June 4, 1963 E. E. WUIGK 3,091,874

HIGH SPEED EXCAVATING MACHINE

Filed May 3, 1961

3 Sheets-Sheet 1

Fig. 1.

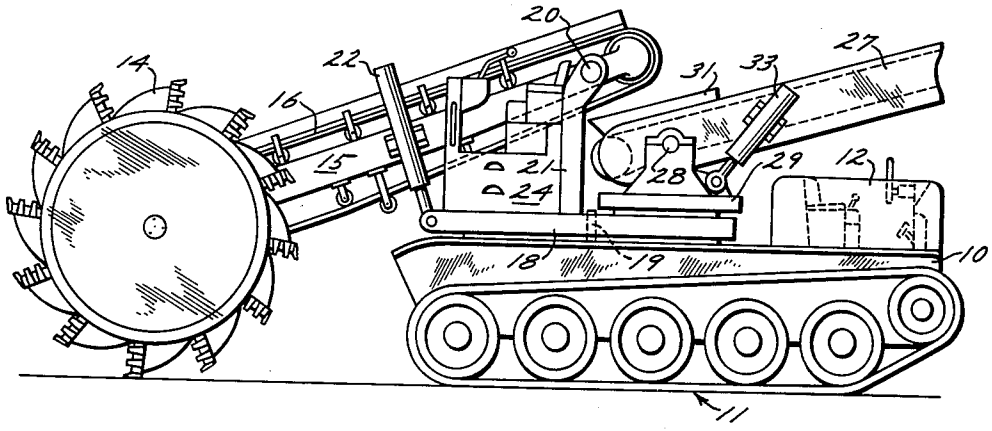
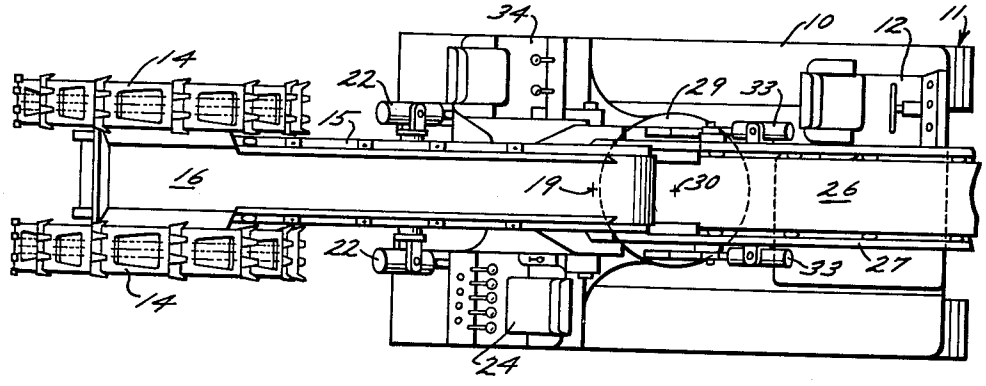


Fig. 2.



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HIGH SPEED EXCAVATING MACHINE

Filed May 3, 1961 3 Sheets-Sheet 2

Fig. 3.

