United States Patent [19]

Binger et al.

[11] **3,901,553**

[45] **Aug. 26, 1975**

[54] **CONCRETE PAVEMENT CUTTING MACHINE**

[75] Inventors: **Wynn S. Binger**, Eden Prairie; **Robert E. Shope**, Apple Valley, both of Minn.

[73] Assignee: **Construction Materials, Inc.**, Minneapolis, Minn.

[22] Filed: **Oct. 30, 1974**

[21] Appl. No.: **519,344**

[52] **U.S. Cl.** **299/39**; 173/24

[51] **Int. Cl.**[2] **E01C 23/09**

[58] **Field of Search** 299/39

[56] **References Cited**

UNITED STATES PATENTS

3,291,532	12/1966	Hatcher	299/39
3,409,330	11/1968	Hatcher et al.	299/39
3,796,462	3/1974	Staab	299/39

Primary Examiner—Ernest R. Purser

Attorney, Agent, or Firm—Merchant, Gould, Smith & Edell

[57] **ABSTRACT**

A mobile frame has a mounting platform underlying the mobile frame which is mounted for swinging movements toward and away from the upper surface of a strip of concrete pavement at a constant degree of angular relationship with the pavement. A plurality of cutting discs are mounted in tandem on the platform for rotation in a common vertical frame. Hydraulic power devices driven by an engine and control apparatus are provided to drive the cutting discs, impart movements to the platform, and impart steering and driving movements to the wheels of the mobile frame. A flow of liquid coolant is provided for the cutting discs and the cutting discs are so disposed relative to the mobile frame that each disc rearwardly of the front disc cuts into the pavement at a greater depth from the surface of the pavement than the preceding disc. A trolley device connected to the steerable wheels of the mobile frame guides the mobile frame in its path of travel along the pavement.

15 Claims, 10 Drawing Figures

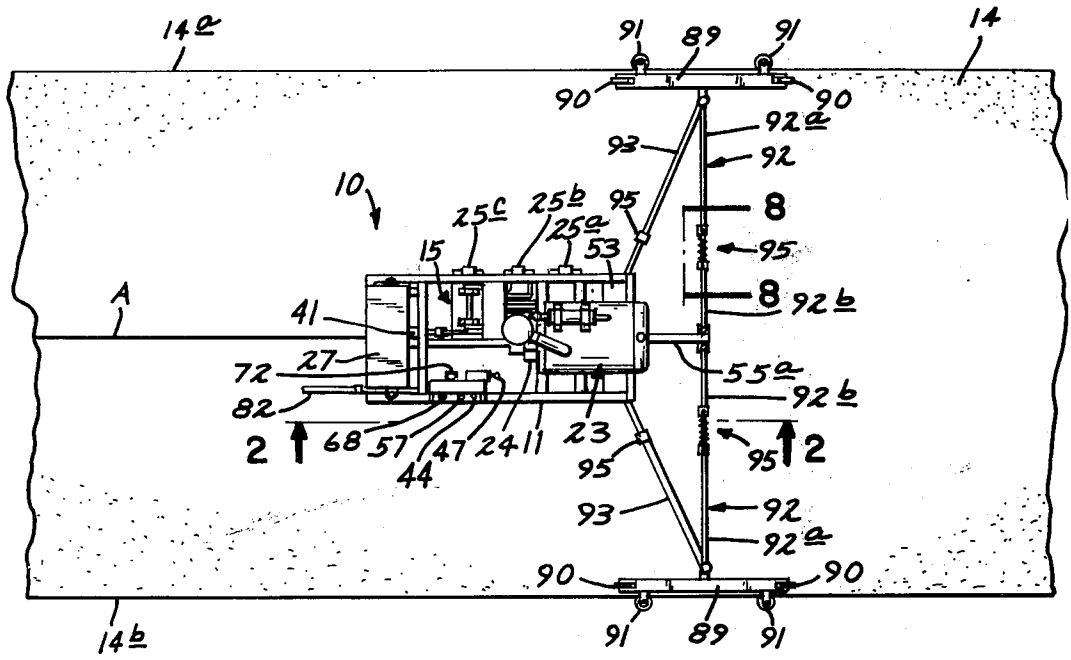


FIG. 1

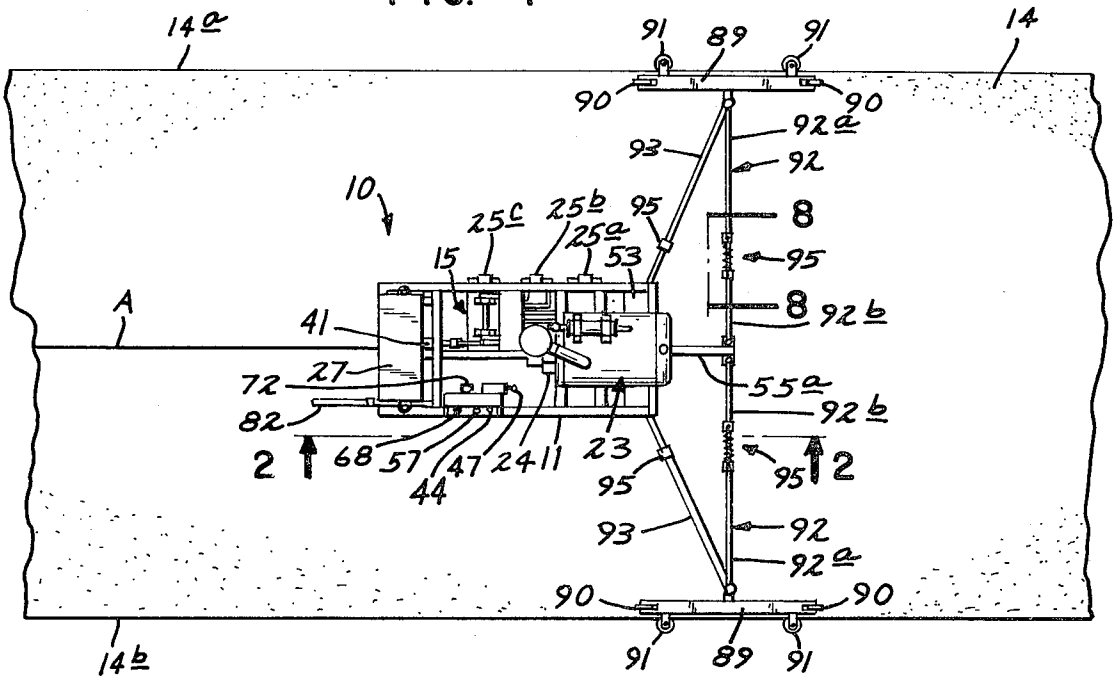

14a
14
91
89
91
90
90
92a
93
92
10
25c
25b
25a
95
8
15
53
95
A
41
8
92b
72
27
55a
82
92b
2
68
57
47
24
11
23
95
95
2
44
93
92
92a
90
90
14b
91
89
91

