

[54] APPARATUS FOR FORMING A
CONTINUOUS CURB STRUCTURE

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[58] Field of Search 94/46, 46 AC

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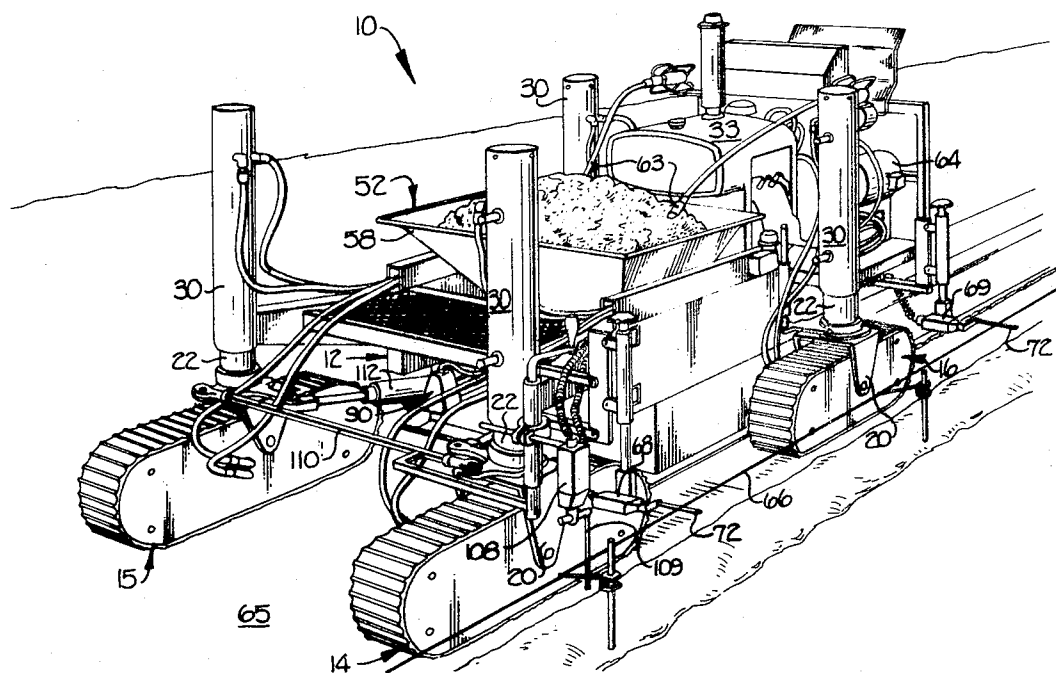
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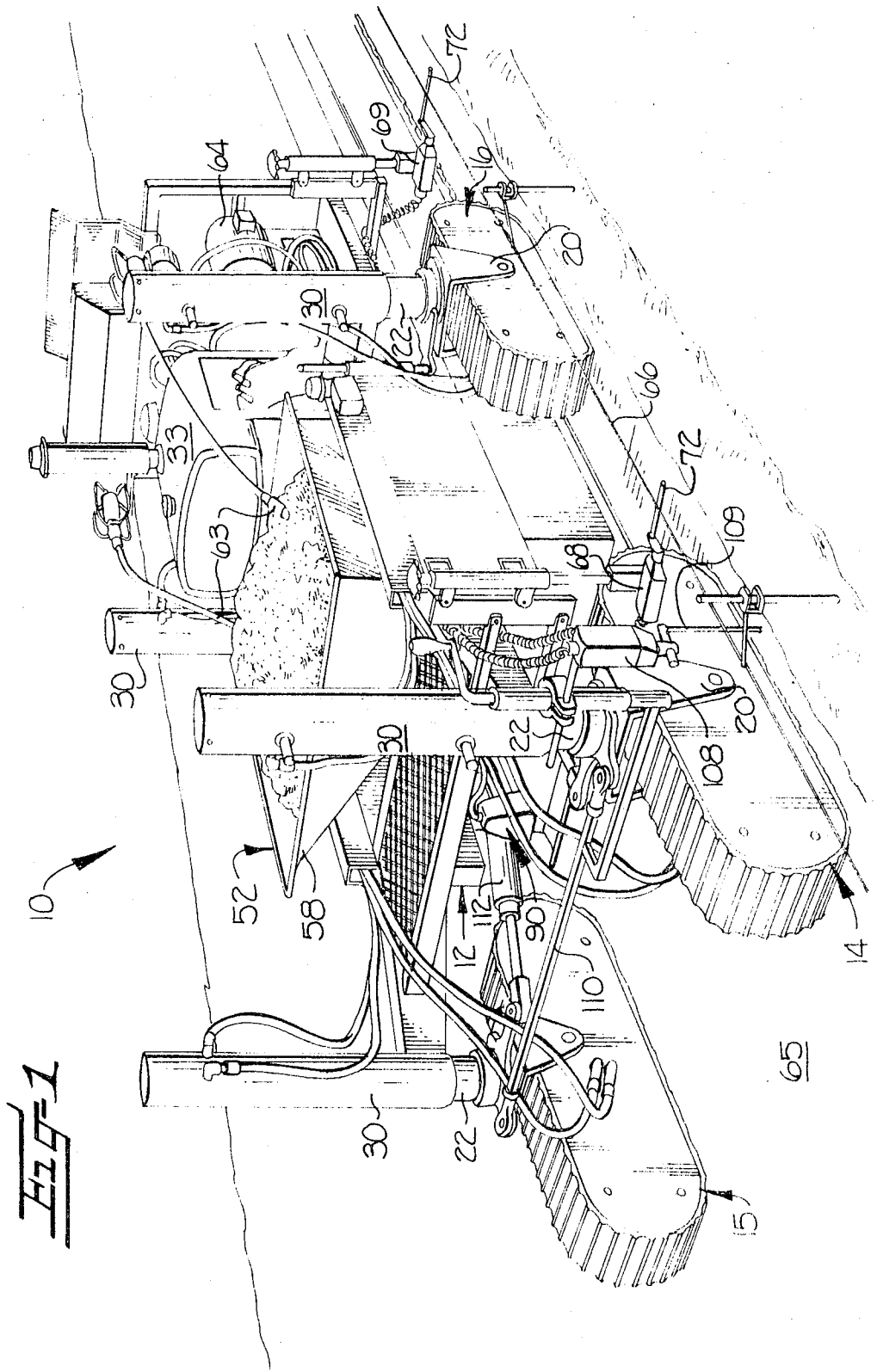
