Nov. 10, 1964 E. M. HARDING, JR 3,156,231

CONCRETE PLANE

Filed Feb. 6, 1962 3 Sheets-Sheet 1

FIG. 1

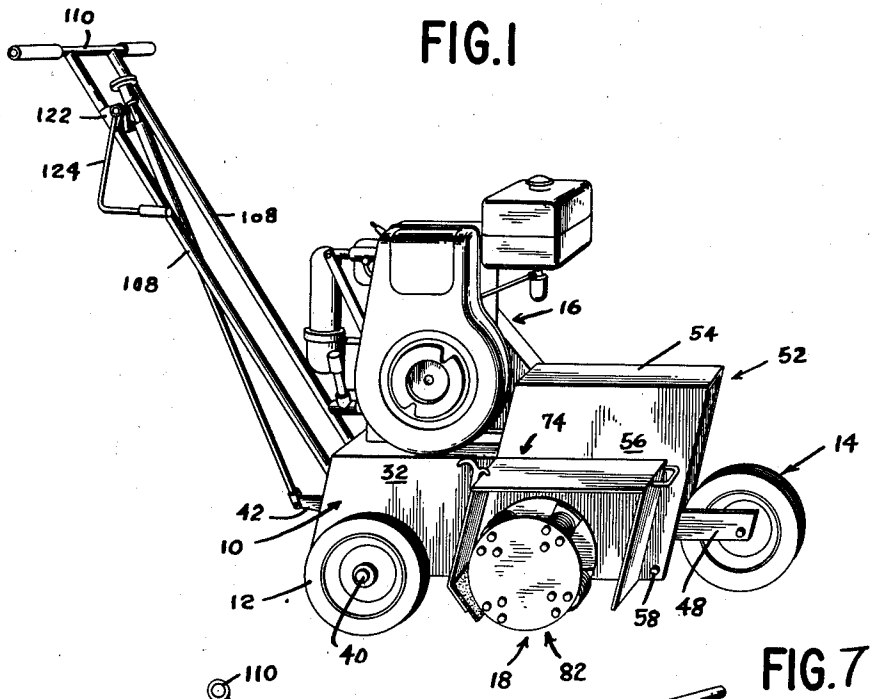


FIG. 7

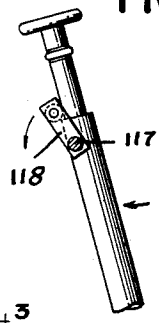


FIG. 6

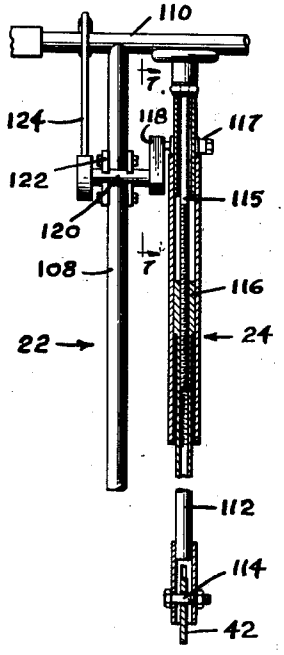


FIG. 2

INVENTOR.
EDWARD M. HARDING, Jr.
BY
Pattison, Wright & Pattison
ATTORNEYS

Nov. 10, 1964 E. M. HARDING, JR 3,156,231

CONCRETE PLANE

Filed Feb. 6, 1962 3 Sheets-Sheet 2

FIG. 4

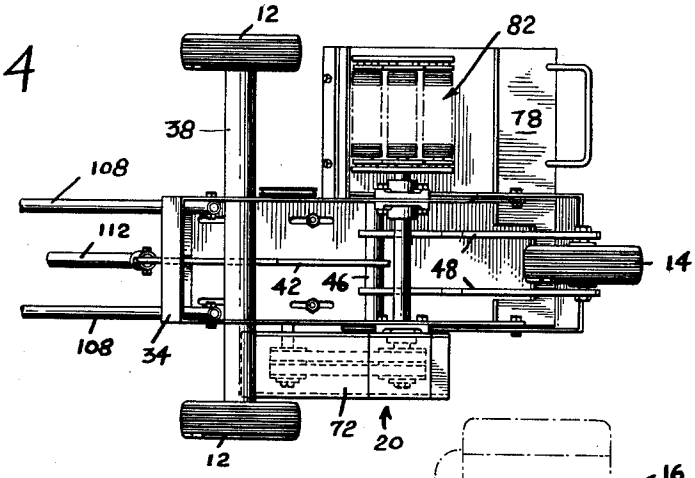
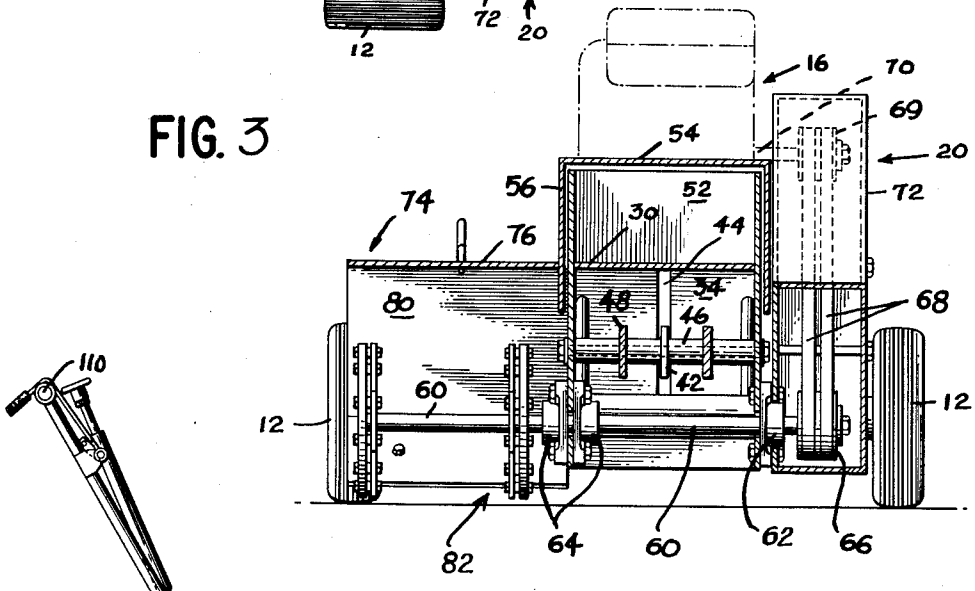