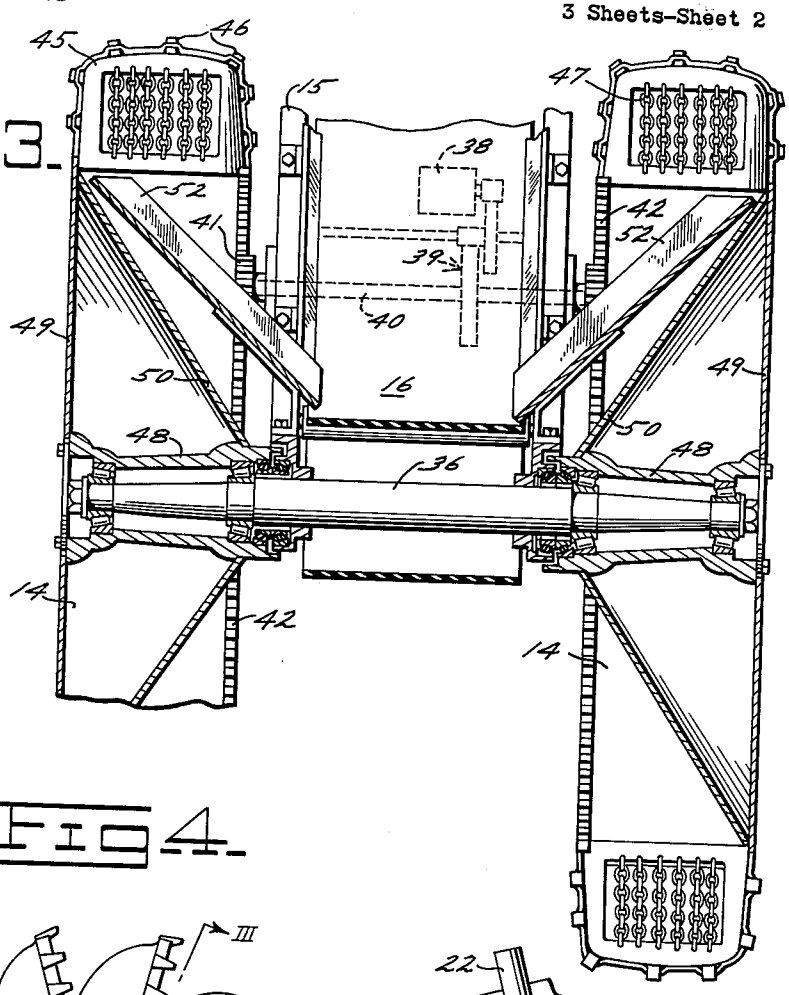
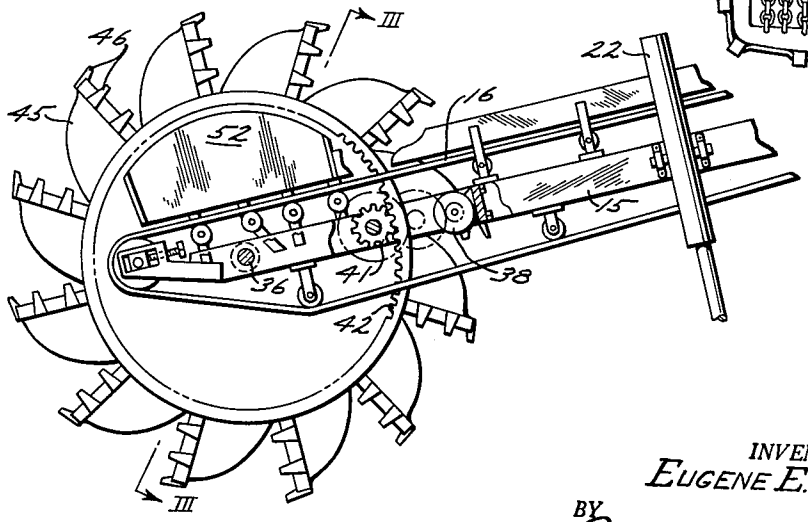


Fig. 4.



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June 4, 1963 E. E. WUIGK 3,091,874

HIGH SPEED EXCAVATING MACHINE

Filed May 3, 1961 3 Sheets-Sheet 3

Fig. 5.

