Nov. 7, 1961 C. W. HATCHER 3,007,688

PAVEMENT CUTTING DEVICE HAVING ALIGNED ABRASIVE BLADES

Filed Oct. 12, 1959

3 Sheets-Sheet 1

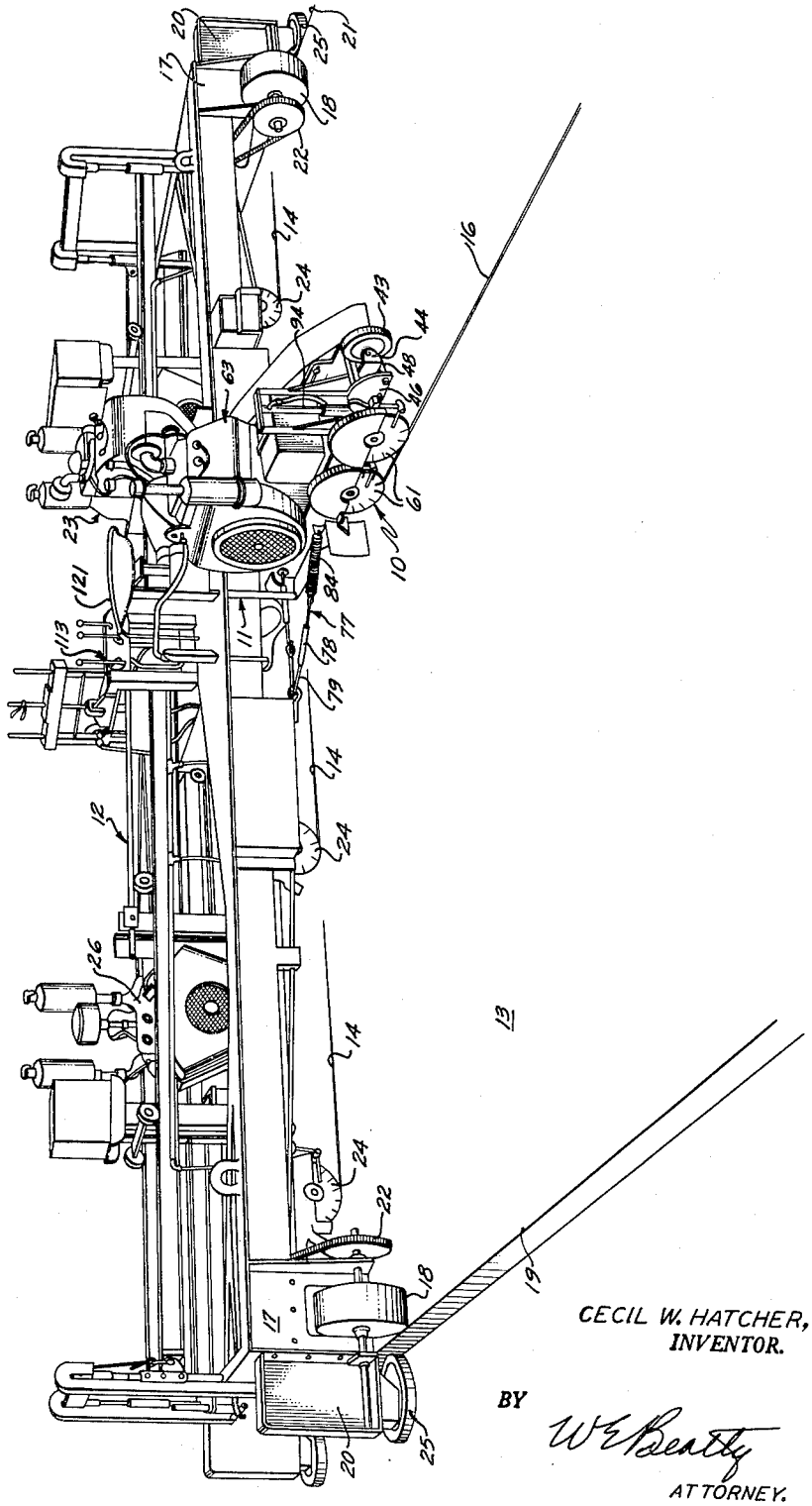


