Oct. 31, 1961 J. F. LINDELL 3,006,087

BUCKET LINE FOR TRENCHING MACHINE

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Fig. 1

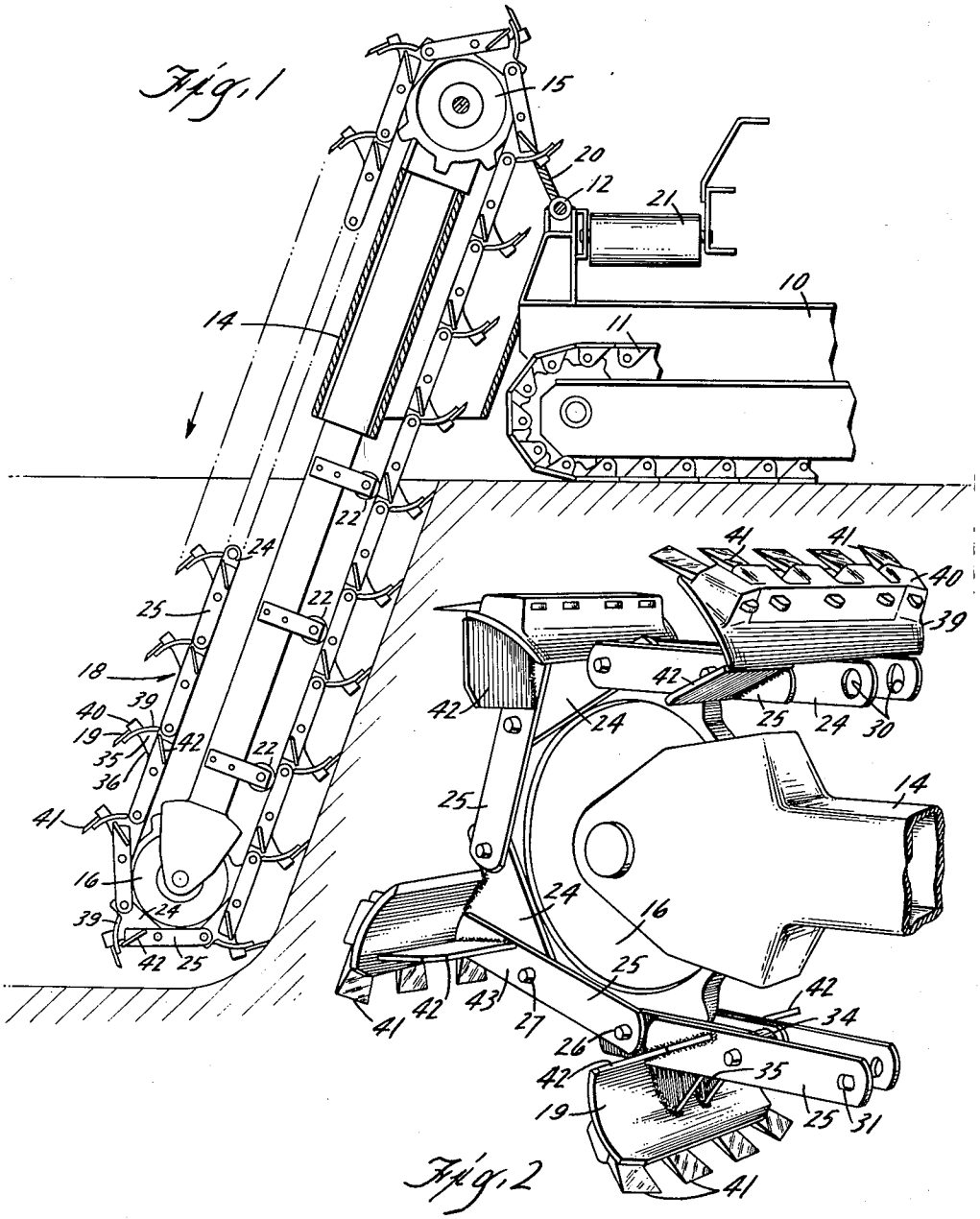


Fig. 2

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Fig. 3

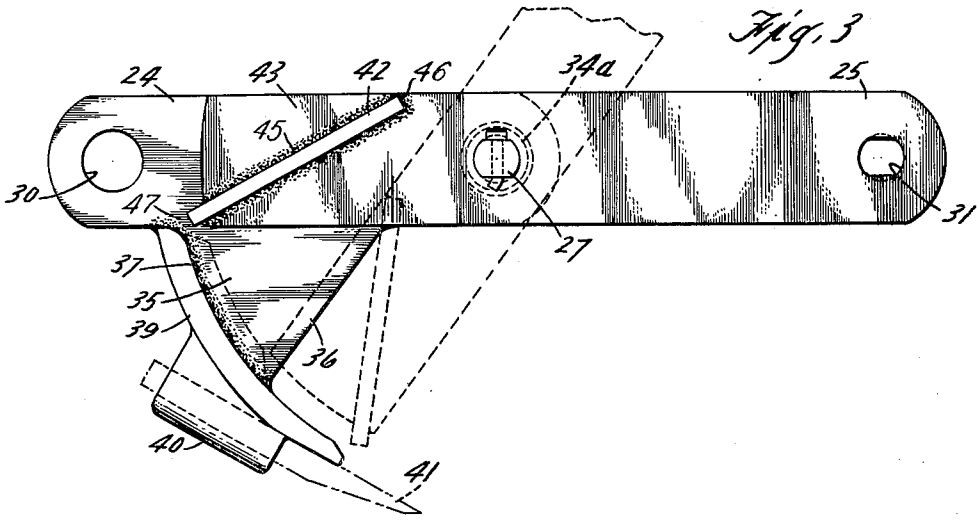
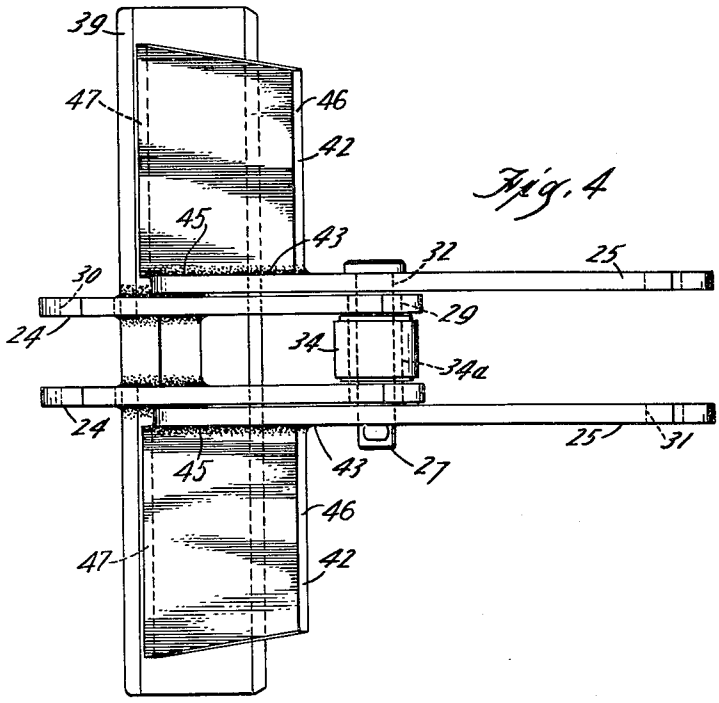


Fig. 4



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BUCKET LINE FOR TRENCHING MACHINE

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4 Claims. (Cl. 37—86)

The present invention pertains to improvements in trench-digging machines of the endless chain type and more particularly to improvements in the digger-bucket and cleaner assemblies therefor.

It is an object of the present invention to provide a novel bucket and cleaner assembly for the endless chain type of trenching machine having improved operating characteristics.

Another object of the present invention is to provide a novel arrangement of alternate digging elements and digger cleaning elements on a trenching-machine chain to increase the effective capacity of the machine and buckets.

A further object of the present invention is to reduce the maintenance and tendency of such machines to become clogged with stones and other debris.

A more detailed object is to increase the bucket capacity for a given size chain and at the same time keep both the buckets and chain free of accumulated or trapped stones and packed dirt which otherwise would reduce the efficiency of the machine and require the trenching machine to be stopped for manual cleaning.

Other objects and aims of the present invention will become apparent as the following description of the preferred embodiment of the invention proceeds, in which:

FIGURE 1 is a partial side elevation of a trenching machine shown partly in cross section illustrating a trencher chain embodying the present invention.

FIG. 2 is a perspective view of the lower end portion of the trenching machine boom showing the lower chain sprocket and a section of the digger chain with digger buckets and cleaning elements embodying the present invention.

FIG. 3 is a side elevation of a bucket link and a cleaner link of the digger chain.

FIG. 4 is bottom or inside plan view of the bucket link and cleaner link of FIG. 3.

