Aug. 19, 1947. E. H. LICHTENBERG 2,425,746

DITCHING MACHINE

Filed July 25, 1945 2 Sheets-Sheet 1

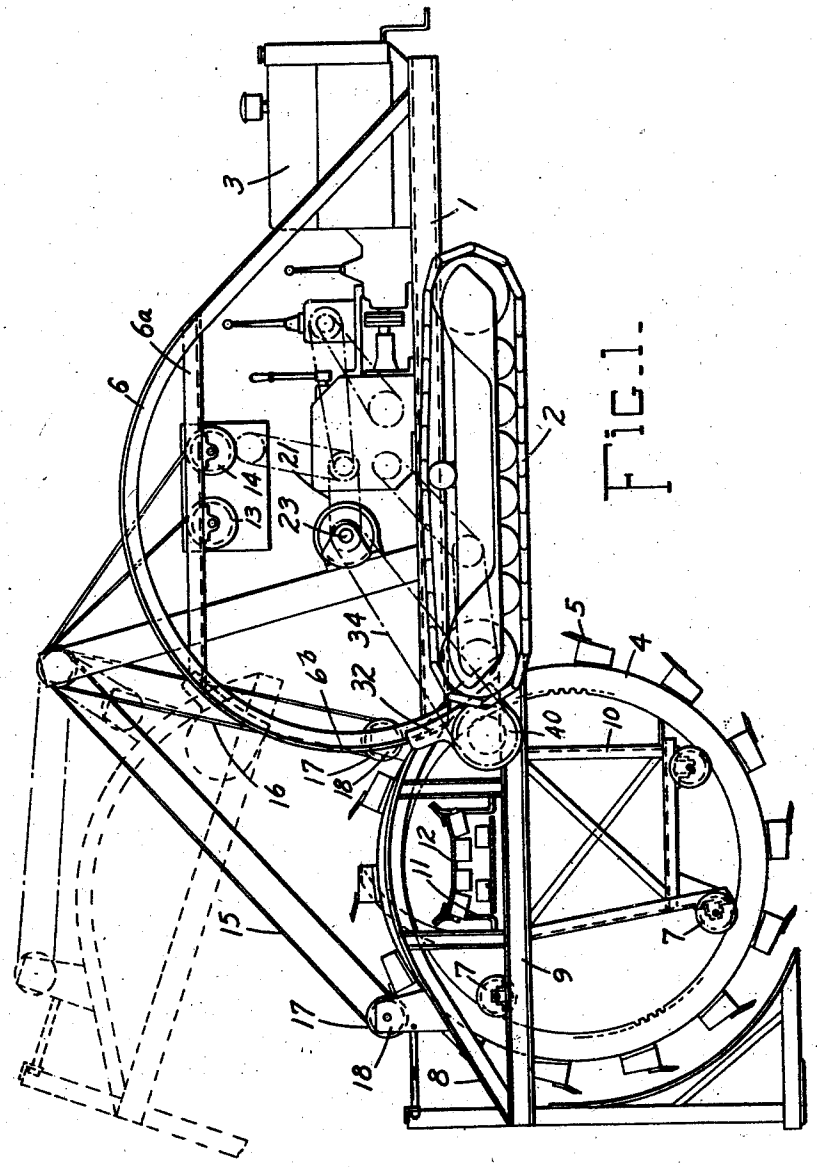


FIG. 1.