FIG. 3



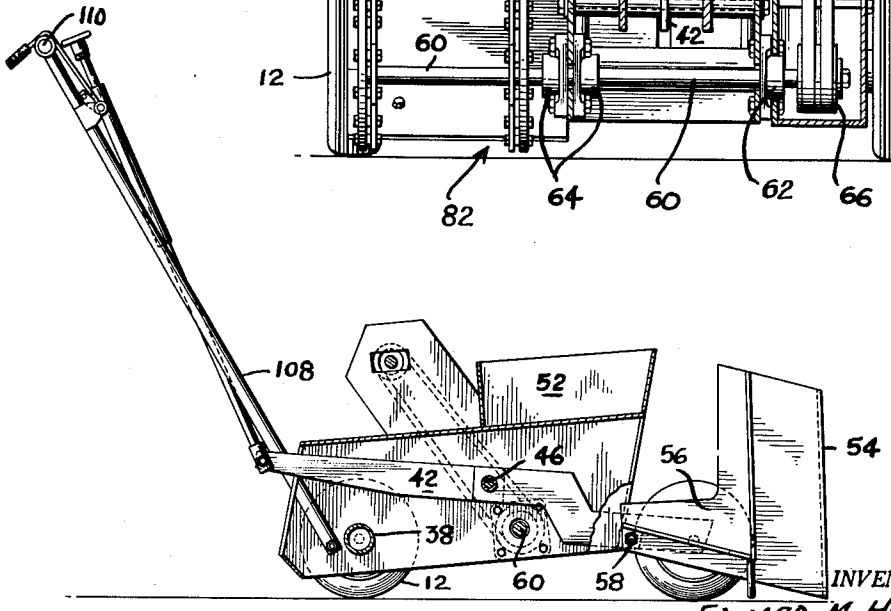


FIG. 5

INVENTOR.
EDWARD M. HARDING, Jr.
BY
Pattison, Wright & Pattison
ATTORNEYS

Nov. 10, 1964 E. M. HARDING, JR 3,156,231

CONCRETE PLANE

Filed Feb. 6, 1962 3 Sheets-Sheet 3

FIG. 8

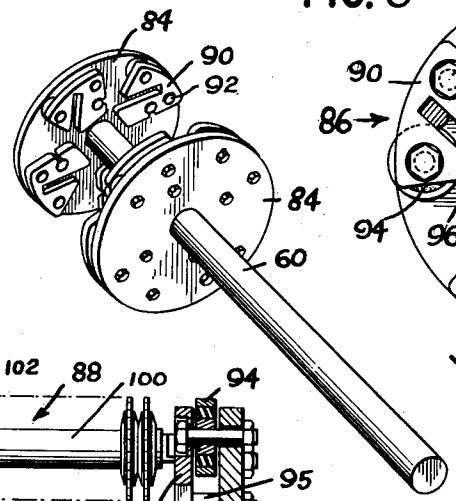
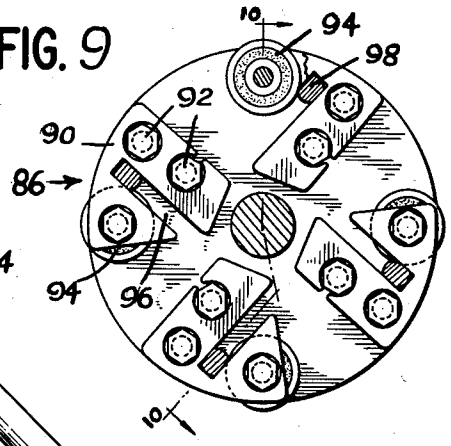


FIG. 9



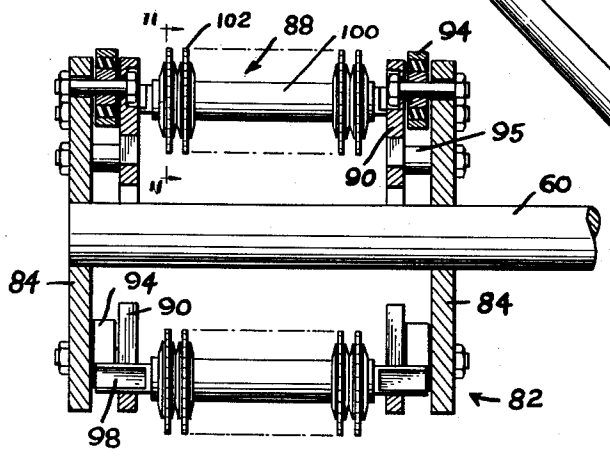


FIG. 11

