Oct. 25, 1966 E. C. HACKEL 3,280,486

RIPPER TOOTH FOR BUCKET DIGGERS AND THE LIKE

Filed Oct. 19, 1964

3 Sheets-Sheet 1

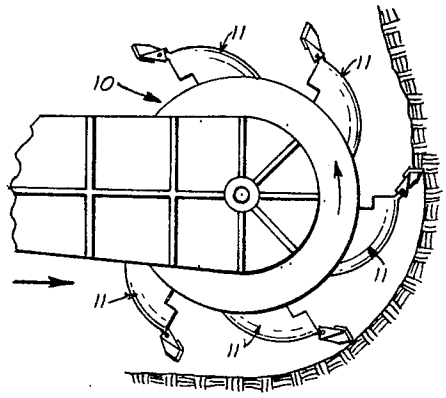


FIG. 1

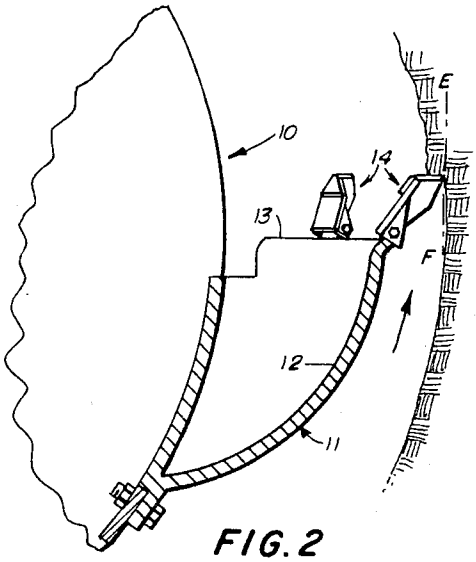


FIG. 2

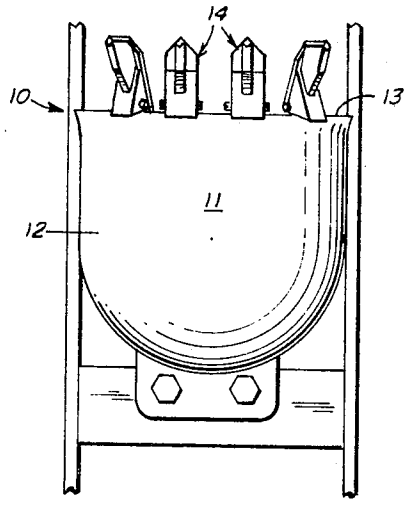


FIG. 3

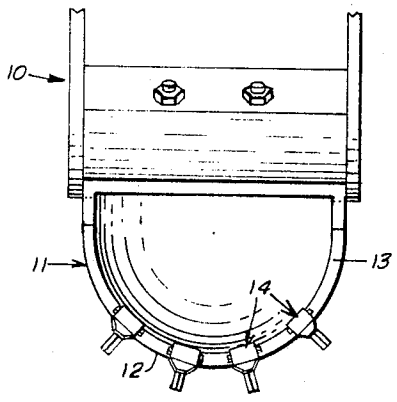


FIG. 4

INVENTOR
ERIC C. HACKEL

BY Beale and Jones
ATTORNEYS

Oct. 25, 1966 E. C. HACKEL 3,280,486

RIPPER TOOTH FOR BUCKET DIGGERS AND THE LIKE