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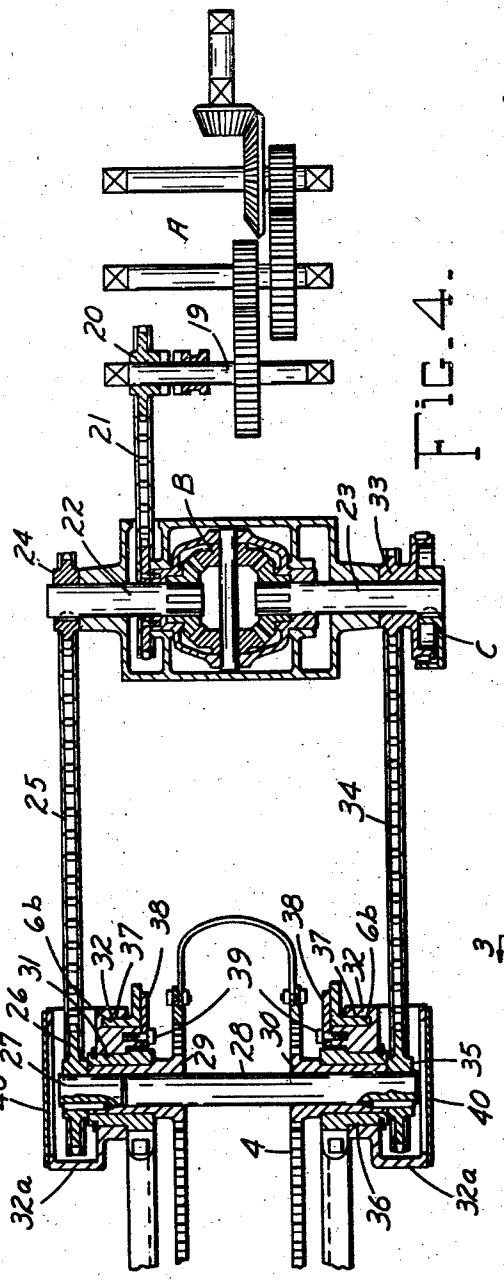


FIG. 4.

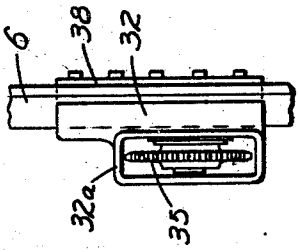


FIG. 3.

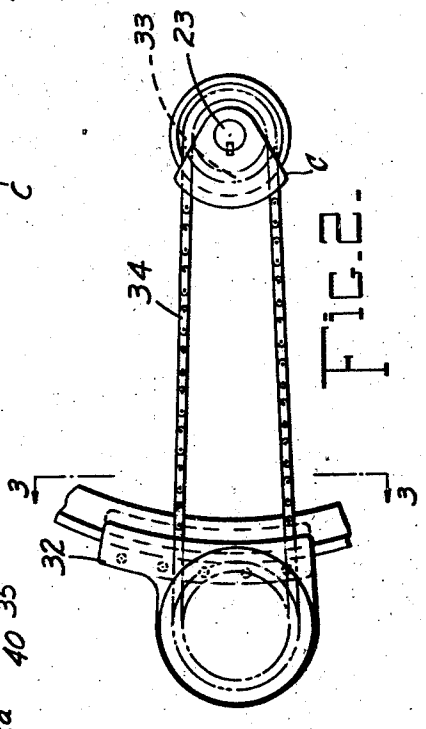


FIG. 2.

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Patented Aug. 19, 1947 2,425,746

UNITED STATES PATENT OFFICE

2,425,746

DITCHING MACHINE

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4 Claims. (Cl. 37—97)

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This invention pertains to the art of wheel type ditching machines, in which a digging wheel is mounted upon a portable machine base carrying the driving machinery for rotating the wheel as it is moved forward with the base, the latter being portable, suitable instrumentalities being employed for lowering the wheel into engagement with the earth for its ditching operation in the formation of a trench or ditch, and for raising the digging wheel to an elevation out of operative engagement with the earth.

The improvements of my invention involve particularly certain novel means for guiding the movement of the digging wheel frame and supported rotatable digging wheel as the latter is raised or lowered for arriving at the positions previously referred to in respect to its mounting upon the portable base by which it is supported.

More specifically speaking, my invention comprises a new form of frame structure for the portable base that supports the digging wheel and its frame, said frame structure comprising sides, guiding members in spaced relation, and the digging wheel frame being associated with connecting shoes adapted to travel along the guide members of the portable base frame, during the upward and downward movement of the digging wheel frame as previously referred to, whereby the digging wheel is carried into a position out of action, or lowered into a position in digging engagement with the earth.

