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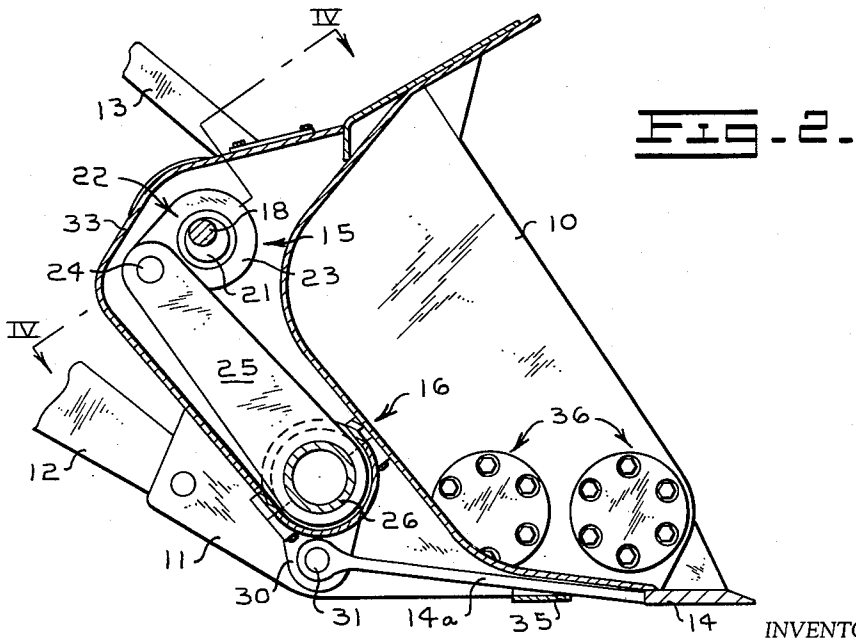
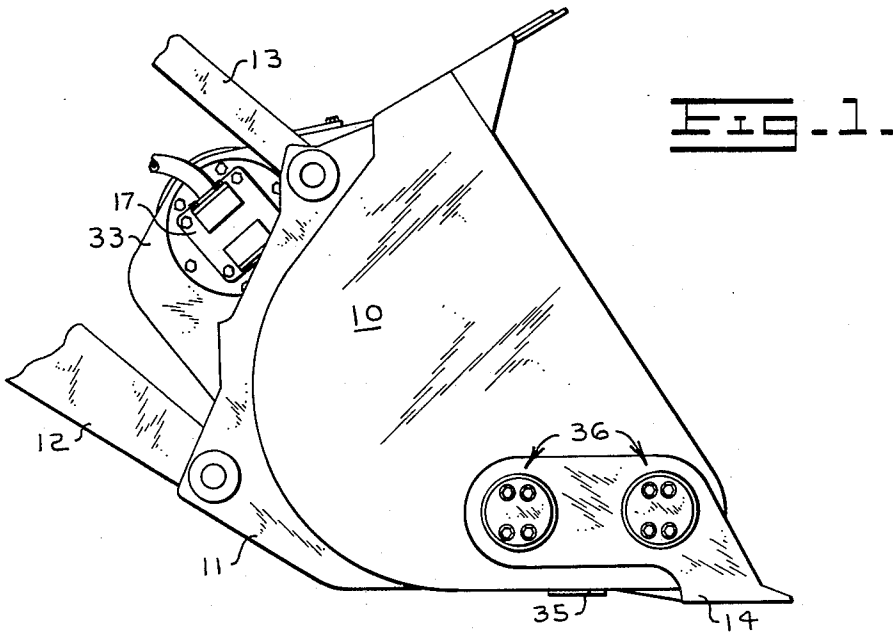
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3,238,646

