April 7, 1953 H. C. OBER 2,633,789

ROTARY TILLER

Filed April 20, 1949 4 Sheets-Sheet 1

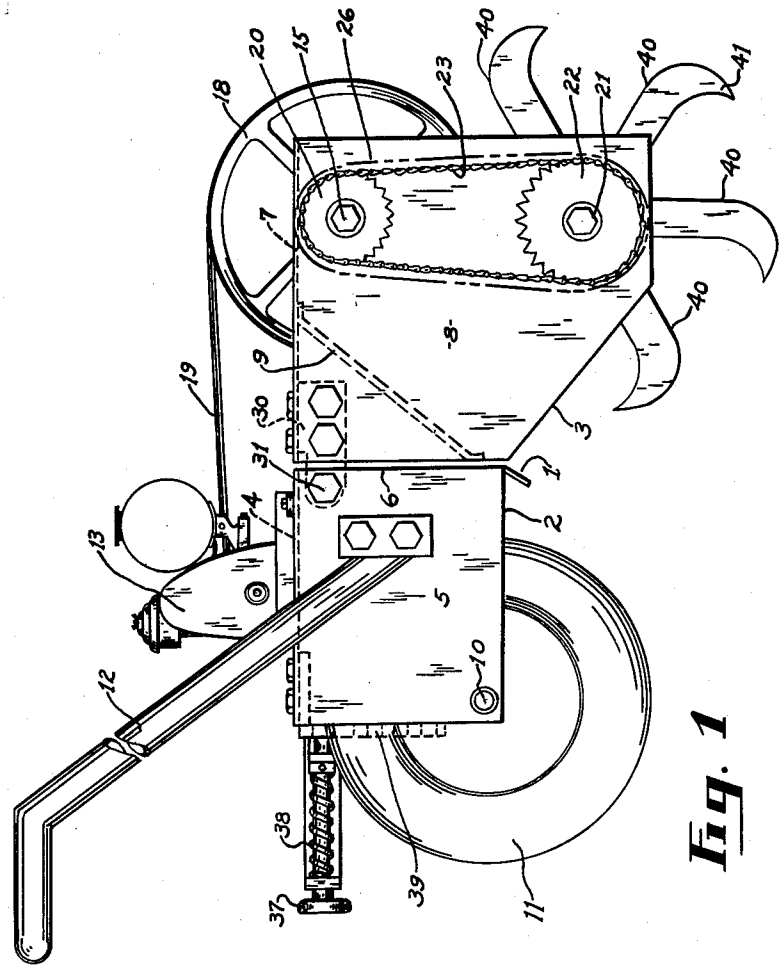


