Feb. 2, 1954 A. R. ASKUE 2,667,709

EXCAVATING CHAIN AND BUCKET MECHANISM

Original Filed April 13, 1949 3 Sheets-Sheet 1

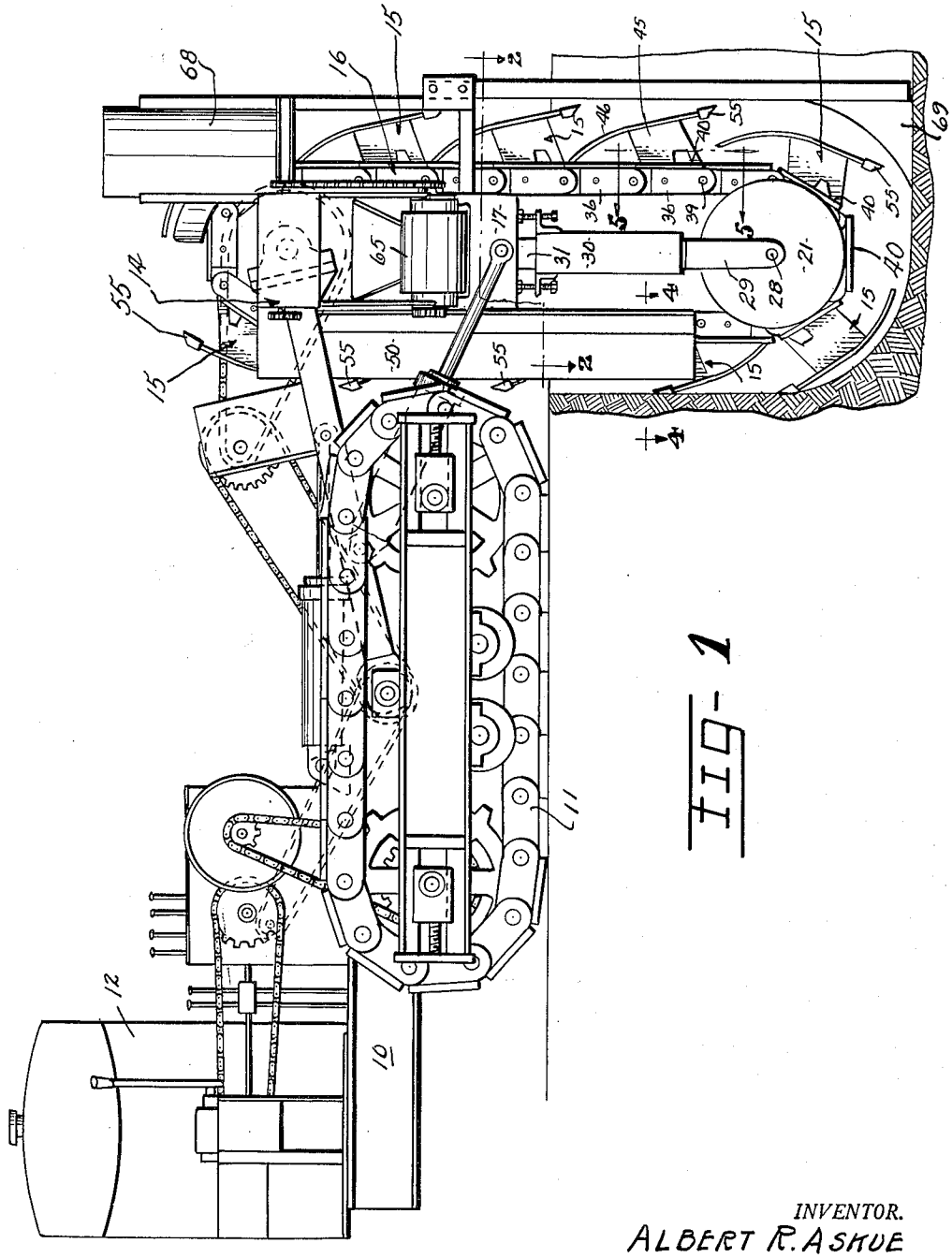

FIG. 1

INVENTOR.
ALBERT R. ASKUE
BY
Bates, Tears, & McBean
ATTORNEYS

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FIG- 2

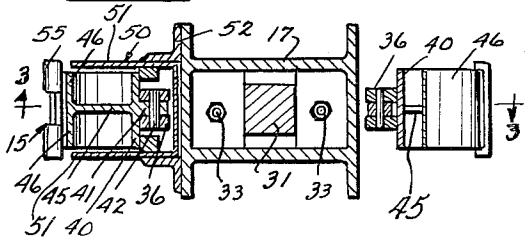
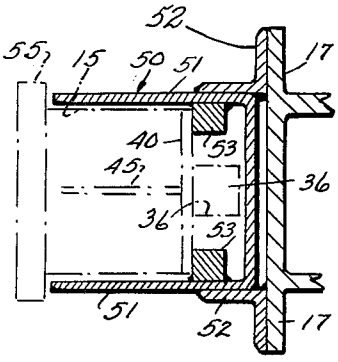