LOADER BUCKET WITH A VIBRATING BLADE

Filed Aug. 20, 1962

3 Sheets-Sheet 1



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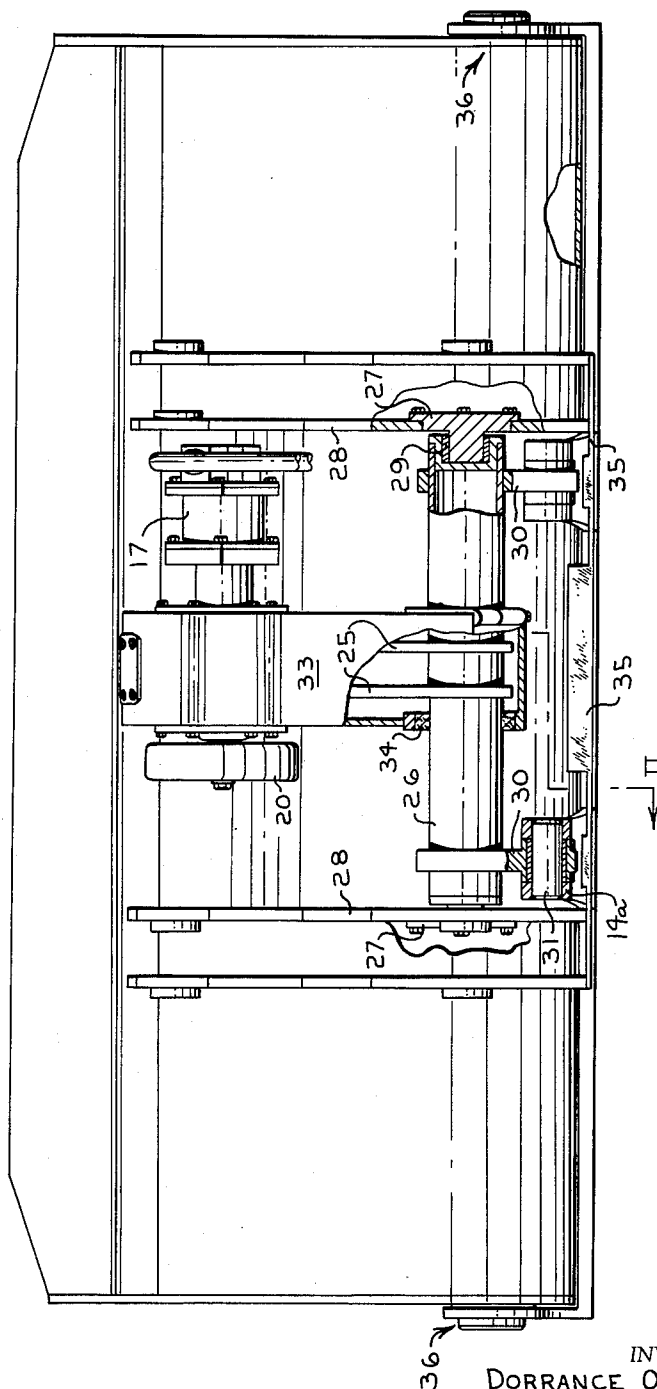
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LOADER BUCKET WITH A VIBRATING BLADE

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3 Sheets-Sheet 2



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LOADER BUCKET WITH A VIBRATING BLADE

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3 Sheets-Sheet 3

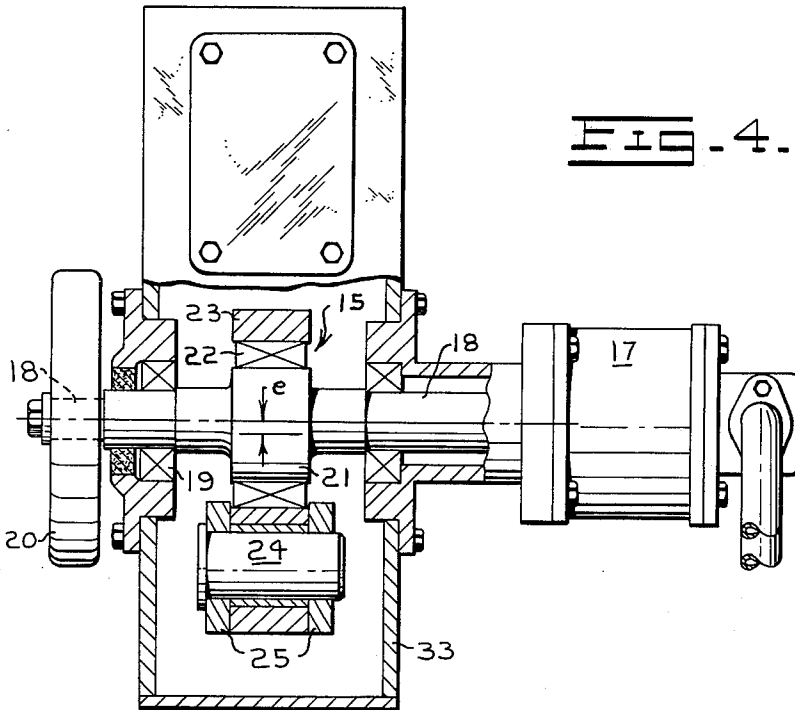


FIG. 4.

