

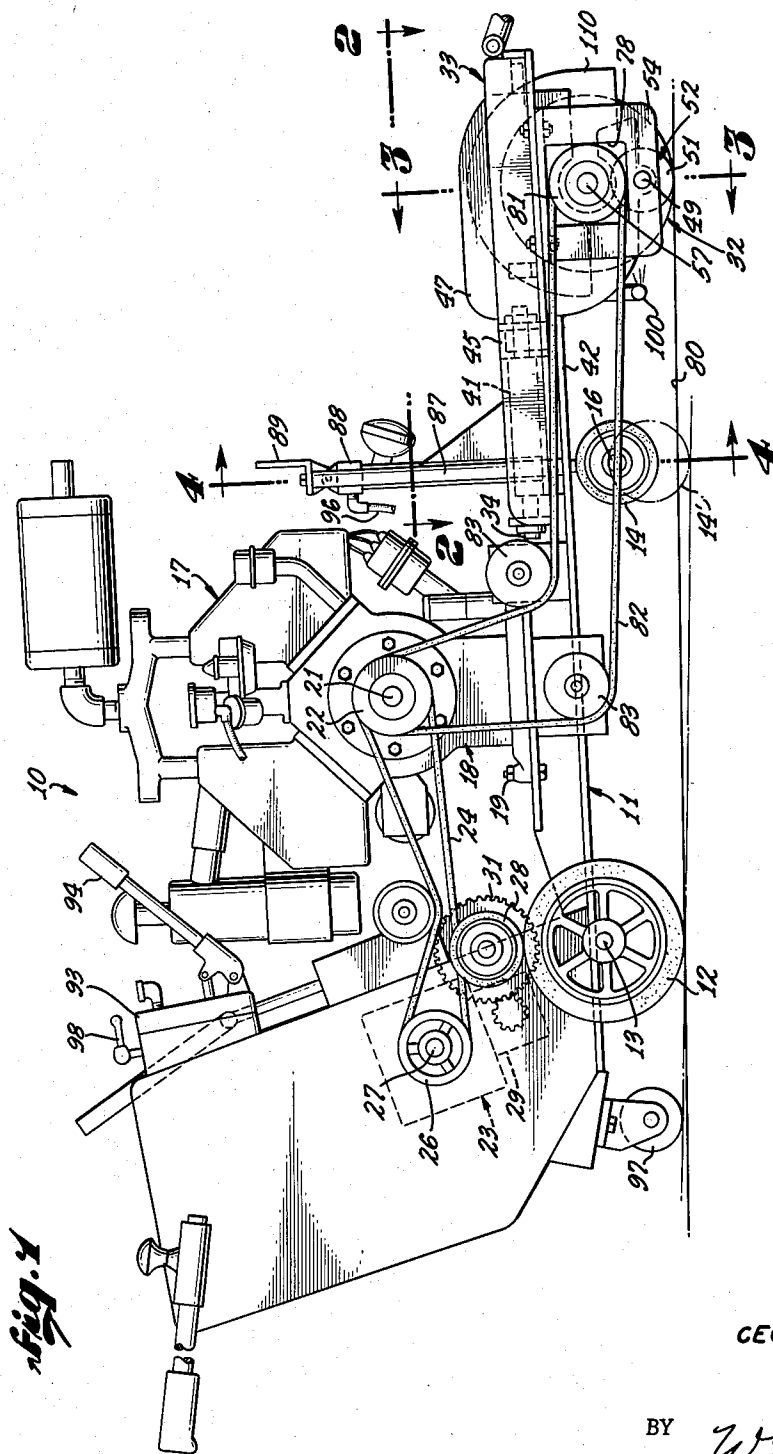
July 4, 1961

C. W. HATCHER
ABRADING MACHINE

2,990,660

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2 Sheets-Sheet 1



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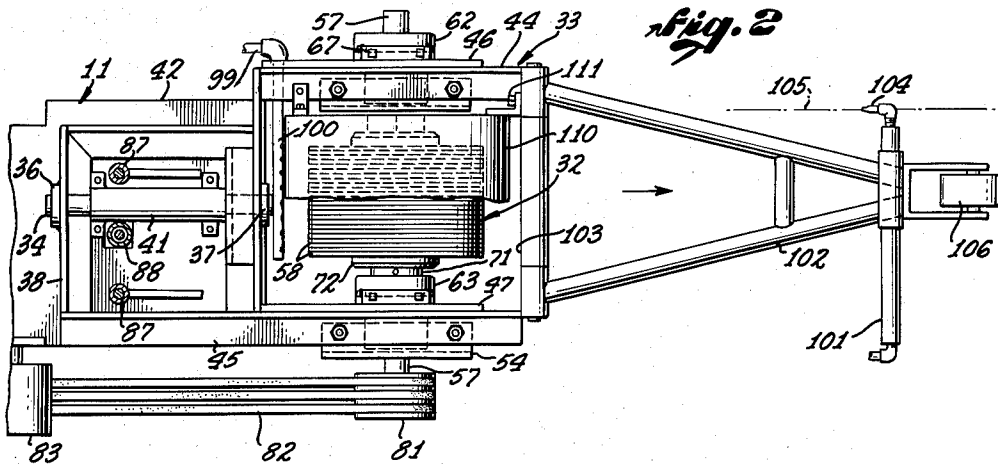
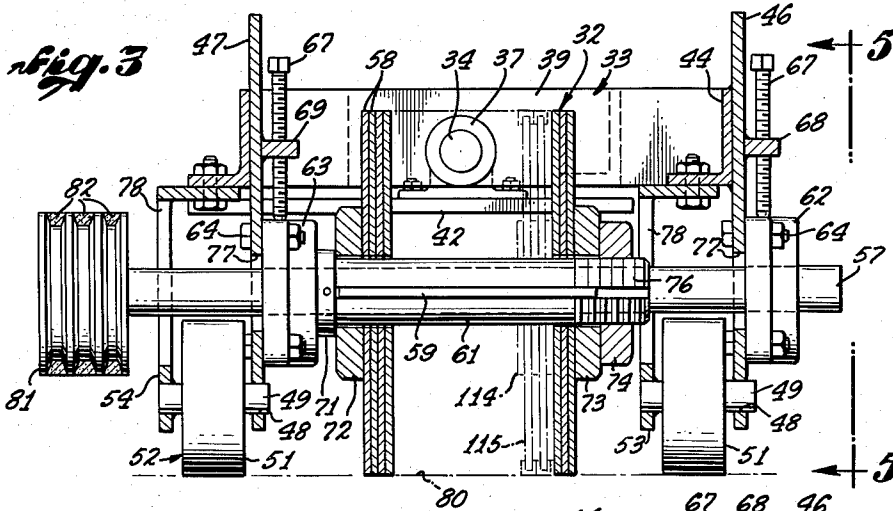
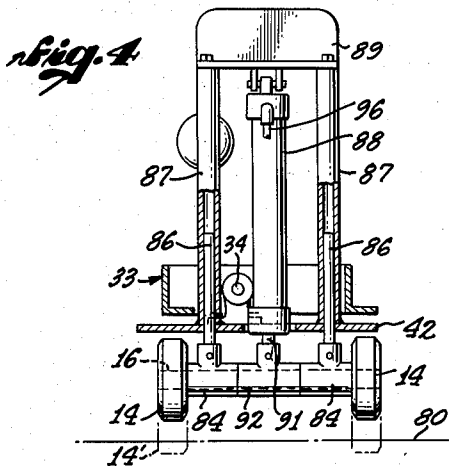
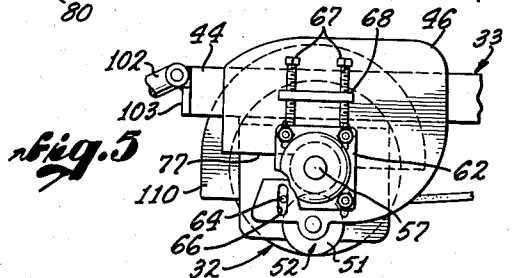
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ABRADING MACHINE

Filed Oct. 16, 1958

2 Sheets-Sheet 2



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2,990,660

ABRADING MACHINE

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Filed Oct. 16, 1958, Ser. No. 767,671
12 Claims. (Cl. 51-176)

This invention relates to an abrading machine, and more particularly to a machine for abrading or grinding the surface of a pavement, or the like, to remove unwanted foreign matter such as paint, or the like, or any roughness or unevenness therefrom.

