Dec. 10, 1963 C. W. PEWTHERS 3,113,390

MOVABLE EXCAVATING BUCKET TEETH

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Fig. 1

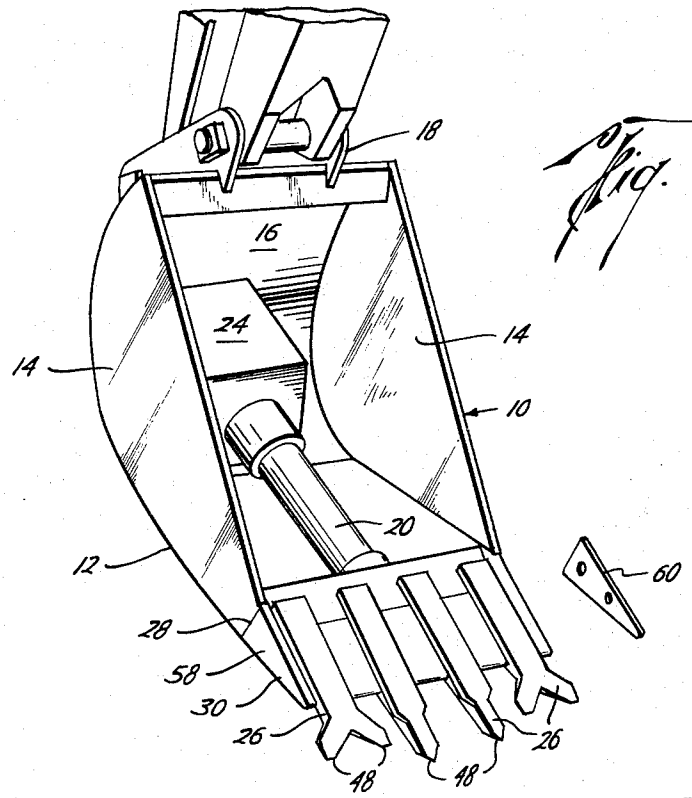
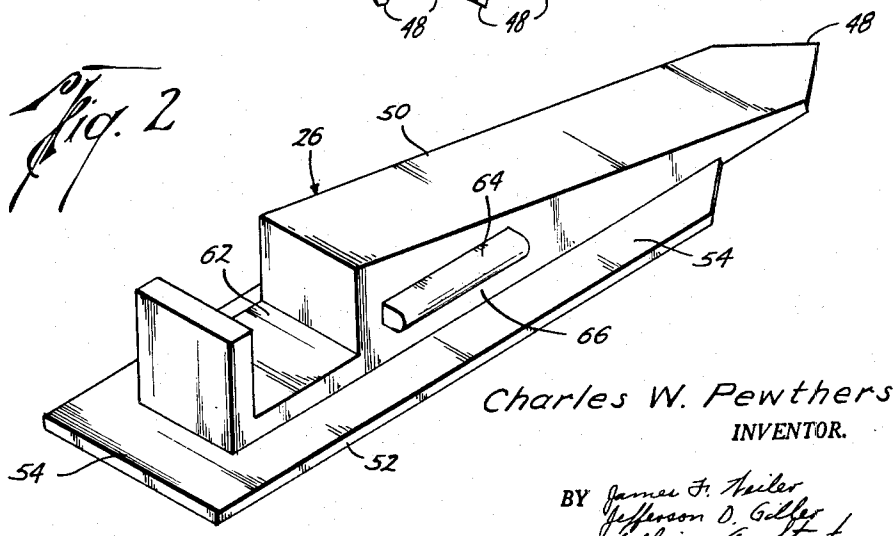