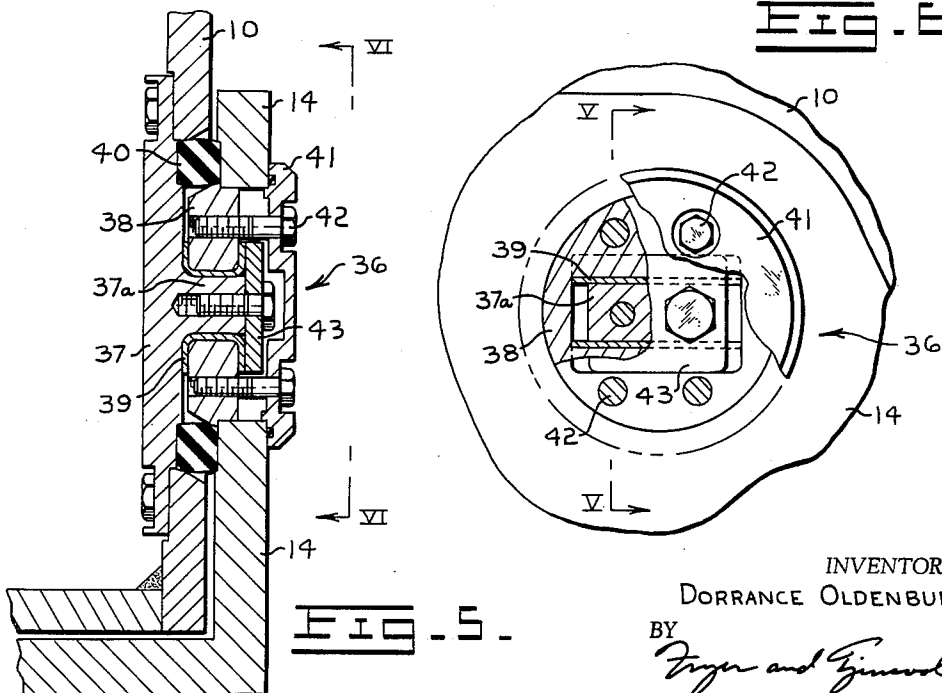


FIG. 5.

FIG. 6.

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LOADER BUCKET WITH A VIBRATING BLADE
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Tractor Co., Peoria, Ill., a corporation of California
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4 Claims. (Cl. 37—141)

This invention relates to a loader bucket with a vibrating blade and more particularly relates to means for vibrating the blade of a vehicle mounted loader bucket to increase blade penetrability and bucket loadability.

Tests have shown that the earth penetrating ability of a loader bucket blade is greatly improved by vibrating the blade in the direction of blade penetration. Such improvement is particularly noticeable in connection with the loading of hard, friable type soils. Consequently, it is possible to reduce the overall size and weight of a tractor for a given bucket size and/or to utilize a wheel-type tractor in lieu of an endless track machine when such a vibration feature is employed. Wheel-type tractors are preferred over track-type machines in many work applications due to their greater degree of mobility.

Heretofore, systems for imparting vibratory movement to a loader bucket blade have generally been complex in nature and not satisfactorily durable in construction. Also, lubrication, servicing and damage protection have provided further problems therewith.

This invention has overcome many of the above problems by providing an efficient eccentric means operatively connected to a loader bucket blade for imparting vibratory movement thereto in the direction of blade penetration. Such means is preferably operatively connected to the blade through a bellcrank assembly which is pivotally mounted on the bucket.

An object of this invention is to provide a simple and durable means for vibrating a loader bucket blade to effect efficient blade penetrability and bucket loadability.

A further object of this invention is to provide a loader bucket blade with means for efficiently imparting vibratory movement thereto, such means being so constructed and arranged that it may be readily lubricated, serviced and protected against damage during operation thereof.