In recent years it has become increasingly common to direct traffic flow upon pavements of roads or highways by applying stripes of a coating such as paint, plastics, or the like, which frequently necessitates removal if it is desired to rearrange such guide lines for rerouting or other purposes. In the past it has been attempted to cover such stripes of coating with additional paint, or coating substance, to obliterate the stripes. This, however, has been found unsatisfactory inasmuch as the additional coating is soon worn off, exposing the original guiding stripe, thereby causing dangerous confusion with the new stripes which have been laid. Removal of such undesired stripes has been attempted, but has heretofore been unsuccessful because of a lack of control of the depth of abrasion which resulted in either incomplete removal of the stripe or unevenness of the pavement after grinding, frequently resulting in undesired, uncontrolled formation of ridges and grooves in the pavement.

It is therefore an object of this invention to remove undesired foreign matter, such as a painted stripe, or the like, from a pavement in a manner in which the depth of abrasion is automatically controlled to remove only the foreign matter therefrom without forming undesired ridges and grooves in the pavement.

Another object of this invention is to grind or abrade the surface of a pavement with a power-driven abrasive means which is self-aligning to rise and fall and tilt to follow the irregularities in the pavement whereby the depth of the abrasive action is always the same along the pavement.

A further object of this invention is to make a cut of a constant depth with the abrasive wheel, the abrasive wheel having an adjustable support to make a cut of a suitable depth.

A still further object of this invention is to cut a groove of a constant depth, corresponding to the irregularities of the pavement, in instances where such a groove is desired.

Yet another object of this invention is to grind or abrade the surface of a pavement with a power-driven abrasive wheel which is easily and quickly adjusted for depth of cut and readily operated by an unskilled operator, to uniformly grind the surface of the pavement, regardless of irregularities in the pavement.

Another object of this invention is to quickly and easily withdraw the abrasive wheel from the surface of the pavement by extensible roller means on the frame to facilitate manipulation of the machine.

This invention provides an abrasive wheel which is rotatably supported on a self-propelled frame and which can rock about the longitudinal axis of the machine, being in a straight-line contact with the pavement with adjacent supporter roller means whereby the abrasive wheel is caused to rise and follow the irregularities in the pavement in the same manner as the adjacent roller means, whereby the depth of the abrasive action is always the same along the pavement. The abrasive wheel is adjustably mounted relative to the adjacent roller means whereby the depth of cut may be adjusted as desired.

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These and other objects of this invention will be more apparent from the following detailed description, drawings and appended claims.

In the drawings:

FIG. 1 is a side view, in elevation, of an abrading machine designed and constructed in accordance with this invention;

FIG. 2 is a fragmentary, horizontal cross-sectional view thereof, as taken substantially along a line 2-2 of FIG. 1, with parts thereof broken away for clarity;

FIG. 3 is an enlarged vertical, cross-sectional view as taken substantially along a line 3-3 of FIG. 1, with parts thereof shown in elevation;

FIG. 4 is a vertical, cross-sectional view as taken substantially along a line 4-4 of FIG. 1, with parts thereof shown in elevation; and

FIG. 5 is a fragmentary view, in elevation, as seen substantially along a line 5-5 of FIG. 3.

Referring more particularly to the drawings, there is shown by way of illustration, an abrading machine, generally designated by the numeral 10 designed and constructed in accordance with this invention, comprising a frame 11 adapted for linear, longitudinal movement on rear wheels 12 rotatably mounted on the frame for rotation about the axis of a transverse shaft or axle 13 secured to the frame 11 and on forward wheels 14 rotatably secured on a transverse shaft 16 which is adapted for linear vertical movement relative to the frame 11, as will be hereinafter described.

A power drive means 17 is provided on the frame 11 to selectively drive the rear wheels 12 to propel the machine 10. The power drive means 17 comprises an engine 18 secured to the frame 11 as at 19 which drives its drive shaft 21 and a pulley 22 secured thereto to drive a hydraulic motor 23 as by a pulley belt 24 and a pulley 25 secured to a shaft 27 of an hydraulic motor. The hydraulic motor 23 drives one or more friction drums 28 through a gear box 29 and a gear train 31, the friction drums 28 being selectively engageable with the outer periphery of the wheels 12 to drive the wheels 12 when in engagement therewith.

The forward wheels 14, as previously mentioned, are vertically extensible to a position shown in the broken lines 14' to support the frame 11 with abrasive means 32 elevated above the pavement when the abrasive means 32 is not in use.