FIG- 4



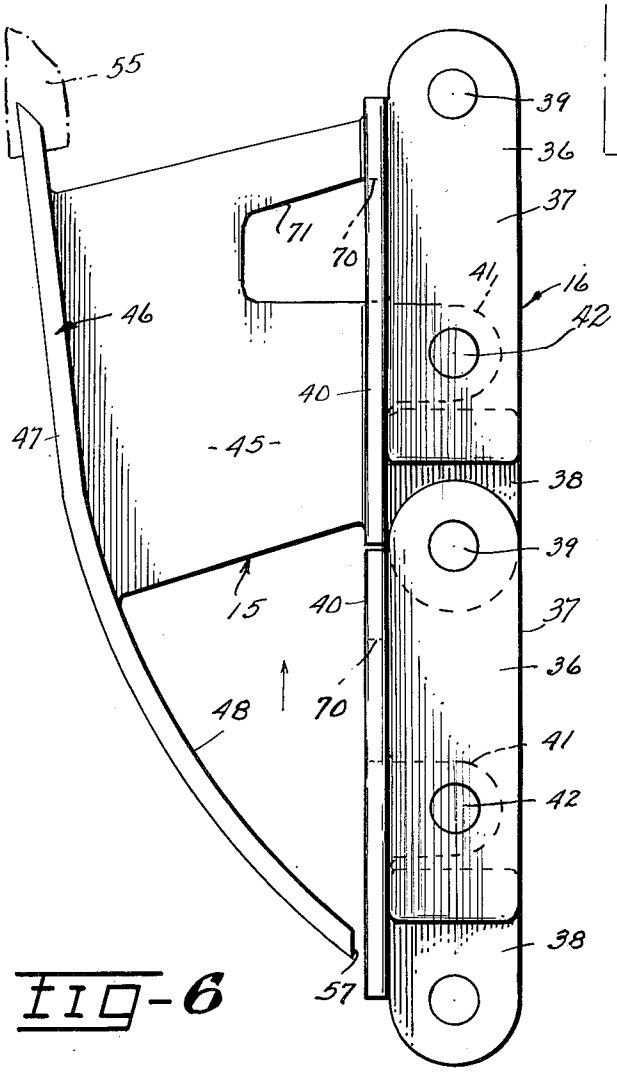
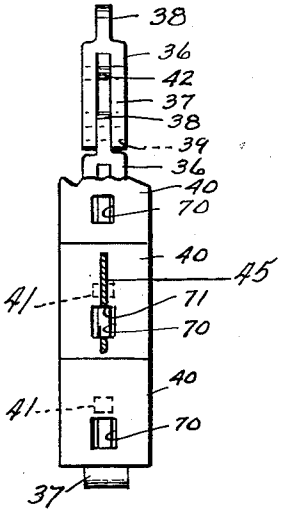


FIG- 6

FIG- 5



INVENTOR.
ALBERT R. ASKUE
BY
Bates, Teare, & McBean
ATTORNEYS

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EXCAVATING CHAIN AND BUCKET MECHANISM