Further and more specific objects of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a loader bucket arrangement employing novel concepts of this invention;

FIG. 2 is a central, sectional view taken on line II—II in FIG. 3;

FIG. 3 is a partially sectioned rear, elevational view of the bucket arrangement shown in FIG. 1 with the lift and tilt arms thereof removed for clarification purposes;

FIG. 4 is an enlarged, partially sectioned view taken on line IV—IV in FIG. 2 disclosing a portion of the actuating mechanism for the loader bucket blade;

FIG. 5 is a sectional view taken on line V—V in FIG. 6 illustrating the constructions of one of the bearing arrangements which guides the blade during vibration thereof; and

FIG. 6 is a partially sectioned, fragmentary view taken in the direction of line VI—VI in FIG. 5.

As shown in FIGS. 1 and 2, a bucket 10 is conventionally arranged on a supporting cradle 11 to be selectively actuated by laterally spaced lift arms 12 and tilt arms 13. Novel concepts of this invention are illustrated as comprising a blade 14, pivotally mounted on the loader bucket, arranged for limited to and fro movements relative thereto for earth digging and loading purposes. An eccentric means, generally shown at 15, is operatively connected through a bellcrank assembly 16 to the blade

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to effect vibration thereof. As will be hereinafter more fully understood, the above briefly described arrangement is simple and durable in construction and highly efficient in operation.

Referring more particularly to FIGS. 3 and 4, actuation means in the form of a motor 17, which may be of the hydraulic vane type, is arranged to drive a shaft 18. The drive shaft is mounted for rotation in bearings 19 and carries a flywheel 20 and eccentric 21 thereon.

The center line of the eccentric is shown in FIG. 4 as offset from the center line of shaft 18 at a distance "e." A roller bearing assembly 22 pivotally mounts a strap portion of a lever 23 on the eccentric. A stub shaft 24 pivotally mounts a pair of arms 25 of the bellcrank assembly 16 on lever 23.

As more clearly shown in FIG. 3, arms 25 are secured to a laterally extending tubular pivot shaft 26 which is pivotally mounted on stub shaft portions of brackets 27 secured to structural extensions 28 of the bucket whereon the lift and tilt arms are mounted. Bronze bushings 29 may be utilized to aid in this pivoting function. A pair of laterally spaced levers 30 also form part of the bellcrank assembly and are secured to shaft 26 and are pivotally connected to extensions 14a of the blade by pivot pins 31.

A housing 33 forms a closed lubricating oil containing compartment for the eccentric means 15 and inter-related components. Annular seals 34 are arranged between the housing and shaft 26 to prevent escape of the lubricating oil as rapid oscillation of arms 25 and shaft 26 effect splash lubrication of the components contained in the housing.

Extensions 14a of blade 14 are supported and guided for their movement on a centrally disposed strap 35, secured to the bottom surface of the bucket. Further support and guide means comprises bracket assemblies 36 mounted on the end portions of the bucket, as shown in FIG. 3. It is obvious to those skilled in the art that the inter-related supporting elements for the blade may be arranged to permit the blade to oscillate in a flat or curved plane.

FIGS. 5 and 6 more particularly disclose the bracket assembly elements each comprising a bracket 37 having a support bar portion 37a arranged in the direction of blade movement for slidably mounting a circular member 38 by means of trough-shaped bronze bushings 39. A resilient, annularly shaped seal 40 is mounted between the bucket 10 and member 38 and is adaptable to relative movements therebetween. Member 38 is attached to the blade by means of cover plate 41 and bolts 42. A plate 43 is secured to bracket 37 to retain bushings 39 and member 38 in a set, lateral position.

In operation, actuation of motor 17 (FIG. 4) by means of fluid pressure generated by a tractor driven pump causes rotation of eccentric 21 and a corresponding oscillation of lever 23 and blade 14 through bellcrank assembly 16. Oscillation of arms 25 functions to splash oil onto components of the bellcrank assembly and eccentric means for lubrication thereof.

Vertical thrusts imparted to the blade are substantially counteracted by support strap 35 and bracket assemblies 36. Bracket assemblies 36 further function to provide a sealing function thereat particularly due to the construction and arrangement of seal 40.