Fig. 2



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Fig. 3

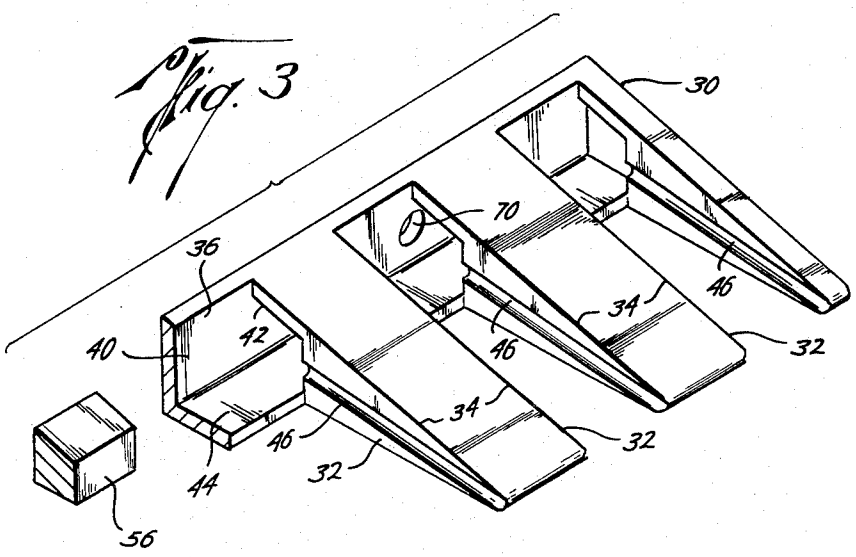
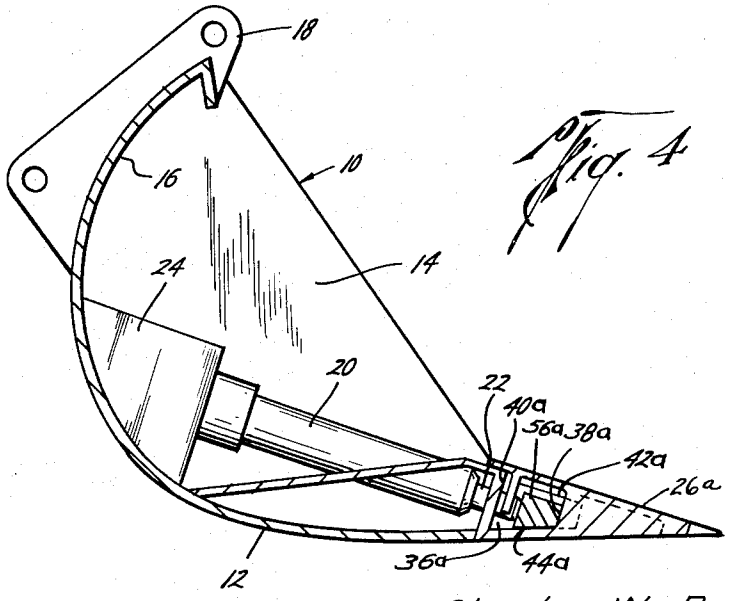