For a full understanding of my invention reference may be had to the following detail description and to the accompanying drawings, in which:

Figure 1 is a general side elevation view of a ditching machine of the wheel type embodying my invention, dotted lines indicating in part the upper position of the digging frame as when it is elevated to lift the digging wheel from earth engagement.

Figure 2 is a detail side elevation view, fragmentary in nature, showing more clearly the manner in which the guide shoe at one side of the portable base frame is operatively and guidingly associated with one of the side frame members of said base frame.

Figure 3 is an end view, fragmentary in nature, taken about on the line 3—3 of Figure 2, the driving chain omitted.

Figure 4 is a fragmentary sectional view illustrating primarily the driving mechanism for driving the digging wheel for its rotative movement from the motor which is mounted upon the portable base of the machine, said view being somewhat diagrammatic in relation to the motor driving instrumentalities particularly.

Generally describing the operative arrangement and construction of the parts of my digging wheel type ditching machine, I refer first to Figure 1 of the drawings, from which it will be observed

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that the body of my machine comprises largely a base frame 1 supported by means of endless crawlers 2. The base frame 1 supports a suitable motor, generally shown at 3, and power is taken off from this motor by suitable clutch and transmission gear mechanism for operation of the digging wheel which is shown generally at 4 as equipped with suitable digging buckets 5.

The base frame 1 carries a superstructure frame which generally includes the side frame members 6 and the front ends of which slope downwardly on a substantially straight line toward the motor end of the base frame 1, whilst the rear ends of the side frame members 6 are curved upon an arc and terminate at their downward rearward ends at the rear end portions of the base frame 1, at which point they may be attached by any securing means.

It will be understood that in the type of machine of my invention, as previously indicated, the digging wheel 4 is adapted to be raised to an upward limit of movement wherein it is out of action, or disengaged from the earth; or, said wheel may be lowered to the operating position generally as shown in Figure 1, at which time, upon its rotation, it will perform the desired excavating action to produce a ditch or trench, the bottom of which may be square or curved dependent upon the form of the digging buckets supplied.

The digging wheel 4 is rotatably supported to travel around rollers 7 which are carried by the frame members of the digging wheel supporting frame, said members being generally designated at 8, 9, and 10, and they may be of conventional construction so far as the present invention is concerned. In these machines in the type of my invention it is customary to provide a laterally extending conveyor frame 11 which leads off from the excavating wheel and delivers by suitable belt 12 the excavated materials to be carried away from the machine at one side thereof in the well known manner.

For the raising and lowering movements of the wheel frame 8, 9, and 10, there are utilized suitable hoisting and lowering drums 13 and 14, mounted upon the frame member 6a of the main frame of the machine. These drums 13 and 14 are connected by suitable cables 15 and 16, respectively, to the sheaves or pulleys 17 that are mounted on brackets 18 which are attached to the curved upper member 8 of the digging wheel frame. Such lowering and raising instrumentalities are conventional and do not form any special part of my invention other than they are used in conjunction with the guiding features for directing the upward and lowering movements of the wheel frame and wheel carried thereby.

According to the construction shown in my

drawings, I utilize very largely certain driving means for the digging wheel 4, which are disclosed in the copending application of George A. Vaughn, filed July 23, 1943, Serial No. 495,874. I will therefore describe the driving mechanism above mentioned in a general way as it is depicted in my drawings.