The abrasive means 32, as best seen in FIGS. 1, 2, 3 and 5, is rotatably supported on a rocker means or sub-frame 33 which is pivotally supported on the forward end of the frame 11 for pivotal movement about the longitudinal axis of frame 11. The rocker means 33 comprises a substantially rectangular frame mounted for pivotal or rocking movement on a shaft 34 substantially parallel to the longitudinal axis of the frame 11, the ends of the shaft 34 residing in bearings 36 and 37 of transverse rear and intermediate members 38 and 39, respectively, of the sub-frame 33, the shaft 34 extending through and being rotatably supported by an elongated bearing 41 secured to a bedplate 42 of the frame 11. The sub-frame 33 is elevated slightly above the bedplate 42 to form a gap 43 therebetween whereby the sub-frame 33 may be rotated or rocked about the axis of the shaft 34.

The sub-frame 33 further includes a pair of longitudinal side members 44 and 45 extending forwardly of the intermediate transverse member 39 and having secured thereto, as by welding or the like, the pair of vertical bearing plates 46 and 47, respectively. The bearing plates 46 and 47 depend downwardly from the sub-frame 33, each including a lower aperture 48, the apertures 48 of each plate being substantially aligned and supporting one end of transverse stub shafts 49 which rotatably support cylindrical rollers 51 of a forward roller means 52.

The opposite end of the stub shafts 49 are non-rotatably supported by depending brackets 53 and 54 respectively of horizontal flanges 55 and 56 of the side members 44 and 45 respectively.

The rollers 51 of the roller means 52 serve to support the sub-frame 33 and the forward end of the frame 11 during the grinding or abrading operation.

The abrasive means 32 is rotatably disposed at the forward end of the sub-frame 33, intermediate the rollers 51, for a driven rotational movement about the axis of a transverse shaft or axle 57 adjustably secured to the bearing plates 46 and 47 of the sub-frame 33. The abrasive means 32 comprises a plurality of abrasive discs 58, of uniform diameter, non-rotatably keyed, as by a key 59, to a sleeve 61 which is non-rotatably secured to the shaft 57. The shaft 57 is supported adjacent its ends as by a pair of bearing blocks 62 and 63 which are adjustably secured on the bearing plates 46 and 47, respectively, whereby the shaft 57 may be elevated or lowered to adjust the depth of the cut of the discs 58. For this purpose, each bearing block 62, 63 is secured to its respective bearing plate 46, 47 by bolts 64 extending through vertically disposed slots 66 extending through the bearing plates 46, 47. To facilitate a more accurate adjustment of the bearing blocks in a vertical direction, a pair of adjusting screws 67 are provided on each bearing plate 46, 47, threadingly extending through flanges 68 and 19 of the bearing plates 46, 47 respectively, and having their lower ends in abutment with the upper surface of the bearing blocks 62, 63. A collar 71 is preferably secured to the shaft 57, interposed between the bearing block 63 and the sleeve 61 of the shaft 57, to prevent axial movement of the shaft 57. The discs 58 are preferably sandwiched between a collar 72, abutting against the collar 71, and a collar 73 held in abutment with the outer face of the abrasive disc 58 opposite the collar 72 as by a nut 74 having threaded engagement with external threads 76 of the sleeve 59. The collars 72 and 73 are preferably provided with keyways (not shown) for engagement with the key 59 for sliding non-rotational axial movement on the sleeve 61.

The outer ends of the shaft 57 extend through openings 77 of the bearing plates 46, 47 and openings 78 of the brackets 53 and 54, the openings 77, 78 being appreciably larger than the diameter of the shaft 57 to provide clearance for vertical movement of a shaft 57 during adjustment of the position of the shaft 57 relative to the pavement surface 80 to be processed. A pulley 81 is non-rotatably secured to one end of the shaft 57 to transmit rotational movement of the pulley 22 of the engine 17 to the shaft 57, as by one or more pulley belts 82 interconnecting the pulleys 81, 82. The forward portion of the pulley belts 82 are preferably retained in a horizontal position as by idler drums 83 secured to the frame 11, thereby exerting lateral force against the shaft 57 in a horizontal direction, rather than a vertical lateral force which would tend to bias the abrasive means in a vertical direction.

It will now be clearly understood from the foregoing description that the frame 11, having thereon the power drive means 17, is supported as by the wheels 12 at its rearward end, and by the roller means 52 at its forward end, the wheels 12 being driven by the engine 18 through the pulley 22, pulley belt 24 and pulley 26 to drive the drum 28 through the hydraulic motor 23.