While the invention is susceptible of various modifications and alternative constructions, the preferred embodiment is shown in the drawings and described here in detail, but it is to be understood that it is not the intention to limit the invention to the specific form disclosed, but the intention is to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, FIG. 1 shows a trenching machine carried and powered by a power driven base machine **10** which in the present instance is mounted on a crawler track **11** for mobility. Pivotally mounted on the rear of the base machine **10** by a transverse pivotal connection **12** for up and down swinging movement is a digger boom **14** of box type construction, as shown in FIG. 2 At the upper and lower ends of the swinging boom are sprockets **15**, **16**, for supporting and driving loops of endless digger chain **18** of the roller link type. The upper one of the sprockets **15** is driven by a suitable power source and transmission (not shown) on the base machine.

As shown in FIG. 1, digger buckets **19** are mounted at uniformly spaced points on the chain **18** and project outwardly therefrom for digging into the forward wall of a trench and elevating dirt from the trench to a chute **20** and transverse conveyor **21** which in turn piles the dirt on the surface of the ground at the sides of the

trench. To support the chain and keep the buckets in digging relation to the forward end of the trench the lower side of the boom **14** has a series of back-up rollers **22** which engage the inside of the chain over the lower portion of the upward travel of the buckets. Normally the forward motion of the machine and the speed of the endless digger chain **18** and buckets **19** are adjusted relative to each other depending upon the depth of the trench, type of soil being dug, and other conditions of operation in order to dig as rapidly as possible without overloading the machine.

Considering now the chain **18** in more detail, the chain is formed of alternate pairs of inside links **24** and overlapping outside links **25** pivotally connected at their ends by pivot pins **26**, **27** which pass through holes **29**, **30**, **31**, **32** in the end portions of the links. The pairs of inside links are connected by bushings **34***a* pressed in the holes **29**, **30**. Rollers **34** are mounted on said bushings between said links. Pivot pins **26**, **27** pass through axial bores in the bushings.

In carrying out the present invention, the inside links **24** carry the digging buckets **19**. For this purpose the inside links **24** each have an outwardly projecting generally triangular support section **35** intermediate its forward and rearward pivot pin receiving holes **29**, **30**. In the embodiment of the invention shown in the drawings this triangular section **35** is an integral part of the links and has a leading edge **36** which slopes rearwardly and outwardly. The inner edge of the triangular section is the juncture of the section **35** with the outer edge of the inner link **24** and the rear or trailing edge **37** is arcuate in shape. For purposes to be explained hereinafter, the trailing edge is preferably formed on a generally circular arc whose radius is substantially equal to the distance from the arc, that is the trailing edge **37**, to the center of this forward or leading pivotal connection **27**.

The bucket comprises a blade **39** formed of a single steel casting extending transversely of the inner links **24** and outwardly with respect to the chain loop. The blade **39** is fastened to the trailing arcuate edge **37** of the triangular support section **35** of each one of the pair of inner links to form a unitary rigid structure comprising the blade **39** and a pair of laterally spaced inner links **24**. The bucket blade **39**, as shown in FIGS. 2 and 4, projects beyond the sides of the chain and generally determines the width of the trench being dug. As shown in FIGS. 1 and 3, the bucket blade **39** is of arcuate cross section conforming to the shape of the trailing edge **37** of the triangular support section **35** to which the bucket is rigidly fastened as by welding. Preferably the leading or outer edge of the bucket extends outwardly in a continuing arc beyond the support section to give increased bucket capacity.

As seen by reference to FIG. 1 of the drawing, that portion of the arc defining the shape of the blade **39** influences the capacity and the cutting or digging angle of the buckets **19**. In the embodiment shown in the drawings, the arc on which the blade **39** is positioned, if extended inwardly, would be substantially normal to the line of centers of the pivotal connections **26**, **27** of the inside digger links **24**.

On the outer, rear face of the digger blade **39** sockets **40** may be formed if desired for the purpose of receiving and holding outwardly and forwardly projecting teeth or bits **41** to aid in digging into and loosening the dirt to be removed. In the specific arrangement of the drawings, four such sockets and bits are mounted on alternate ones of the buckets including the lowermost bucket, shown in FIG. 2, and five bits are shown mounted on remaining buckets as shown on the uppermost bucket in FIG. 2. The particular number and configuration of the bits may

be varied to suit the conditions in which the machine is intended to operate.

