

- [54] PAVEMENT GROOVING MACHINE
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- [21] Appl. No.: 58,916
- [52] U.S. Cl. 299/39, 299/10
- [51] Int. Cl. E01c 23/09
- [58] Field of Search..... 299/39, 41, 10

FOREIGN PATENTS OR APPLICATIONS
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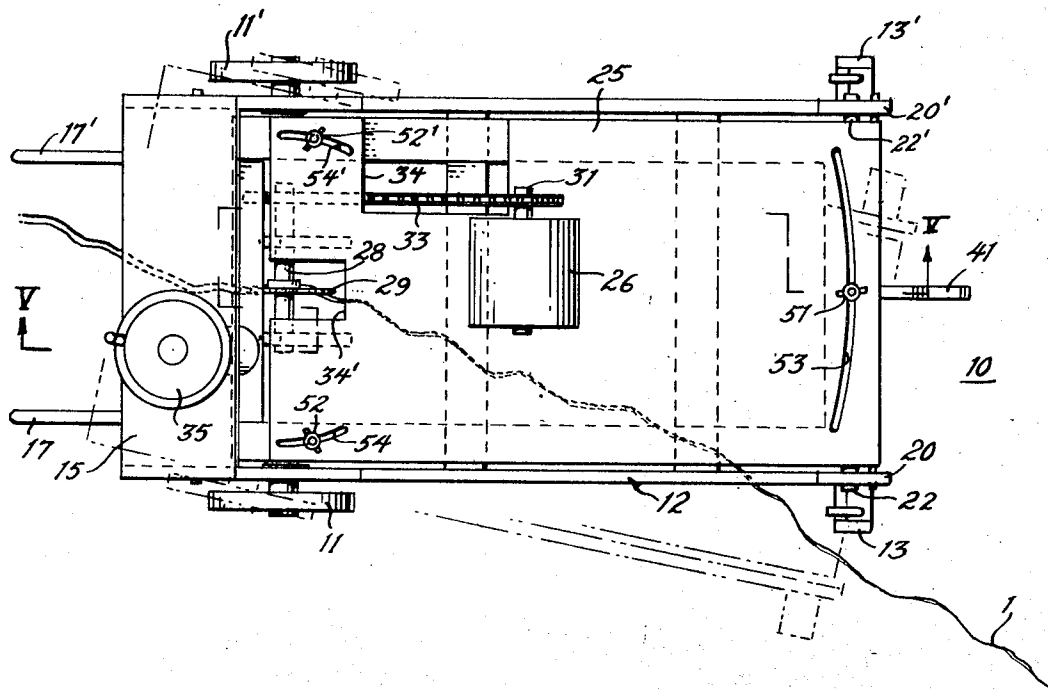
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[57] **ABSTRACT**
 A saw machine having a rotary abrasive blade for working a groove in pavement or the like is provided with means for laterally swivelling movement about the blade. The machine is adapted to be swivelled bodily, as during use as a pavement crack router, or to be propelled straight ahead. The blade support is adapted to be swivelled individually to an acute angle with regard to the fore-and-aft direction, as for flaring the top edge of a pavement groove, especially with a blade having a tapered edge.

