The present invention relates to improvements in a beater type topping machine.

The features of this character are used for removing the tops from such crops as sugar beets, potatoes and the like. It is the principal purpose of the present invention to provide an improved machine of this character wherein the beater elements are so constructed as to cause them to ride toward the center of the exposed root when they strike it, and the foliage removed is carried over and deflected away from the row of roots, leaving the row clear of the foliage for subsequent removal of the roots. The machine embodies means for drawing the dust created by the beaters striking the soil, to the ends of the beaters and discharging the dust rearwardly.

It is also a purpose of the invention to provide a machine of the character described with a simple construction whereby it may be driven by an individual power unit on the machine or by a power take-off from the towing tractor, at the desire of the operator.

A further purpose of the invention is to provide in a machine of this character a simple mechanism for slicing the tops of projecting roots immediately following the removal of the foliage. This particular feature is of advantage in a beet topping machine where the beets must have the crowns removed.

It is also a purpose of the invention to provide a machine of this character with a quick detachable flail construction which permits the use of rigid flails and avoids the breakage of such flails when they strike hard objects.

The nature and advantages of the invention will appear more fully from the following description and the accompanying drawings. It should be understood, however, that the drawings and description are illustrative only and are not intended to limit the invention except insofar as it is limited by the claim.

In the drawings:

Figure 1 is a view in side elevation of a machine embodying my invention;

Figure 2 is an enlarged sectional view taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a plan view of the front portion of the machine;

Figure 5 is an enlarged sectional view on the line 5—5 of Figure 4;

Figure 6 is a plan view of the rear portion of the machine;

Figure 7 is a sectional view on the line 7—7 of Figure 6;

Figure 8 is a fragmentary sectional view taken on the line 8—8 of Figure 3;

Figure 9 is an enlarged perspective view of part of the flail showing the construction which causes the flail to ride toward the center of an exposed root when it strikes the root;

Figure 10 is an enlarged detailed view of the fan flails embodied in the machine for driving out the dust;

Figure 11 is a detailed view of a modified flail and flail mounting construction used in the machine;

Figure 12 is a view in side elevation of the flail shown in Figure 11; and

Figure 13 is a bottom plan view of the flail shown in Figure 11.

Referring now to the drawings, my invention is embodied in a beater type topping machine. In these machines a multiplicity of beater elements are mounted on a shaft which extends transversely to direction of travel of the machine. The shaft is rotated at high speed in a direction to cause the beaters to move in the direction of travel of the machine in their lower orbit of travel. The beaters are pivoted at the base so that they are free to yield in striking the ground or the foliage on an exposed root. These machines are utilized for a great variety of foliage removing purposes. One of the principal uses is to remove the foliage from the tops of sugar beets before digging the beets. Another common use of the machine is the removal of the tops of potatoes before digging potatoes so as to keep the potato vines from clinging to the potatoes and causing difficulties in the mechanical potato diggers. These machines are also used to break up heavy stubble or other top growth into a finely divided material that can be left as a mulch on top of the ground or worked into the soil by cultivation.

The machine is shown in Figure 1 as comprising a tongue 1 which may be connected to a towing vehicle, a hood 2 which is pivoted to the tongue by pivotal connections 3 and 4, a rear frame 5 with supporting wheels 6, a beater shaft 7 and flails 8 on the shaft 7. The machine includes a front gear box 9 provided with a power take-off drive shaft 10 that is extensible and that is provided with universal joints so that it may be connected to the power take-off shaft of a towing vehicle. The gear box 9 has a shaft 11, a pulley 12 on the shaft 11 and a pulley 13 on the beater shaft 7 may be connected by a belt for driving the beater shaft 7. In general it is preferred to provide a separate power unit 14 on the rear frame 5. This power unit may be a small internal combustion engine. A shaft 15 from the power unit 14 is connected by pulleys 16 and 13 and a belt 18 to the beater shaft 7. The construction is such that the belt 18 can be used to connect pulleys 16 and 13 and a similar type belt can be used to connect pulleys 12 and 13 so that the machine can be driven alternately from the towing vehicle or from the power unit 14.

The tongue 1 and the hood 2 are so connected that the hood may be raised and lowered to adjust it to the proper height for the operation of the beater 8. The details of this mechanism are shown best by Figures 4 and 5. A cross frame member 19 on the hood 2 and a corresponding cross frame member 20 on the tongue 1 carry the connecting members 3 and 4 which pivot the tongue to the hood. Upstanding bars 21 are provided on the frame member 20. At the upper ends of these bars, 1 provide pivoted blocks 22 which are pivoted by pins 23 to the upper ends of the bars 21. The blocks 22 rotateably mount hand cranks 24. The cranks are prevented from sliding endwise in the blocks 22 by collars 25 and 26. Frame members 27 extend upwardly and rearwardly from the frame member 19 over the semi-cylindrical shell 28 of the hood. These frame members 27 have loops 29 therein which secure eye bolts 30 to the members 27. The eye bolts 30 are threaded into the end cranks 24.