In order to increase the capacity of the buckets and also to clean them of accumulated dirt or other matter having a tendency to adhere to them, relatively movable, auxiliary transverse cleaning plates 42 are provided. In further practice of the invention, the auxiliary plates 42 are transverse projections on rearward extensions of the outer chain links 25. In more detail, the outer chain links 25 are preferably of the usual rectangular shape, but each one has an integral rearward or trailing extension 43 projecting beyond the rear pivot receiving hole 32. The trailing extension 43, which in the illustrated construction is merely a continuation of the link proper, overlaps the following inner bucket-carrying link 24 for swinging movement along the outer lateral face of the following inner link. The trailing ends of the outer link extensions are positioned immediately ahead of the rear edge 37 of the bucket support sections 35 and hence are free to swing across and adjacent to the inner face of the bucket blade 39 upon inward pivoting of the outer links relative to the bucket links.

Each one of the pair of outer links 25 has a cleaner plate 42 which comprises a metal plate of rectangular shape securely and rigidly fastened to the link 25 as by welding indicated by the numeral 45. The cleaner plates project transversely perpendicular to the face of the outer links 25 and may have a length equal to the transverse projection of the bucket blade 39, or slightly less. In the fore-and-aft directions the cleaner blades are inclined or canted with the leading edge 46 located inwardly relative to the trailing edge 47. Preferably the trailing edge 47 is positioned close to, or at, the inner edge of the bucket blade 39 which, in the illustrated embodiment, is at the juncture of the blade 39 and the inner bucket links 24 to form a bucket of generally V shape with the mouth of the V opening in the direction of chain travel.

In the present instance, the leading and trailing edges 46, 47 of the cleaner blades are adjacent the inner and outer edges, respectively, of the outer links 25 to reduce the possibility of interference of the blades to movement of the digger chain. The cleaner plates 42 on the respective right and left hand outer links 25 are also transversely alined with each other so as to form a single cleaner blade, continuous except for the space between the outer links 25, as shown in FIG. 2 and 4.

In th operation of the device described, it will be seen with reference to FIG. 1 that during downward travel of the buckets on the upper straight reach of the digger chain 18, the inner bucket links 24 and the outer, intermediate or cleaner links 25 are alined to form by cooperation of the bucket blade 39 and the two transversely extending cleaner blades 42, a downwardly opening bucket. Upon reaching the lower sprocket 16, the chain links pivot about their respective pivot pins 26, 27 to conform to the periphery of the sprocket 16. Preferably the links 24, 25 are of sufficient width to completely encase the teeth of the sprockets 15, 16 so that no stones or other foreign matter has an entrance by which to come between the chain links 24, 25 or rollers 34 and the sprockets 15, 16.

When each pair of outside links 25 pivots inwardly relative to the immediately following pair of inner or bucket links 24 in passing over the sprocket, the cleaner blades 42, being on the trailing extensions 43 of the outside links 25, are swung outwardly from the plane of the chain and sweep across the inner or working face of the bucket blade 39. As the bucket links 24 and cleaner links 25 move around and from the sprocket 16, the cleaner blades 42 swing back inwardly across the bucket blade 39 to once more form the V shaped bucket. The bucket now opens upwardly and is ready to receive dirt for lifting the same as the bucket travels upwardly on the lower reach of the digger chain.

As previously described, the arcuate shape of the bucket blade is preferably circular with its center at the forward pivotal connection 27 of the bucket link 24. Since the extension 43 supporting the cleaner blade 42 also pivots about the forward pivotal connection 27 of the bucket link, the cleaner blade 42 swings uniformly and concentrically across the inner face of the bucket blade 39.

In addition, it is to be noted that the cleaner blade 42 is free and any opposed parts of the digger chain 18 either in its outward or inward swing so that there are no opposed parts between which stones can become trapped or dirt will be packed. In this connection, the triangular support sections 35 of the bucket links serve as a shield and protector to prevent foreign matter from being trapped or packed between the inner edges of the cleaner blade extensions 43 and the outer edges of the inner links 24. For this purpose, the triangular support sections 35 extend outwardly from the inner links 24 as shown in FIG. 3 a distance greater than the outward swing of the inner edge of the cleaner blade extension 43. The extension 43 thus at all times is in overlapping relation with either the inner links 24 or the triangular support section 35.

When the bucket links 24 and intermediate or cleaner links 25 arrive at the upper end of the lifting movement, the dirt carried is discharged into the chute or guide 20. Upon passing over the upper supporting and driving sprocket 15, the links are again pivoted inwardly with the cleaner blade 42 sweeping across the inner or working face of the bucket blade 39. By such relative swing of the cleaner blade, packed dirt, clay or other adhering material is removed from the bucket blade 39 to unload and clean it for the next digging operation. The bucket blade 39 thus is traversed by the cleaner blade 42 twice, once at each sprocket, 15, 16, for each pass during which it digs and elevates dirt.