Fig. 4



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Fig. 5

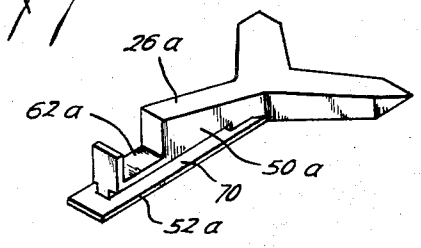


Fig. 6

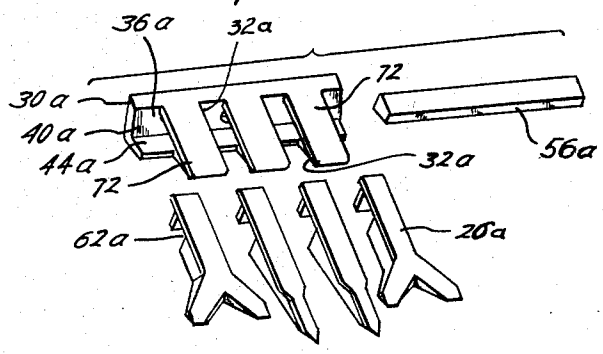
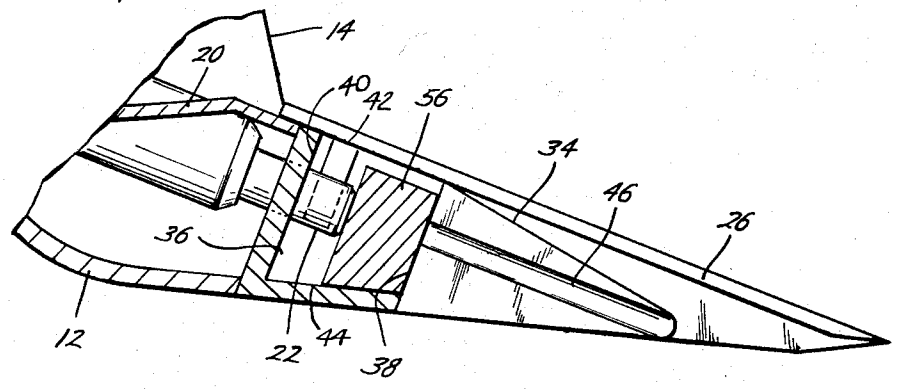


Fig. 7



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MOVABLE EXCAVATING BUCKET TEETH

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5 Claims. (Cl. 37—142)

The present invention relates to improvements in power excavating devices, and more particularly relates to improvements in movable teeth mounted at the leading edge of excavating devices. The present application is a continuation-in-part of my copending application for Power Excavating Device, Serial No. 40,455, filed July 1, 1960, now Patent No. 3,065,557.

Power driven excavating devices, such as shovels, front end loader buckets, back hoe buckets, and other types of power shoveling devices are in widespread use. In many instances, however, such excavating devices are ineffectual and substantially useless, for example, in digging in hard materials such as frozen ground, concrete surfaces, and hard rock formations and the like. And when the earth is heavy-bodied or sticky, it offers a viscous resistance to the movement of the bucket so that an extremely large amount of power is required to pass the bucket into and through the earth.

It is therefore an object of the present invention to provide a power excavating device which includes a power driven impact tooth assembly by which the device will readily and easily dig through extremely hard formations or through formations offering viscous resistance and which is relatively small, simple, compact and which does not materially increase the bulk of the excavating device or materially interfere with the normal function of the excavating device.

Yet a further object of the present invention is the provision of an improved means for removably mounting teeth on the leading edge of a power excavating device by a very simple and ruggedly efficient arrangement.

Yet a still further object of the present invention is the provision of an impacting assembly to a power excavating device in which individually movable teeth are detachably supported in position at the forward end of the excavating device and in which the teeth may be individually removed and replaced.

A still further object of the present invention is the provision of an improved tooth assembly means for removably mounting individual teeth at the forward edge of an excavating device and by which impact may be provided to a plurality of teeth by a common impact anvil shaft which may be actuated by a single impacting hammer.

A still further object of the present invention is the provision of a power excavating device which includes a plurality of individually movably mounted bucket teeth which may be driven by a single impact hammer and in which the teeth are detachably mounted on a single impact actuated means so as to be actuated simultaneously, but yet may be individually removed and replaced.

Yet a still further object of the present invention is the provision of an individually movable tooth for an excavating device which is wedge shaped to provide a relatively sharp forward edge, and which includes longitudinal guide means for coacting with an individual bucket tooth slot and includes a transverse notch for receiving an imparting member for holding the tooth in place and for impacting the tooth forwardly of the excavating device.