Fig. 1

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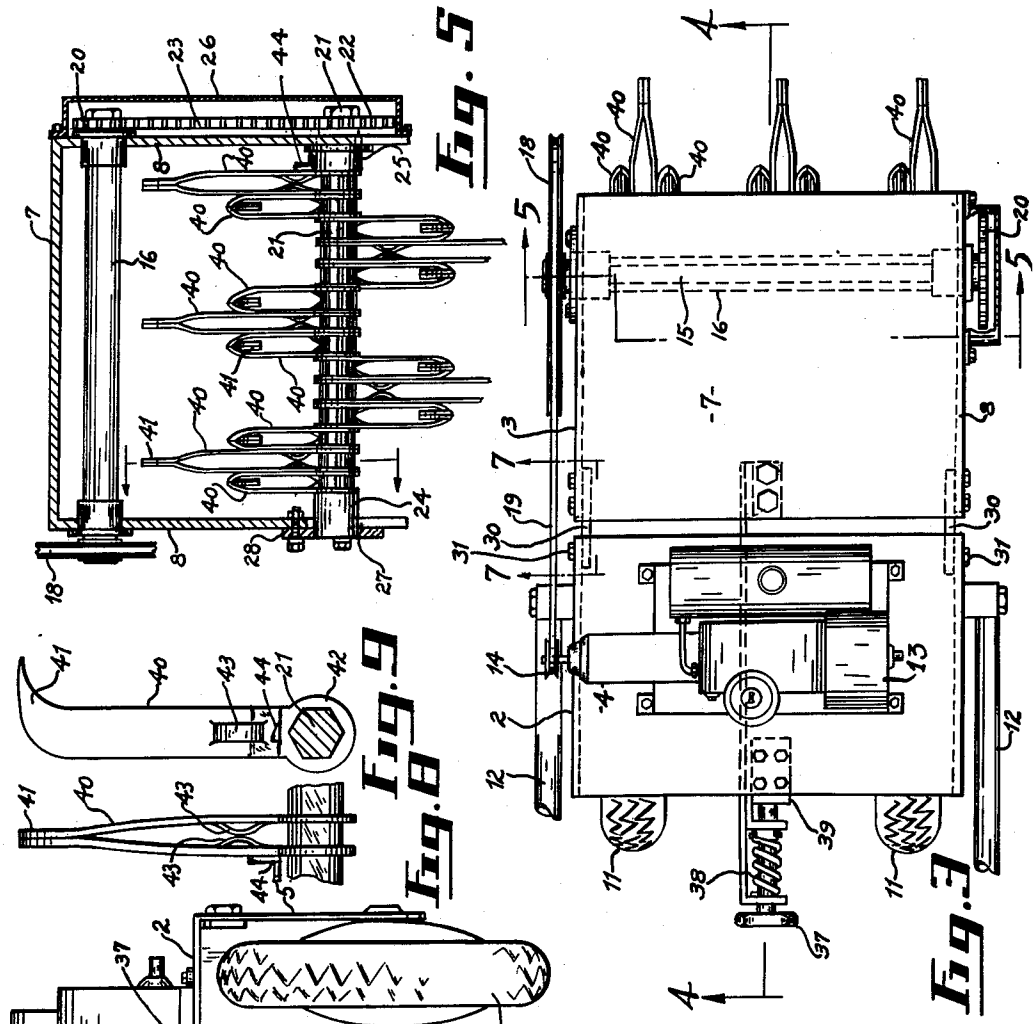