Fig. 1

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3 Sheets-Sheet 2

Fig. 2

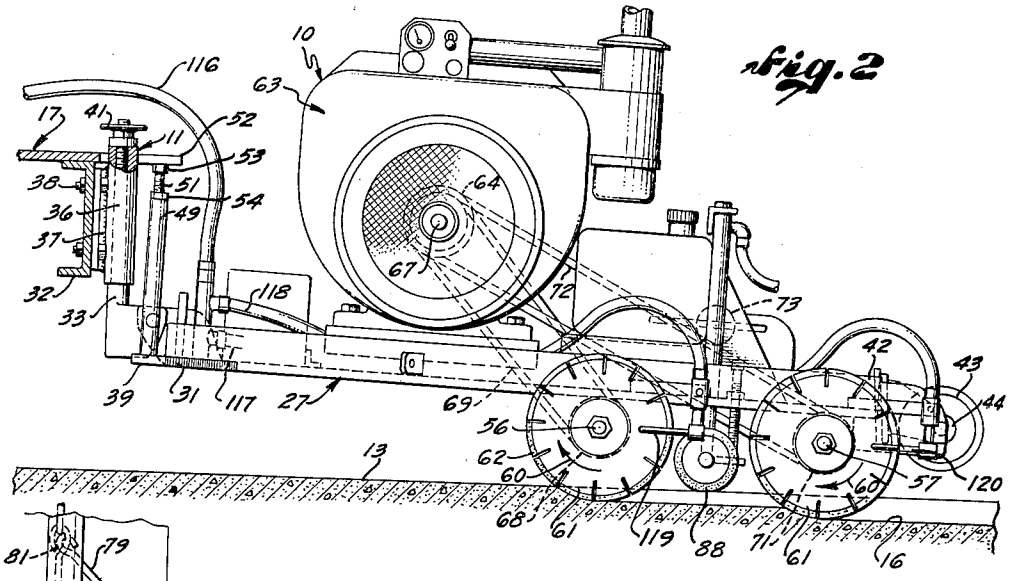
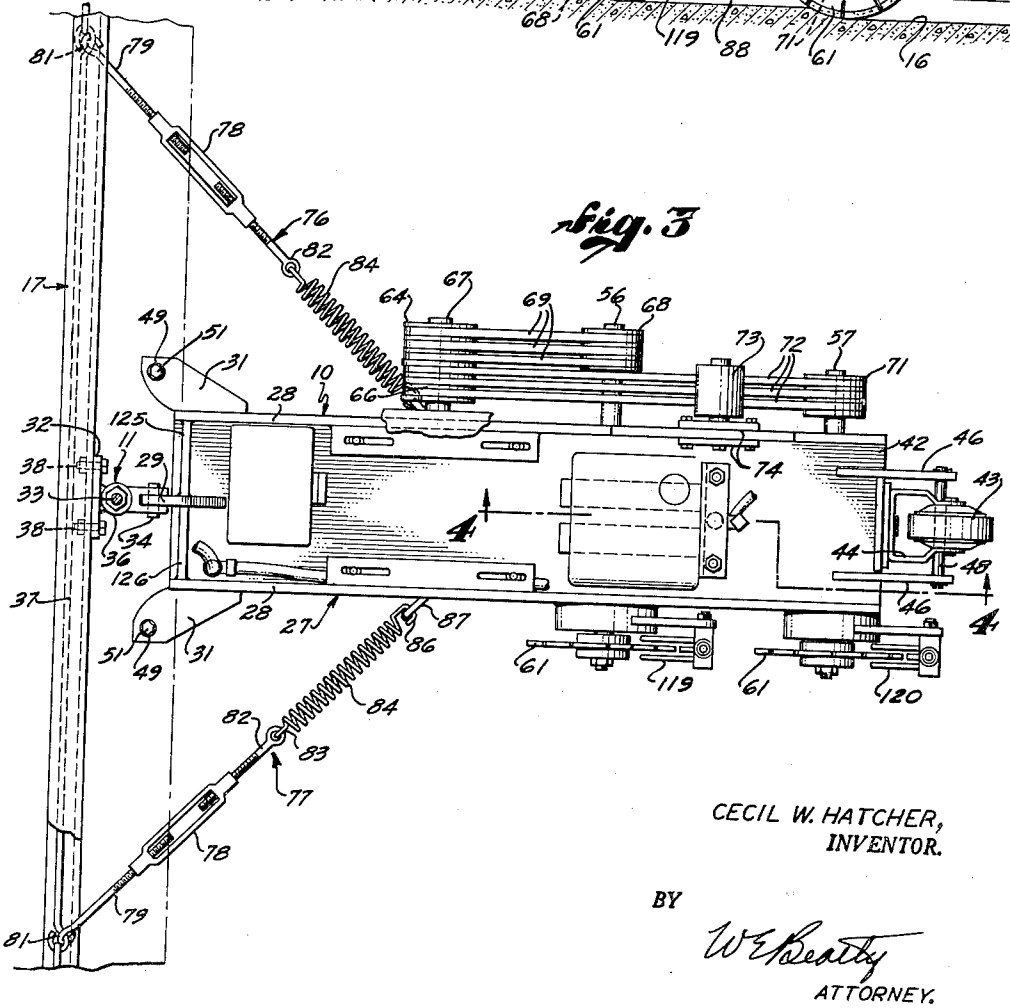