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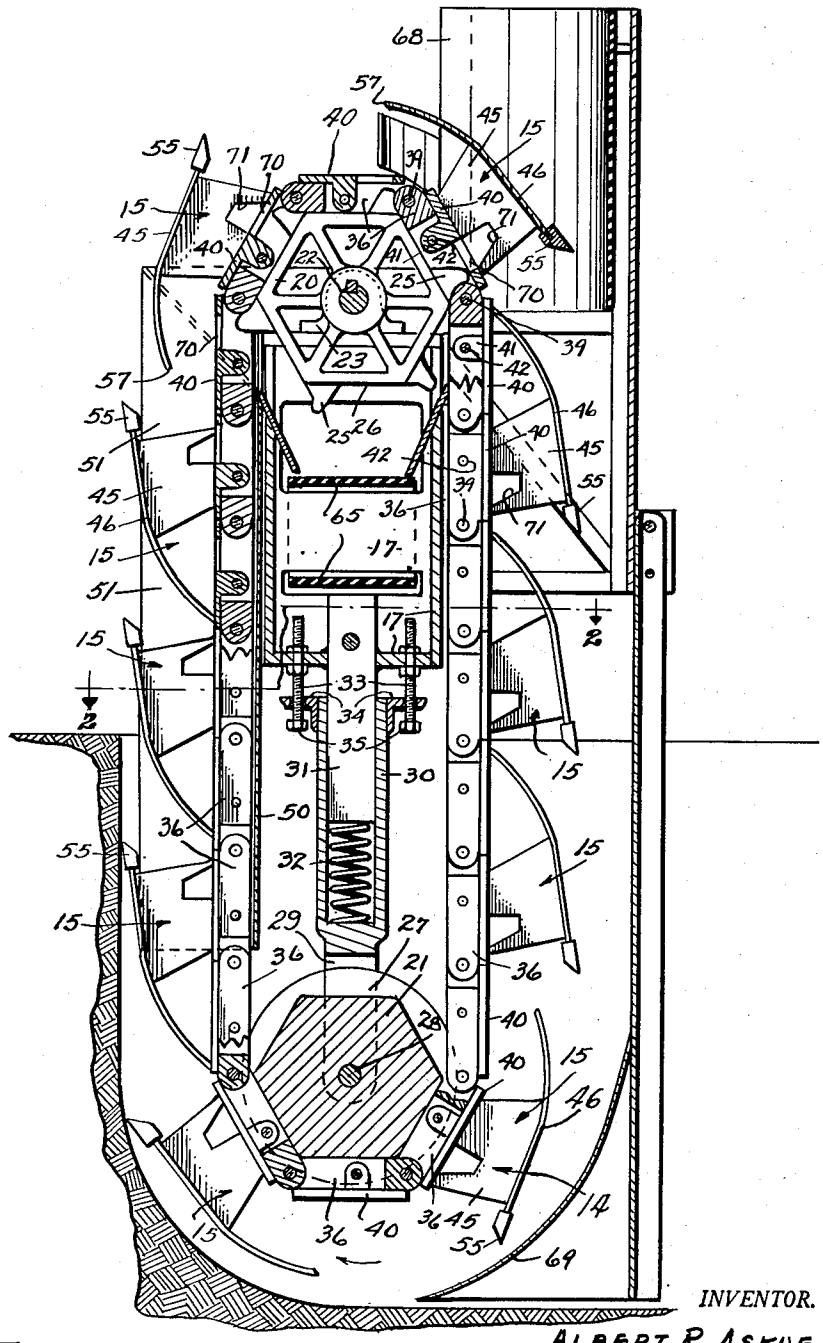

FIG. 3

INVENTOR.
BY ALBERT R. ASKUE
Bates, Teare, & McBean
ATTORNEYS

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EXCAVATING CHAIN AND BUCKET MECHANISM

Albert R. Askue, Euclid, Ohio, assignor to The Cleveland Trencher Company, Cleveland, Ohio, a corporation of Ohio

Original application April 13, 1949, Serial No. 87,217. Divided and this application May 25, 1950, Serial No. 164,242

1 Claim. (Cl. 37—83)

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This application is a division of my copending application filed April 13, 1949, and assigned Serial No. 87,217.

The present invention relates to improvements in trench excavating machines and is especially concerned with the provision of an improved soil excavating and elevating unit or chain to facilitate the construction of light weight trench excavating machine of the type used to excavate for public utility service lines, i. e., to excavate trenches between the curb and dwellings to enable the laying of underground gas, water, or sewer service lines, and the like. These, accordingly, are the general objects of the present invention.

A more specific object of the invention is the provision of an excavating chain and bucket unit for a trenching machine which will be compact, light in weight, exceedingly rugged in its construction, and capable of high speed operation under various soil conditions.

Other objects and advantages of the invention will become more apparent from the following description, reference being had to the accompanying drawings in which a preferred embodiment of the invention is illustrated. The essential novel features of the invention will be summarized in the claims.

In the drawings, Fig. 1 is a side elevation of an excavating machine illustrating an excavating unit having the improved excavating chain and bucket assembly in position thereon; Fig. 2 is a horizontal transverse section through the excavating unit, the plane of which is indicated by the lines 2—2 on Figs. 1 and 3; Fig 3 is an enlarged, substantially vertical longitudinal section taken through the excavating unit, the plane of the section being indicated by the lines 3—3 on Fig. 2; Figs. 4 and 5 are sectional details of the excavating chain and bucket unit, the planes of the sections being indicated by the correspondingly numbered lines on Fig. 1; and Fig. 6 is an enlarged side elevation of a portion of the excavating chain required for one excavating bucket.