Fig. 5

Fig. 9

Fig. 8

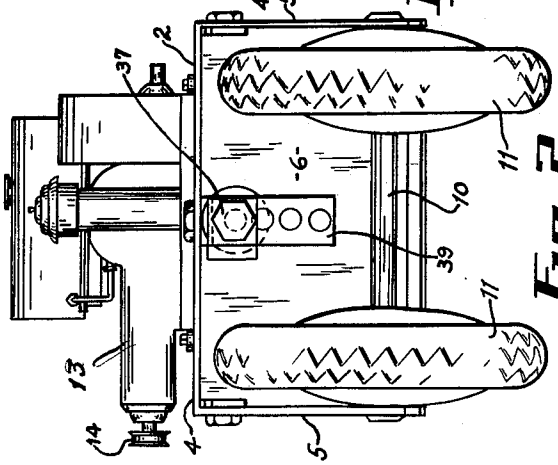


Fig. 2

Fig. 3

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Fig. 1

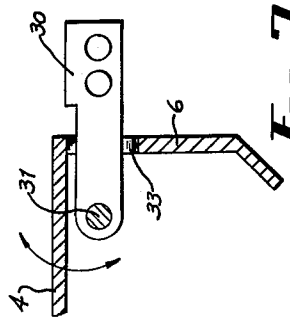
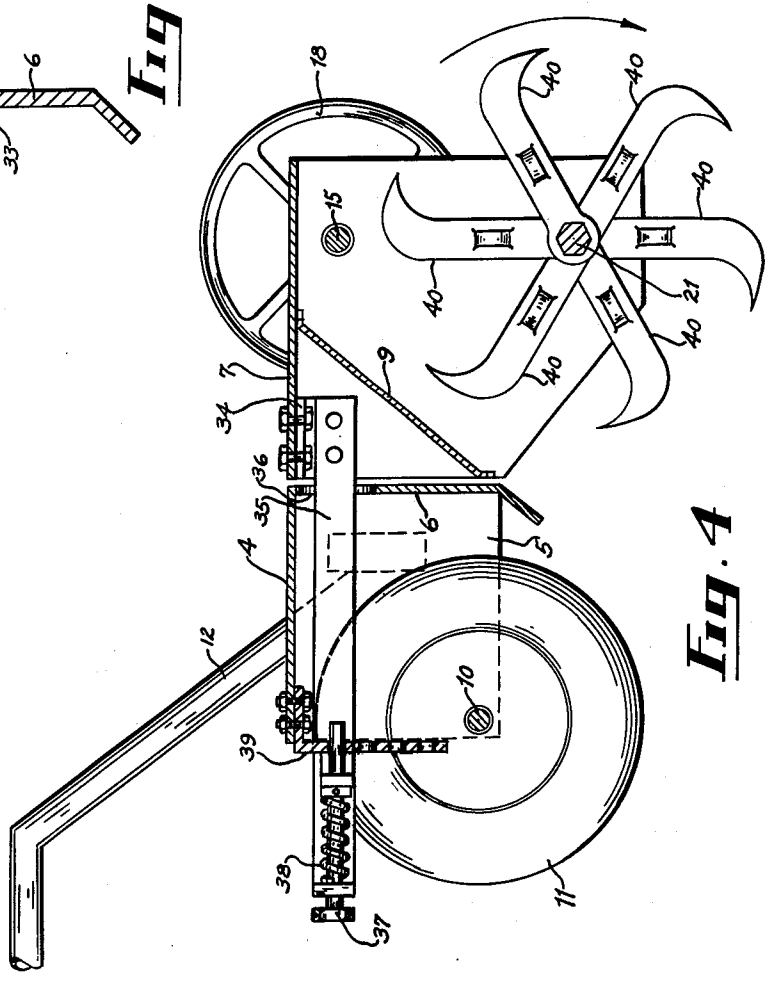


Fig. 4



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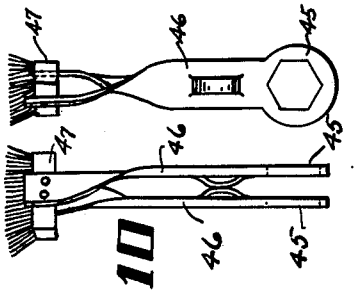