I claim as my invention:

1. For use with a trenching machine having an endless loop of digger chain, the combination comprising, a pair of laterally spaced outer links and a pair of laterally spaced inner links pivotally connected together at the rear portion of said outer links and leading portion of said inner links, said inner links having intermediate their end portions a transverse bucket blade extending substantially beyond the sides of said inner links and projecting therefrom in a direction outwardly from said loop, each outer link having a trailing extension and a transversely extending cleaner blade on the rear portion of said extension projecting laterally in a direction away from said inner links, said cleaner blade being positioned at an angle with respect to said extension with its leading edge adjacent the inner edge of said extension and its trailing edge adjacent the outer edge of said extension, said cleaner blade on each said extension being transversely alined with the cleaner blade on the other of said extensions and being positioned to cooperate with said transverse bucket blade for forming a dirt receiving bucket when said inner and outer links are in alinement and for moving across the forward face of said transverse blade upon inward pivoting movement of said outer links relative to said inner links.

2. For use with a trenching machine having an endless loop of digger chain, the combination comprising, a pair of laterally spaced inner links each having fore and aft pivotal chain connections and a support section on the outer edge thereof projecting outwardly relative to said chain loop, said support section having an arcuate trailing edge of generally circular shape with the center thereof coincident with the axis of the forward pivotal connection, a bucket blade extending transversely across and substantially beyond the outer edges of said inner links and rigidly fastened to the trailing edge of said support section, said bucket blade having a cross sectional outline conforming to the arcuate shape of the trailing edge of said support section, a pair of laterally spaced outer links each having a forward pivotal chain connection and an aft pivotal connection connected to the for-

ward pivotal connection of respective ones of said pair of inner links, said outer links each having a trailing extension and a transversely projecting cleaner blade rigidly affixed to the outer side face of said extension, said cleaner blade being inclined with its leading edge positioned inwardly of its trailing edge and having its trailing edge located adjacent the forward face of said arcuate blade for forming with said arcuate blade a dirt receiving bucket when said inner and outer links are alined and for swinging across the forward face of said arcuate blade to clean said forward face upon relative inward pivoting of said outer links.

3. For use with a trenching machine having an endless loop of digger chain, the combination comprising, a first pair of laterally spaced chain links, a second pair of leading laterally spaced chain links overlapping the leading portion of outer side faces of said first pair of links and pivotally connected thereto, each of said first pair of links having a triangularly shaped support section on the outer edge thereof projecting outwardly relative to said chain loop, said support section having a rearwardly and outwardly inclined leading edge and an arcuate trailing edge of generally arcuate shape with the center thereof substantially coincident with the axis of said pivotal connection, a bucket blade extending laterally across and substantially beyond the outer edges of said inner links and rigidly fastened to the trailing edge of said support section to form a unitary structure including said first pair of links and said blade, said bucket blade having a cross sectional outline conforming to the arcuate shape of the trailing edge of said support section, each of said second pair of links having an integral trailing extension and a transversely projecting cleaner blade rigidly affixed to the outer side face of said extension, said cleaner blade being inclined in a fore and aft direction with its leading edge adjacent the inner edge of said extension and its trailing edge located adjacent the outer edge of said extension, said cleaner blade being positioned rearwardly to locate its trailing edge adjacent the leading face of said arcuate blade for forming with said arcuate blade a dirt receiving bucket when said inner and outer links are alined and for swinging across the forward face of said arcuate blade to clean said forward face upon relative inward pivoting of said outer links, said triangular support section having its leading edge positioned forwardly and outwardly relative to said extension such that the lateral sides of said support section and said extension maintain an overlapping relationship at all positions of swing of said extension.

4. For use with a trenching machine having an endless digger chain, the combination comprising, a pair of transversely spaced leading outer links and a pair of transversely spaced trailing inner links pivotally connected together at the rear portion of said outer links and leading portion of said inner links, said trailing links each having a support section on the outer edges thereof, a transverse blade fixed to the trailing edges of said support section, and interconnecting the same, said transverse blade extending substantially beyond the sides of said inner links and having an arcuate shape opening toward said leading links, each leading link having a trailing extension and a cleaner blade projecting from the outer side face thereof in a transverse direction and having a face portion positioned substantially remote from the inner edge of said extension, said cleaner blade on each said extension being transversely alined with the cleaner blade on the other of said extensions and being positioned to cooperate with said transverse blade for moving across the forward face of said transverse blade upon inward pivoting movement of said outer links relative to said inner links, said support section and said extension being positioned relative to each other whereby their side faces are maintained in overlapping relationship in all positions of movement of said transverse blade and extensions.

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