Filed Oct. 19, 1964

3 Sheets-Sheet 2

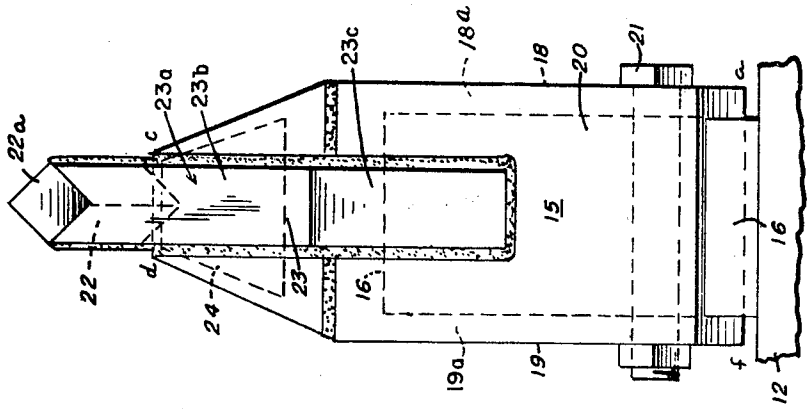


FIG. 7

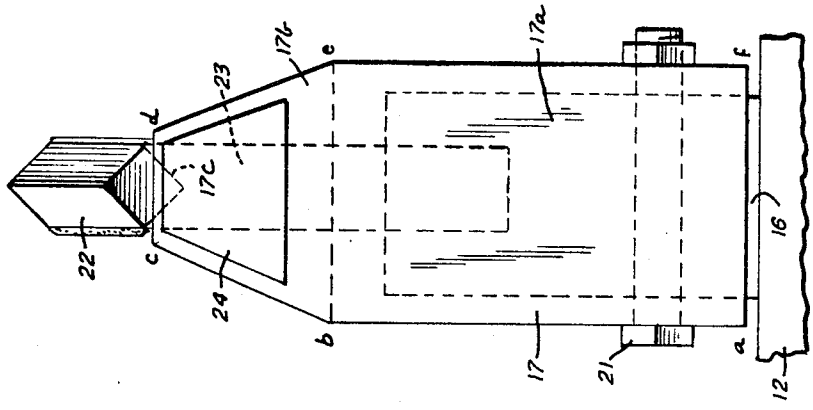


FIG. 6

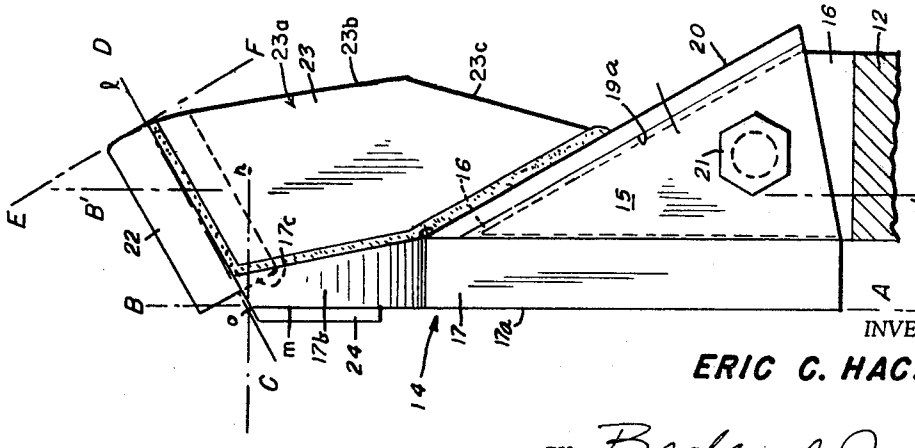


FIG. 5

INVENTOR

ERIC C. HACKEL

BY Beale and Jones

ATTORNEYS

Oct. 25, 1966 E. C. HACKEL 3,280,486

RIPPER TOOTH FOR BUCKET DIGGERS AND THE LIKE

Filed Oct. 19, 1964

3 Sheets-Sheet 3

FIG. 8

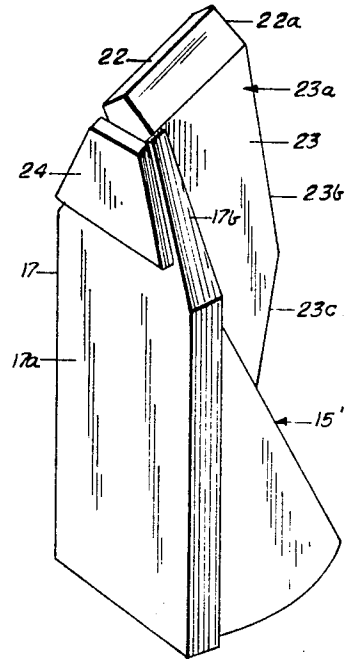
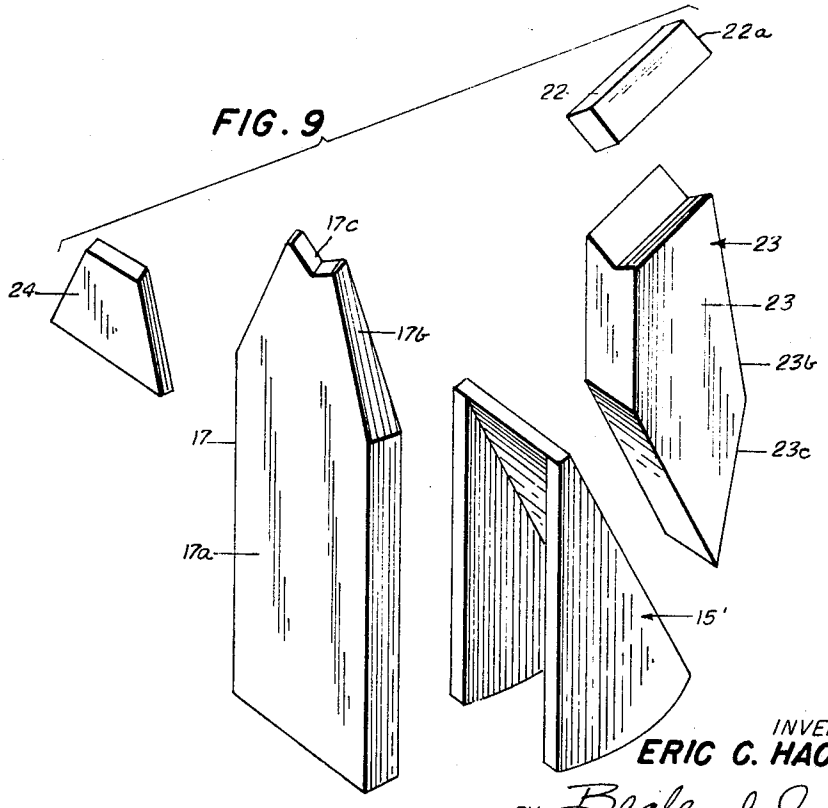