The improved excavating chain and bucket unit has been illustrated in connection with the excavating machine of my copending application heretofore mentioned. Briefly, this machine comprises a main frame 10 supported by a pair of tractor or crawler belts 11. A power unit, or motor 12, is mounted on the frame 10 and is suitably connected to drive the crawlers 11 and to actuate the excavating chain 16 of an excavating unit 14. Suitable manually operable controls are provided to enable the operator to control the actuation of the machine as desired.

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The improved excavating chain and bucket mechanism, with which the present invention is particularly concerned, is incorporated in an excavating unit 14 which is mounted on the frame 10 rearwardly of the tractor belts 11. This unit is arranged to be selectively positioned for the excavation of trenches of various depth, or to be raised out of the ground to an idle position. The excavating unit is the basis of my copending application filed May 25, 1950, and assigned Serial No. 164,241. Briefly, this unit includes a vertically extending frame 17, comprising a substantially rectangular box-like structure having a sprocket wheel 20 rotatably mounted adjacent its upper end and a wheel 21 rotatably mounted at its lower end and spaced from the sprocket wheel 20.

The excavator belt or chain 16 is in the form of an endless belt and is looped about the sprocket wheel 20 and the wheel 21. The sprocket wheel 20 is drivingly secured to a shaft 22 journalled in bearings 23 which are secured to the top wall of the frame 17, and into which the sprocket wheel 20 projects. The periphery of the sprocket wheel 20 is substantially hexagonal. A chain driving lug 25 extends outward from each face 26 of the sprocket wheel 20. These lugs are positioned at the forward end of their respective sprocket wheel faces 26 and are somewhat narrower than such faces so as to drivingly engage the excavating chain 16, as will be hereinafter more fully described.

The lower chain supporting member or wheel 21 is freely rotatable and comprises a hexagonal surfaced member similar in size and contour to that of the sprocket wheel 20, and which engages the links of the chain 16 as shown in Fig. 3. This member has no chain engaging teeth but is provided with a pair of side flanges 27 which retain the chain in position thereon. The wheel 21 is journalled on a spindle 28 carried by the forked lower end 29 of a rectangular post 30. The upper end of this post telescopically embraces the lower end of a correspondingly shaped downwardly extending post 31 of the excavator frame 17.

The excavator chain 16 is tensioned or maintained taut by a coil spring 32 which is interposed between the telescoping members 30 and 31. As shown in Fig. 3, bolts 33 are secured to the bottom of the frame 17 and extend downwardly therefrom, passing freely through openings in flanges 34 carried by the telescoping post 30. These bolts have heads 35 which limit the downward movement of the lower chain supporting member 21.

The excavator chain and bucket mechanism 16

with which the present invention is particularly concerned includes a series of pivotally interconnected substantially identical links 36. Each link is forked as at 37, and at one end is provided with a narrow tongue 38 arranged to enter between the open end of the fork 37 of an adjacent link and be pivotally connected thereto by a pin 39. A flat rectangular plate 40 is secured to each chain link 36. These plates are each provided with a lug 41 which projects inwardly from the plate into the space between the fork of its respective chain and link and is secured thereto by a pin 42. The plates 40, when on the relatively straight stretches of the chain extending between the two supporting members 20 and 21, abut each other in an end to end relation, thus forming a substantially continuous surface on such chain stretches, the width of which is slightly less than the width of the trench to be excavated.

In the embodiment shown, every other plate 40 carries an outer or spade portion of an excavator bucket 15. Each alternate plate 40 is provided with a centrally located outwardly projecting web 45. These webs are parallel with the extent of the chain and project outward at right angles to the surface of the plates 40. Each web 45 carries on its outer edge a plate 46 of substantially the same width as the plates 40.

Referring to Fig. 6, which illustrates one excavator bucket, it will be noted that the upper edge of the plate 46, with reference to its direction of travel which is indicated in that figure by an arrow, lies substantially in a horizontal plane passing through the upper pivot pin 39 of its supporting link 40. As there illustrated, the plate 46 extends downwardly from said horizontal plane, inclining slightly inward toward its supporting link 36, throughout its portion 47, until it nears a horizontal plane which passes through the lower pivot 39 of its supporting link and then continues downward curving more sharply inward to terminate at 57 substantially in contact with the rearmost edge of the plate 40 of the next succeeding link 36. The plate 46 thus forms the outer wall and spade portion of an excavator bucket, the inner wall of which is formed by two abutting plates 40.