The required blade amplitude, frequency and the like will largely depend on the type of soils which are being worked. For example, greater amplitudes are generally required when highly elastic type soils are being loaded whereas lesser amplitudes may be employed during the loading of hard, friable type soils. Also, too high frequency of blade vibration will often tend to dissipate

excessive amounts of power to the soil and cause excessive vibration of machine components.

The power requirement for blade vibration will essentially depend on soil types, amplitude and frequency. For example, in actual practice it has been found desirable to utilize maximum power of from 40 to 45 horsepower in connection with a frequency of 750 c.p.m. and a 0.5 inch blade cutting edge motion. In further actual practice, an amplitude of 0.25 inch and frequency of 1300 c.p.m. resulted in noticeable efficient bucket loading. Also, in various hole digging tests, loadability was improved over previous types of loading apparatus by 28% in connection with the loading of hard, plastic-like blue clay soils whereas loadability increased by 16% when softer plastic-like clay soils were worked.

Thus a simple and durable loader bucket-vibrating blade arrangement is provided which assures efficient blade penetrability and bucket loadability. Also, such an arrangement may be readily lubricated, serviced and protected against damage.

I claim:

1. A loader bucket comprising lift and tilt arm means operatively connected to said bucket for selectively maintaining it in an earth carrying or digging position, a bellcrank assembly pivotally mounted on said bucket, a blade reciprocally mounted on a first arm of said bellcrank assembly which is substantially shorter than a second arm thereof, said blade arranged for to and fro movement relative to said bucket in response to pivotal movement of said bellcrank assembly, the longitudinal axis of the second arm of said bellcrank assembly arranged in substantial underlying relationship with respect to said bucket when the bucket is in earth digging position, eccentric means mounted on said bucket and operatively connected to the second arm of said bellcrank assembly for imparting vibratory movement to said blade in the direction of blade movement and lubricating means comprising a housing arranged to form a closed compartment enclosing the second arm of said bellcrank assembly and said eccentric means for lubrication thereof in response to oscillation of said second arm.

2. A loader bucket comprising a cradle operatively connected to said bucket to support said bucket, lift and tilt arms operatively connected to said cradle for selectively imparting lifting and tilting movements thereto for raising said bucket from an earth digging position to an earth carrying position, a bellcrank assembly comprising a pivot shaft pivotally mounted on said bucket, at least one first arm attached to said pivot shaft and at least one second arm attached to said pivot shaft, said second arm being substantially longer than said first arm and arranged in substantial underlying relationship to said bucket when the bucket is in earth digging position, a blade arranged on said bucket for earth penetrating purposes, said blade having at least one extension pivotally mounted to said first arm for limited to and

fro movement in response to pivotal movement of said pivot shaft, eccentric means operatively connected to the second arm of said bellcrank assembly for oscillation thereof, actuation means for selectively driving said eccentric means whereby said blade may be vibrated in the direction of blade movement and at least one bracket assembly detachably mounting said blade onto said bucket, said bracket assembly comprising a support bar portion arranged to extend in the direction of blade movement and a member slidably mounted on said support bar portion attached to said blade.

3. The invention of claim 2 further comprising annular sealing means arranged between said bucket and said member for preventing said member from being subjected to contaminants while yet permitted vibratory movements of said blade and said member.

4. A loader bucket comprising a cradle operatively connected to said bucket to support said bucket, lift and tilt arms operatively connected to said cradle for selectively imparting lifting and tilting movements thereto for raising said bucket from an earth digging position to an earth carrying position, a bellcrank assembly comprising a pivot shaft pivotally mounted on said bucket, at least one first arm attached to said pivot shaft and at least one second arm attached to said pivot shaft, said second arm being substantially longer than said first arm and arranged in substantial underlying relationship to said bucket when the bucket is in earth digging position, a blade arranged on said bucket for earth penetrating purposes, said blade having at least one extension pivotally mounted to said first arm for limited to and fro movement in response to pivotal movement of said pivot shaft, eccentric means operatively connected to the second arm of said bellcrank assembly for oscillation thereof, actuation means for selectively driving said eccentric means whereby said blade may be vibrated in the direction of blade movement and lubricating means comprising a housing arranged to form at least a closed portion of said compartment to enclose the second arm of said bellcrank assembly and said eccentric means for lubrication thereof in response to oscillation of said second arm.

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