15 Claims, 10 Drawing Figures



Patented July 24, 1973

3,747,981

3 Sheets-Sheet 1

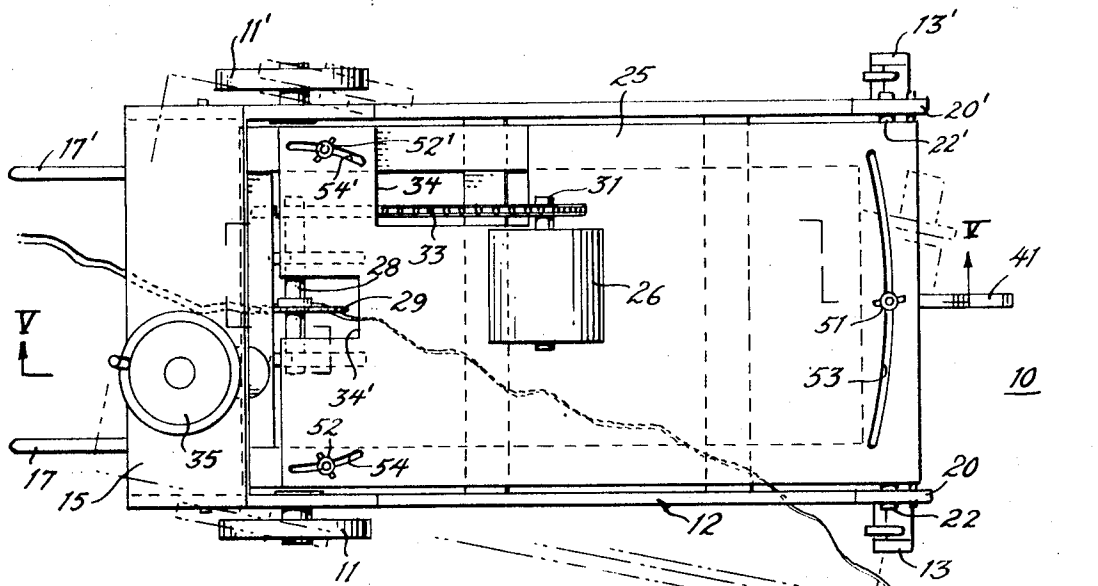


Fig. 2.

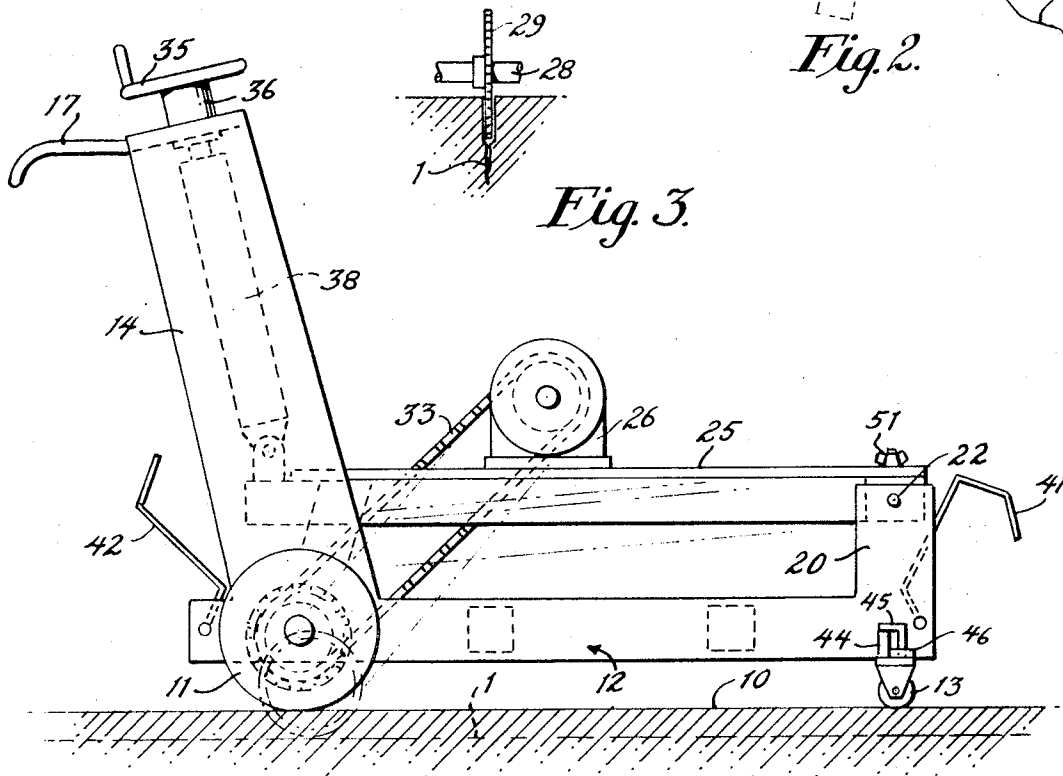


Fig. 1.