Referring to Figure 4 of the drawings, it will be noted that at the right end of said figure are diagrammatically illustrated certain transmission gears of a transmission gear unit generally designated at A. The transmission gear unit carries the driving forces of the motor or engine at 3 of Figure 1, to the digging wheel 4 through the following instrumentalities. One of the gears of the unit A is carried by a driving shaft 19 connected by sprockets 20 and chain 21 with the shaft 22 of the differential gear unit designated at B and which includes also the shaft 23 in alinement with the shaft 22. The shaft 22 has a sprocket 24 keyed thereto, which sprocket is connected by a chain 25 to a coacting sprocket 26 keyed in turn to drive the short section 27 of a split digging wheel driving shaft which includes the alined shaft section 28 driven from the other differential shaft member 23. The digging wheel 4 is driven by driving gears 29 and 30 after the conventional method of operating digging wheels of the type to which my invention relates. The short shaft section 27 referred to is drivingly connected with the driving gear 29 which has a long sleeve portion to receive partially the shaft section 27, and of course the sprocket 26 is keyed to said member 27. The sleeve portion of the driving gear 29 is mounted in a bearing 31 which in turn is mounted or supported by means of a shoe 32 located at one side of the digging wheel 4. Now in reference to the differential shaft member 23, the same carries a sprocket wheel 33 connected thereto by means of a slip and safety clutch unit generally designated at C in Figure 4, and which may be of any known construction, though as illustrated this unit is the same as shown and described in the Vaughn application for patent previously identified herein. The drive is carried through the slip and clutch unit C from the sprocket wheel 33 and sprocket chain 34 to a sprocket wheel 35 which is keyed on the shaft section 28 of the driving shaft unit which directly actuates the digging wheel 4. The shaft section 28 drives the driving gear 30 previously referred to as functioning with the driving gear 29 to directly engage and drive the digging wheel 4 for its rotative digging operation. In a manner similar to the driving gear 29, the gear 30 is provided with a sleeve extension which fits in a bearing 36 similar to the bearing member 31, and which bearing is mountedly supported in another shoe 32 similar to that previously described.

As shown in Figures 2, 3, and 4 primarily the shoes 32 are curved on an arc vertically and are formed with guide grooves 37 in which are received the outwardly extending flanges 6b of the side frame members 6, which it will be remembered are curved forwardly and downwardly toward the base frame 1 of the machine, as previously described. The arc of curvature of each of the shoes 32 corresponds with that of the side frame member 6 in which it is associated and on which it is adapted to slide in a generally vertical direction along the rear arcuate portions of the members 6.

It will of course be understood that the side frame members 6 are composed primarily of angle bars bent to proper form to give the arcuate construction and straight portion construction which is fully illustrated in Figure 1.

From the foregoing it will therefore be understood that the sections 27 and 28 of the digging wheel driving shaft are practically supported by the bearings 31 and 36 provided in the shoes 32, as above described. For detachably holding the shoes 32 engaged with the outwardly extending flanges 6b of the side frame members 6, I contemplate the employment of detachable plate members 38 located at the inner sides of the shoes 32 and attached to the bodies of the shoes by any suitable securing bolt means such as designated at 39.

With the above description I have set forth the transmission and driving means for driving the differential gear unit B and for carrying the drive from said unit by means of the sprocket chains 25 and 34 to the shaft sections 27 and 28, respectively, of the driving shaft and gear unit for the digging wheel.

It may be desirable, though such is not necessary, to provide the vertically movable guiding shoes 32 with housing portions 32a for shrouding or enclosing the sprocket gears 26 and 35, and if such housing portions are utilized, the outer sides of the shoes and said housing portions may be closed by detachable dust plates 40.

With the foregoing details of the construction of my invention in mind, referring to Figure 1 of my drawings, it is notable that in the raising and lowering movements of the digging wheel 4 and its supporting frame 8, 9, 10, by means of the cables 15 and 16 operated by the hoisting drums 13 and 14, an arcuate movement, either upwardly or downwardly, depending upon direction, will be caused by the guiding action of the shoes 32. In other words, as the digging wheel and its frame are raised by the cables 15 and 16, the shoes 32 will travel upwardly on the rear arc-shaped portions of the side frame members 6 and be guided in an arcuate path in such movement by means of said members 6. On lowering the digging wheel and its frame, an opposite arcuate movement will, of course, be compelled. The design of the driving mechanism is coordinated with the nature of the upward and downward movement of the digging wheel and its frame, in that the driving shaft sections 27 and 28 move on an arc controlled by the arcuate formation of the members 6 at their rear portion, which arc has for its axis the axis of the differential shaft members 23 and 22 that are disposed in alinement as previously described.

