pivotally attached arms, the pivot connection of the two arms being pivotally connected to the boom by a connecting linkage.

3. A digging apparatus as set forth in claim 1, and in which a load releasing member is associated with the digging implement, and is immovably attached to the rear end of the boom, whereby the load in the digging implement is loosened upon swinging movement of the digging implement about its pivotal mounting during the dumping operation.

4. A digging apparatus as set forth in claim 1, and in which the linkage is formed of two pivotally attached link members, one of said members comprising two sections telescoped together, and with the means forming part of the linkage for selectively holding it in extended position constituting a releasable locking device for maintaining the members in extended position, a releasing means forming part of said locking device, and means carried by the boom to operate the releasing means of the locking device to permit telescoping of the members to thereby shorten the linkage.

THOMAS K. ANDERSEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,311,671	Larsen	Feb. 23, 1943
2,352,466	Arps	June 27, 1944
2,398,585	Hayward	Apr. 16, 1946