Fig. 10

Fig. 11

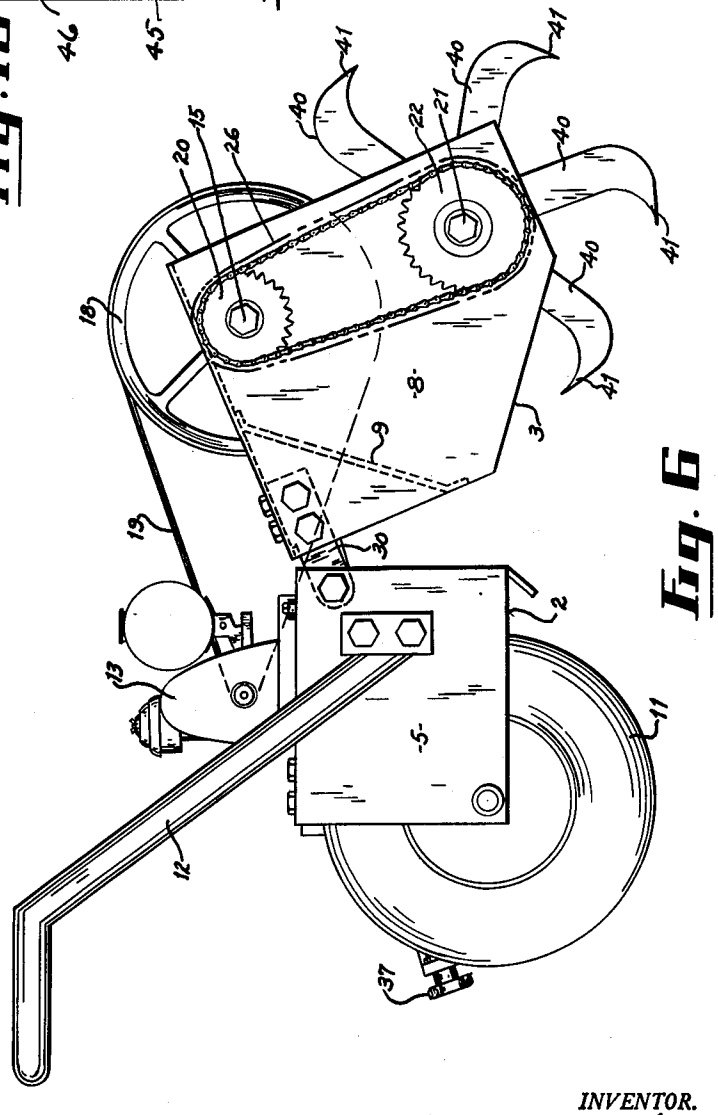


Fig. 6

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UNITED STATES PATENT OFFICE

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ROTARY TILLER

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Application April 20, 1949, Serial No. 88,532

8 Claims. (Cl. 97—40)

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This invention relates to a device for manipulating loose or frangible materials and particularly to a device for cultivating the soil, loosening and stirring packed frangible materials, and for removing snow and the like from side walks.

The device comprises essentially a two-wheeled carriage supporting a horizontally disposed rotary tool and having manipulating handles thereon so it can be guided and propelled by hand and, by swinging the carriage about the axle of the wheels, raised and lowered so as to cause the rotary tool carried thereby to operate at different depths in the material, an engine connected by a belt to a power transmission for the rotary tool with a novel means for tightening and loosening the belt so as to drivingly connect and disconnect the engine from the transmission, and a plurality of identical rotary tool members which may be easily assembled on and disassembled from a driven shaft of the device by manipulation of a minimum number of parts.

The present application is directed to the rotary tiller machine as a whole, the rotary agitating element and component elements thereof being disclosed and claimed in my copending application Serial No. 249,776, filed October 4, 1951, which is a continuation in part of the present application.

One of the principal objects of the present invention is to provide a small compact rotary tool tilling device which is simple and rugged in construction and of which the parts are relatively simple and easily assembled yet which is sufficiently light for easy manipulation.

Other objects and advantages will become apparent from the following description wherein reference is made to the drawings, in which:

Fig. 1 is a side elevation of a device embodying the principles of the present invention and showing the device in normal operating position;

Figs. 2 and 3 are a rear elevation with the handles removed, and a top plan view, respectively, of the device illustrated in Fig. 1;

Figs. 4 and 5 are a longitudinal sectional view with the engine omitted, and cross-sectional view, respectively, taken on lines 4—4 and 5—5, respectively, of Fig. 3;

Fig. 6 is a side elevation similar to Fig. 1 but showing the device in condition for operatively disconnecting the engine;

Fig. 7 is an enlarged fragmentary sectional view taken on line 7—7 of Fig. 3;

Figs. 8 and 9 are rear and side elevations, respectively, of one of the operating tool members of the rotary tool, the shaft thereof being fragmentarily shown for clearness in illustration; and

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Figs. 10 and 11 are a rear and side elevation, respectively, of another operating tool member of which a number may be used to form the rotary tool of the device.

Referring to the drawings the device comprises a carriage, indicated generally at 1, having an engine carrying portion 2 and a rotary tool carrying portion 3. The engine carrying portion 2 comprises essentially a top wall 4, depending side walls 5 and a front wall 6, and is open at the bottom and at the rear.