For the above reason, it will be apparent that it is unnecessary to connect the frame of the digging wheel by arms or rigid members of any kind with the driving differential B since the driving chains 25 and 34 will be maintained taut owing to the fact that in the raising and lowering of the digging wheel and supporting frame therefor the shoes 32 compel the arcuate movement of said parts along the arcuate side members 6 with the arc of movement of the driving shaft members 27 and 28 centered about the axis of the shaft members 22 and 23 of the differential unit B.

The bearing members 31 and 36 are integrally formed or suitably connected with the frame of the digging wheel and particularly with the relatively horizontal members 9 of the said frame which is comprised of the parts 8, 9, and 10.

From the foregoing it will be understood that my invention lies primarily in the utilization of the shoes 32 which are connected in a peculiar manner, as described, with the front arcuate

portions of the side members 6 of the main frame of the machine, and which are also connected in the manner set forth with the frame of the digging wheel which is raised and lowered for effecting corresponding movement of the wheel 4, together with the utilization of a driving unit of some kind equivalent to the differential gear unit B and driving shaft means comprising parts equivalent to the members 27 and 28, these members connected with the differential gear shaft by suitable movement transmitting means, and the members 27 and 28 or their equivalent parts operating in an arc of upward and downward movement with the axis of the members 22 and 23, as the axis of said movement.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a ditching machine of the digging wheel type, in combination, a portable support comprising a base frame, a main frame thereon comprising spaced side frame members extending in a general vertical direction from the base frame, a digging member disposed at one end of the base frame, a supporting frame for said member, means for raising and lowering the said supporting frame, guide means movable along the side frame members of the main frame and connected with the supporting frame for the digging member, a motor on the base frame, and driving connections between the motor and the digging member aforesaid, said guide means comprising guide shoes movable along the side frame members at the ends thereof adjacent to the digging member supporting frame and interlocked with the said side frame members, the driving connections between the motor and digging member comprising driving gears for the digging member mounted on said shoes.

2. In a ditching machine of the digging wheel type, in combination, a portable support, a motor mounted upon said portable support, a main frame for said portable support comprising spaced side members curving upon an arc adjacent to one end of the portable support, a digging wheel at said end of the portable support, a supporting frame for the digging wheel, means for raising and lowering the said supporting frame of the digging wheel, and guide shoes connected with the digging wheel supporting frame and engaging the said curved end portions of the side members of the main frame so as to operate along the latter as track means for the said guide shoes, combined with driving members carried by the guide shoes for effecting rotation of the digging wheel, and driving means leading from the motor to the said driving members on the shoes for operating the latter.

3. In a ditching machine of the digging wheel type, in combination, a portable support, a frame on said support comprising side frame members curved on an arc adjacent to one end of the support, a digging wheel at said end of the portable support, a digging wheel supporting frame for the digging wheel, and guide shoes on the digging wheel supporting frame interengaged with the side frame members of the said main frame for guiding the movement of the digging wheel and its supporting frame when raised and lowered, hoisting means for raising and lowering the digging wheel and digging wheel supporting frame, and driving members mounted upon the said shoes for actuating the digging wheel, said shoes being provided with means connecting the same pivotally to the digging wheel frame.

4. In a ditching machine of the digging wheel type, in combination, a portable support, a motor mounted upon said support, a main frame for said portable support comprising spaced side members curving upon an arc adjacent to one end of the portable support, a digging wheel at said end of the portable support, a supporting frame for the digging wheel, means for raising and lowering the said supporting frame of the digging wheel, and guide shoes connected with the digging wheel supporting frame and engaging the said curved end portions of the side members of the main frame so as to operate along the latter as track means for the said guide shoes combined with driving members carried by the guide shoes for effecting rotation of the digging wheel, and driving means leading from the motor to the said driving members on the shoes for operating the latter, said driving means including a driving shaft unit on the portable support operably driven from the motor, and a driving shaft unit on the guide shoes, the arc of curvature of the side frame members forming the track means for the guide shoes being centered from the said driving shaft unit on the portable support, as an axis.

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The following references are of record in the file of this patent:

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