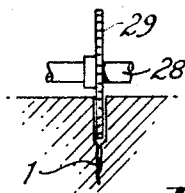


Fig. 3.

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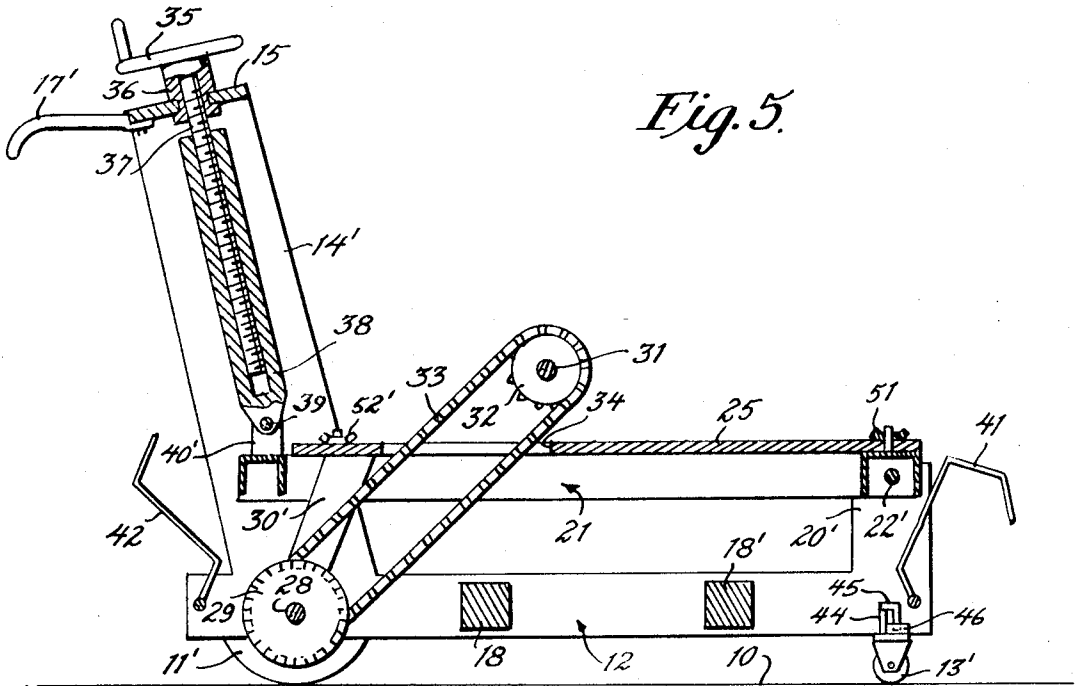


Fig. 5.

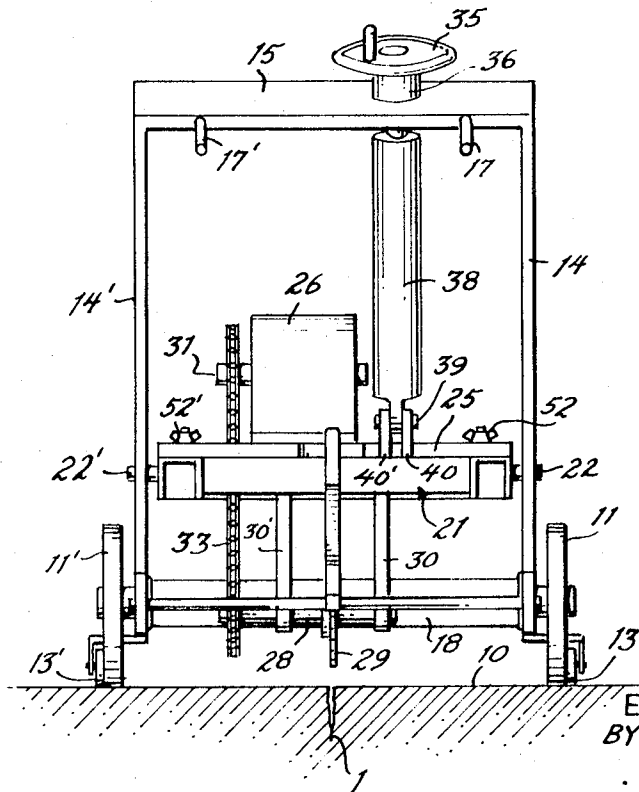


Fig. 4.