The abrasive means 32 is adjustably supported on a rocker means or sub-frame 33 which is pivotally secured on the frame 11 whereby the sub-frame 33 and the abrasive means 32 may rock about the axis of the longitudinal shaft 34, the sub-frame 33 being supported by rollers 51. The rollers 51 and discs 58 of the abrasive means 32 are in contact with the pavement in a straight line transverse to the longitudinal axis of the machine and the direction of travel, with the result that the abrasive wheel follows

the irregularities in the pavement, the same as the rollers 51 follow such irregularities, whereby the depth of the abrasive is always the same along the pavement. The abrasive means 32 is rotated by the power drive means 17 through a pulley and pulley belt connection 81, 82, 22 to transmit the rotational movement of the shaft 21 of the engine 18 to the shaft 57 of the abrasive means 32.

Various types of abrasive discs 58 may be used to form the abrasive means 32. A disc 58 having a uniform thickness has been herein illustrated as being a practical type of abrasive disc usable for the purpose, however, if desired, a diamond-edged saw blade may be substituted for the abrasive discs illustrated. Diamond-edged saws, however, do have a built-up peripheral edge, therefore it is preferred to place spacers 114 in between the blades 115, as indicated in the broken lines of FIG. 3 in order that the blades are solidly stacked when clamped between sleeves such as 72 and 73 and compressed by the nut 74.

In order to lift the abrasive means 32 quickly from the surface of the pavement 80 at the end of the abrading operation, and/or to transport the machine or manoeuvre the machine into turns or about-turns to repeat the operation, or to place or align the machine in a new direction, the wheels 14 are preferably extensible to a position beyond a plane tangent to both the wheels 12 and the roller means 52, as indicated at 14' in FIGS. 1 and 4. For this purpose, as best seen in FIGS. 1, 2 and 4, the shaft 16 is rotatably disposed in a pair of spaced trunnions 84 which have slide members 86 extending transversely therefrom and into tubular guides 87, secured as by welding or the like to the bedplate 42 of the frame 11, for reciprocal movement therein. An hydraulic piston 88 is pivotally secured to a bracket 89 securing the upper ends of the tubular slide members 87, the piston rod 91 of which is anchored in a trunnion 92 circumjacent the shaft 16 whereby operation of a hand pump 93 (see FIG. 1) as by a handle 94 applies hydraulic pressure as through a conduit 96 to the hydraulic cylinder 88 to extend the piston rod 91 and thereby lower the wheels 14. Lowering of the wheels 14 raises the front end of the frame 11 and the sub-frame 33 to disengage the rollers 52 and the abrasive means 32 from the surface 80 of the pavement, and subsequently disengage the wheels 12 from the pavement whereby the frame 11 is supported by the forward wheels 14 and rear caster wheel means 97 to facilitate maneuvering of the machine 10. Pressure in the hydraulic system may be relieved as by a manually operated relief port actuated by a handle 98 of the hand pump 93.

An arcuate guard 110 is preferably removably secured to the sub-frame 33 as by bolts 111 to protect the abrasive means 32 and confine cuttings and grindings from being showered on the operator and the machine, see FIG. 2.

In order to prolong the life of the abrasive wheels, a cooling agent, such as water or the like, is conveyed as through a conduit 99 mounted on the frame 11 and having a nozzle 100 directed at the discs 58 and connected at its other end (not shown) to a suitable water supply, see FIG. 2. The water supply may be also connected as to a transverse conduit 101 mounted to a hinged guide frame 102 pivotally secured as to the front transverse wall 103 of the sub-frame 33 (FIGS. 2 and 5), the conduit 101 communicating with a depending nozzle 104 directed downwardly at a chalk-line or other visible indicator indicated at 105 in FIG. 2, whereby the chalk-line is kept clean and free of dust scattered by the abrasive means 32 as the machine is progressed in a forwardly direction. The frame 102 may be supported at its free end as by a roller 106, as indicated in FIG. 2.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention which is not to be limited to the details disclosed

herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

I claim:

1. A machine for abrading the surface of pavement or the like comprising: frame means supported at one end by wheel means, at least one of which is selectively driven by power drive means; rocker means pivotally mounted on the opposite end of said frame means for rotation about an axis parallel to the longitudinal axis of said frame means; axially spaced roller means rotatably mounted on said rocker means for rotation about a transverse axis for supporting said rocker means and thereby said opposite end of said frame means; and abrasive means rotatably mounted on said rocker means intermediate of said roller means for rotation about an axis parallel to said axis of said rocker means and being adapted to be rotated by said drive means, the bottom surface of the periphery of said abrasive means and said roller means being tangent to a common plane, the axes of said abrasive means and said roller means being in a common plane normal to said first plane, whereby the surface of the pavement is cut by said abrasive means to a depth corresponding to the plane tangent to the bottom surface of the periphery of said roller means.