Fig. 3



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3 Sheets-Sheet 3

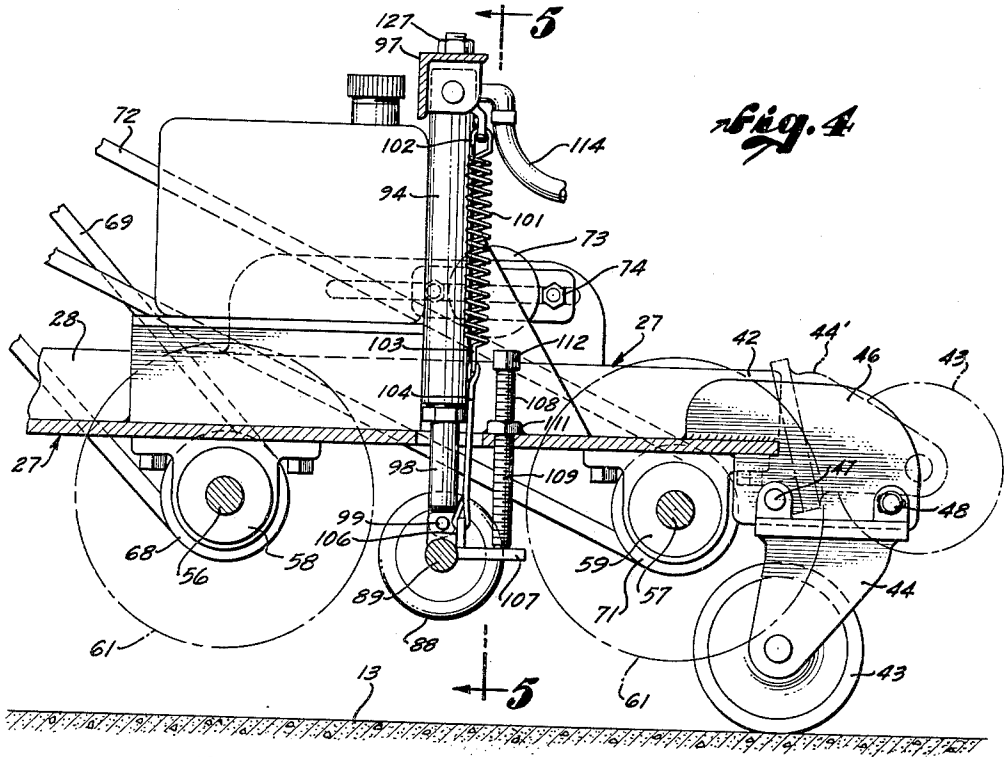


Fig. 4

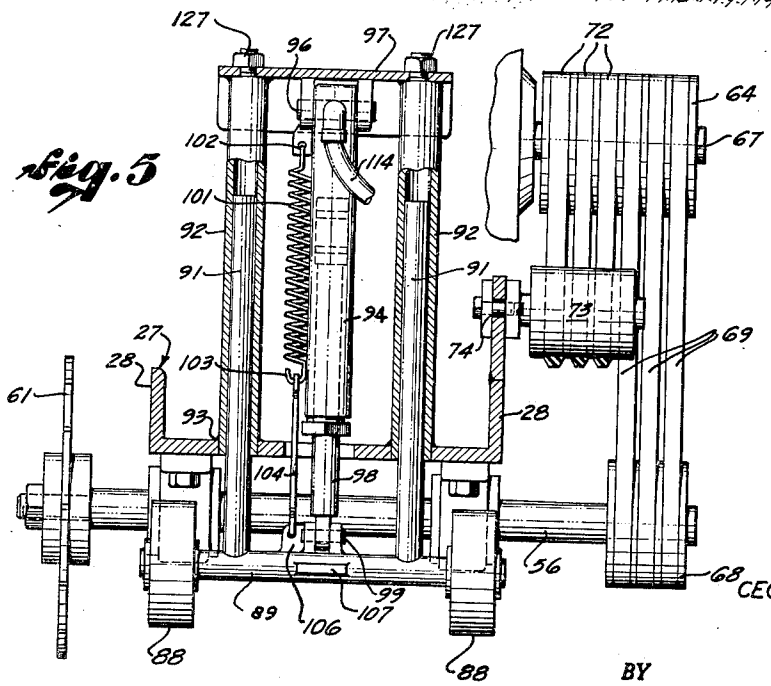


Fig. 5

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3,007,688
PAVEMENT CUTTING DEVICE HAVING ALIGNED ABRASIVE BLADES

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5 Claims. (Cl. 262—20)

This invention relates to a pavement cutting device and more particularly to a cutting device which is attachable to a motor-driven vehicle for selectively cutting a slit of selective depth in the pavement parallel to the direction of travel of the vehicle.

The device, although being towable by any suitable driven vehicle, is most practically useful as an attachment and a supplement to the Concrete Sawing Machine disclosed in my issued Patent No. 2,791,412.

In the art of road building, it has been found that the surface pavement, particularly that comprising a cementitious material, requires contraction joints at spaced intervals to allow for contraction and expansion of the pavement due to changes in temperatures.

In the past, pavements were poured or laid at relatively narrow widths thereby necessitating only transverse contraction joints to allow contraction and expansion of the pavement material when set and hardened. Normally a roadway was paved in successive adjoining lanes not exceeding twelve feet in width and leaving or creating a gap between lanes to provide a contraction joint between the lanes. Transverse contraction joints at selected intervals were conveniently provided by cutting the pavement transversely to the lane, as with the above mentioned Concrete Sawing Machine designed and constructed in accordance with my issued patent.