The mechanism just described provides a triangular connecting means between the tongue 1 and the hood 2 which can be utilized to raise or lower the hood at its front end. By rotating the hand cranks 24 to increase the distance from the loops 29 to the blocks 22, the pivotal connections 3 and 4 are raised with respect to the front end of the tongue 1 and the wheel support at the rear of
the machine. This obviously lifts the beaters 8. Conversely as the hand cranks are turned to reduce the distance between the loops 29 and the blocks 22, the pivotal connections 3, 3, 3 and 4 will be lowered to move the beaters 8 closer to the ground.

The rear end of the frame 5 includes a cross bar 31, which carries a plurality of vertical bars 32. These bars 32 are secured to the cross bar 31 by clamps 33 so that the spacing of the bars 32 may be adjusted to coincide with the row of roots to be topped. Figure 4 shows three of the bars 32 used for a beater that tops three rows at one time. The bars 32 mount sliding units 34 in such a position that they will be properly situated for slicing the tops or crowns off the protruding roots of beets and the like. All of the units 34 are alike so that a description of one will suffice for all of them. As shown best in Figures 6 and 7, each bar 32 carries an upper sleeve 35 and a lower sleeve 36. The upper sleeve 35 pivotally mounts a U-shaped rod 37. A like rod 38 is pivotally mounted by the lower sleeve 36. Washers 39 are provided at the ends of the sleeves 35 and 36 and any suitable means such as cotter pins 40 are used to secure the rods 37 and 38 in the sleeves 35 and 36 so that they can be easily removed. A spring 42 is connected under tension between a pin 43 on the rod 37 and a pin 44 on the rod 38 so that the rods 37 and 38 are urged downwardly by the spring 42. The rear legs 8 of the rods 37 and 38 are connected by uprights 45 and 46 which have sleeves 47 and 48 extending between them and forming bearings around the rear legs of the rods 37 and 38. The lower ends of the bars 45 and 46 are connected by and support a plate 49 which extends downwardly and rearwardly and which has a foot portion 50 at its rear end to ride over the exposed roots. The plate 49 has a front support 51 for a cutter carrying bar 52. The portion 50 of the plate 49 carries an upright 53 which is slotted at 54 to provide an adjustable support for the rear end of the bar 52.

The bar 52 extends rearwardly beyond the plate 49 and mounts a bearing 55 for a shaft 56 that carries a disk cutter 57. The disk cutter 57 is fitted substantially and is supported by the bar 52 so that it is just rearwardly of the rear edge of the portion 50 and below this rear edge. The distance the disk 57 extends below the portion 50 is varied by the adjustment of the bar 52 on the upright 53. It will be noted from an examination of Figure 6 that the cutter disk 57 is offset to one side of the plate 49 and the plate 49 is substantially centrally behind the bars 32. This is done in order to have the disks 57 normally strike the roots slightly off center. This will cause the disks 57 to rotate in the direction in which they cut and clear themselves, it will be appreciated, of course, that the beets are not always exactly in line so that sometimes the disks 57 may be rotated in the other direction by engagement with the beet. Each beet, however, will in general tend to cause the disks to rotate and in this fashion the disks are self cleaning.

Referring now to Figures 1, 2 and 3 in particular, these figures illustrate the construction and arrangement of the beaters 8 on the shaft 7 and the way in which the machine operates to remove the foliage and spread it in such a fashion as to deposit the foliage removed between the rows of beet root. The shaft 7 is enlarged within the shell 28 of the hood 2, to provide a hub which carries a multiplicity of mounting lugs 58. At the end of the shell 28, there are four of the lugs 58 arranged circumferentially at 90 degrees apart. These four lugs pivotally mount fan flails 75. The fan flails 59 are made of metal strips which are twisted from the pin and mounted on lugs 58 in their free ends so they act as fan blades that tend to push the air and dust toward the end walls of the shell 28. The outer ends of the blades are turned up as indicated at 60 so as to stiffen the blades. The shell 28 is apertured as indicated at 61 to provide for escape of the dust that is forced outwardly by the flails 59. The dust forced back through the apertures 61 is directed rearwardly and outwardly by guards 62 over the aperture 61. Inwardly of the flails 59, the hub of the shaft 7 has additional lugs 63 arranged in staggered relation throughout its length to mount beater flails 64 which actually strike the foliage to be removed and strip it from the roots. Most of the foliage is lifted by the flails and carried around to be discharged at the rear of the shell 28. In order to dispose of this foliage between the rows, I provide the rear of the shell 28 with a series of deflecting strips 65 which are so positioned that they intercept the foliage as it passes from beneath the hood and deflects it sidewise to leave the row of roots substantially free. The strips 65 are adjustable transversely of the machine to adapt them to spacing of different row crops by providing a multiplicity of apertures in the attaching flange 66 of the shell 28 into which bolts 67 that secure the strips 65 may be inserted.

The particular construction of the flails 64 is illustrated best in Figure 9 of the drawings. These flails are constructed of a suitable resilient material such as rubber so that they will bend when they strike the root. Each flail is provided on its advancing face with diagonally extending ribs 68 and 69. The outer end of each rib is closer to the pivot of the flail than its center end and the ribs extend substantially to the mid line of the front face of the flail. Preferably each rib is staggered with respect to the opposite rib and extends beyond the tip of the flail slightly. When this flail strikes a round beet top or other root top, the ribs 68 and 69 tend to deflect the flail transversely if the flail is not centered with respect to the root. The deflection is in such a direction as to tend to force the flail toward the center of the top of the root.