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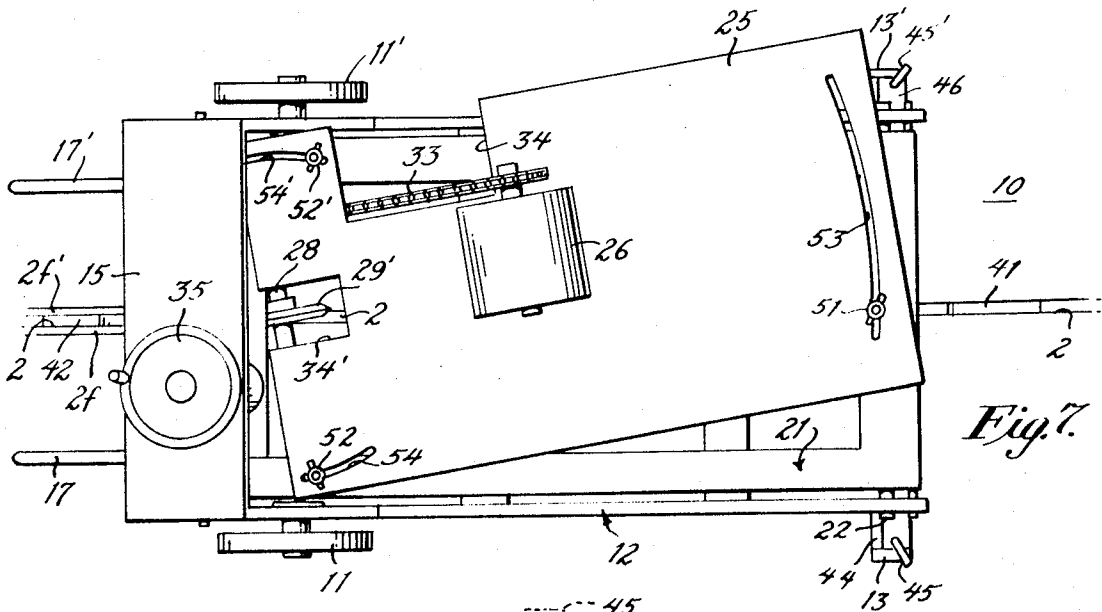


Fig. 7.

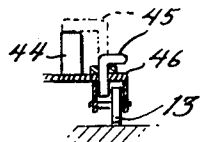


Fig. 6.

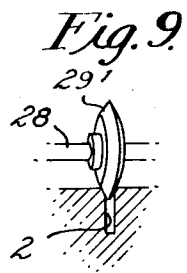


Fig. 9.

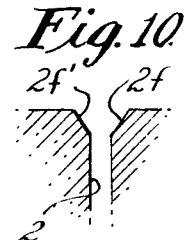


Fig. 10.