FIG. 3

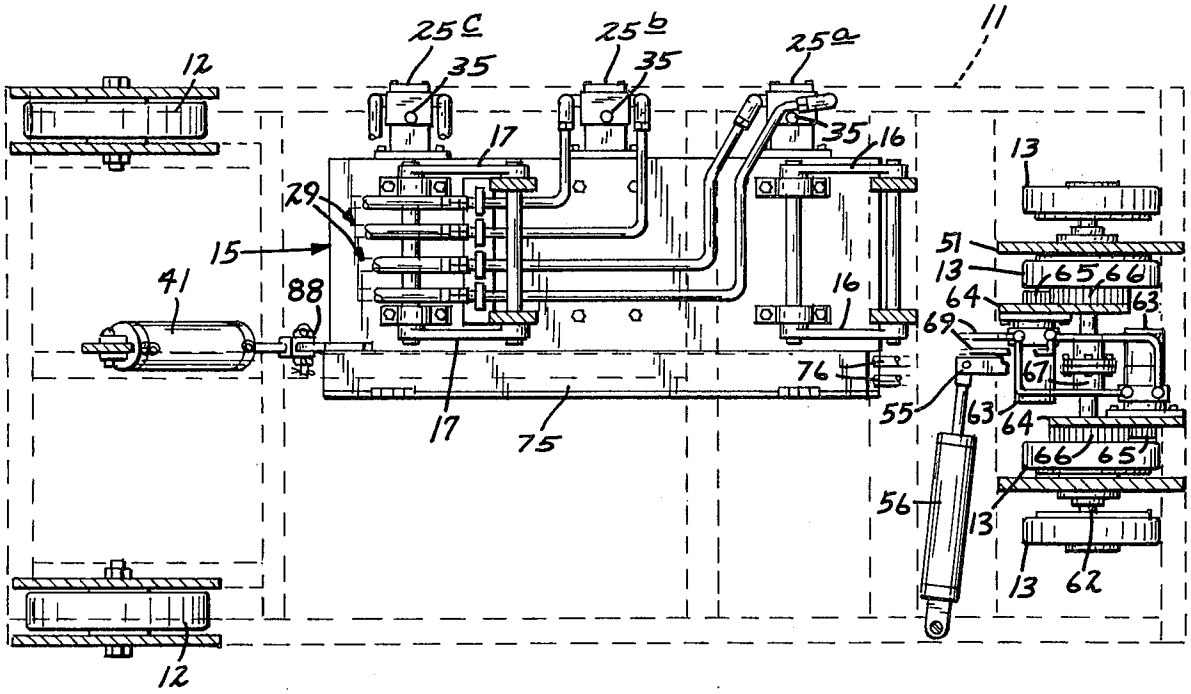

25c
25b
25a
11
12
35
35
35
16
17
13
29
15
51
13
65,66
41
88
16
64
63
69
67
76
55
63
64
66
65
56
13
13
62
17
75
12

FIG. 2

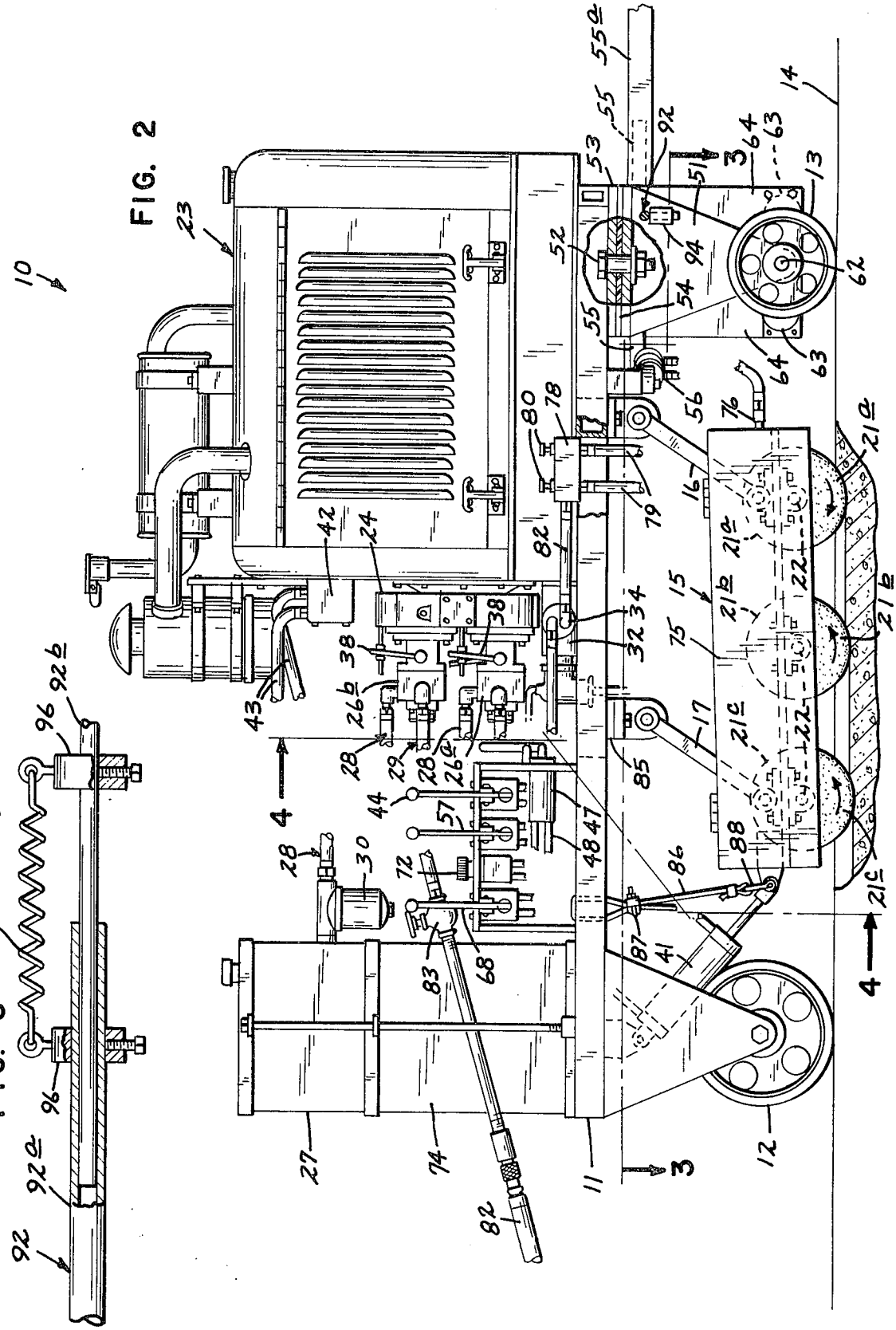

10
23
42
24
43
38
26b
28
29
26a
44
57
28
30
72
68
83
74
82
27
11
12
3
4
48
47
32
34
75
15
21b
21a
22
21c
16
17
85
86
88
87
41
79
80
78
76
56
52
54
94
55
53
92
51
64
63
62
13
14
55a