The curved portion 48 of each bucket 15 is preferably an arc of a circle scribed from a center which, as the bucket passes around the upper sprocket wheel 20, is coincident with the axis of such wheel. The inclined portion position 47 of each bucket 15 preferably extends tangentially from the curved position. This facilitates the opening of the buckets as they pass around the upper sprocket wheel 20.

The side walls of the buckets are formed by side walls 51 of a relatively stationary, elongated channel shaped trough 50 which is carried by the excavator frame 17. As shown in Figs. 3 and 5, the trough 50 extends from a horizontal plane relatively close to the lower chain supporting member 21 to a horizontal plane slightly above the axis of the sprocket wheel 20 and is secured to vertically extending spaced angle members 52 carried by the frame 17. The excavating chain 16 rides in this trough, the side walls 51 of which extend forward substantially to the outermost edge of the buckets 15, thereby closing the sides of the buckets at the forward stretch of the excavator chain,.

The buckets 15 excavate a trench of sufficient width to clear a path for the trough 50 and the excavator chain support. To this end the forward edge of the spade or plate 46 of each bucket 15 is provided with a rooter or cutter 55. These cutters extend substantially along the entire forward edge of their respective buckets, projecting to either side thereof in front of the side walls 51 of the trough 50. Consequent upon the rotation of the chain in the direction of the arrow in Fig. 3, accompanied by forward movement of the machine, dirt will be removed from the trench and carried to the upper end of the chain.

Inward flexing or bending of the forward stretch of the excavating chain is prevented by a pair of bearing bars or rails 53. As shown in Fig. 4, a bar 53 is secured to the inner surface of each side wall 51 of the trough 50. These bars extend substantially the entire length of the trough and engage the inner face of the chain-plates 40 adjacent their side edges.

As the buckets 15 pass around the sprocket wheel 20, the rearmost edge 57 of the plates 46 thereof are separated from the plates 40 of the next succeeding chain link, thus opening the bucket, to permit the excavated material to discharge by gravity. Such material drops to either side of the frame structure 17, falling onto a conveyor 65 which ejects the material from the machine. This conveyor may comprise an endless flexible belt which extends transversely through the excavator frame 17 and which may be driven from the sprocket shaft 31. A more complete description of a suitable conveyor may be had by reference to either of my copending applications heretofore referred to. Excavated material which might be overthrown is deflected downward by a shield 68 carried by the conveyor frame and is gathered by a crumbing shoe 69 which propels it forward into the path of the descending buckets 15.

Each plate 40 is provided with a rectangular opening 70. As the links 36 pass over the sprocket wheel 20 these openings substantially align with the teeth or lugs 25 thereof which projects between the forks of the chain links. The web plates 45 are provided with a similar opening 71 which align with the opening 70. Thus excavated material may be forced outward through such aligned openings by the sprocket wheel lugs, thereby avoiding any damage which otherwise might result from the inadvertent accumulation of excavated material between the chain and sprocket wheel 20.

From the foregoing it will be seen that this invention provides an improved excavating and elevating unit for trench excavating machines, which unit may be compactly constructed and capable of efficiently excavating and elevating material at a relatively high rate of speed, and which is extremely rugged and comparatively light in weight.

I claim:

A bucket equipped excavator chain for excavating machines having a pair of spaced wheels one of which has outwardly projecting wheel teeth, said chain comprising a plurality of elongated links interconnected to form an endless loop, each link comprising an elongated member having an elongated tooth receiving slot extending inward from one end and a relatively short lug extending outward from the other end and occupying the outer portion of the slot in the adjacent link, a transverse pin interconnecting such lug with the adjacent link, a plate mounted on each link, each plate having a substantially centrally positioned lug extending outward from one face thereof and seated in the slot of its respective link, said plates forming

bucket backs, a transverse pin connecting the link with its respective plate lug, alternate plates having a second longitudinally extending plate secured thereto and projecting outward from its other face intermediate its edges and forming bucket webs, a third plate secured to the outer edge of each web and spaced from the first plate thereby and forming the front walls of the buckets, each of the third plates having its forward edge spaced from the forward edge of its respective first named plate and extending rearwardly and inwardly therefrom terminating substantially in contact with the rear portion of the first named plate of the next succeeding chain link, said first and second named plates

each having openings aligned with each other and with the slot in its respective link to permit material to be ejected from the chain slots through such openings by said wheel teeth.

ALBERT R. ASKUE.

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