Other and further objects, features and advantages of the invention will be apparent from the following description of a presently preferred embodiment of the invention, given for the purpose of disclosure and taken in

conjunction with the accompanying drawings, where like character references designate like parts throughout the several views, and where,

FIGURE 1 is a perspective view illustrating a plurality of movable impact teeth of the present invention in position on a conventional power excavating bucket,

FIGURE 2 is a perspective view illustrating one form of the individual bucket teeth of FIGURE 1,

FIGURE 3 is a fragmentary, exploded view, illustrating the leading excavating bucket edge and an impact member for actuating the individual teeth of FIGURE 2 when they are placed in position,

FIGURE 4 is a side elevational view, in cross-section, illustrating the power excavating device of FIGURE 1 actuating the teeth shown in FIGURES 5 and 6,

FIGURE 5 is a perspective view illustrating another form of bucket tooth,

FIGURE 6 is a fragmentary, exploded view, illustrating the leading edge of an excavating device and an impact member which actuates the individual teeth such as the one illustrated in FIGURE 5 when placed in position, and

FIGURE 7 is a fragmentary view, in cross-section, illustrating the actuation of the teeth of FIGURE 2 in the tooth connecting assembly of FIGURE 3.

Referring now to the drawings, and particularly to FIGURE 1, a power excavating device as disclosed in my copending patent application, such as a bucket or shovel, here shown as a back hoe, is generally designated by the reference numeral 10. The power bucket 10 may take any desired shape, and ordinarily includes the bottom 12, the sides 14, and the back 16. A suitable bracket or supporting element 18 is connected to the power bucket 10 and is supported by a suitable power driven linkage, not shown, which is in turn connected to suitable power excavating machinery, for example, a tractor, not shown, in the conventional manner. Since the particular shape or configuration of the power bucket as such does not constitute the present invention and as the principles of the invention may be applied to any power bucket or shovel, no further description thereof is deemed necessary.

A suitable impact hammer 20 is mounted on the bucket 10, preferably closely adjacent the bottom wall 12 with the hammer end 22 (FIGURES 4 and 7) extending towards the front edge of the bucket for a purpose which will be more fully described hereinafter. The impact hammer 20 may be of any suitable and conventional type, but preferably is a hydraulically actuated hammer for delivering a longitudinal impact and which is driven by a hydraulic motor (not shown) disposed in a well 24 at the back of the bucket 10, all of which is shown in my copending application. Thus, as at the present time a large number of power excavating devices are actuated by machinery which includes a hydraulic system, the impact hammer 20 may be advantageously connected to and use the hydraulic system of the machinery for actuation and thereby provide a longitudinal directed impact through the shaft 22. Since the particular shape or mechanism of the impact hammer 20 as such does not constitute the present invention and as any suitable impact hammer providing a longitudinal impact may be applied and used with the individually movable bucket teeth of the present invention, no further description thereof is deemed necessary or appropriate.

In accordance with the present invention a plurality of individually movable bucket teeth or digging elements, generally indicated by the numeral 26, are releasably secured to the leading edge 28 of the power bucket 10 by a tooth connecting assembly 30. The assembly 30 generally includes a plurality of longitudinally extending

tooth receiving slots 32 (FIGURE 3) formed by a pair of sidewalls 34. The tooth receiving assembly 30 also includes a transversely extending slot 36, as best seen in FIGURES 3 and 7, formed by the front and back walls 38 and 40, the upper wall 42, and the bottom wall 44.

On either side 34 of the tooth receiving slots 32, a longitudinally extending guide support means 46 is provided to slidably coact with individual teeth for slidably mounting the teeth in the slots 32. While the coacting guide support means 46 may be of any suitable configuration, they are here shown as slots to receive a coacting longitudinally extending tooth guide 64 which will be more fully described hereinafter.

Referring particularly to FIGURE 2, in order to provide a relatively sharp forward edge 48 and still provide sufficient strength, the teeth 26 are formed generally, when viewed in the longitudinal section, in a triangular or wedge shape. Thus, a tooth body 50 is provided having a flange 52 connected to the top side of the body 50 which provides an overhang 54 about the sides and back of the top of the body 50. The body 50 is tapered forwardly towards the front end to provide the relatively sharp leading edge 48, and still is of a sufficient size and shape to coact with and receive an impact from an impact anvil means 56 (FIGURES 3 and 4).