FIG. 8

95
96
92b
97
96
92a
92

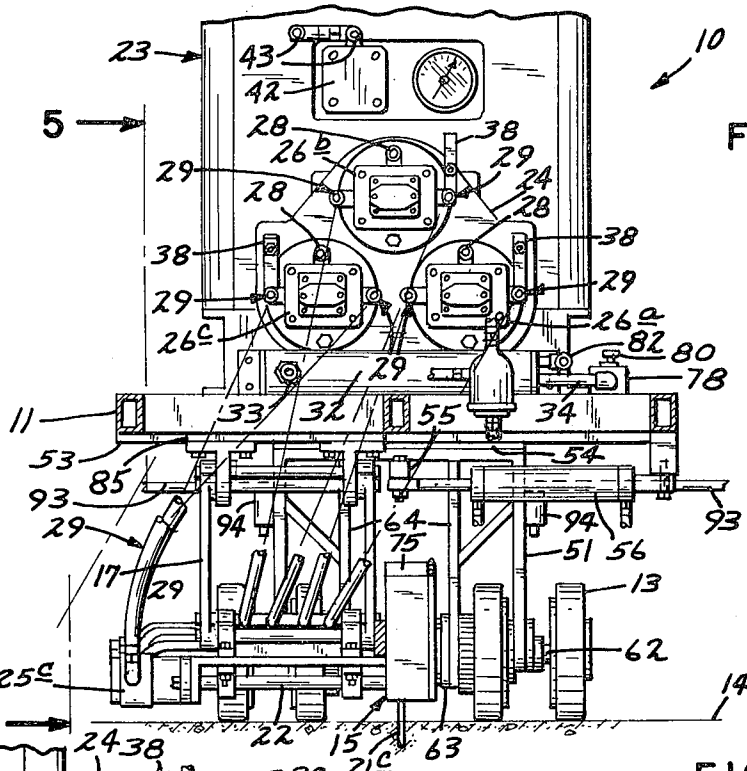


FIG. 4

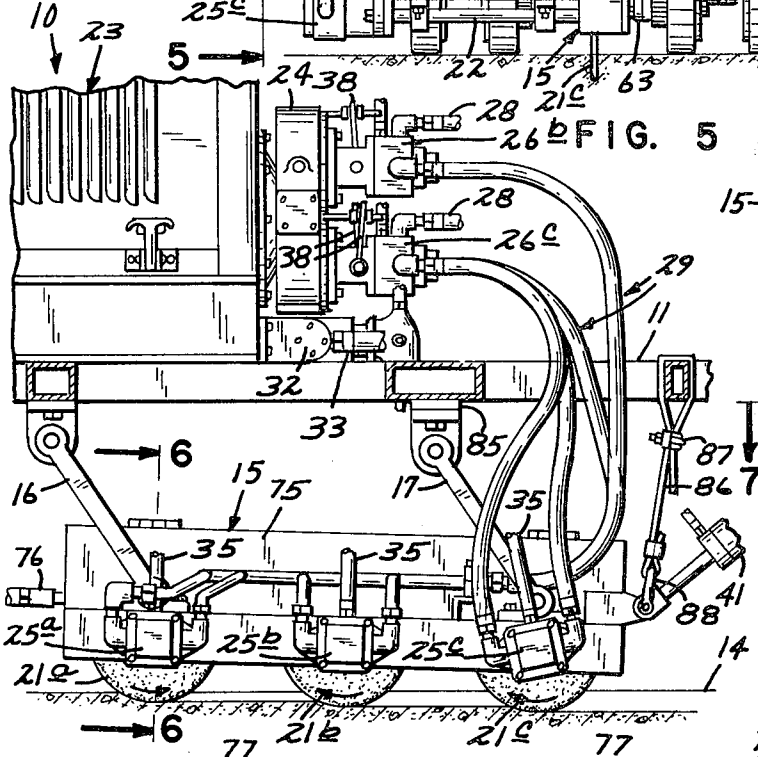


FIG. 5

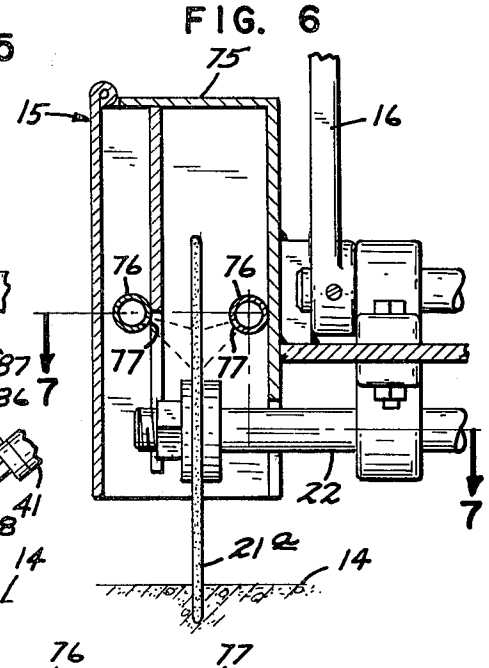


FIG. 6

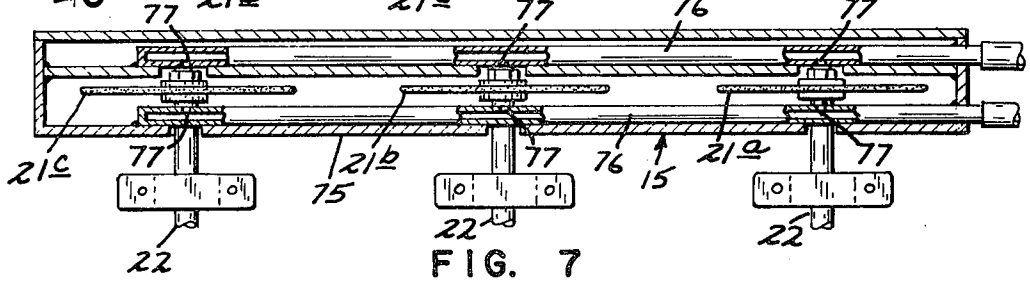


FIG. 7

FIG. 9

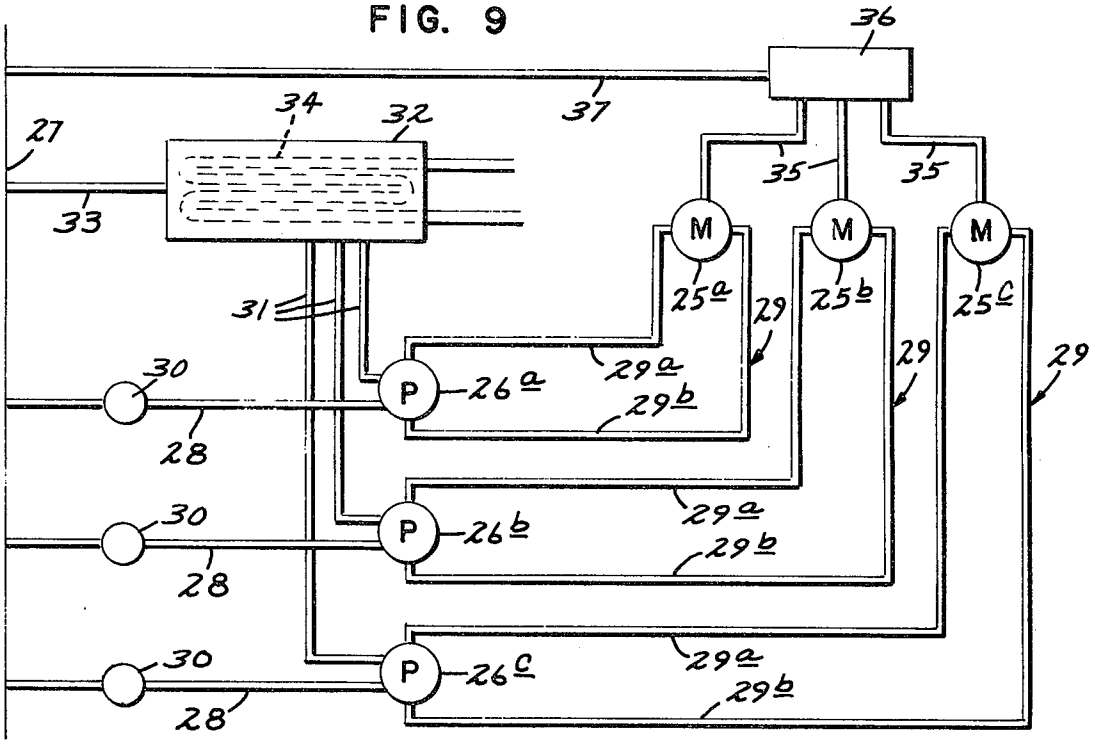
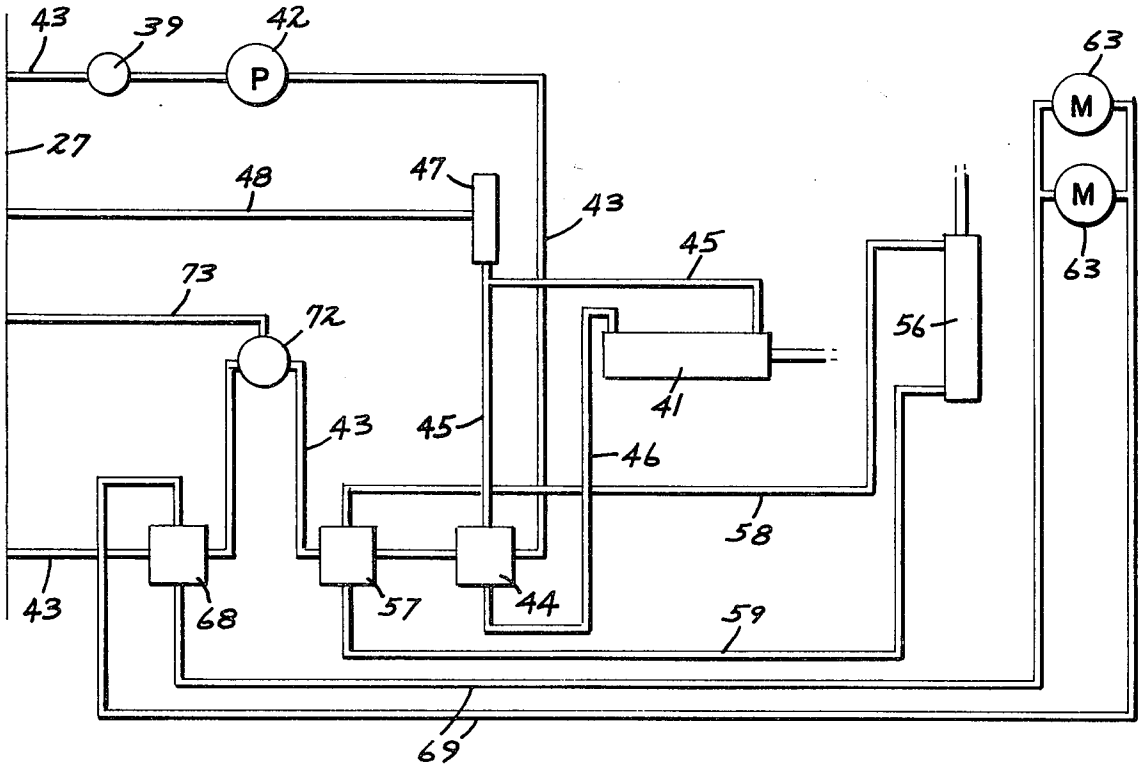

36
37
34
32
27
33
35
35
M
M
M
25a
25b
25c
29
29
29
29
31
30
P
26a
29a
29b
28
30
P
26b
29a
29b
28
30
P
26c
29a
29b
28

FIG. 10


43
39
42
P
63
M
M
63
27
48
47
43
45
73
72
56
41
43
45
46
58
43
68
57
44
59
69

CONCRETE PAVEMENT CUTTING MACHINE

BACKGROUND OF THE INVENTION

This invention is in the nature of a modification of pavement cutting apparatus as disclosed and claimed in U.S. Pat. Nos. 3,547,492 issued to Wynn S. Binger and 3,785,705 issued to Wynn S. Binger, et al and is devised for the purpose of controlling the cracking of concrete pavement. This machine is intended to cut a single slot in concrete aprons, down the center of a roadway pavement or a stretch of airplane runway to control cracking of the apron, pavement or runway caused by expansion/contraction in areas having wide seasonal temperature variations. The cracking or fracture of the concrete normally occurs at random spacing and along crooked lines leading to an unsightly appearance and often resulting in weakened portions as well as portions which may be disposed at slightly different elevations. In slotting the aprons, pavement or runway, a 2¼ inch deep slot is generally sufficient for a concrete thickness from 4 to 6 inches thick and a 3 inch deep slot appears to be satisfactory for slotting concrete between 6 and 12 inches thick. A particular problem in cutting slots of this magnitude is that a single expensive cutting disc is subjected to extreme wear and abuse and the cutting machine must frequently be shut down to replace such worn cutting discs. If the travel of the cutting machine is slowed in an attempt to overcome the abuse to the cutting discs, the time element needed to accomplish the cutting job is prohibitively expensive. Also, it is practically impossible to make repeated cuts of lesser depth with a single cutting disc without varying from the path of travel of the preceeding cut or cuts.