2. A machine in accordance with claim 1, including adjustment means for effecting a linear movement of said abrasive means relative to said roller means and on said normal plane for adjusting the depth of cut of said abrasive means.

3. A machine for grinding the surface of a pavement or the like comprising: frame means; wheel means rotatably mounted on said frame for rotational movement around an axis normal to the longitudinal axis of said frame means; power drive means on said frame means and adapted to selectively drive one of said wheel means; rocker means pivotally mounted on said frame means for oscillating movement about an axis substantially parallel to the longitudinal axis of said frame means and having roller means rotatably mounted thereon for rotational movement about an axis normal to the longitudinal axis of said rocker means; and abrasive means rotatably mounted on said rocker means for rotational movement about an axis substantially parallel to said axis of said roller means and being adapted to be driven by said power drive means, the outer periphery of said abrasive means and said roller means being substantially tangent to a common plane parallel to a transverse axis of said roller means, and the axis of said roller means and said abrasive means being on a common plane normal to said first plane.

4. A machine in accordance with claim 3, including means for selectively effecting a vertical linear movement of the other of said wheel means of said frame means in a direction normal to the longitudinal axis of said frame means.

5. A machine in accordance with claim 3, including means for effecting a vertical linear movement of said abrasive means relative to said roller means for adjusting the depth of cut of said abrasive means.

6. A machine in accordance with claim 4, including swivel roller means on said frame means, said swivel roller means being spaced rearwardly of said first wheel means and having the bottom of its outer peripheral surface spaced above a plane tangent to said first wheel means and said roller means of said rocker means, whereby selective vertical movement of said second wheel means in a downward direction below said last-mentioned plane elevates said first wheel means above a plane tangent to said second rocker means and said second wheel means, the frame means being supported by said swivel roller means and said second wheel means.

7. A machine for abrading the surface of pavement or the like comprising a carriage frame having a longitudinal axis, said carriage frame having two transversely spaced front wheel means and rear wheel means, means supporting said two front wheel means on said frame for rotation with respect to an axis transverse to said longitudinal axis, said supporting means supporting said two front wheel means in spaced relation with an intervening space extending therebetween and intercepting the axis of said front wheel means, rotatable abrasive means, means supporting said abrasive means on said frame for rotation on an axis parallel to and above said first mentioned transverse axis and with said abrasive means in said intervening space in position to contact pavement substantially on a straight line parallel to said transverse axis.

8. A machine comprising a carriage frame having a longitudinal axis, said carriage frame having two transversely spaced front wheel bearing supports, a front wheel means rotatably carried by each of said supports, a cutter shaft rotatably carried by said frame, means for driving said cutter shaft, means supporting said cutter shaft for rotation on an axis above and in a vertical plane containing the axis of said bearing supports, and cutters on said cutter shaft, said cutters extending downwardly between said bearing supports across the axis of said bearing supports.

9. A machine according to claim 8 including means for adjusting the height of said cutters relative to the axis of said front wheel bearing supports.

10. A machine for abrading the surface of pavement or the like comprising a main carriage frame having certain rear wheels for supporting the machine on a surface to be abraded, a sub-frame, means supporting said sub-frame on said main frame for rocking movement about the longitudinal axis of said main frame, other wheels for supporting the machine on said surface, means supporting said other wheels on said sub-frame, rotatable abrasive means, means supporting said abrasive means on said sub-frame for rotation on an axis parallel to the axis of its associated said other wheels and with said abrasive means and its associated said other wheels in position to contact said surface substantially on a straight line transverse to said longitudinal axis.

11. A machine for abrading the surface of pavement or the like comprising a main carriage frame having certain rear wheels for supporting the machine on a surface to be abraded, a sub-frame, means supporting said sub-frame on said main frame for rocking movement about the longitudinal axis of said main frame, other wheels for supporting the machine on said surface, means supporting said other wheels on said sub-frame, rotatable abrasive means, means supporting said abrasive means on said sub-frame for rotation on an axis parallel to the axis of its associated said other wheels, said axis of said abrasive means and said axis of said other wheels being substantially in the same vertical plane.

12. A machine according to claim 11 and including additional wheels and means for adjustably supporting the same on said main frame for raising or lowering said main frame to bring said abrasive means out of or into contact respectively with said surface.

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