As shown in FIGURES 3 and 7, the tooth receiving assembly 30 includes a transversely extending slot 36 which is arranged to receive an impact anvil bar 56 which may be inserted therein. The impact bar 56 may be enclosed within the assembly 30 and is prevented from moving out of the slot 36 by contacting the inner side 58 of a fixed side wall of the tooth receiving structure 30 and at the other end by a removable side wall 60 (FIGURE 1).

Referring now to FIGURE 2, it is noted that the movable tooth 26 also includes a transversely extending notch 62. This transverse tooth notch 62 is adapted to be aligned with the tooth receiving structure transverse slot 36 when the teeth 26 are mounted in the slots 32. The tooth notch 62 is also sized to receive and engage the impact bar 56 (FIGURES 3 and 7) when the bar 56 is placed in the slot 36 thereby releasably holding and securing the teeth in the tooth receiving assembly 30. Thus, the impact bar 56 may be secured in the slot 36 in the tooth receiving assembly 30 and through the anvil receiving notches 62 in each of the teeth 26 and is permitted limited reciprocating motion in a generally backward and forward direction of the teeth 26. When the impact bar 56 is driven forwardly by the impact hammer 20, the individual teeth are slidably driven forward and provide a cutting action. Since the plate 60 is removably secured to one side of the tooth receiving assembly 30 by suitable nuts and bolts (not shown) the impact bar 56 may be quickly and easily inserted and removed so as to individually replace the teeth 26 as needed. It is noted that the impact bar 56 functions also as a fastening means to hold the teeth 26 in position in the tooth receiving assembly 30.

Each of the teeth 26 is provided with a longitudinally extending guide 64 on each side which are adapted to be slidably mounted in the longitudinally extending support slot 46 at the edges of the tooth receiving slots 32 so as to slidably mount the teeth 26 into the tooth receiving slots 32. Thus, a plurality of digging teeth 26 are secured to the leading edge 28 of the bucket 10 by simply placing the teeth in position as shown in FIGURE 1 and sliding the impact bar 56 through each of the tooth notches 62.

Referring now to FIGURE 7, the impact end 22 of the hammer 20 extends through an opening 70 of the tooth receiving structure 30 (FIGURE 3) and thus is positioned adjacent and contacting the impact bar 56. Thus, the arrangement described provides a structure whereby a single actuating hammer 20 serves to simultaneously impact or move a plurality of teeth 26 which are individually slidably mounted and releasably connected to the forward edge 28 of the bucket 10. In addition, it is noted

from FIGURE 7, that the longitudinally extending guide slots 46 along the edges of the tooth receiving slots are aligned with the axis of the impact hammer 20. Thus as the teeth 26 are impacted by the impact end 22 of the hammer the guides 64 move along the slots 46 to drive the points of the teeth into the material to be excavated.

Of course, various modifications of the individual bucket teeth 26 and their coaction with the tooth receiving assembly 30 may be provided for supporting the teeth for movement forwardly of the forward wall 28. FIGURES 4, 5 and 6 illustrate modifications of the structure according to the invention, the letter "*a*" being applied to parts corresponding to those in FIGURES 1–3 and 7 for convenience of reference. The teeth 26*a* as shown in FIGURE 5 are provided with longitudinally extending guide slots 70 on each side formed in the body 50*a* adjacent to and parallel to the longitudinally extending flange 52*a*. The tooth receiving assembly 30*a* of FIGURE 6 includes a plurality of tooth receiving slots 32*a* which are formed by the longitudinally extending flanges 72. The edges of the flanges 72 fit in the longitudinally extending slots 70 of the teeth 26*a* shown in FIGURE 5 for slidably holding a plurality of digging teeth 26*a* to the leading edge of an excavating bucket. The teeth 26*a* are secured in position with the anvil bar 56*a* similarly to the teeth and tooth receiving structure shown in FIGURES 1–3 and 7. It is noted in the coaction between the teeth 26*a* and the tooth receiving structure 30*a* (FIGURES 4–6) that the tooth flange 52*a* moves parallel to and coacts with the tooth assembly flanges 72 at all times.