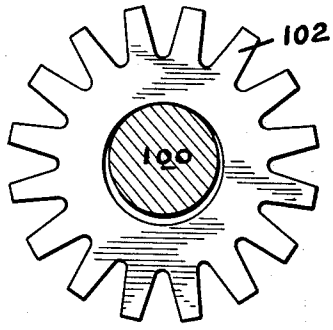


FIG. 10

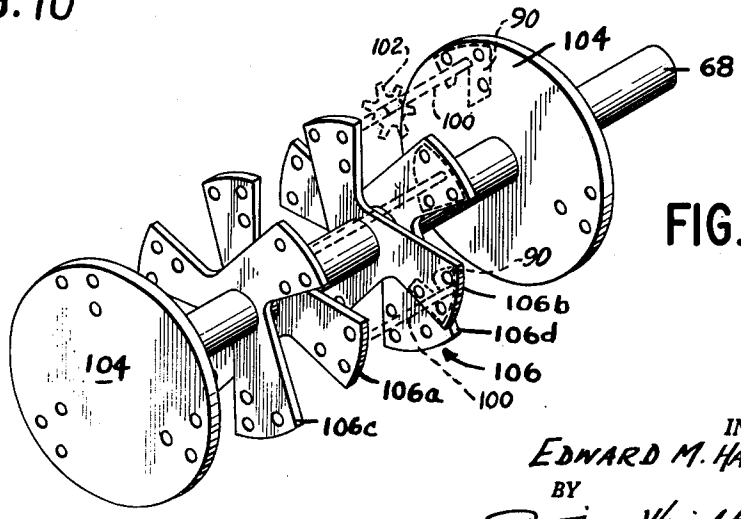


FIG. 12

INVENTOR.
EDWARD M. HARDING, JR.
BY
Pattison, Wright & Pattison
ATTORNEYS

United States Patent Office 3,156,231 Patented Nov. 10, 1964

3,156,231

CONCRETE PLANE

Edward M. Harding, Jr., Rockville, Md., assignor to Equipment Development Co., Inc., Silver Spring, Md., a corporation of Maryland