The tool carrying portion 3 comprises essentially a top wall 7 with depending side walls 8 and a sloping reinforcing and baffle wall 9, and is open at the bottom and forwardly.

One of the carriage portions, preferably the carriage portion 2, is mounted by a suitable axle 10 on a pair of wheels 11, the axle being arranged near the lower edge and rear of the engine carrying portion 2. Suitable manipulating handles 12 are detachably secured to the engine carrying portion 3 and extend rearwardly and upwardly therefrom to a convenient position for manipulation of the device by the operator. Thus the forward end of the engine carrying portion 2 can be raised and lowered by rocking it about the axle 10. Mounted on the engine carrying portion 2 is an engine 13 having a driving pulley 14.

Referring next to the tool carrying portion 3, a power transmission mechanism is mounted thereon. In the form illustrated, this mechanism comprises a transversely extending shaft 15 rotatably mounted in a suitable bearing and reinforcing sleeve 16 which is connected to the side walls 8. Mounted on the shaft 15 outside of one of the side walls 8 is a driven pulley 18 which is drivingly connected by a belt 19 to the engine. At its opposite end the shaft 15 extends outwardly beyond the opposite side wall 8 and carries a sprocket 20. The shaft 15 preferably is arranged near the front and top wall of the tool carrying portion 3.

Mounted near the lower forward part of the tool carrying portion 3 is a rotary tool shaft 21 which at the end adjacent the sprocket 20 is provided with a sprocket 22 which is drivingly connected to the sprocket 20 by a suitable chain 23. The shaft 21 is mounted adjacent its ends in bearings 24 and 25, the bearings in turn being mounted on the side walls 8, respectively. A suitable dust proof housing 26 is connected to one of the side walls 8 and encloses the sprockets and chain.

The bearing 24 at the opposite end of the shaft

21 from the sprocket 22 is detachably secured to the side wall on the outside and extends therethrough. For a purpose of removing the operating tools from the shaft 21, as will later be described, the side wall 8 is provided with a passage 27 which is open at the bottom of the side wall and which is bridged by a suitable flange 28 on the bearing 24. Thus the bearing 24 can be removed by movement axially off of the shaft and withdrawn from the passage 27 thus leaving a passage for removing the tools from the shaft axially thereof.

In order to drivingly connect and disconnect the engine from the pulley 18 and for tightening and loosening the belt for adjustment the carriage portions 2 and 3 are hingedly secured together at their adjacent ends for swinging movement about a horizontal transverse axis which is parallel to the axis of the pulley 18. For this purpose suitable arms 30, which may be pieces of strap metal, are secured to the side walls of the tool carrying portion 3 at the upper rear thereof and extend rearwardly therefrom beyond the rear limit of the portion 3. At their opposite ends, the arms 30 are pivotally connected by bolts 31 to the side wall of the engine carrying portion 2 near the upper forward limit of its side walls. Suitable passages 33 are provided in the forward wall 6 to afford passage of the arms therethrough and to permit relative swinging movement of the portions 2 and 3 about the axis of the pivots 32.

Rigidly connected to the tool carrying portion 3, preferably to the top wall 7 thereof, is a bracket 34 on which is mounted a rearwardly extending rigid arm 35. The arm 35 is of sufficient length to extend entirely beyond the rear of the engine carrying portion 2, a suitable passage 36 being provided in the wall 6 to permit the arm 35 to extend therethrough. The passage 36 is of adequate size to afford free rocking movement of the arm 35 about the axis of the bolts 31 consequent upon swinging of the portions 2 and 3 about their pivotal axis.