In use, with the tooth receiving assembly 30 suitably attached to the lower forward wall 28 of the bucket 10 the individual teeth 26 of FIGURE 2 may be quickly and easily inserted in the tooth receiving slots 32 of the tooth receiving structure 30 of FIGURE 3. The longitudinally extending slots 46 on the edges 34 of the tooth receiving slots 32 coact with the longitudinally extending guides 64 so that the teeth 26 may be slidably mounted and positioned adjacent the front edge of the bucket 10. In addition, when the teeth 26 are positioned in the slots 32, the flanges 54 cover the slot 36 and prevent rocks or other objects from entering the slot 36. Each of the individual teeth 26 is releasably secured in the tooth receiving assembly 30 by aligning the transverse tooth notches 62 with the transversely extending slot 36 and slidably inserting the impact member 56 into each of the tooth notches 62. The impact member 56, as best seen in FIGURE 7, is then in a position adjacent to and contacting the hammer end 22 of the impact hammer 20 and is secured in the tooth assembly 30 between the fixed end plate 58 and the releasably secured end plate 60 (FIGURE 1). Actuation of the hammer end 22 of the hammer 20 causes the hammer to alternately retract and impact the impact bar 56 which in turn simultaneously hammers all of the individual teeth 26 in a forward direction. Thus, upon contacting a particular formation or surface through which it is desired to dig, the operator needs merely to position the power bucket or shovel 10 to engage the surface in the usual manner for digging, and then actuate the impact hammer 20 which in turn provides an impacting blow against the anvil 56 and drives the individual teeth or digging elements 26 in a forward direction. It is not necessary to provide a biasing means to return each of the individual teeth and anvil 56 to a backward position in order to again receive the impact from the hammer. That is, the teeth 26 and anvil 56 are normally biased to a retracted position by a pressure of a bucket pushing the teeth against the excavating material as the teeth are pressed against the earth or other object being excavated and no structure is thus required to return the anvil 56 and teeth 26 to a retracted position in order to receive an impact blow from the hammer end 22.

Because of the hammer action of the individual teeth 26, a power device according to the present invention has

been highly satisfactory in penetrating extremely hard materials and formations, for example concrete, caliche, iron ore, coral, limestone, frost lines and various other hard ground formations which heretofore could not successfully be penetrated by previous power buckets and shovels.

Similarly, the teeth **26***a* of FIGURES 4, 5 and 6 coacts with the tooth receiving assembly **30***a* of FIGURE 6 in a similar manner with the exception that the longitudinally extending flanges **72** of the tooth assembly **30***a* fit into the longitudinally extending slots **70** on each side of the teeth **26***a* for slidable movement of the teeth **26***a* in the slots **32***a*. Thus, the flanges **52***a* of the teeth **26***a* move along the top of and parallel to the flange **72** of the assembly **30***a* and prevent the entry of debris into the tooth sockets **32***a*. The teeth **26***a* are secured in the slots by sliding the anvil bar **56***a* through the transverse notches **62***a* in the teeth for releasably holding the teeth attached to the leading edge of an excavating bucket (FIGURE 4).