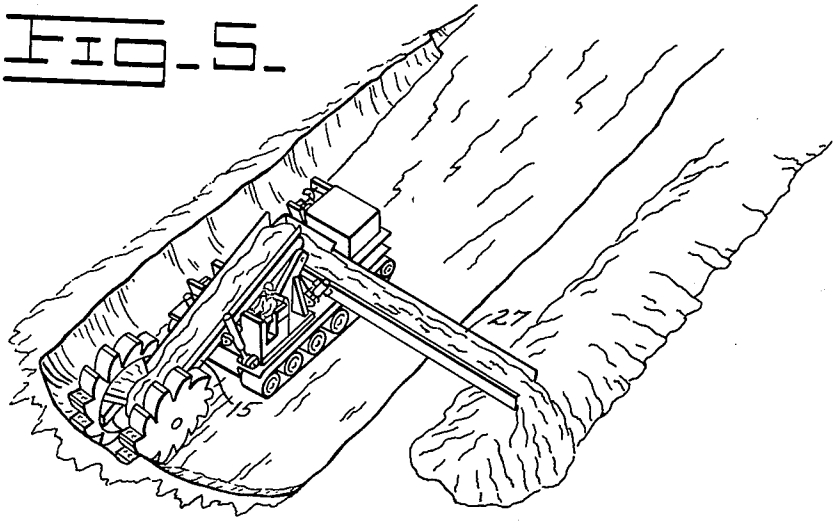


Fig. 6.

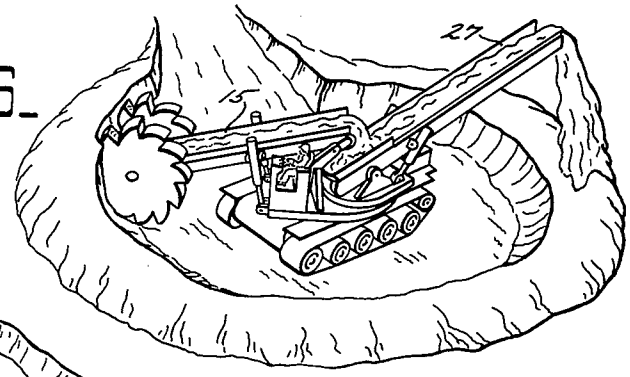
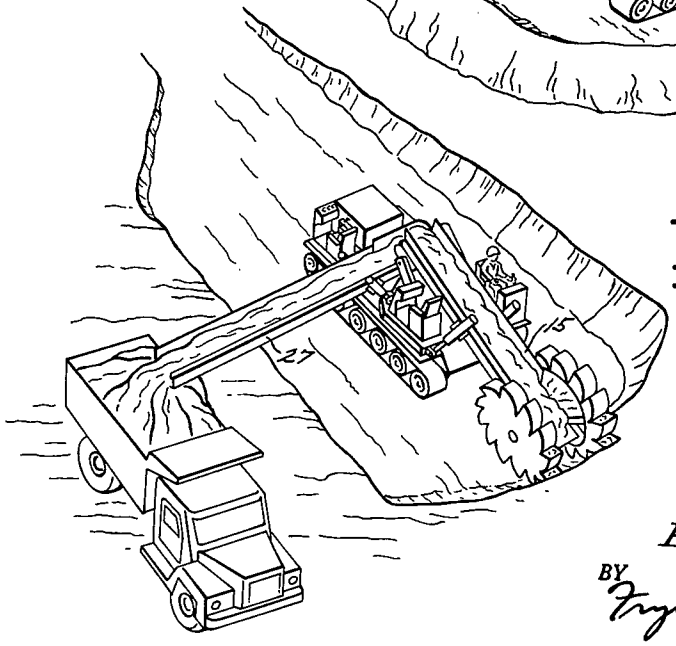


Fig. 7.



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United States Patent Office 3,091,874 Patented June 4, 1963

3,091,874

HIGH SPEED EXCAVATING MACHINE

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Filed May 3, 1961, Ser. No. 107,450
2 Claims. (Cl. 37—190)

This invention relates to machines for the excavation of earth and particularly to a machine which is mounted for ready mobility and capable of rapid excavation to very great depths and to provide cavities of many different configurations.

Machines presently employed for excavation are of two general types. One type is the cyclic type typified by a conventional tractor mounted bucket loader. The operation of such a loader is slow because each cycle includes the several steps comprising dig, raise, carry, dump and return.