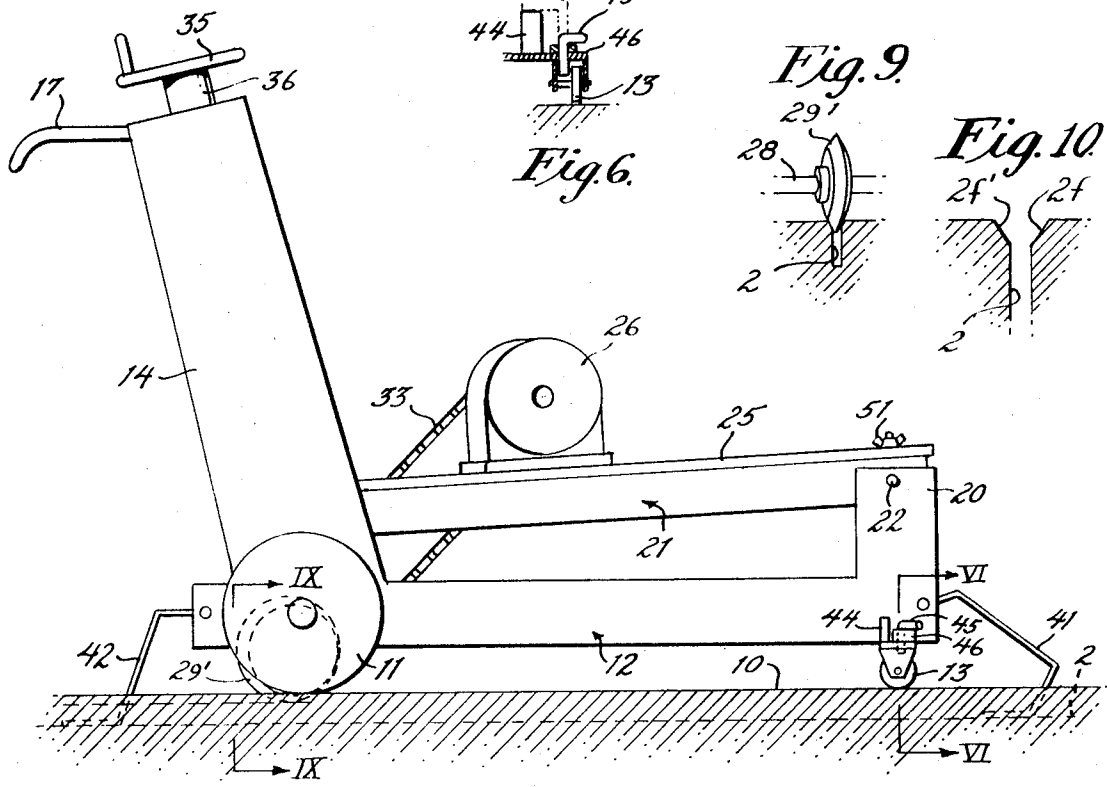


Fig. 8.

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PAVEMENT GROOVING MACHINE

This invention relates to saw machinery for working a crack or groove in pavement or similar surfaces of concrete, asphalt, or other durable material, especially a machine convertible between use as a crack router, which requires laterally swivelling movement, and use to work a substantially straight groove such as to flare the top edge thereof.

Pavements such as roadways, airport runways, and parking lots, for example, often develop cracks by reason of temperature-induced expansion and contraction or related reasons. Such cracks are worsened by adverse effects of rain, snow, freezing, and thawing or melting. Properly installed expansion or contraction joints alleviate the problem and require a vertical groove in the exposed surface of the pavement plus sealing thereof with an appropriately resilient and weather-resistant material. Cracks should be surface-sealed also but often are too narrow to receive sealing materials. Such materials tend to lose their resiliency or flexibility as time passes, with consequent loss of seal along the sides of the groove.

A primary object of the present invention is provision of a pavement saw machine laterally swivellable for use as a crack router.

Another object is provision of a pavement saw machine having a rotary abrasive blade mounted at an acute angle to the lengthwise direction of a pavement groove to be worked thereby so as to flare the top edges thereof.

A further object is provision of a pavement saw machine convertible to attain the foregoing objects alternatively.

Other objects of the invention, together with means and methods for attaining the various objects, will be apparent from the following description and the accompanying diagrams of a preferred embodiment thereof, which is so treated by way of example rather than limitation.

FIG. 1 is a side elevation of an embodiment of saw machine of this invention in use as a crack router;

FIG. 2 is a top plan of the saw machine of the preceding view;

FIG. 3 is a fragmentary rear elevation, on an enlarged scale and partly in section, showing the cutting blade of such saw machine in such operation;

FIG. 4 is a rear elevation of the same saw machine; and

FIG. 5 is a sectional side elevation thereof taken at V—V on FIG. 1.