FIG. 9



INVENTOR
ERIC C. HACKEL
BY Beale and Jones
ATTORNEYS

United States Patent Office

3,280,486
Patented Oct. 25, 1966

3,280,486

RIPPER TOOTH FOR BUCKET DIGGERS AND THE LIKE

Eric C. Hackel, Edmonton, Alberta, Canada, assignor, by direct and mesne assignments, of thirty percent to Atlantic Richfield Company, a corporation of Pennsylvania, thirty percent to Cities Service Athabasca, Inc., Edmonton, Alberta, Canada, a corporation of Delaware, thirty percent to Imperial Oil Limited, a corporation of Canada, and ten percent to Royalite Oil Company, Limited, a corporation of Canada

Filed Oct. 19, 1964, Ser. No. 404,673
6 Claims. (Cl. 37—142)

This application is a continuation-in-part of my copending application Serial No. 245,917, filed December 19, 1962 and now abandoned. This invention is directed to improvements in the ripper teeth of excavating apparatus and particularly to the leading portion of the whole tooth.

In the digging of different soils and deposits and in particular tar and oil sands the wear on the teeth of the excavating equipment is highly pronounced and there is a relatively frequent down time of equipment for repair and replacement of the worn teeth. A more efficient ripping or cutting tooth is needed to provide the most efficient cutting action for abrasive, difficult digging conditions. Ripping with the apparatus of this invention assists in breaking hard materials along their natural cleavage planes and results in much less wear per unit of material moved than the usual digging chisel teeth. The desired ripping or cutting action can best be obtained through a tooth of a particular geometrical configuration and mounting to be described.

It is an object of the invention to provide an improved tooth and particularly a ripper tooth having extremely hard insert at the leading portion of the tooth at a particular attitude to perform a ripping action against the surface being dug so that the excavation material is loosened in advance of the bucket to which the tooth is attached.

A further object of the invention is to provide in a ripper tooth a reinforcement for the leading and ripping portion of the tooth.

A still further object of the invention is to provide a ripper tooth that has a leading portion of relatively great hardness and wear resistance positioned at an advantageous attitude that is supported by a relatively small profile of mounting so as to reduce the area exposed to abrasion.

Yet a still further object of the invention is to provide a ripper tooth that supports as the leading portion an insert of high wear resistance that has a relatively large exposed contact cutting edge.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should be understood, however, that the detailed description and specific example is given by way of illustration only and, while indicating a preferred embodiment of the invention, is not given by way of limitation, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

For a more complete understanding of the nature and scope of the invention reference is had to the following figures of the drawings, the description that follows and the appended claims. In the drawings:

FIG. 1 is a diagrammatic side elevation in digging position of a rotary excavator having buckets and ripper teeth attached;

FIG. 2 is a fragmentary enlarged view of a single bucket of FIG. 1 with an outline of ripper teeth attached adjacent the lip of the bucket and engaging the work;

FIG. 3 is a front elevational view of the bucket in FIG. 2;

FIG. 4 is an end on view of the bucket of FIG. 3 looking into the bucket;

FIG. 5 is a side elevational view of the digger tooth on an enlarged scale and in more detail;

FIG. 6 is a left side elevational view of the digger tooth shown in FIG. 5;

FIG. 7 is a right side elevational view of the digger tooth in FIG. 5.