With the present day acceleration of the road building program of this country and others, it has been found more practicable to construct roadways of greater widths and preferably widths providing more than one lane at a time, such widths attaining dimensions of up to twenty-four feet. In a roadway of such increased dimension it has been found necessary to provide a longitudinal contraction joint bisecting the pavement to allow for contraction and expansion of the material and thereby prevent cracking of the pavement. Due to present methods of paving, it is not feasible to provide a contraction joint before or during the paving operation. It has been found more practical, economical and time saving to cut a longitudinal slot bisecting the pavement after the material has set and hardened which at best, with present facilities available for such an operation, is expensive and time consuming.

For this purpose, this invention provides a pavement cutting device in the form of a trailer which can be hitched to the motor-driven transverse cutting apparatus of my issued patent, or to any other suitable motor-driven vehicle, for travel therewith in a longitudinal direction relative to the pavement and having a power driven cutter means thereon for cutting a longitudinal contraction joint in a pavement to allow for lateral expansion and contraction of the cementitious material comprising the pavement.

It is therefore a general object of this invention to provide a contraction joint in a pavement by cutting a longitudinal slit in the pavement.

Another object of this invention is to brace the trailer to the motor-driven vehicle in such manner so as to cut an unwavering linear slit parallel to the direction of the travel of the motor-driven vehicle.