The other and faster type of excavator employs a continuously moving series of excavating buckets. Some have buckets on an endless chain, as for example, a trencher which prepares ditches for laying pipe. Some carry buckets on a wheel and are used in pit mining and similar operations. Both of these bucket type machines are limited as to the depth to which they can operate and as to the type of cavity they can produce.

It is an object of the present invention to provide a high speed bucket type excavator capable of excavating to great depths and to provide vertical side wall excavations of a type suitable for use as for artillery or troop emplacements in military maneuvers as well as for other purposes.

A further object is to provide a relatively light weight highly mobile machine of this kind.

Another object is to provide a bucket wheel excavator in which a pair of bucket wheels is employed at the end of a maneuverable boom in a manner to enable the cutting of vertical banks.

Still further and more specific objects and advantages of the invention are made apparent in the following specification wherein reference is made to the accompanying drawings.

In the drawings:

FIG. 1 is a schematic view in side elevation of an excavator embodying the present invention;

FIG. 2 is a similar plan view of the same excavator;

FIG. 3 is a sectional view taken through the bucket wheels of the excavator shown in FIGS. 1 and 2 and on the line III—III of FIG. 4;

FIG. 4 is a fragmentary view in side elevation of the forward end of the boom which supports the bucket wheels with parts in section and with one bucket wheel removed;

FIG. 5 is a perspective view illustrating the machine of the present invention in use preparing a wide trench and discharging spoil in a pile disposed parallel to the trench;

FIG. 6 is a similar perspective view illustrating the use of a machine in preparation of a circular cavity and disposing spoil in a circular pile around the cavity; and

FIG. 7 is a view similar to FIG. 5 but illustrating the spoil being received by a truck for transportation to a different location.

Referring first to FIGS. 1 and 2 of the drawings, the machine of the present invention is shown as supported and capable of being transported on a mobile platform 10. This mobile platform is of conventional construction and is illustrated as having a track mechanism generally indicated 11 though it may be supported on wheels if desired. It is provided with the usual engine, drive and steering mechanism and may be operated for transportation from one site to another from an operator's station indicated at 12. A pair of excavating bucket wheels 14 is carried at the forward end of and on opposite sides of a maneuverable boom 15. A conveyor belt 16 extends throughout the length of the boom and is driven through a source of power not shown to receive earth excavated by the bucket wheels 14 and transported upwardly and rearwardly during an excavating operation.

The entire boom together with its digging wheels and conveyor belt is mounted on a turntable 18 which is pivotally supported with respect to the mobile platform 10 as at 19, the position of the center of such support also being indicated at 19 in FIG. 2. The turntable 18 is rotated by conventional power means (not shown) to swing the digging wheels at the end of the boom through an arc of 180° or more. The boom 15 is pivotally supported as at 20 on posts 21 which rise from the turntable and is capable of being raised and lowered about its pivot as by means of pair of hydraulic jacks shown at 22. An operator's station shown at 24 is also supported on the turntable 18 and is so positioned that an operator occupying the station always faces the excavating wheels with a good view of the work being performed and with suitable controls for raising and lowering the boom and adjusting the turntable.

A second conveyor or stacker belt shown at 26 in FIG. 2 is carried by a second boom 27 which is pivotally mounted as at 28 and supported on a second turntable 29 rotatable about a center 30 (see FIG. 2) on the first turntable 18. As is apparent from the relative positions of the turntable centers 19 and 30, the second turntable and the lower end of the stacker belt 26 thereon will always be disposed beneath the discharge end of the first belt 16 and a hopper structure shown at 31 is provided to receive earth from the first belt and deposit it on the second belt for delivery to a stack or truck as the case may be. The boom 27 is capable of being raised or lowered about its pivotal support 28 by means of a pair of hydraulic jacks 33. An operator's station 34 may also be mounted on the turntable with controls for an operator to vary the position of the stacker boom and belt and the operator in this case faces the stacker boom in order conveniently to observe its operation. It is, of course, possible to combine the controls of the operator's station 12 with those of the operator's station 34 so that the mobile platform 10 can be driven from place to place from station 34 eliminating the necessity of station 12.