SUMMARY OF THE INVENTION

With the above in mind, a concrete pavement cutting machine is provided which includes a mobile frame having fixed and steerable wheels mounted for movement of the frame along a path of travel. A mounting platform underlies the mobile frame and a plurality of arms mounts the platform for swinging movements toward and away from the concrete pavement underlying the mobile frame at a constant degree of angular relationship with the plane of the concrete pavement. A plurality of cutting discs are mounted in tandem on the platform for rotation in a common vertical plane extending longitudinally of the direction of travel of the mobile frame. Hydraulic devices driven by an engine impart driving movements to the cutting discs, impart movement to the platform, impart driving movements to the wheels, and impart steering movements to steerable wheels of the mobile frame. A flow of liquid coolant is introduced to each of the cutting discs and the cutting discs are so disposed relative to the mobile frame that each disc rearwardly of the front one of the discs cuts into the pavement at a greater depth from the surface of the pavement than the preceeding disc.

An important object of this invention is the provision of a pavement cutting machine which can relatively quickly and easily cut a groove extending longitudinally along a concrete pavement or runway so as to promote cracking or fracture of the pavement or runway within the groove.

Another object of this invention is the provision of a machine of the class above described which will cut a groove longitudinally in a strip of concrete pavement within a minimum amount of time and with a minimum amount of abuse or wear to the cutting discs of the machine.

A still further object of the present invention is the provision of a machine of the class above described which is operable to cut grooves in concrete aprons as well as strips of concrete pavement.

These and other important objects will become apparent to those skilled in the art upon consideration of the following detailed specification, appended claims and attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in top plane of a concrete pavement cutting machine constructed in accordance with the present invention and showing its operative position in relation to a strip of concrete pavement;

FIG. 2 is an enlarged side elevational view of the invention as seen generally from the line 2—2 of FIG. 1, portions thereof being broken away and shown in section;

FIG. 3 is a view in horizontal section as seen generally from the line 3—3 of FIG. 2;

FIG. 4 is a view in transverse vertical section as seen generally from the line 4—4 of FIG. 2, portions thereof being broken away;

FIG. 5 is a view in vertical section as seen generally from the line 5—5 of FIG. 4, portions thereof being broken away;

FIG. 6 is an enlarged vertical section as seen from the line 6—6 of FIG. 5;

FIG. 7 is a view in horizontal section as seen generally from the line 7—7 of FIG. 6;

FIG. 8 is a detail view illustrating a portion of the guide mechanism for the present invention, as seen generally from the line 8—8 of FIG. 1;

FIG. 9 is a schematic diagram of the hydraulic system utilized to drive the cutting discs of the present invention; and

FIG. 10 is a schematic diagram of the hydraulic mechanism utilized to impart raising and lowering movements to the cutting discs and to impart steering and driving movements to the mobile frame of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring in detail to the drawings wherein like reference characters indicate like parts throughout the several views, the reference numeral 10 generally indicates a concrete pavement cutting machine constructed in accordance with the present invention. Cutting machine 10 comprises a mobile frame 11 including fixed and steerable wheel mechanisms 12 and 13. Wheels 12, 13 are mounted for movement of the frame along a path of travel such as that which is defined by the strip of concrete pavement 14 illustrated in FIG. 1 of the drawings. A mounting platform 15, disposed to underlie the mobile frame 11, is mounted for swinging movements toward and away from an upper surface of the concrete pavement 14 at a constant degree of angular relationship with the plane of the concrete pavement 14. Means for mounting the platform 15 for the above movements include a pair of front arms 16 and a pair of rear arms 17. Each of the pairs of arms 16, 17 are pivotally connected to respective front and rear portions of the platform 15 and to the frame 11 in a parallelogram arrangement to effect the proper rela-

tionship of the platform 15 relative to the upper surface of the pavement 14.

A plurality of cutting discs 21*a*–21*c* are mounted in tandem on the platform 15 for rotation in a common vertical plane extending longitudinally of the direction of travel of the mobile frame 11. As shown, each of the cutting discs 21*a*–21*c* is fixedly secured to one end of an axle 22 rotatably mounted on the platform 15 by suitable bearing members. Hydraulic power means for driving the cutting discs 21*a*–21*c* include an engine 23 and a transmission mechanism 24 coupled to the power output shaft, not shown, of the engine 23. The hydraulic power means further include a plurality of hydraulic motors 25*a*–25*c*. The power output shaft, not shown, of each of the motors 25*a*–25*c* is coupled to each of the axles 22 of respective cutting discs 21*a*–21*c* whereby rotation of the output shafts of the motors 25*a*–25*c* directly drive the shafts 22 of respective cutting discs 21*a*–21*c*. A plurality of hydraulic pumps 26*a*–26*c* are mounted on the transmission 24 to be driven by the engine 23 in a manner not specifically shown, but well known to those skilled in the art. Each of the hydraulic pumps 26*a*–26*c* is operatively connected to a source of fluid contained within a reservoir 27 by means of flexible conduits indicated generally by the numeral 28 and to respective hydraulic motors 25*a*–25*c* by flexible fluid conduits 29 as more fully described hereinafter. Each of the fluid conduits 28 has a fluid filter 30 interposed therein to filter fluids from reservoir 27. As seen particularly in FIGS. 3–5, the platform 15 forms a base for mounting a plurality of rigid conduits extending from the hydraulic motors 25*a*, 25*b*. In this manner, connections of the flexible conduits 29 to the hydraulic motors 25*a*–25*c* are such that they are positioned in generally underlying relationship to the connections of the flexible conduits 29 to respective hydraulic pumps 26*a*–26*c*. As such, movement of the platform 15 toward and away from the concrete pavement 14 results in the flexible conduits bending in generally flat planes whereby a minimum of rotational forces are exerted on the connections of the flexible conduits 29 to respective hydraulic pumps and motors during such movement of the platform 15.