It is a particular object of this invention to secure the pavement cutter device to a motor-driven vehicle having a transverse cutter device whereby a longitudinal cut is

formed in the pavement transverse to spaced transverse cuts of the pavement formed by the transverse cutting apparatus of the motor-driven vehicle.

A further object of this invention is to provide means on the pavement cutter device by which the depth of cut of cutter means thereof can be easily and readily adjusted. The invention provides two kinds of adjustment for the depth of cut, namely an adjustment whereby fore and aft cutter blades are adjusted in the same sense, as well as another adjustment whereby the depth of cut of such blades is adjusted in the opposite sense, one blade being raised when the other one is lowered. This latter feature is provided by arranging a wheel which supports the trailer, between the fore and aft cutter blades, with means for adjusting the tilt of the trailer frame.

A still further object of this invention is to provide a pavement cutter device of the character described in which the cutter means thereof may be elevated to disengage the cutter means from the pavement and support it in such elevated position for travel with the motor-driven vehicle without cutting the pavement.

The general object of this invention is to more quickly, easily and economically cut a longitudinal slit in a pavement to provide a contraction joint therefor, and more particularly to provide a longitudinal slit cutting device suitable for attachment to a motor-driven vehicle.

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

In the drawings:

FIG. 1 is a perspective view, in elevation, illustrating the pavement cutter device of the present invention as secured to a motor-driven vehicle of my former patent.

FIG. 2 is an enlarged side view, in elevation of the pavement cutter device of FIG. 1, with a portion of the power-driven vehicle shown in cross section.

FIG. 3 is a plan view, in elevation, corresponding to FIG. 2.

FIG. 4 is an enlarged fragmentary cross-sectional view as taken substantially along the line 4—4 of FIG. 3.

FIG. 5 is a vertical cross-sectional view as taken substantially along the line 5—5 of FIG. 4.

Referring in detail to the drawings, there is shown, by way of illustration, but not of limitation, a pavement-cutting device, generally designated by the numeral 10 and designed and constructed in accordance with this invention. The pavement-cutting device is illustrated herein as being removably and pivotally secured, as by a coupling 11, to a motor-driven vehicle, generally designated by the numeral 12, adapted for longitudinal travel on a strip of pavement 13 of cementitious material.

The motor-driven vehicle 12, illustrated herein, is the Concrete Sawing Machine claimed in my issued Patent 2,791,412. This instant invention is particularly designed to complement the machine 12 which is capable of sawing two or more conjoining slots 14 which are transverse to the pavement and to the travel of the machine. It is to be understood, however, that any suitable motor-driven vehicle may be employed to impart longitudinal movement to the device 10 for selectively cutting a longitudinal slot 16 in the pavement, as will be hereinafter described.

The concrete-sawing machine 12 comprises a carriage frame 17, having a plurality of wheels 18 adapted to ride on the edges 19 and 21 of the pavement 13. Selective wheels 18 are driven through suitable sprocket gear and chain means 22 by an engine or motor 23 to impart linear travel to the frame 17, in a direction parallel to the longitudinal axis of the pavement 13. The machine 12 is provided with a plurality of cutting means in the form of circular saw blades 24 capable of cutting the transverse conjoining saw cuts 14 at selective intervals by selectively halting the frame 17 and actuating the saw blades 24 by

means including an engine 26 and described in the above-referred-to patent. Although the machine 12 was described as having a pair of saw blades, like 24, reciprocally mounted on the frame 17 for cutting the slot 14, it will be noted that the particular machine 12 illustrated herein is adapted for a wider pavement 13 concerned with this application and is therefore illustrated as having three such saw blades in transverse alignment, although, two or four saw blades can be used.

Referring to FIGS. 2 to 5, the pavement cutting device 10 comprises a substantially rectangular frame 27 having upstanding, reinforcing flanges 28, along opposing longitudinal edges thereof. Welded between the forward end of flanges 28 are two cross pieces 125 and 126, their inner ends being spaced apart to receive tongue 29 welded thereto. Frame 27 has a pair of laterally and forwardly extending lugs 31 adjacent to the tongue 29. The frame 27 is adjustably secured to a rear portion 32 of the frame 17 of the machine 12, as by the coupling 11 which includes a threaded post 33 pivotally secured as at 34 to the tongue 29 and extending through a tubular body 36 of a bracket 37 secured to the portion 32 as by fasteners, such as bolts 38. The front end 39 of the frame 27 may be raised and lowered by manual manipulation of a nut 41 threadedly engaging the upper end of the threaded post 33 to adjust the angular relationship of the frame 27 relative to the pavement 13.