Filed Feb. 6, 1962, Ser. No. 171,435
8 Claims. (Cl. 125—5)

This invention relates to abrading machines, and more particularly and specifically to a novel, all-purpose plane for use on concrete and asphalt surfaces.

It is a general object of the present invention to provide a manually operated, mobile plane adapted for a variety of uses incident to the placing, resurfacing and maintaining of concrete and asphalt surfaces. For example, but not by way of intended limitation, the subject invention has equal utility in removal of paints, tars, sealer compounds and the like from the asphalt and concrete surfaces, as well as the removal of substantial material thicknesses from such surfaces incident to the patching or leveling of surfaces prior to finishing them.

Another object of the present invention resides in the provision of a manual or pedestrian operated mobile unit for the planing or abrading of concrete or asphalt surfaces which is well balanced and self-leveling in respect to the surface upon which it is working and which is readily and easily manipulated by a single pedestrian operator.

A further object of the present invention lies in the provision of a novel plane which incorporates a quickly replaceable cutter assembly and the ability to mount cutter assemblies of varying coarseness for different cutting requirements.

Another object of this invention rests in the provision of a mobile concrete and asphalt plane of the type described which provides for the combination therewith of a unique cutter assembly with means for the quick and easy removal and replacement of the assembly, and a plane in which maximum benefit is obtained from the work potential of the cutters derived by the floating action thereof and the centrifugal forces established therein.

A still further object of this invention lies in the provision of a mobile plane of the type described wherein quick adjustable means are incorporated to permit rough and fine adjustment settings of the cutter assemblies relative to the surfaces upon which the work is being done.

Still another object of the present invention resides in the provision of a mobile plane for work treatment of concrete and asphalt surfaces which is of a relatively simple and inexpensive design and manufacture, yet which is rugged and durable in use, easily operated by a single pedestrian operator, and highly efficient and effective.

Further objects of the present invention will become more readily apparent to one skilled in the art when the following general statement and description are considered in the light of the accompanying drawings.

The instant invention may be described in general terms as relating to a mobile plane for concrete and asphalt surfaces which consists of a carriage supported on three triangularly spaced wheels, a power unit and belt drive assembly supported on said carriage, a horizontal driven shaft rotatably supported by said carriage and coupled to said drive assembly, a cage fixed on a projected end of said horizontal shaft in concentric arrangement with the axis thereof, a plurality of cutter bar units removably coupled in said cage, each extending longitudinally thereof about the circumference thereof, control handle means for manipulating said carriage including thereon controls for said power unit, and a lever system for raising and lowering said carriage and cage relative to the supporting surface beneath the triangulated wheels.

Referring now to the accompanying drawings in which like numerals designate similar parts throughout the several views:

FIG. 1 is a side pictorial view of the mobile plane constituting a preferred embodiment of the present invention;

FIG. 2 is a partial vertical section of the plane of FIG. 1 with the power unit removed;

FIG. 3 is a transverse vertical section taken on line 3—3, FIG. 2;

FIG. 4 is a bottom plan view of the plane illustrated in FIG. 1;

FIG. 5 is a view similar to FIG. 2 with the carriage and cutter in an elevated position;

FIG. 6 is a partial front elevation of the handle controls for the mobile unit;

FIG. 7 is a vertical section on line 7—7, FIG. 6;

FIG. 8 is a perspective view of the driven shaft and cutter assembly cage;

FIG. 9 is a vertical section transversely of the cage with the cutter bars in place;

FIG. 10 is a vertical section on line 10—10, FIG. 9;

FIG. 11 is a vertical section on line 11—11, FIG. 10;

FIG. 12 is a perspective view of a modified form of the cutter cage.