FIG. 6 is a fragmentary rear elevation of a portion of the same machine, taken at VI—VI in FIG. 8, converted from use as in the preceding views (phantom) to use as in the succeeding views (solid);

FIG. 7 is a top plan of the same embodiment of saw machine in use to flare the top edges of a pavement groove;

FIG. 8 is a side elevation of the saw machine in use as in FIG. 7;

FIG. 9 is a fragmentary rear elevation, on an enlarged scale, of the cutting blade of the saw machine in the latter use, taken at IX—IX on FIG. 8; and

FIG. 10 is a transverse sectional elevation of the resulting flared groove on a further enlarged scale.

In general, the objects of the present invention are accomplished, in a saw machine for working cracks or grooves in pavement or the like, having a plurality of

wheels spaced laterally from one another for supporting itself on pavement to be worked thereby, an abrasive blade adjustable in height and rotatable to work the same when in contact therewith, means for supporting the blade adjustably in height, and means for rotating the blade. More specifically, included are frame means including a base carried by the wheels, a blade-supporting subframe pivotally supported by the base, also height-adjustment mechanism interconnected to both the base and the subframe and operable to pivot the subframe with respect to the base and thereby adjust the height of the blade, the blade being substantially coaxial with the wheels when at the height thereof, or at least preferably so coaxial.

FIGS. 1, 2, 4, and 5 show the exemplified apparatus in right side elevation, top plan, rear elevation, and sectional elevation (as indicated), respectively. Pair of laterally spaced wheels 11, 11' resting on pavement 10 support base frame 12 of longitudinal and transverse members at its rear corners, while the front corners thereof are supported on the pavement by pair of casters 13, 13' mounted thereon. Upstanding obliquely to the rear from the sides of the base frame are pair of supporting plates 14, 14' joined at their top ends by transverse plate 15, which supports pair of handles 17, 17' extending rearwardly therefrom. The base frame has transverse members 18, 18' tying the respective side members thereof together.

Upturned front corners 20, 20' of the base frame support therebetween subframe 21 of longitudinal and transverse members pivoted to swing up and down on pins 22, 22' about a lateral horizontal axis. Swivel plate 25 resting on top of the subframe is adapted to swivel laterally, as discussed further hereinafter, and itself supports engine or motor 26 on its upper surface and horizontal axle 28 for rotary grooving blade 29 underneath and toward the rear thereof. The axle is carried on pair of flanges 30, 30' depending from swivel plate 25 on the subframe. Drive shaft 31 of the motor carries sprocket 32 interconnected by chain 33 passing through cutout 34 in the plate to a similar sprocket (not separately visible) affixed to axle 28 of the rotary blade. The plate has cutout 34' in the rear edge thereof so that the operator can see the rotary blade in both its raised or non-engaged and its lowered or engaged positions.

Height-adjustment means for the rotary blade is in the form of handwheel 35 above transverse plate 15, which has an opening therein to receive collar 36, which acts as a bearing for threaded rod 37 secured at one end to the handwheel and extending obliquely downward and forward therefrom into internally threaded cylinder 38, the lower end of which is secured by transverse pin 39 to pair of ears 40, 40' upstanding from the rear part of subframe 21. The pivotally lowered position of the subframe to engage the pavement with the rotary blade is indicated in phantom in FIG. 1, and FIG. 3 shows the rotary blade so engaged working a groove into the upper part of a crack.

Crack 1 shown in transverse section in FIG. 3 and meandering to the lower right in FIG. 2 (i.e., to the right of the saw machine) is routed by rotary blade 29 to essentially uniform width wherever the crack is narrower than the blade. The entire saw machine is swivelled as suggested in phantom to follow the meandering crack with the blade so engaged. Such swivelling is permitted by swivel-mounted casters 13, 13' and is

brought about by manual application of appropriate forces to handles 17, 17'. Progression of the saw over the pavement is brought about similarly, but an engine or other motive means suitably mounted on the frame and interconnected to the wheels may be employed for the latter purpose if desired. During use of the saw machine as a crack router swivel plate 25 is fixed in position with the plane of the blade aligned in the fore-and-aft direction, with front and rear groove guides 41 and 42 lifted out of engagement with the pavement.