Referring to FIG. 4, the frame 27 is supportable at its rearward end 42 by a wheel 43 rotatably mounted on a bracket 44 pivotally secured to a bracket 46 which is mounted on the end 42 and extends rearwardly therefrom. The bracket 44 includes a pivot pin 47 and as best seen in FIG. 4 is locked in a lowered position to support the frame 27 by a removable pin or bolt indicated at 48. The pins 47 and 48 extend through aligned openings through the brackets 44 and 46. By removing the pin 48, the bracket 44 may be swung upwardly into the position indicated in solid lines of FIGS. 2 and 3 and in broken lines 44' of FIG. 4 to position the wheel 43 clear of the pavement 13, as in FIG. 2, and supported in the elevated position by replacement of the pin 48 in its aligned openings, whereby the bracket 44 rests on the pin 48.

To steady the frame 27 against horizontal wobble, each lug 31 is provided with an upwardly extending, internally-threaded tubular member 49, fixed to and arising from the frame. Each member 49 has an externally threaded inner member 51 axially extendable for abutment with the underside of a flange 52 of the frame 17, the members 51 being rotatable by heads 53 having tool engaging outer surfaces and being locked in place as by lock nuts 54.

Two saw-mounting arbors 56 and 57 are rotatably mounted on the underside of the frame 27 for rotation around parallel axes transverse to the frame 27 and to the longitudinal direction of travel of the frame. Only one arbor like 56 or 57 may be used. The arbors 56, 57 are rotatably mounted in bearing members 58 and 59, respectively, secured to the underside of the frame 27 and extend outwardly beyond flange 28 at one edge of the frame 27 for securement thereto of cutting means in the form of circular saw blades 61 having a suitable abrasive outer periphery 62 for cutting the slot 16 in the pavement 13.

The arbors 56 and 57 are driven by an engine, generally designated by the numeral 63, having a pair of pulleys 64 and 66 keyed to the engine shaft 67. The pulley 64 is connected by belt 69 to a pulley 68, keyed to the end of the arbor 56 opposite the end supporting the saw blade 61. The pulley 66 is connected by belt 72 to the arbor 57 by a similar pulley 71 keyed to an end of the arbor 57 opposite to the end supporting a similar saw blade 61. The tension of the pulley belt 72 may be adjusted by an idler roller 73 adjustably secured to the flange 28 as at 74. The arbors 56 and 57 are thereby simultaneously driven by the engine 63 to simultaneously rotate the two saw blades 61.

It is to be understood that one of the saw blades 61 may be omitted, as from one of the arbors 56, 57, to form the slot 16. It is preferred, however, to provide a saw blade 61 on each of the arbors 56, 57, the arbors 56 and 57 being parallel to each other and on a common horizontal plane spaced from the bottom surface of the frame 27, and coplanar to form a single cut. The purpose is that, as best seen in FIG. 2, the angular relationship of the frame 27 to the pavement 13 may be adjusted by the coupling 11 so that the saw blade 61 of the forward arbor 56 cuts a shallower cut than the saw blade 61 of the rearward arbor 57, even though the diameters of the saw blades 61 are equal. The adjustment of the forward saw blade 61 to a desired depth relative to the bottom surface of the rearward saw blade is facilitated by the present invention, by arranging the wheels 88, see FIGS. 2 and 5, at a position intermediate the forward and rearward saw blades 61, whereby, noting that the frame 27 is supported only by the carriage wheels 88, the result of raising or lowering the front end of frame 27, by operating the nut 41 as previously described, results in lowering the rearward saw blade and raising the forward saw blade about the point of contact of wheels 88 with the pavement as an axis, when the tongue 29 is raised, while the reverse movement takes place when the tongue 29 is lowered. This facilitates adjusting the relative depth to which the saw blades 61 will cut.