The mobile plane constituting the present invention, as illustrated by way of preferred embodiment in the accompanying drawings, consists of a carriage or housing 10, a pair of laterally spaced rear wheels 12, a single forward wheel 14, a power unit 16 mounted on the carriage, a cutter unit 18, a drive casing 20, and a handlebar unit 22 including a cutter adjusting mechanism 24, all such components being so generally designated.

Carriage and Wheel Support

The carriage 10 consists, more particularly, of an inverted, generally rectangular box housing having a substantially horizontal top wall 30, depending vertical side walls 32, depending rear wall 34, and a depending, partial front wall 36. An elongated tube 38 extends transversely of the lower rear end of the housing and is secured in and projects through each of the side walls 32 for a predetermined distance therebeyond. An axle 40 extends through the tube 38 and supports a wheel 12 on each extended end thereof adjacent each end of the tube.

An elongated bar 42 extends longitudinally, horizontally of the rearward portion of the housing projecting rearwardly therefrom through a vertical slot 44 in the rear wall 34, and having its forward end fixed to a shaft 46 rotatably supported transversely between and by the side walls 32 intermediate the front to rear extensions thereof. A pair of horizontally stepped bars 48 are positioned with their rearward ends fixed on the rotary shaft 46 on opposite sides of the attachment of bar 42 thereof and with their forwardly, downwardly, stepped front ends projecting through and beyond the front wall 36 of the housing where they support the remote ends of an axle 50 on which is mounted the single forward wheel 14.

The forward portion of the top wall of the housing is provided with an open top storage box 52. A storage box enclosing top plate 54 is supported by a pair of depending side plates 56 which lie outside the side walls 32 of the housing and which are hinged on pins 58 to the lower forward ends of the side walls. This arrangement permits the top wall or cover to pivot from a box closing position, FIGS. 1 and 2, to a box opening position, FIG. 5.

Cutter and Drive Assembly

Forwardly from and below shaft 46 a drive shaft 60 extends transversely of the housing and projects outwardly through and beyond the side walls thereof. On one

side wall shaft **60** is mounted in a bearing **62** which is supported on the outside surface of the side wall **32**, and shaft **60** is also supported in two additional bearings **64** which are mounted, one each, the inner and outer surfaces of the opposite side wall **32**.

Externally of the side wall supported bearing **62**, shaft **60** supports a double drive belt sheave **66** about which are trained a pair of parallel belts **68** which extend angularly upwardly and rearwardly of the housing where the upper ends are trained about a double sheave **69** supported on the drive or output shaft **70** of the power unit **16** supported on the upper surface of the carriage. The belts **68** and driving and driven sheaves are all enclosed within a housing **72** which is supported by the side wall **32** of the carriage housing of the mobile unit.

The second end of shaft **60** which is supported in the bearings **64** projects beyond that side wall of the housing supporting the bearing **64** within a cover unit generally designated at **74** which includes a top wall **76**, front wall **78** and rear wall **80**. Within the general bounds of the cover unit the extended end of shaft **60** supports a cutter cage generally designated at **82** which is more specifically disclosed in FIGS. 8 through 10.

Cutter Cage and Cutter Bar Assembly

The cutter cage **82** consists of a pair of circular plates **84** which are axially mounted on and fixed to the driven shaft **60** in spaced relationship thereon one to the other. Each plate is provided on that face disposed toward the other plate with a plurality of socket elements generally designated at **86** for the reception of the extreme ends of cutter bars generally designated **88**. As best seen in FIG. 9, each socket element consists of a generally rectangular bracket **90** positioned adjacent the face of the circular plate **84** which the apex portion thereof disposed toward the axial center of the plate and driven shaft **60**. Each such bracket **90** is secured to the circular plate **84** by means of three triangularly arranged bolt elements **92** which project through the triangular bracket **90** and the circular cage plate **84**. One bolt in each bracket **90** supports a neoprene or other resilient cushioning washer **94** which is interposed between the bracket and plate, and each of the other two bolts **92** supports a rigid spacer **95** between the bracket and plate.