It will be understood that the groove resulting from working of a crack by the rotary blade will be sufficiently wide to be capped or filled with suitable sealing material, whereas all or most of the original crack was too narrow. Sealing strips of standardized width are accommodated readily by cracks so routed. Alternatively, viscous materials can be applied in bulk thereto. While such further steps do not constitute any part of this invention they are mentioned to indicate further its utility and benefits.

FIGS. 6 to 10 show an alternative use of the illustrated embodiment of saw machine of this invention. So employed, the machine flares the top edges of a pavement groove. In such use the machine need not be swivelled bodily and, in fact, should not be swivellable. Accordingly, as shown in FIG. 6, inverted L-shaped locking pin 45, which during crack routing was held by engagement over stop 44 out of engagement with an underlying opening in the frame of caster 13 (as indicated in phantom), now is inserted (as indicated in solid) therethrough and through an alignable hole in overlying support member 46 therefor extending laterally from frame 12. In the inserted position of the locking pin the caster is fixed in orientation in the longitudinal or fore-and-aft direction of the machine. Equivalent locking means maybe used instead.

As shown in FIG. 7, however, rotary blade 29 is oriented at an acute angle to the fore-and-aft direction by reason of orientation of swivel plate 25 at such an angular displacement from its aligned position previously illustrated in FIG. 2. Wing nut 51 at the front and pair of wing nuts 52; 52' at the rear corners of the swivel plate secure bolts extending vertically through long arcuate slot 53 near the front edge and shorter arcuate slots 54 and 54' near the rear corners. The slots extend through the plate, of course, and are centered at the intersection of the plane of the plate with a perpendicular axis passing substantially diametrically through rotary blade 29' (so designated to distinguish it from crack routing blade 29 shown previously). The blade is oriented at an acute angle with reference to groove 2, which itself is oriented in the fore-to-aft direction. FIG. 9 shows on a larger scale such angling of the blade, which is relatively wide and has its edges tapered or chamfered. FIG. 10 shows on an even larger scale the resulting flared top end portion of groove 2, characterized by oblique edge portions 2f, 2f' on the right and left, respectively. Front and rear guides 41 and 42, which were in an inoperative raised position during use of the saw machine as a crack router, are now shown (FIGS. 7 and 8) swung down in place in the groove to aid the operator in maintaining longitudinal direction of the machine along the groove.

Conversion of a saw machine of this invention from use as a pavement crack router to use in flaring the top of a pavement groove (or vice versa) is readily accomplished simply by substitution of the appropriate rotary

blade in conventional manner and adjustment of the blade-supporting swivel plate to the desired angle. Of course, the handwheel is rotated to bring the blade to an appropriately raised position before changing blades or adjusting blade angle.

Pavement grooves flared as described herein are less likely to chip or spall than are unflared grooves, such as from stress overloads at the top corners by reason of contact with heavy equipment or exposure to wide ranges of temperature and humidity.

Notwithstanding the foregoing description and accompanying illustration of a preferred embodiment of saw machine according to this invention, certain useful modifications therein have been suggested also. Other modifications may be made in such apparatus or its mode of operation, as by adding, combining, or subdividing parts or steps or by substituting equivalents thereof, while retaining at least some of the advantages and benefits of this invention. The invention itself is defined in the following claims.

The claimed invention:

1. In a saw machine for working a crack or groove in pavement or the like, having a plurality of wheels spaced laterally from one another for supporting itself on pavement to be worked thereby, an abrasive blade adjustable in height and rotatable to work the same when in contact therewith, means for supporting the blade adjustably in height, and means for rotating the blade, the improvement comprising frame means including a base carried by the wheels, a blade-supporting subframe pivotally supported by the base, also height-adjustment mechanism interconnected to both the base and the subframe and operable to pivot the subframe with respect to the base and thereby adjust the height of the blade, and intermediate supporting means interconnecting the subframe and the blade for laterally swivelling adjustment of the blade relative to the subframe about a perpendicular axis passing substantially diametrically through the blade.