Referring now to FIG. 9 of the drawings, a schematic diagram illustrating the preferred method of connecting the several hydraulic motors 25*a*–25*c* to respective hydraulic pumps 26*a*–26*c* and to the source of fluid in the reservoir 27 is illustrated. It will be here noted, that each of the hydraulic pumps 26*a*–26*c* is of a variable delivery reversible type whereby to reverse the direction of rotation of the hydraulic motors 25*a*–25*c* as will be presently described. As seen particularly in FIG. 9, the fluid connections between each of the motors 25*a*–25*c* and respective pumps 26*a*–26*c* include a pair of flexible conduits 29*a*, 29*b* which provide for flow of fluid in either direction through the motors 25*a*–25*c*. In the preferred embodiment as seen in FIG. 2 of the drawings, the front cutting disc 21*a* is driven in a clockwise direction while the succeeding discs 21*b* and 21*c* are driven in a counter-clockwise direction. Thus, for example, the flow of fluid from pump 26*a* to motor 25*a* is through flexible conduit 29*a* and the flow of fluid from pumps 26*b* and 26*c* to respective motors 25*b*, 25*c* is through flexible conduits 29*b*. It has been found that this arrangement for driving the cutting disc 21*a*–21*c* permits the cutting operation to proceed at a faster pace with less strain on the cutting disc. Fluid flowing from the reservoir 27 through the pump 26*a*–26*c* and motors 25*a*–25*c* is returned to the reservoir 27 through a return conduit 31 connected to each of the pumps 26*a*–26*c* and to a manifold 32. Manifold 32, in turn, is connected to the reservoir 27 by means of a return conduit 33.

Because the several motors and pumps must run for extended periods of time and under heavy load conditions, it is desirable to provide some method of cooling the fluids which pass through the pumps and motors from the reservoir 27. In this respect, manifold 32 is provided with a heat exchange coil 34 which is supplied with a liquid coolant (from a source to be presently described) to dissipate the heat from the fluid passing through the manifold 32. Pressure relief is provided for the system through conduits 35 which connect pressure release mechanisms, not shown, within the motors 25*a*–25*c* to a manifold 36 and thence to the reservoir 27 through a conduit 37.

Referring particularly to FIGS. 2, 4 and 5, the direction of fluid flow and displacement of the pumps 26*a* through 26*c* is controlled by means of a level 38 connected to a suitable valve mechanism, not shown, but contained within the housing of each pump 26*a*–26*c*. Such valve mechanism is well known in the art and therefor is not shown in detail.

Hydraulic power means for imparting movements to the platform include a hydraulic elevator ram 41 pivotally connected to and extending between the mobile frame 11 and platform 15. A separate hydraulic pump 42 is operatively coupled, by means not shown, to be driven by the engine 23. As shown particularly in FIG. 10 a fluid conduit 43 extends from the source of fluid in the reservoir 27 through the separate pump 42 to a control valve 44. A fluid filter 39 is interposed in the line 43 between the pump 42 and reservoir 27 and thence back to reservoir 27. A pair of fluid conduits 45, 46 extend from the control valve 44 to the hydraulic elevator ram 41. Operation of the control valve 44 selects the proper conduit 45, 46 to impart raising or lowering movements to the hydraulic elevator ram 41 and platform 15. A manually operated pump 47, interposed in a fluid conduit 48 connected between the fluid conduit 45 and source of fluid in the reservoir 27, is provided to manually operate the hydraulic ram 41 and raise or lower the platform 15 should the separate hydraulic pump 42 fail to operate.

As seen particularly in FIGS. 2–4 the steerable wheels 13 utilized to guide the mobile frame 11 along a path of travel include a generally inverted U-shaped wheel carriage 51. Wheel carriage 51 is mounted on the mobile frame for rotation on a vertical axis by means of a bolt 52 extending through an upper plate of the carriage 51 and a plate 53 affixed to the underside of the mobile frame 11. A sheet of teflon bearing material 54 is interposed between the plate 53 and adjacent surface of the carriage 51 to facilitate rotation of the carriage 51 on the vertical axis of the bolt 52. A tongue 55 is secured to the carriage 51 to extend from the carriage 51 in the direction of travel of the mobile frame 11.

Hydraulic power means for steering the steerable wheels 13 comprise a hydraulic steering ram 56 which is pivotally connected to and extends between the mobile frame 11 and tongue 55 in a position to cause rotation of the carriage 51 on the vertical axis 52 upon the appropriate introduction of fluid under pressure to the

steering ram **56**. As seen particularly in FIG. **10** the steering ram **56** is connected to a control valve **57** by means of a pair of fluid conduits **58, 59**, the control valve **57** being interposed in the fluid supply line **43** of the separate pump **42**. Thus, the control valve **57** controls the direction the wheel carriage rotates on the vertical axis of the bolt **52** by supplying fluid pressure to the appropriate line **58, 59**.

In the preferred embodiment, the steerable wheels **13** include at least a pair of wheel members mounted for rotation on a horizontal axle **62** having a rotary axis extending transversely to the direction of travel of the mobile frame **11**. The axle **62** is mounted for rotation in suitable bearings carried by the lower ends of the depending legs of the inverted U-shaped carriage **51**. The spaced wheel members are fixedly mounted on the axle **62** inwardly of the legs of the U-shaped member **51**. Because of the substantial weight of the cutting machine **10** and to add an increased amount of stability to the cutting machine **10**, a second pair of wheels are affixed to the axle **62** outwardly of the depending legs of the U-shaped carriage **51**.

Hydraulic power means for driving the steerable wheels include a pair of hydraulic wheel motors **63** mounted on the wheel carriage by means of suitable brackets **64**. As seen particularly in FIG. **3** of the drawings, a pinion gear **65** is affixed to the output shaft of each of the wheel motors **63**. The pinion gears **65** each have meshing engagement with a driven gear **66** carried by a respective steerable wheel affixed to the axle **62** inwardly of the depending legs of the U-shaped carriage **51**. As seen particularly in FIG. **3** the axle **62** is formed from separate axle portions joined for independent rotation on aligned axes by means of a coupling **67**. In this manner, a differential arrangement is set up between the wheels driven by respective wheel motors **63** to compensate for different speeds of rotation of the wheel members **13** during turning movements imparted by the hydraulic ram **56** to the wheel carriage **51**. A control valve **68**, interposed in the fluid line **43** from the separate pump **42**, is connected to the wheel motors **63** by means of a pair of fluid conduits **69**, the wheel motors **63** being connected in parallel in the fluid lines **69**. Thus, fluid flowing from the separate pump **42** through the line **43** can be directed into an appropriate one of the fluid conduits **69** by the control valve **68** to cause a rotation of the wheel motors **63** in a direction to drive the steerable wheels **13** in either a forward or a reverse direction.

The speed at which the cutting machine **10** is capable of cutting a concrete pavement is dictated by many variables. For example, recently cured cement can be grooved at a much faster pace than can cement which has been cured for some time. In addition, various mixtures of materials forming the cement dictate the speed at which such cement can be cut by the cutting machine **10**. With this in mind, the speed that the machine travels is controlled by a speed control valve **72** interposed in the fluid supply conduit **43** between the control valve **68** and fluid pump **42**. A pressure relief conduit **73** extends from a pressure relief valve, not shown, in the speed control valve to the reservoir **27** or the fluid supply conduit **43** at a point downstream of the fluid control valve **68**. This provides a flow path for the fluid in line **43** restricted from flowing through the control valve **68** to the motors **63** by the speed control valve **72**.