Each socket bracket **90** is provided with a straight channel or passage **96** opening thereinto from a point adjacent the general apex area of the triangular bracket and extending in the direction of that side of the triangulated bracket adjacent the circumference of the cage plate **84**. The side walls of the channel are straight and are adapted to slidably receive the tang end **98** of a circular cutter bar **100**. As is best seen in FIG. 9, the resilient washer **94** surrounding that bolt **92** nearest to the channel **96** has a peripheral portion thereof extending into and obstructing the channel at a point intermediate the depth of the channel whereby it is necessary to force the tang end **98** of the cutter bar past the resilient washer whereupon it becomes removably locked in the inner end area of the passage or channel.

Each cutter bar, as best seen in FIGS. 10 and 11, is provided with a series of circular star cutter wheels **102** which are positioned on the circular cutter bar in packed side by side relationship longitudinally thereof between the tang end portions thereof and which are held in place by means of crimped washers or the like (not shown) beyond the extreme ends of the pack.

In FIG. 12 of the drawings there is shown a modified form of the cutter assembly wherein a cutter cage of greater width than that previously described is provided by utilization of two end plates **104** identical to plates **84** in the preferred embodiment and wherein additional propeller-shaped elements **106**, each having three projecting blade plates thereon, are interposed between the end plates in such combination or arrangement as will permit a series of elongated cutter bars to be mounted between the extreme end plates **104** in overlapping relationship. As best seen in this FIGURE 12, four propeller shaped plates **106** are disposed intermediate the two end plates and it is immediately evident that the two inside plates designated **106***a* and **106***b* could support extreme ends of cutter bars the second ends of which would be supported in the extreme end plates **104**, while the outside propeller plates **106***c* and **106***d* would support the remote ends of cutter bars therebetween centrally of the cage so that the end portions thereof would overlap the inside end portions of the blades supported from the extreme end plates of the cage. As is seen in this figure it is also necessary for this particular type of arrangement, that the blade elements of the plates **106***c* and **106***d* be aligned longitudinally of the driven shaft **60** and that the blades of intermediate elements **106***a* and **106***b* also be aligned longitudinally of the shaft but offset radially from the blades of the elements **106***c* and **106***d*.

Control Handles and Cutter Height Adjustment Assembly

The rearward portions of the side walls **32** of the carriage housing support the lower ends of two upwardly and rearwardly inclined handlebars **108** which, in turn, support a handgrip bar portion **110** bridging the upper spaced ends thereof. This provides a conventional form of pushing and steering arrangement for a wheeled vehicle.

In conjunction with the spaced handlebar elements **108** there is provided a height adjustment rod **112**, the lower end of which is pivotally attached at **114** to the rearward projected end of bar **42**. The upper end of the height adjustment rod, which takes the form of a piece of tubular stock, telescopically receives therein a threaded rod **115** which has screw engagement with a fixed nut block **116** in the lower end of the tube. At a point above the tube the rod has pivotal connection with a horizontal pin **117** which, in turn, is pivotally hinged to one end of a crane bar **118**, the second end of which, in turn, has fixed connection on a shaft **120** which is rotatably mounted in bearing plates **122** secured on one of the handle uprights **104**. A handle element **124** is secured to the shaft **120** for manual rotation of the shaft about its horizontal axis.

Operation

It is evident from the structure shown that operation of the power unit will rotate shafts **60** and the cutter cage **82** secured thereon. Rotation of the end plates **84** of the cutter cage centrifugally throws cutter bars **100** circumferentially outward to produce a driving force in the star cutter wheels **102** thereon about the entire circumference of the cage. The engagement of the star wheels with the asphalt or cement surface beneath the supporting wheels of the carriage produces a scarifying or planing effect. The particular coarseness of the star wheels **102** will determine the cutting effect of the plane.

Rotation of the control rod **115** in the control tube **112** will raise or lower, with five adjustments, the rear end of bar **42** thereby regulating through front wheel **12** the elevation of the carriage and cutter relative to the wheel supporting surface.

For rapid and extensive raising and lowering of the carriage and cutter, the handle **124** is moved back and forth from its illustrated positions in FIGS. 6 and 2, respectively, causing substantial raising and lowering of the rear end of bar **42** between the positions illustrated in FIGS. 5 and 2, respectively. This ability to substantially elevate the carriage and cutter is of utility in wheeling the unit from place to place, or, for example, when replacing cutter bars in the cutter cage.