2. Saw machine according to claim 1, wherein the blade edge is characterized by a tapered configuration for flaring the top edge of a groove worked thereby.

3. Saw machine according to claim 1, wherein the blade is supported substantially equidistant between two such wheels.

4. Saw machine according to claim 1, including adjustable locking means on the subframe for securing the intermediate supporting means adjustably thereto about an axis of swivelling adjustment.

5. Mobile saw machine convertible between utility as a crack router and a groove cutter for use on pavement or the like, comprising means for supporting a rotary abrasive blade about a horizontal axis, including means for adjusting the height of the axis, means for adjusting the horizontal axis orientation with respect to an azimuthally constant fore-and-aft direction of movement of the saw machine, a pair of pavement-contacting laterally spaced wheels supporting the machine and being mounted near the aft end thereof, the wheels flanking the blade and paralleling the fore-and-aft direction, azimuthally fixed steering handle means on the aft end of the machine, and pavement-contacting swivellable caster means spaced from the wheels in the fore-and-aft direction and lockable in fore-and-aft orientation.

6. Saw machine according to claim 5, wherein the caster means includes a pair of laterally spaced casters mounted on the forward end of the machine.

7. Saw machine according to claim 5, including guide means aligned in the fore-and-aft direction and engageable with a correspondingly aligned groove in the pavement.

8. Saw machine according to claim 7, including a plurality of such guide means, one forward and one aft of the blade.

9. In a saw machine for working a crack or groove in pavement, having a frame, at least one pair of laterally spaced pavement-contacting wheels supporting the frame, a rotatable cutting blade adjustably mounted thereon, and means for steering the machine, the improvement comprising a subframe interposed between the frame and the blade, the subframe being carried by the frame and carrying the blade midway of one pair of the laterally spaced wheels, means for adjusting the subframe to move the blade vertically independently of those wheels, and means for adjusting the subframe to move the blade azimuthally within an acute angle independently of the wheel orientation.

10. Saw machine according to claim 9, wherein the frame overlies the blade and is configured to expose the blade to view by an operator of the machine.

11. Saw machine according to claim 10, wherein the position of the operator is determined by steering handle means upstanding from the frame in the vicinity of the wheels flanking the blade.

12. Saw machine according to claim 9, including horizontal pivot means mounting the subframe tiltably for raising and lowering of the blade.

13. Saw machine according to claim 12, including adjusting means interposed between the frame and the subframe for controlling the blade height.

14. Mobile saw machine for working pavement, comprising a frame, a pair of laterally spaced frame-

supporting pavement-contacting wheels rotatable about a common transverse horizontal axis perpendicular to the direction of travel of the machine, a pavement-cutting blade supported between the wheels and rotatable about a horizontal axis oriented at an adjustable acute angle relative to the common axis of the wheels, means for so supporting the blade, and motive means carried by the frame and adapted to rotate the blade in cutting contact with pavement underlying the wheels, including pavement-contacting frame-supporting caster means spaced forwardly of the common axis of the pair of laterally spaced wheels and normally adapted to swivel laterally but further adapted to be locked for rotation about an axis parallel to the common wheel axis, and means for so locking the caster means from swivelling.

15. Mobile saw machine for working pavement, comprising a frame, a pair of laterally spaced frame-supporting pavement-contacting wheels rotatable about a common transverse horizontal axis perpendicular to the direction of travel of the machine, a pavement-cutting blade supported between the wheels and rotatable about a horizontal axis orientable parallel to the common axis of the wheels and also orientable at an acute angle to the common wheel axis, means for so orienting and supporting the blade, and motive means carried by the frame and adapted to rotate the blade in cutting contact with pavement underlying the wheels, wherein the blade is so orientable at an acute angle to each side of such parallelism, and wherein the means for so orienting and supporting it include a subframe adjustable azimuthally to that end and also adjustable vertically to lower and raise the blade into and out of contact with the pavement.

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