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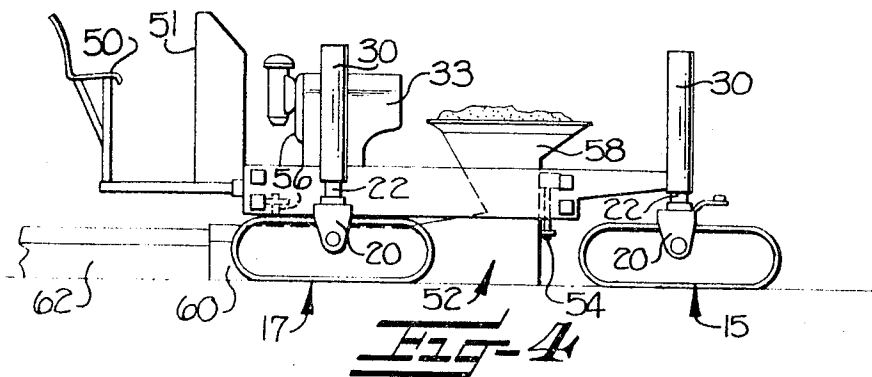
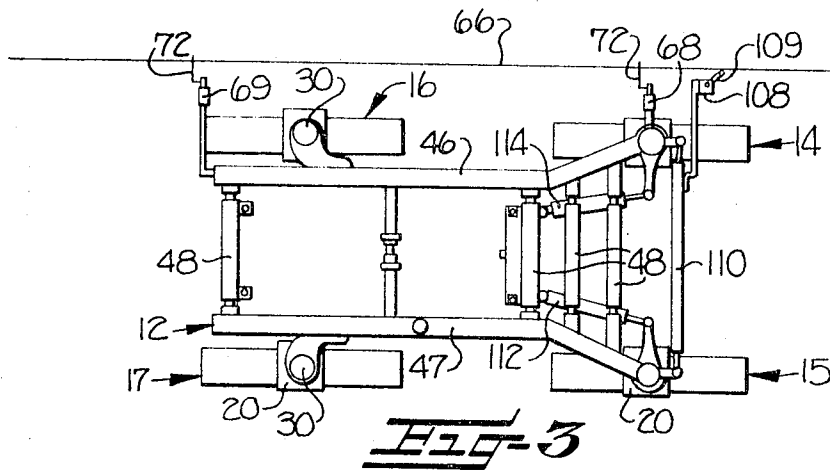
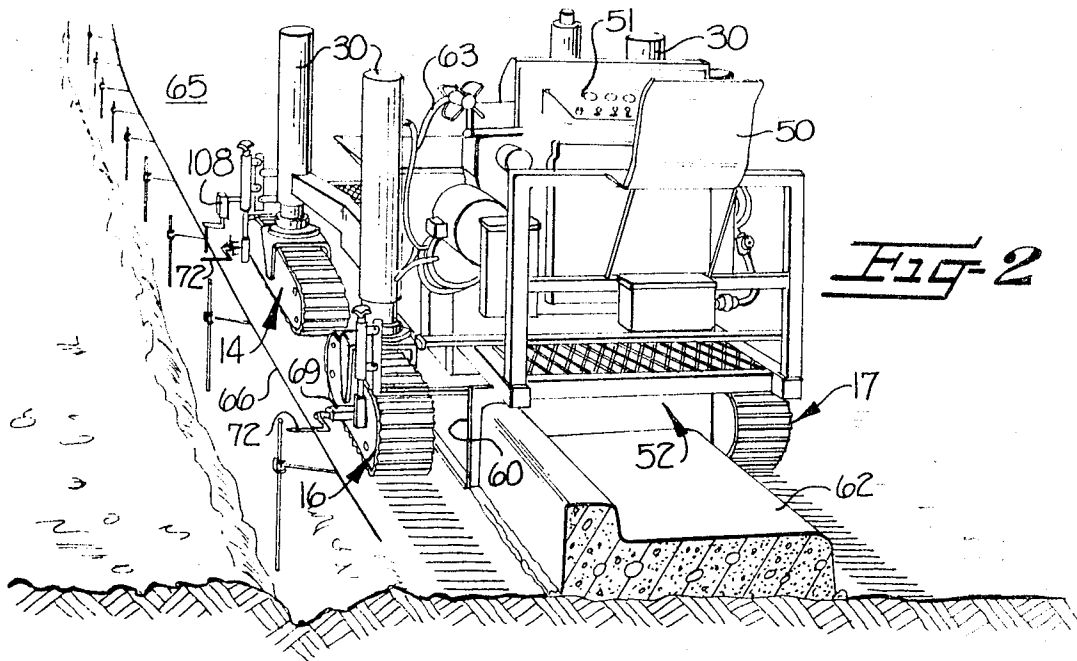
ABSTRACT