A second reservoir **74** is mounted on the mobile frame **11** in underlying relationship to the fluid reservoir **27**. The second reservoir **74** provides a supply of fuel for the engine **23** and serves to position the fluid reservoir **27** whereby the fluid therein is elevated above the level of the several pumps **26*a*–26*c*** and **42** for self-priming purposes. The tanks **27, 74** together with the fluids contained therein are positioned on the mobile frame **11** in overlying relationship to the fixed wheels **12** to counterbalance the weight of the engine **23**.

Turning now to FIGS. **2–7**, the platform **15** includes a shroud **75** which encloses the upper portion of the cutting discs **21*a*–21*c*** so as to guard against flying particles during the cutting action of the discs **21*a*–21*c***. Means for introducing a flow of liquid coolant to the cutting discs **21*a*–21*c*** includes rigid conduits **76** carried by the shroud **75** to extend along opposite side surfaces of each of the cutting discs **21*a*–21*c***. Each of the conduits **76** is formed with apertures **77** adjacent each of the cutting discs **21*a*–21*c*** to supply the required coolant to such discs. The rigid conduits **76** are connected to a manifold **78** by means of a pair of flexible hose connections **79**. A fluid conduit **82**, including a shut-off valve **83**, leads from the manifold **78** to a source of liquid coolant, not shown, but remote from the cutting machine **10** and which may take the form of a tank truck or the like. As seen in FIGS. **2** and **4**, the conduit **82** has the heat exchange coil **34** interposed in series therein so that the liquid coolant flowing through the conduit **82** can be utilized to dissipate the heat within the fluid flowing through the manifold **32** to the reservoir **27** from the pumps **26*a*–26*c***. Manifold **78** is provided with control valves **80** to regulate the flow of liquid coolant to opposite sides of the discs **21*a*–21*c***.

The particular means in the preferred embodiment for disposing the cutting discs so they cut into the pavement at a greater depth from the surface of the pavement than the preceding disc include a shim **85**. Shim **85** is interposed between the pivotal connection of the rear arms **17** and the frame **11**. This causes the rear end of the platform **15** to be more closely spaced to the pavement **14** than the front end of the platform **15**. In this manner, each of the cutting discs **21*a*–21*c*** cut into the concrete pavement a substantially equal amount at progressively greater depths from the surface of the concrete pavement. This, of course, assures that each disc cuts only a portion of the total depth of the groove permitting the cutting machine **10** to progress at a faster rate of travel with less frictional heat build-up and consequently less wear on the particular discs **21*a*–21*c***. This arrangement further permits the cutting machine **10** to be operated for extended periods of time without the need to shut down the machine **10** and change the cutting discs **21*a*–21*c*** as would be the case with the use of but a single cutting disc for cutting the entire depth of the groove. While the preferred method of disposing the cutting discs **21*a*–21*c*** in the above-described relationship is by interposing a shim **85** as described, it will be appreciated that the platform may be mounted in other ways to position it in the desired relationship with respect to the upper surface of the pavement **14**. For example, the shim **85** could as easily be placed between the pivotal connection of the arm **17** to the platform **15** or different thickness shims could be placed between the bearing connecting the axles **22** of the cutting discs **21*a*–21*c*** to the platform **15**. In the preferred embodiment of the invention adjustable stop

means in the nature of a flexible cable **86** is provided. Cable **86** extends between the frame **11** and the platform **15** and is secured in place by means of a suitable releasable clamp **87** and a clevis connection **88.** The flexible cable **86** limits downward movement of the platform **15** and parts carried thereby at the desired operational level and supports the platform at such operational level with a minimum of strain on the elevator ram **41.**

The cutting machine **10** can be steered along a path of travel by the use of steering cylinder **56** in cases where grooves are to be cut in aprons or the like or the cutting machine is to be driven onto a truck or the like for transporting same to other locations. However, it is highly desirable to provide a more efficient method for guiding the machine **10** down a strip of pavement or runway so that the groove indicated by the reference character A in FIG. **1** is disposed at a desired dimension between the opposite side edges **14***a*, 14*b* of the strip of pavement for runway **14** without the need for constant correction by an operator of the cutting machine **10.** For this purpose, a pair of opposed trolley carriages **89** are provided. Each trolley carriage **89** is constructed to include rollers **90** which have rolling engagement with the upper surface of the pavement **14** and rollers **91** which have rolling engagement with an adjacent one of the opposed side edges **14***a*, 14*b*.

A pair of first control rods **92** have opposite ends of each one pivotally connected to a different one of the trolley carriages **89** and to a removable forward extension **55***a* of the carriage tongue **55.** A second pair of control rods **93** have opposite ends of each thereof pivotally connected to a different one of the trolley carriages **89** and to the wheel carriage **51,** as at **94.** The second pair of control rods **93** function to preclude their respective trolley carriages **89** from trailing rearwardly in response to forward movement of the cutting machine **10.** The first control rods **92** are extensible and retractable and are provided with tension means indicated generally by the numeral **95** for biasing each of the first pair of control rods **92** in a direction to retract the control rods **92** whereby rollers **91** of a respective trolley carriage **89** are maintained in rolling engagement with a respective side edge **14***a*, 14*b* of the concrete pavement **14.** Each of the second control rods **93** is likewise extensible and retractable to position its respective trolley **89** in an opposed relationship at a desired position relative to the cutting machine **10.** A suitable locking device **95** locks the second control rods **93** in a desired position of extensible, retractable adjustment.

Returning to FIGS. **1** and **8** of the drawings, it can be seen that the first pair of control rods **92** each include a pair of telescoping members **92***a*, 92*b*, a collar **96** mounted on each of the telescoping members **92***a*, 92*b* for adjustment longitudinally thereof and a tension spring **97.** Opposite ends of the tension spring **97** are connected to different ones of the collars **96** under a sufficient degree of tension to exert a force to bias the first control rod sections **92***a*, 92*b* toward a retracted position. With this arrangement, if the pavement **14** should curve, for example, in a direction towards the side **14***b* of the trolley carriage **89** engaging the side edge **14***b* exerts a force through its respective control rod **92** to move the tongue extension **55***a* in the same direction causing the cutting machine **10** to proceed along its path of travel at the desired distance between the side edges **14***a*, 14*b* in spite of a curved portion in the pavement **14.** Dimensional differences between the side edges **14***a*, 14*b* along the pavement **14** as well as between cooperating first and second control rods **92,** 93 and tongue extension **55***a* are compensated for by the tensioning means **95.** In addition, the extensible, retractable feature of the control rods **92, 93** permit the trolley carriages **89** to be adjusted to different widths of pavement **14.** It will be appreciated, that the control rods **92** may be adjusted longitudinally by releasing the collars **96** readjusting the members **92***a*, 92*b* and reattaching the collars to their respective control rod portions **92, 98** with the spring **97** under the desired degree of tension.