It is important to note, as shown in the drawings, that the transversely aligned rear wheels are extended laterally beyond the widest projection of the cage and drive housing, while the single front wheel is longitudinally aligned

on the center line of the carriage housing. This wheel arrangement provides for maximum ease of maneuverability and maximum balance and self-leveling character.

Having thus described and explained the invention, what I desire to claim is:

1. In combination with a horizontal shaft rotatably supported in a mobile unit and having operable connection with power means on said unit, a cutter assembly comprising, plates fixed axially on said shaft in longitudinally spaced relationship therealong, wedge sockets on the opposed faces of said plates arranged in spaced relationship about the peripheries thereof, said sockets being formed by brackets having frictionally obstructed channels therein opening generally radially inward of their supporting plates, bar means each having its remote ends frictionally coupled in opposed wedge sockets on said spaced plates, and a plurality of cutter wheels arranged in packed side by side relationship longitudinally of each bar means with the peripheral cutting edges of said wheels projecting radially from said shaft beyond the outermost circumferential edges of said plates.

2. A combination as defined in claim 1 wherein each wedge socket consists of a substantially triangular bracket secured flat against the end plate with the apex portion thereof projecting toward the central region of the end plate, a channel opening inwardly of the apex region of the triangular bracket, and a resilient element partially obstructing said channel intermediate the length thereof.

3. A combination as defined in claim 1 wherein each wedge socket consists of a partially restricted channel formed substantially radially of one of said end plates with the open end thereof disposed inwardly away from the circumference of said end plate.

4. In combination with a horizontal shaft rotatably supported in a mobile unit and having operable connection with power means on said unit, a cutter assembly comprising, a pair of circular end plates fixed axially on said shaft in longitudinally spaced relationship, propeller-shaped plates fixed axially on said shaft, intermediate said circular end plates with the blade elements of each offset from the other longitudinally of said shaft, bar means having cutter wheels packed therealong detachably secured between one end plate and one blade of that propeller plate farthest therefrom whereby bar means having end support in the opposed end plates overlap centrally of said shaft length intermediate the end plates.

5. A combination as defined in claim 4 including means for adjusting the elevation of said shaft relative to the mobile unit.

6. In combination with a horizontal shaft rotatably supported in a mobile unit and having operable connection with power means on said unit, a cutter assembly comprising: a pair of plates fixed axially on said shaft in longitudinally spaced relationship therealong, flat bracket members secured in spaced relationship about the peripheral edges of the opposed faces of said plates, each bracket being provided with a channel formed therein and opening toward the axial center of the plate supporting shaft, each channel provided intermediate its length with a resilient partial obstruction; and bar means having plural cutting wheels packed therealong, the remote ends of said bar means having tang extensions engageable in the channels of opposed brackets on said spaced plates.

7. In a mobile plane including a carriage, spaced ground engaging wheels supporting one end of said carriage, a power driven shaft suported horizontally of said carriage, and a handlebar fixed to and projecting upwardly from the wheel supported end of said carriage, means for raising and lowering the shaft relative to the carriage comprising, a ground engaging wheel forwardly of said carriage and from said supporting wheels, an elongated bar member supporting said ground engaging wheel and projecting rearwardly of said carriage, a supporting pin horizontally traversing said bar intermediate its length and journalled in said carriage, an adjustment rod having one end pivoted to the rearward end of said bar member and the second end having bell crank connection to an upper portion of said handlebar, and means for moving said bell crank between its extreme positions.

8. Structure as defined in claim 7 wherein said adjustment rod consists of a threaded rod having screw engagement with a sleeve member, said sleeve member having operable connection to said bell crank, and means for manually rotating said threaded rod in said sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,084,810	Messer	Jan. 20, 1914
1,758,647	Burrell et al.	May 13, 1930
2,454,650	Harris	Nov. 23, 1948
2,664,281	Luksch et al.	Dec. 29, 1953
2,673,725	Coates	Mar. 30, 1954
2,701,134	Klicpera	Feb. 1, 1955
2,858,650	Janowitz	Nov. 4, 1958
3,044,223	Bruck	July 17, 1962
3,063,690	Cornell	Nov. 13, 1962