In FIG. 3 of the drawings, the bucket wheels 14 are shown as mounted on a common shaft 36 carried adjacent the outer end of the boom 15. Conventional bearings, as shown, are provided to enable rotation of the bucket wheels. A small motor indicated at 38 preferably of the fluid type is capable of being driven by a suitable source of fluid under pressure supplied from the mobile platform 10. A reduction gear train generally indicated in dotted lines at 39 in FIG. 3 transmits power to a cross shaft 40 upon the outer ends of which are mounted gears 41 (see also FIG. 4) which mesh with internally toothed ring gears 42 carried by the bucket wheels 14. This method of driving provides a small positive drive for both wheels with the use of only one motor and a single set of reduction gearing. The individual buckets which are shown at 45 in FIGS. 3 and 4 are provided with conventional digging teeth 46 and are of the open bottom type, the opening being spanned by loosely hung chains 47 which retain earth in the buckets but when clay or other sticky material is encountered aid in expelling it as the bucket reaches the top of its circular path of travel. Each of the wheels 14 comprises a hub 48 supporting an outer flat disc member 49 and an inner conical mem-

ber **50**. This enables the buckets to be supported between member **49** and the ring gear **42** and provides space for a pair of ramps **52** best shown in FIG. 3 which are supported by the boom **15** and extend outwardly to positions beneath the buckets as they approach the top of their circular path of travel so that earth discharged by them is deposited on the ramps **52** and guided inwardly to the belt **16**. This earth is carried upwardly by the belt **16** until it is deposited in the hopper **31** and received by the belt **26** on the stacker boom. It is then carried by this belt to a stack or truck as the case may be.

The versatility of operation of a machine of this kind is illustrated in FIGS. 5, 6 and 7. In FIG. 5, the machine is illustrated as digging a wide trench by advancing forwardly with its main boom **15** swinging from side to side. The stacker boom **27** is held at right angles to the direction of movement of the machine and deposits spoil in a long stack parallel with the edge of the trench as shown.

In FIG. 6, the machine is shown as digging a circular emplacement, the boom **15** being swung in a circular path by manipulation of the turntable **18** and the boom **27** also following a circular path for deposit of the spoil around the upper edge of the emplacement.

FIG. 7 illustrates an operation similar to that of FIG. 5 with a truck receiving the spoil as the machine advances. FIGS. 6 and 7 both show a driveway formed by operation of the machine itself into the cavity being excavated. As noted in FIGS. 5 and 7, the side walls of the trench being formed are of slightly arcuate contour due to the angle of approach of the bucket wheels as the boom **15** is swung from side to side. Where substantially vertical side walls are desired, they may be trimmed by advancing the entire machine parallel to the wall with the boom of the bucket wheels in a forwardly extending slightly angled direction for making a final cut.

The machine is also capable of making a very narrow trench by swinging the bucket wheels from side to side to form a trench only wide enough to permit passage of the mobile platform therethrough.

Various minor details of construction such for example as rollers which support the conveyor belts, belt tighteners and other conventional mechanisms disclosed in the drawings but not pertinent to the present invention as well as disclosures of power units and hydraulic circuits are purposely omitted from the description as not germane and as unnecessary to an understanding of the invention hereinafter claimed.

I claim:

1. An excavator of the kind described comprising a mobile unit, a maneuverable boom carried thereby, a shaft extending transversely of the boom adjacent its outer end, two power driven bucket wheels mounted for rotation on the shaft one at each side of the boom, and buckets spaced peripherally of the wheels and having cutting edges which extend outwardly with respect to the boom at least as far as the ends of the shaft and the outermost surfaces of the wheels.

2. A combination of claim 1 in which the wheels have recessed facing surfaces extending into them substantially the full width of the buckets, ramps extending into said recesses for substantially their full width and of a length which is greater than half the diameter of the wheels for receiving spoil discharged by the buckets and directing it inwardly, and conveyor means on the boom for receiving said spoil and discharging it from the opposite end of the boom.

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