At the rear of the carriage portion 3, the arm 35 is provided with a latch in the form of a detent 37 which is urged to seated position by a spring 38. Rigidly mounted at the rear of the portion 2 is a depending bracket 39 which is provided with a vertical row of holes adapted to receive the forward end of the detent 37 for locking the arm 35 in fixed relation to the rear of the carriage portion 3 in different adjusted positions of the portions 2 and 3 about the axis of the piyot 32.

In Figs. 1 and 4 the device is shown with the walls 4 and 7 substantially co-planar in which condition the maximum distance between the axes of the pulleys 14 and 18 is obtained, thus tensioning the belt to the maximum. By releasing the detent 37 and lowering the arm 35, the carriage portions 2 and 3 are swung about the pivot 32, thus decreasing the distance between the axes of the pulleys 14 and 18 and consequently loosening the belt. Thus adjusted tension on the belt can be obtained by merely releasing the detent and moving the arm 35 to the desired position. The amount of movement permitted is sufficiently great so that when the arm is in its lowermost position, as illustrated in Fig. 6, the belt is ineffective for drivingly connecting the pulleys 14 and 18. Thus the pivotal arrangement of the carriage portions 2 and 3 and the arm 35 cooperate to provide a clutching mechanism for adjusting the belt tension and for drivingly connecting and disconnecting the engine and the rotary tool.

Referring next to the specific arrangement of the rotary tool, the shaft 21 is non-circular in the cross section and preferably polygonal in cross section at its tool receiving portion between its ends. In the form illustrated, it is shown as hexagonal in cross-section. The tool members shown for purposes of illustration in Figs. 1 through 9 are primarily for tilling the soil. As best illustrated in Figs. 8 and 9, each tool 40 comprises two pieces of flat strap metal stock welded together in face to face relation at the operating end 41 and for a short distance therefrom toward the opposite end. Therebeyond, toward the opposite ends the two pieces of metal are spaced apart from each other flatwise and provide a hub 42 with an arm portion joining the hub and end 41. The hub 42 has a passage therethrough which fits the shaft 21. Between the hub portion 42 and the chopping or operating end 41 of the tool member, bosses 43 are struck out of the metal and are such that they engage each other for limiting the movement of the laterally spaced hub portions of each hub 42 relatively toward each other. All of the tool members 40 preferably are identical with each other. The tools are made of low carbon steel, for example, S. A. E. 20, which is inexpensive and tough and can absorb heavy shocks without fracturing. The cutting ends are hard faced with harder steel alloys which are deposited thereon by the electric arc process. Thus the cutting edges have the required characteristics yet the tool members as a whole are not brittle.

The passage 27 in the wall 8 is such that with the bearing 24 removed, and a tool member 40 turned with its cutting end beneath the shaft, the tool member so disposed can be slipped off of the shaft endwise through the passage 27.

The tool hubs 42 are preferably arranged in abutting face to face relationship to each other endwise of the shaft and the operating or cutting end of each tool member is off-set sixty degrees from that of the next adjacent member, progressively, in the same direction circumferentially and the same direction endwise of the shaft. The tool members 40 thus present a spirally arranged row of cutting ends. They are inexpensive and rugged. At the same time, the spacing of the arm portions of each tool member between its operating end and its hub presents relatively narrow edges to the material being subjected to the tool and assists in penetration of the material by the tool member.

There is a tendency for grass, weeds and the like to wind about the outer surface of the bearings 24 and 25 during operation of the device with resultant binding which resists rotation of the shaft 21. To relieve the shaft from the binding effects of such weeds and grass, the end tool members 40 of the row are provided at their outermost faces with cutting blades 44 which extend parallel to the axis of the shaft and are spaced radially outwardly therefrom so as to pass around the circumferences of the bearings 24 and 25 with very slight operating clearance. The blades may be supported by welding their shank portions to the end tools 40, as illustrated in Figs. 5, 8 and 9, and preferably are substantially coextensive endwise with those portions of the bearings which are exposed between the side walls 8 of the carriage. If desired, the leading edges of the outermost pieces of flat strap metal forming the end tool members 40 may be sharpened to a knife edge

to assist in cutting any grass or weeds tending to be wound around the bearings **24** and **25**.