What is claimed is:

1. A concrete pavement cutting machine comprising:

a. A mobile frame including fixed and steerable wheels mounted for movement of said mobile frame along a path of travel;

b. a mounting platform underlying said mobile frame;

c. arm means mounting said platform to said mobile frame for swinging movements toward and away from the concrete pavement underlying said mobile frame at a constant degree of angular relationship with the plane of the concrete pavement;

d. a plurality of cutting discs mounted in tandem on said platform for rotation in a common vertical plane extending longitudinally of the direction of travel of said mobile frame;

e. hydraulic power means including engine means for driving said cutting discs, for imparting said movement to said platform, for driving one of said fixed and steerable wheels and for steering said steerable wheels;

f. Means for adjusting the depth to which said cutting discs cut into the concrete pavement whereby said cutting discs cut into the concrete pavement a substantially equal amount at progressively greater depths from the surface of the concrete pavement; and

g. means for introducing a flow of liquid coolant to each of said cutting discs.

2. The structure of claim **1** in further combination with adjustable stop means for limiting the movement of said platform toward the concrete pavement.

3. The structure of claim **1** wherein each of said cutting discs is fixedly mounted on an axle which is rotatably mounted on said platform, wherein said engine means includes a power transmission and wherein said hydraulic power means for driving said cutting discs includes a hydraulic motor mounted on said platform and coupled to each of said axles, a plurality of hydraulic pumps coupled to said engine transmission, each one of said hydraulic pumps being connected to a different one of said hydraulic motors and to a source of fluid.

4. The structure of claim **3** wherein the connections of said hydraulic pumps to said hydraulic motors includes a plurality of flexible hoses, said flexible hoses being positioned to bend in generally flat planes responsive to movement of said platform whereby a minimum of rotational forces are exerted on the connections of said flexible hoses to respective hydraulic motors and pumps during such movement.

5. The structure of claim **3** wherein the fluid displacement of each of said hydraulic pumps is variable and reversible and each of said pumps includes a fluid return conduit leading to said source of fluid.

6. The structure of claim 5 including a fluid manifold, wherein each of said fluid return conduits is connected to said fluid manifold, and wherein the liquid coolant introducing means includes a fluid conduit having a heat exchange coil passing through said manifold whereby the liquid coolant cools the fluids flowing through said manifold.

7. The structure of claim 3, wherein the hydraulic power means for imparting movement to said platform comprises:

a. a hydraulic elevator ram extending between said mobile frame and platform;

b. a separate hydraulic pump coupled to said engine means;

c. fluid conduits connecting said separate hydraulic pump to said source of fluid and to said hydraulic elevator ram; and

d. control valve means interposed in said fluid conduit for controlling the flow of liquid to said hydraulic elevator ram to impart movement to said platform toward and away from the concrete pavement.

8. The structure of claim 7 in further combination with manually operated pump means connected to said hydraulic elevator ram and said source of fluid for manually imparting movements to said platform toward and away from the concrete pavement.

9. The structure of claim 7 wherein said steerable wheels include a wheel carriage mounted on said mobile frame for rotation on a vertical axis, a tongue extending from said carriage in the direction of travel of said mobile frame, and wherein said hydraulic power means for steering said steerable wheels comprises:

a. a hydraulic steering ram extending between said frame and carriage so as to cause rotation of said carriage on said vertical axis;

b. fluid conduits connecting said steering ram to said separate pump and source of fluid; and

c. control valve means interposed in said fluid conduits of said steering ram for controlling the movement of said wheel carriage in opposite directions on said vertical axis.

10. The structure of claim 9 in further combination with a pair of opposed trolley carriages, each trolley of said pair of trolley carriages being constructed to have rolling engagement with the upper surface and a different one of opposed side edges of the concrete pavement, a pair of first control rods having opposite ends of each one pivotally connected to a different one of said trolley carriages and said wheel carriage tongue, a pair of second control rods having opposite ends of each one pivotally connected to a different one of said trolley carriages and said wheel carriage, each of said first and second pair of control rods being extensible and retractable, tension means for biasing each of said first pair of control rods in a direction to retract said control rods whereby each one of said trolley carriages is maintained in rolling engagement with a respective side edge of the concrete pavement and means on each of said second control rods for locking said second control rods against said extensible retractable movements.

11. The structure of claim 9 wherein said steerable wheels include a pair of spaced wheel members mounted for rotation on a horizontal axis extending transversely to the direction of travel of said mobile frame, a pair of hydraulic wheel motors each operatively coupled to a different one of said wheel members, fluid conduits connecting each hydraulic wheel motor to said separate hydraulic pump, and control valve means for controlling the flow of fluids to said hydraulic motors whereby said hydraulic wheel motors may be stopped and started and operated in forward and reverse directions of rotation.

12. The structure of claim 11 in further combination with a speed control valve connected to said source of fluid and to said control valve means of said hydraulic wheel motors for controlling the speed of operation thereof.

13. The structure of claim 1 wherein said arm means is a pair of front arms and a pair of rear arms each pivotally connected to respective front and rear portions of said platform and said mobile frame in a parallelogram arrangement and wherein said means for adjusting the depth to which said cutting discs cut into the concrete pavement is a shim interposed between said rear pair of arms and said mobile frame.

14. The structure of claim 1 wherein said platform includes a shroud enclosing the upper portion of said cutting discs and wherein said means for introducing a flow of liquid coolant to said cutting discs includes a rigid conduit extending along opposite sides of said cutting discs within said shroud, said conduits being formed with apertures for spraying liquid coolant on opposite sides of each of said cutting discs.

15. A concrete pavement cutting machine comprising:

a. a mobile frame including fixed and steerable wheels mounted for movement of said mobile frame along a path of travel;

b. a mounting platform underlying said mobile frame;

c. arm means mounting said platform to said mobile frame for swinging movements toward and away from the concrete pavement underlying said mobile frame at a constant degree of angular relationship with the plane of the concrete pavement;

d. a plurality of cutting discs mounted in tandem on said platform for rotation in a common vertical plane extending longitudinally of the direction of travel of said mobile frame;

e. hydraulic power means including engine means for driving said cutting discs, for imparting said movement to said platform, for driving one of said fixed and steerable wheels, and for steering said steerable wheels; and

f. means for introducing a flow of liquid coolant to each of said cutting discs;

g. said cutting discs being so disposed relative to said mobile frame that each disc rearwardly of the front one of said discs cuts into the pavement at a greater depth from the surface of the pavement than the preceeding disc.

* * * * *