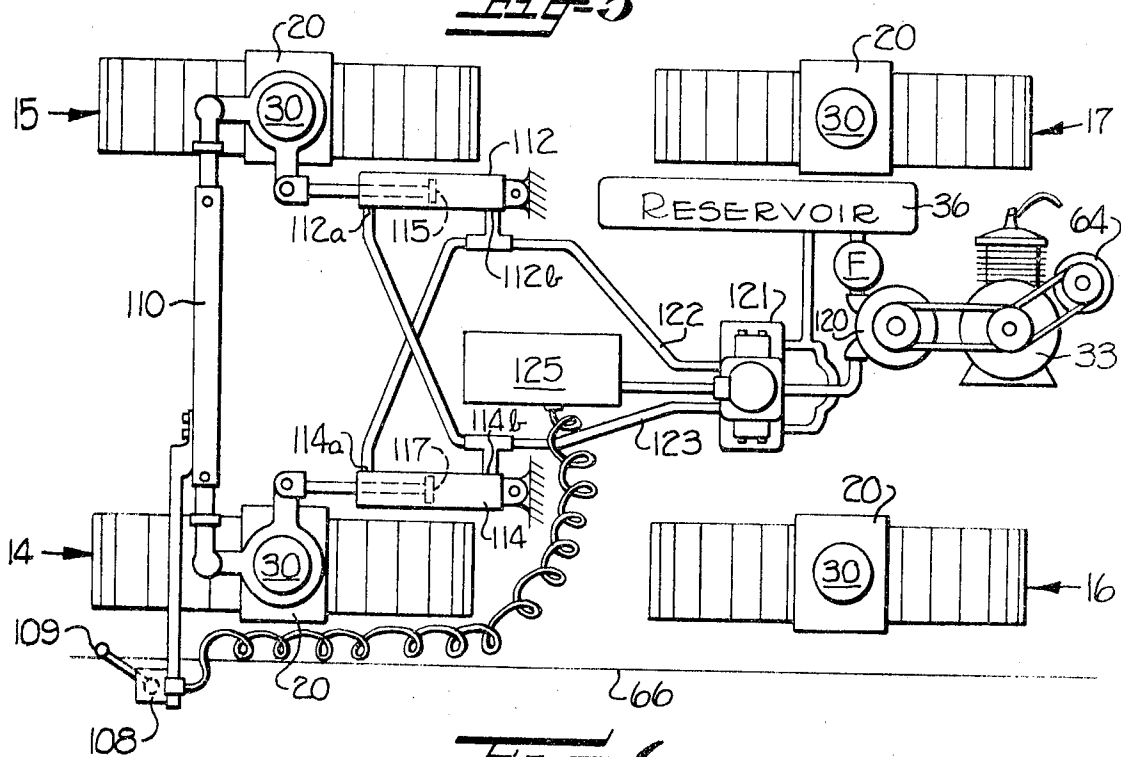
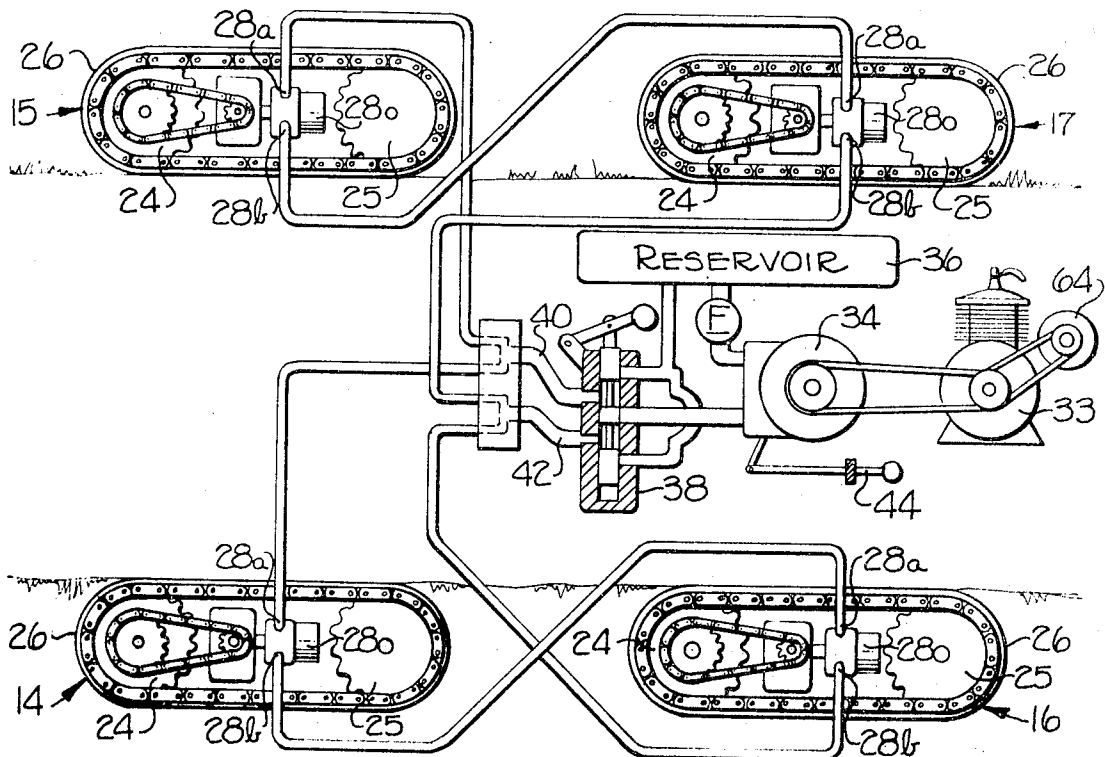
An apparatus for forming a continuous strip of pavement such as a curb, gutter or the like along a prepared ground surface. The apparatus is self-propelled and includes a mold adapted to continuously extrude a pre-formed paving strip as the apparatus moves along the ground. Provision is made for automatically adjusting the elevation of the mold according to an externally positioned control line, and for maintaining the opposite sides of the mold substantially level with respect to each other. Provision is also made for automatically controlling the direction of movement of the apparatus in accordance with the external control line.