In operation, the depth to which the cutting portions of the composite rotary tool penetrate is dependent upon the position in which the front or tool carrying portion of the carriage is elevated by rocking the carriage as a whole about the axle **10**. The shape of the operating ends of the tool members is such that the members exert a forward pull on the device due to their engagement with the ground and thus assist in moving it along.

In order to make possible the use of the device for removing snow and the like from side walks, tool members such as illustrated in Figs. 10 and 11 are provided. As there illustrated, each tool has at one end a hub **45** and spaced arms **46** radiating therefrom. Between the arms at the ends opposite from the hub **45** brushes **47** are secured, the forward faces of the brushes being biased about forty-five degrees or more to their circumferential path of travel. All of the brushes are biased in the same direction so that the snow engaged thereby is propelled laterally of the device. If desired, a longer belt can be used for this purpose and crossed between the pulleys so as to rotate the shaft **21** in the opposite direction from which it is rotated when the device is used for tilting. For example, as viewed in Fig. 1, the shaft **21** is rotated in a clockwise direction for tilling the soil whereas when used with the brushes for sweeping snow it is rotated counterclockwise as viewed in Fig. 1. Thus, when the tool member is rotated in the direction of rotation for tilling, as indicated by the arrow in Figure 4, each tool or prong **40**, when passing below the rotative axis of the tool, swings in a direction rearwardly of the carriage and its outer extremity can pass below the level of the ground engaging surfaces of the wheels and below the frame assembly and thereby till the ground and propel the device forwardly inasmuch as the device is free-wheeling.

Having thus described my invention, I claim:

1. A device of the character described, comprising a carriage including a free-wheeling engine assembly having a pair of axially aligned supporting wheels which are rotatable freely in opposite directions about an axis extending transversely of the carriage, handle bars connected to the carriage and extending rearwardly therefrom, an engine mounted on the engine assembly forwardly of the wheel axis, and a pulley drivingly connected to the engine, a frame assembly including a tool supporting frame, a rotary tool mounted on the lower portion of the frame for rotation about an axis extending generally transversely of the frame, and a pulley drivingly connected to the tool, pivot means pivotally connecting the assemblies together for relative swinging movement upwardly and downwardly about a fixed axis positioned forwardly of the wheel axis and extending transversely of the engine assembly and frame and suspending the frame from the engine assembly in a position forwardly of the engine, latch means for latching the assemblies together, in a normal operating position, against said relative swinging movement, each of said pulleys having its axis parallel to and spaced from said pivotal axis so that the distance between the pulleys can be decreased by swinging the assemblies relative to each other about the pivotal axis from said normal operating position, a belt drivingly connecting the pulleys when the assemblies are latched in said normal operating position, said assemblies being overbalanced so that, when they are unlatched, they swing about, and relative to, the pivotal axis under the influence of gravity in a direction for decreasing the distance between the pulleys, said tool including a plurality of combination driving and tilling prongs extending outwardly from the rotative axis of the tool and constructed and arranged so that, when the tool is driven by the engine while the assemblies are in normal operating position, the prongs, when passing below the rotative axis, swing in a direction rearwardly of the carriage and their outer extremities can pass below the level of the ground engaging surfaces of the wheels and below the frame assembly and till the ground and concurrently propel the carriage forwardly by their engagement in the ground, whereby the forward drive of the carriage can be effected and discontinued, selectively, by swinging the carriage upwardly to different relative positions about the wheel axis when the assemblies are latched together, and both the forward drive of the carriage and rotational drive of the tool can be effected concurrently and discontinued, concurrently, selectively, by unlatching the assemblies, and said carriage being overbalanced forwardly of the wheel axis to swing downwardly about the wheel axis when the assemblies are latched together in said normal operating position.