FIG. 8 is a perspective view of the digger tooth on a smaller scale and with the body mounting portion slightly modified; and

FIG. 9 is an exploded view of parts of the digger tooth in FIG. 8.

Throughout the description like reference numbers refer to similar parts.

A typical rotary excavator or digger is indicated at **10** having peripherally disposed spaced apart digger buckets **11**. These buckets **11** have a wall **12** and a lip portion **13**. Mounted on the wall **12** of the bucket **11** are spaced apart ripper teeth generally indicated at **14**.

Reference to FIGS. 5, 6 and 7 shows an enlargement of a ripper tooth **14**. The tooth **14** has a body mounting portion generally indicated at **15** for mounting the tooth on the wall of a bucket. In the particular mounting illustrated the bucket wall **12** has a shank **16** projecting from the lip or leading edge of the bucket. Also in the illustration shown the mounting body **15** of the tooth is formed with a face portion **17** outlined in FIG. 6 at *a, b, c, d, e, f* shown as in the form of a plate-like member of rectangular elongated shape at its bottom portion as at **17** as by outline *a, b, e, f*, and a leading end portion **17***b* outlined at *b, c, d, e*, of isosceles trapezoidal shape. The leading end portion **17***b* presents a relatively narrow end and lessens the surface exposed to the work and diggings. The face portion **17** has in the illustration shown a planar face **17***a* in parallel alignment with the wall **12** of the bucket and has an elongated axis A–B. An elongated axis of the whole body portion **15** is indicated at A'–B' extending parallel to axis A–B.

In the form shown, the mounting body **15** is further made up of spaced apart triangular plates **18** and **19** attached to the back of the face portion **17** in a transverse attitude as by welding. The triangular plates **18** and **19** have their outer or leading edges **18***a* and **19***a* tapering toward the face portion **17** with the triangular plates **18** and **19** extending for the general length of the rectangular portion **17***a* as per outline *a, b, e, f*. Attached to the edges **18***a* and **19***a* is a transverse plate **20** to complete with the face portion **17** and with the triangular plates **18** and **19** a socket open at the rear or trailing end of the tooth. This socket portion fits over the shank **16** and

is shown here apertured to receive a pin or bolt **21** extending through suitable apertures in the plates **18** and **19**. A pin such as shown in U.S. Patent No. 2,716,822, might be used.

The elements shown in FIGS. 8 and 9 are the same as previously described except that the mounting body portion designated **15'** is slightly modified at its top edge and its side plates have an arcuate bottom edge.

Mounted on the leading end of the mounting body **15** and more particularly the end portion **17***b* as in a formed recess **17***c* extending in from the leading edge *c*, *d* is an elongated insert **22**. This elongated insert **22** is here illustrated as being square in cross section and has an elongated axis C–D extending therethrough. It is brazed in place so that its axis C–D extends at an oblique angle *l*, *o*, *m* with the longated axis A–B of the face portion **17** and so also to the elongated axis A'–B' of the whole mounting body **15**. This presents the insert at an attitude so that its elongated axis is generally perpendicular to the face of the work being dug such face being indicated by the line E–F. The outer end **22***a* of the insert **22** lies transverse to the elongated axis CD and this face **22***a* is a wear face which extends generally parallel to the face of the work being dug as indicated by the line EF. For a particular bucket arrangement as here illustrated, it has been found that the minimum oblique angle between the elongated axis C–D of the insert and the axis A–B or A'–B', i.e. angle *l*, *o*, *m*, is about 120° to 125°. Thus the angle of the elongated axis C–D of the insert with a plane perpendicular to the elongated axis A–B of the face portion **17** or the elongated axis A'–B' of the whole mounting body **15** is indicated by the angle *l*, *o*, *n* and for the particular illustrated arrangement is a minimum angle of about 30° to 35°.

Backup support for the elongated insert **22** is a web plate **23** of about the same thickness as the full width presented by the insert **22**. This reinforcing web **23** may be welded in place to the insert, the rear face of face portion **17***b* and to the adjacent plate **20**. This reinforcing web **23** may have an initial wear edge **23***a* of the shape illustrated in FIG. 5 with a portion **23***b* adjacent the insert extending at a small divergent angle to the face portion **17** of the mounting body and an edge portion **23***c* remote from the insert extending at a converging angle to the face portion **17**.

A wear piece **24** of a hard surface or carbide may be attached to the face portion **17***b* as by brazing.