The pavement cutting device 10 can travel at a relatively fast speed as each of the saw blades 61 does a part of the cutting. By adjusting the angular relationship of the frame 27 to the pavement 13, blades 61 of equal diameter are caused to cut conjoining slots of different depths and as the blades 61 are coplanar, a single cut 16 is formed of the desired depth.

The frame 27 is yieldably braced against lateral swaying movement by a pair of angularly displaced braces 76 and 77. Each brace 76, 77 has at one end an adjustable securement in the form of a turn buckle 78, having one end 79 hooked as by means of a hook 81 to the frame 17 and another end 82 secured to one end 83 of a coil spring 84. The other end 86 of the spring 84 is secured to an apertured lug 87, one on each side of the frame 27. The frame 27 is thereby yieldably braced to the frame 17 so that in the event that the blades 61 strike an obstruction, the frame 27 may veer to one side or the other to prevent breakage of the blades 61.

In addition to means for adjusting the depth of cut of the two blades 61 in opposite senses, means are provided for adjusting the depth of cut of the blades 61 in the same sense. This last mentioned depth adjustment means comprises a pair of laterally spaced wheels 88 mounted for rotation on a horizontal shaft 89 substantially parallel to the axes of the arbors 56 and 57, the shaft 89 being adjustable in a vertical direction to support the frame 27 at a desired distance from the pavement 13 to thereby adjust the depth to which the saw blades 61 may penetrate the surface 13.

The shaft 89 is guided in a vertical travel by a pair of upwardly extending posts 91, each slidably disposed in one of a pair of upright tubular guide members 92, secured to the frame 27, as by welding, or the like, indicated at 93 and extending upwardly from the frame 27. Vertical movement of the shaft 89 is effected by a hydraulic cylinder 94 pivotally supported as at 96 to a bracket 97 secured by bolts like 127 to the upper ends of the tubular members 92. The outer end of a piston rod 98 of the cylinder 94 is pivotally secured, as at 99, to the shaft 89, whereby, extension of the piston rod 98, as a result of directing pressure into the cylinder 94, causes the shaft 89 to lower and bring the wheels 88 into contact with the pavement 13, eiher to adjust the depth of cut or to support the disks 61 in a position

clearing the pavement 13. A coil spring 101 is connected at one end 102 to a portion of the bracket 97 and at another end 103 through a rigid or flexible connector 104 to an apertured lug 106 on the shaft 89 to bias the shaft 89 upwardly. Release of the pressure within the cylinder 94 permits the spring 101 to retract the piston rod 98 to thereby lift the rollers 88 in an upward direction.

An adjustable stop is provided to limit the upward travel of the piston rod 98, when lifted by spring 101, to thereby adjust the distance between the lower surface of the wheels 88 and the frame 27. The stop means comprises a horizontal stop member 107 secured to the shaft 89 for abutment with a vertically-movable limiting member 108 threadably mounted on the frame 27. The member 108 includes external threads 109 for engagement with an internally threaded nut 111 secured to the frame 27 and an enlarged tool-engaging head 112, whereby rotation of the member 108 causes the member to move in a vertical direction for abutment of the member 107 with the lower end of member 108 at a desired distance from the frame 27.

The hydraulic cylinder 94 is controlled by control means remotely located for convenience on the machine 12, as indicated at 113, in FIG. 1, the control consisting of a hand-operated valve adapted to selectively admit hydraulic pressure to, or exhaust it from the cylinder 94 as through a flexible conduit 114 from a pump on the machine 12.

Operation

In the operation of the pavement cutting device 10 to cut a longitudinal slit 16 in the pavement 13, the device 10, being in the form of a trailer, is secured to the frame 17 of the motor-driven vehicle 12 by means of the coupling 11 and braces 76 and 77. The weight of the trailer device 10 is removed from the rearward supporting wheel 43 by hydraulically extending the piston rod 98 outwardly of its cylinder 94 to bring wheels 88 into contact with the pavement 13 so that the frame 27 is lifted sufficiently to clear the wheel 43 from the pavement 13. The bracket 44 is then released from the bracket 46 by removing the pin 48 and swung upwardly into the position 44' of FIG. 4, for support by pin 48 when replaced. The pressure within the cylinder 94 is then relieved to permit the spring 101 to retract the piston 98 until the saw blades 61 driven by the engine 63 penetrate the pavement 13 to form a slot of a given depth. The adjustable stop member 108 is then rotated to bring its lower end into abutment with the lug 107 secured to the shaft 89 to effect a solid support of the frame 27 on the wheels 88.