The present invention, therefore, is well suited and adapted to attain the ends and objects mentioned herein as well as others inherent therein. While a presently preferred embodiment of the invention is given for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts may be made which are within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In an excavating bucket having an impact hammer connected thereto, a tooth receiving assembly connected to the forward wall of said bucket and including a plurality of longitudinally extending tooth receiving slots having longitudinally extending support means extending on each side of said slots supporting a tooth in each slot and a transversely extending impact bar carried by the assembly adjacent but spaced from the impact hammer and detachably connecting the teeth to the wall and for impacting said teeth forwardly, the improvement in a slidable and releasable bucket tooth comprising,

a tooth body sized to fit and including longitudinally extending and slidable guide means on each side of the body coacting with one of said slots for longitudinal movement of said tooth therein,

each tooth body having a transversely extending anvil receiving slot detachably holding the teeth to said anvil, and

said tooth body having an impact face engaging said impact bar when the impact bar is driven forwardly by the hammer thereby moving said tooth forwardly of said forward wall when the impact hammer actuates the impact bar and the teeth mounted in said slots.

2. In a tooth receiving assembly for use with an excavating bucket having an impact hammer connected thereto, said assembly including a plurality of longitudinally extending tooth receiving slots having longintudinally extending support means on each side of said slots supporting a tooth in each slot and a transversely extending impact bar carried by the assembly adjacent the impact hammer and detachably connecting the teeth to the bucket for impacting the teeth forward, the improvement in a slidable and releasable impact bucket tooth comprising,

a tooth body,

a longitudinally extending and slidable guide means on each side of the body which coacts with the slot support means for longitudinal movement of said tooth in a slot,

a flange on top of said tooth body extending transversely beyond each side of the body thereby covering a tooth receiving slot of said tooth receiving assembly, and

said tooth body including a transversely extending impact bar receiving notch at the back of the body receiving said impact bar thereby detachably supporting said tooth in said slot and receiving an impact from the impact bar.

3. The invention of claim 2 wherein the flange engages the tooth receiving assembly and is parallel to the top of the tooth receiving slot.

4. For use with an excavating bucket having an impact hammer connected thereto, a tooth receiving assembly connected to the forward edge of said bucket and including a plurality of tooth receiving slots supporting a plurality of teeth forwardly from the forward edge of the bucket, a transversely extending impact bar carried by the assembly adjacent the impact hammer and detachably connecting the teeth to the assembly for impacting the teeth forwardly when impacted forwardly by the hammer, the improvement in a slidable and releasable bucket tooth comprising,

a tooth body,

longitudinally extending and slidable guide means on each side of the body coacting with one of the slots for longitudinal movement of said tooth therein,

said tooth body having a transversely extending slot detachably holding the tooth to said impact bar, and

an impact face on said tooth body engaging the impact bar when the impact bar is driven forwardly by the hammer thereby moving the tooth forwardly of the forward edge.

5. In a tooth receiving assembly for use with an excavating bucket having a retractable hammer, said assembly including a plurality of tooth receiving slots each supporting a tooth projecting forwardly in advance of the leading edge of the bucket, and an impact receiving anvil detachably connecting each of the teeth to the assembly and supported by the assembly for limited movement in a direction for projecting the bucket teeth forwardly of the leading edge of the bucket when impacted by the hammer, the improvement in a slidable and releasable impact bucket tooth comprising,

a tooth body,

a longitudinal guide means on each side of said body slidably coacting with a slot whereby the tooth may be impacted and moved forwardly in said slot,

said tooth body having a transversely extending slot for receiving and coacting with the anvil means for detachably securing the tooth in said slot and supporting the tooth for an impact forwardly.

References Cited in the file of this patent

UNITED STATES PATENTS

305,800	Cox	Sept 30, 1884
1,333,852	Kittredge	Mar. 16, 1920
1,802,106	Bosworth	Apr. 21, 1931
1,840,002	Wallis	Jan. 5, 1932
2,427,651	Baer	Sept. 23, 1947
2,694,354	Roberg	Nov. 16, 1954
2,905,168	Henry	Sept. 22, 1959

FOREIGN PATENTS

103,025	Great Britain	Jan. 11, 1917
710,650	Great Britain	June 16, 1954