The insert **22** is of hard wear resistant material. A highly beneficial material, sintered tungsten carbide having a Rockwell Hardness of 78 has been found highly acceptable. With a cutting speed ranging from about 300 to 330 ft./min., these ripper teeth according to the invention have given remarkable performance and very good life qualities. In some runs in average 40° F. surrounding air temperature with some of the face of the work frozen in digging tar sands with the teeth that do the most work, not the corner and side teeth which do not get so much wear, the average wear per hour of the insert bar has been about .006 inch with the arrangement according to this invention with a total possible wear of 1½ inches. The possible total life hours have been found to be about 250 hours. This in comparison with other ripper teeth and arrangements under like conditions has been found to be from about 6 to 8 times greater in the total life hours.

In the prior art such as in U.S. patent to Stewart et al. 2,935,801 the angle of attack and ratio of cutting area to riding area are specifically designed to provide controlled digging action which assists the advance of the conveyor and bucket into the cut face. This action is essential to such diggers. In such diggers the material separating surface of the teeth extends at an angle of about 45° to 50° with respect to the direction of travel. Even with marginal changes in the geometry of such prior art teeth there would result a loss of the desired action. Such teeth as in Stewart serve a dual purpose of cutting area and riding area and much more energy is utilized than in the tooth and mounting here described that is for cutting or ripping only and its axis extends at a 90° angle to the surface cut.

The subject tooth and mounting according to this invention provides a most efficient cutting action for abrasive, difficult digging conditions. Ripping with the tooth of this invention as mounted and utilized assists in breaking hard materials along their natural cleavage planes and results in much less wear per unit of material moved than the shaving action of normal chisel teeth such as in the prior art and the Stewart patent.

In the use of ripper teeth on buckets as illustrated, for example, not all the teeth would necessarily have to be ripper teeth.

The ripper teeth according to this invention are highly acceptable and give remarkable performance with long life resulting in low down time of machine for repair and replacement.

What is claimed as the invention is:

1. A ripper tooth for mounting on an excavating bucket, comprising in combination, a mounting body having a face portion for general alignment with a mounting wall of a bucket, a leading elongated insert member having an inner end portion mounted on the leading end portion of said mounting body with the remainder of the insert lying outside and beyond said mounting body and with its longitudinal axis extending on the opposite side of said mounting body from said face portion at an obtuse angle thereto whereby said insert axis extends generally normal to the face of the work being dug, and a reinforcing web for the insert in direct contact with a rear of the insert beyond said inner end portion and extending from said mounting body generally transverse to said face portion and having a thickness approximately equal to the width of said elongated insert and having an exposed wear edge behind the insert having a portion thereof extending in spaced relation and generally parallel to said face portion of the body.

2. A ripper tooth for mounting on an excavating bucket, comprising in combination, a mounting body having a face portion for general alignment with a mounting wall of a bucket, means for mounting the body on the bucket, a leading elongated insert member having an inner end portion mounted on the leading end portion of said mounting body with the remainders of the insert lying outside and beyond said mounting body and with its longitudinal axis extending on the opposite side of said mounting body from said face portion at an obtuse angle thereto and an outer and extreme leading end portion on the insert lying in a plane extending generally transverse to the longitudinal axis of the insert whereby said outer and extreme end portion forms a wear surface generally parallel to the surface of the engaged work and a reinforcing web for the insert extending from said mounting body in direct supporting contact with the insert in its portion extending beyond said inner end portion and having a thickness approximately equal to the width of said elongated insert, said reinforcing web having an elongated exposed wear edge behind the insert with a portion thereof extending generally parallel and spaced from said face portion of the mounting body.

3. A ripper tooth according to claim **2** wherein said longitudinal axis extends at an obtuse angle to said face of about 120°.

4. A ripper tooth according to claim **2** wherein said means on the body for mounting the body on the bucket comprises a socket to be received over a shank on the bucket.

5. A ripper tooth according to claim **4** wherein said socket is formed by two spaced apart planar members

secured to and extending generally transversely from the face portion on the same side of the face portion as extends said elongated insert, said spaced apart planar members having their outer leading edges converging toward said face portion and a plate member joining with said last mentioned outer leading edges.

6. A ripper tooth according to claim 5 wherein said reinforcing web member for said insert has its end opposite to said end supporting said elongated insert attached to said plate member of said socket.

References Cited by the Examiner

UNITED STATES PATENTS

2,033,594	3/1936	Stoody	37—142 X
2,238,081	4/1941	Soberanes	37—142
2,285,455	6/1942	Newell	37—142
2,549,088	4/1951	Hettelsater	37—189
2,935,801	5/1960	Stewart	37—142 X

ABRAHAM G. STONE, *Primary Examiner.*

WILLIAM A. SMITH, III, *Examiner.*