The frame 27 is angularly adjusted relative to the surface of the pavement 13 by manipulation of the nut 41 of the coupling 11 to tilt the frame 27 to a position such that the forward saw blade 61 cuts a slot approximately half the depth of the cut of the rearward saw blade 61, thereby forming a continuous slot 16. If at any time it is desired to disengage the blades 61 from the pavement 13, as to form intermittent slots like 16, the hydraulic cylinder 94 is again actuated to extend the piston rod 98 to thereby lift the frame 27 sufficiently to clear the blades 61 from the surface of the pavement 13 to discontinue cutting the slot 16. Lowering the frame 27 to resume cutting of a slot 16 is effected by release of the hydraulic pressure in the hydraulic cylinder 94 whereby the frame 27 drops until the lower end of the member 108 is brought into abutment with the lug 107 of the shaft 89 to return the cutting blades 61 to the depth of cut previously determined by the adjustment of the member 108.

A flexible conduit 116 is preferably provided and connecting through branches 117 and 118 to nozzles 119 and 120 adjacent each of the saw blades 61 to spray a lubricating and cooling liquid on the blades.

For transportation of the device 10 without using the cutting blades, the piston rod 98 may be again hydraulically extended to raise the frame 27 sufficiently so as to facilitate swinging of the bracket 44 into its lowermost position, see FIG. 4, to support the frame 27 on the wheel 43 and the frame 17, whereafter the wheels 88 are retracted to clear the pavement 13.

It is to be understood that although the pavement-cutting device 10 has been described as using a pair of saw blades 61 mounted on the arbors 56 and 57, the device may be operated with a single blade 61 mounted on one or the other of the arbors.

A seat 121 on the motor-driven vehicle 12 is provided for the operator of the motor-driven machine 12 and its trailer machine 10, to drive the saw blades 61. The blades 61 may be engaged or disengaged from the pavement 13 by the hydraulic control means 113 controlling cylinder 94 to cut the longitudinal slot 61 parallel to the direction of travel of the machine 12 as desired.

While an edge guide wheel 25 carried by an extension 29 of frame 17, see FIG. 1, may be employed to guide the vehicle during its travel along the pavement, an alternate construction such as the flange wheels indicated at 2 and 3 in my above mentioned patent may be employed.

As shown by the arrows indicated at 60 in FIG. 2, the direction of rotation of saw blades 61 which make the longitudinal cut is clockwise as seen in that figure so as to make the cut in an upward direction at the leading edge of the pavement slot 16.

Various other modifications may be made in the invention without departing from the spirit of the following claims.

I claim:

1. A pavement cutting device comprising a two-wheel trailer having a frame having a hitch, said frame having two pavement engaging wheels in transverse alignment, said frame having shafts for two abrasive blades in longitudinal alignment fore and aft respectively of the axis of said wheels, and an engine on said frame for driving said shafts.

2. A pavement cutting device according to claim 1, in combination with means for adjusting the elevation of the front of said frame with respect to said hitch, to adjust the depth of said blades in opposite senses.

3. A pavement cutting device according to claim 2, in combination with means for adjusting the depth of said blades in the same sense.

4. A pavement cutting device according to claim 1, including means for adjusting the angular relationship of said frame to the pavement so as to adjust the depth of cut of one of said blades relative to the other, said adjusting means including a vertically adjustable coupling means securable to a driven vehicle.

5. A pavement cutting device according to claim 1, comprising forwardly extending yieldable brace means on said frame and securable to a driven vehicle for biasing said frame against sway relative to the vehicle, said brace means including a pair of diverging yieldable connectors, each having one end secured to said frame and an opposite end having a fastener for the vehicle.

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