2. A device according to claim 1 characterized in that said prongs, at their outer ends, are in the form of hooks of which the points project forwardly in the direction of rotation at an abrupt angle to the length of the prongs, respectively.

3. A device according to claim 1 characterized in that the center of gravity of the engine assembly is forwardly of the wheel axis and the center of gravity of the frame assembly is rearwardly of the lowermost one of the prongs of the tool.

4. A device according to claim 1 characterized in that the pivotal axis is close to the top of the engine assembly and of the frame, whereby, said engine assembly tilts downwardly forwardly about the pivotal axis and the frame assembly tilts downwardly rearwardly about the pivotal axis.

5. A device according to claim 1 characterized in that the wheel axis is close to the rear limit of the engine assembly, the pivotal axis is close to the front of the engine assembly and to the rear of the frame assembly, and the rotative axis of the tool is close to the front of the frame assembly.

6. A device according to claim 1 characterized in that said carriage is unconstrained from rocking rearwardly about the wheel axis to a position in which the tool is above the level of the ground engaging surfaces of the wheels when the frame assembly is in normal operating position relative to the engine assembly.

7. A device according to claim 1 characterized in that said latch means is constructed and arranged to latch the assemblies in a plurality of relatively rotated positions about the pivotal axis for controlling the tension on the belt.

8. A device of the character described comprising a carriage including a free-wheeling engine assembly having a pair of axially aligned supporting wheels which are rotatable freely in opposite directions about an axis extending transversely of the carriage near the rear thereof, handle bars connected to the carriage and extending rearwardly therefrom, an engine mounted

on the engine assembly forwardly of the wheel axis, and a pulley drivingly connected to the engine, the center of gravity of the engine assembly being forwardly of the wheel axis, a tool supporting frame assembly including a frame, a rotary tool mounted on the lower forward portion of the frame for rotation about an axis extending generally transversely of the frame, and a pulley drivingly connected to the tool, the center of gravity of the frame assembly being rearwardly of the tool axis, pivot means pivotally connecting the assemblies together for free relative swinging movement upwardly and downwardly about a fixed axis positioned near the upper forward portion of the engine assembly and upper rear portion of the frame assembly and suspending the frame assembly from the engine assembly, a latching arm fixedly connected to the upper portion of the frame and extending rearwardly therefrom past the rear of the engine assembly for swinging to different positions relative to the engine assembly, means for latching the bar to the engine assembly in a plurality of said positions, selectively, for holding the frame assembly against swinging movement relative to the engine assembly about said pivotal axis, each of said pulleys having its axis parallel to said pivotal axis and spaced therefrom, so that the distance between the pulleys can be decreased by swinging the frame assembly upwardly about the pivotal axis from an operating position, a belt drivingly connecting the pulleys when the frame assembly and engine assembly are latched in said operating position, said frame assembly, when in operating position, being spaced from the engine assembly so that shocks imparted to the frame assembly by the tool are transmitted from the frame to the engine assembly only through the pivot means, arm, and latch means, said tool including a plurality of combination driving and tilting prongs extending outwardly from the rotative axis of

the tool and constructed and arranged so that, when the tool is driven by the engine while the assemblies are in normal operating position, the prongs, when passing below the rotative axis, swing in a direction rearwardly of the carriage and their outer extremities can pass below the level of the ground engaging surfaces of the wheels and below the frame assembly and till the ground and concurrently propel the carriage forwardly by their engagement in the ground, whereby the forward drive of the carriage can be effected and discontinued, selectively, by swinging the carriage upwardly to different relative positions about the wheel axis when the assemblies are latched together, and both the forward drive of the carriage and rotational drive of the tool can be effected concurrently and discontinued concurrently, selectively, by unlatching the assemblies, and said carriage being overbalanced forwardly of the wheel axis to swing downwardly about the wheel axis when the assemblies are latched together in said normal operating position.

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