Figure 10, looking endwise of a fan flail 59 illustrates how the flail is twisted. The amount of twist given should always be less than 90 degrees end to end, but may vary widely.

Referring now to Figures 11, 12 and 13, these figures illustrate a modified flail construction and the mounting thereof on the lugs 63. This mounting is also used for the fan flails 59. A bushing 70 and a spring 71 are used between two lugs 58 or 63. The aperture in the flail is slightly larger than the securing pin 72 so that the flail may rock a certain amount to permit it to be deflected around a solid object in the ground. The spring 71 may be a coil metal spring or a block of resilient material such as rubber. The bushing 70 preferably is a metal bushing although it may also be made of rubber.

The modified flail construction shown in Figures 11-13 is particularly applicable where rigid flails are used instead of the flexible flails 64. In this construction, I mount a stub arm 73 on the pin 72. This arm is offset at 74 and has an aperture 75 in its outer end. This aperture is generally circular but has a notch 76 at one point in the periphery. A metal bar 77 has a pin 78 thereon. The pin 78 has a lug 79 which will pass through the notch 76 when the bar 77 is turned forwardly and inwardly at an angle of about 60 degrees to the arm 73. When the bar 77 is extended outwardly or trailing the arm 73, the lug 79 of course, prevents the pivot pin 78 from being withdrawn through the aperture 75. In normal operation the bar 77 will trail the arm 73 due to the rapid rotation of the beater. Each of the bars 77 is provided with a tip plate 80 which is intended to strike the soil or the foliage. The plate 80 is a square sheet of metal which is secured to the end of the bar 77 so that it has one of the corners projecting forwardly. The side portions 81 and 82 of the plate 80 are bent downwardly so that when the flail is in operation, the natural trailing angle taken by the bar 77 will make the advance edges of the plate 80 strike the foliage or the ground more nearly in a straight horizontal line. It will be appreciated that with this construction, the bars 77 with their attached plates 80, can be quickly removed in the event of damage without taking out any bolts. These bars 77 are also reversible after being worn to give a greater life in their use as flails. To reverse the bars 77, the pins 72 are removed and the arms 73 are turned around so as to maintain the bars 77 in align-
ment with the arms 73. The loose mount of the arms 73 on the pins 72 allows the flails to deflect sidewise when the tip of the blade 80 strikes a rock or other hard object. By providing the two pivot points by means of the pins 72 and 78, the wear due to the oscillation of the bar 77 is divided with a resultant longer life of the entire flail.

It is believed that the construction and operation of my improved topping machine will be clear from the foregoing description. It will be appreciated that the different types of flails illustrated in Figure 9 and in Figures 11 to 13 can be used interchangeably in the machine. For some purposes the flexible flails 64 are preferred while in other situations the pointed all metal flails are desirable. The length of the flails may be varied, of course, in the well known manner to adapt the machine for use where the row crops are either hilled or planted in valleys.

The combination of the fan flails 59 with either the flails 64 or the flails of Figures 11-13, and the dust outlets 61 in the shell 28 provides a machine wherein one of the worst drawbacks of beater type topping machines is substantially overcome. These machines naturally stir up a lot of dust whenever they are used on soil that is not wet at the surface. The beaters, in striking the soil, pick up the dust and throw it forward. Unless there is some means to reduce the air pressure in the shell 28 over the beater, the dust will boil out forwardly around the outer edges of the shell. With my invention, however, the pressure is not permitted to build up beneath the shell 28. The fan flails 59 act to draw air from the center of the beater and to force the dust and air out through the openings 61 and rearwardly of the machine so that whenever dust is raised by the flails, it tends to move up inside the hood and be discharged through the openings 61 and thrown out at the rear of the hood. The guards 62 may be extended as far to the rear as desired.

Having thus described my invention, I claim:

In a machine for removing plant foliage by beating, a beater, a hood over the beater, a supporting frame on which the beater is mounted, the hood being secured to the frame, rear wheels supporting the rear end of the frame, a tongue extending forwardly from the front end of the frame, a cross frame member at the rear of the tongue and a cross frame member at the front of the frame, pivot means pivoting said cross frame members to each other, uprights on the tongue cross frame member, extensible members rotatably mounted at the tops of said uprights and extending rearwardly, frame members on the supporting frame extending over the hood, said extensible members being connected to the last named frame members whereby to change the angle of the tongue with respect to the supporting frame by extension of said extensible members.

References Cited in the file of this patent

UNITED STATES PATENTS

842,021 Sandberg ........................ Jan. 22, 1907
1,115,250 Schroeder ........................ Oct. 27, 1914
2,429,044 Bassett ........................ Oct. 14, 1947
2,506,054 Agee et al. ...................... May 2, 1950
2,608,816 Lembke .......................... Sept. 2, 1952
2,634,570 Brockman et al. .............. Apr. 14, 1953