15 Claims, 8 Drawing Figures









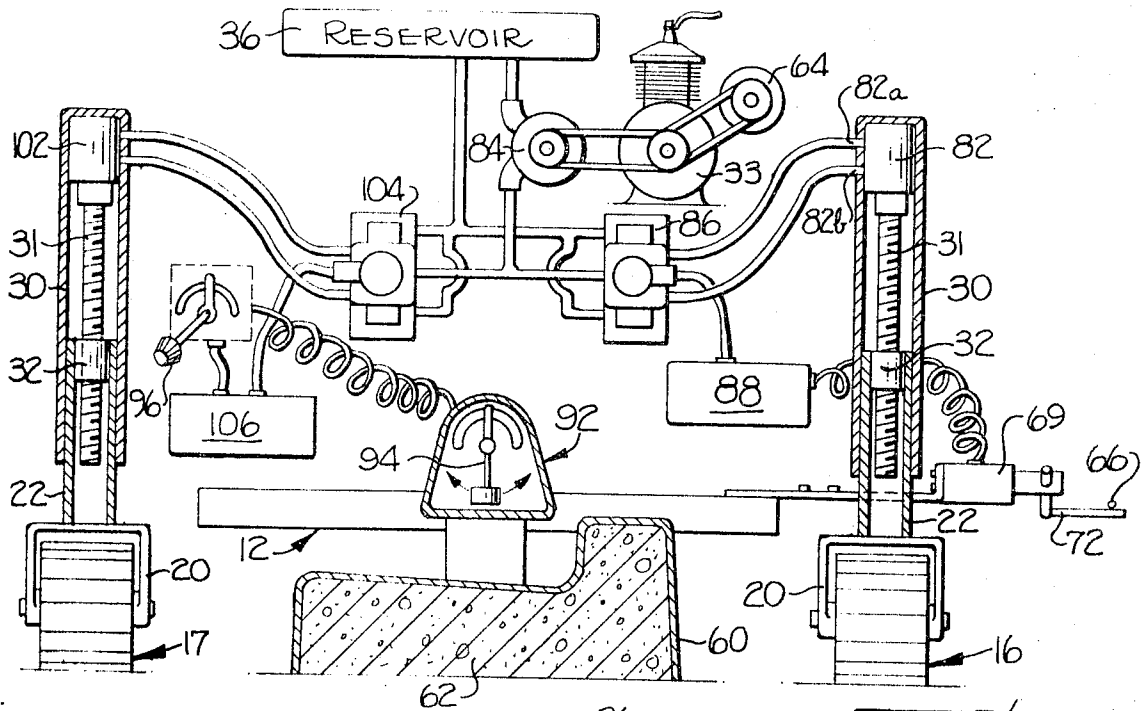


FIG-7

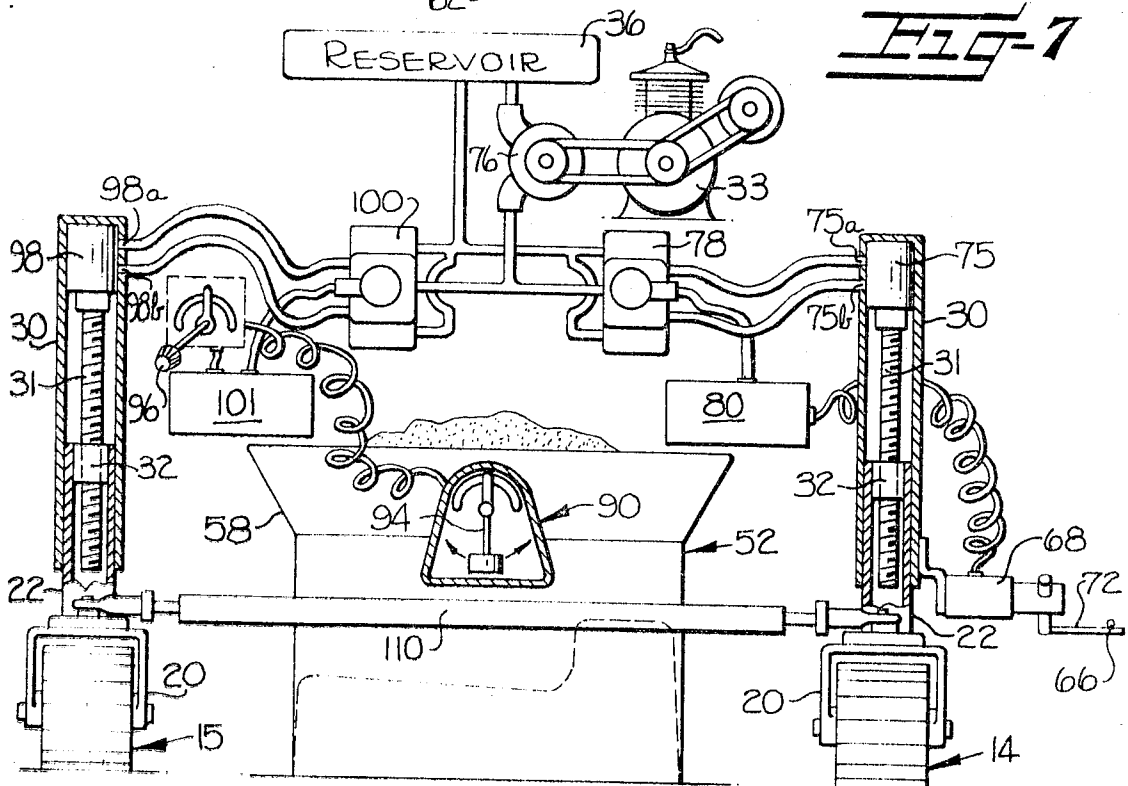


FIG-8

APPARATUS FOR FORMING A CONTINUOUS CURB STRUCTURE

The present invention relates to an apparatus for extruding a preformed paving strip along a ground surface. More specifically, the invention relates to an apparatus adapted to form a continuous and level concrete curb along a ground surface, either before or after the roadbed has been laid, and wherein the apparatus is accurately guided along a predetermined direction and at a predetermined elevation by an external control line positioned adjacent the ground surface.

In recent years, several machines have been developed which are designed to continuously form highway curbs and the like without using manually positioned forms or rails. While such machines are an obvious improvement over the previous manual construction methods, they have not proven satisfactory in all applications since they are generally small in size and have a limited production capacity. In addition, most machines of this type have no provision for adjusting the position of the mold to counteract the effect of an uneven ground surface, and thus they must rely on an accurately graded ground surface to obtain a level curb and one which is properly oriented with regard to the desired elevation and direction. This procedure is obviously unsatisfactory since conventional grading equipment is unable to provide the required accuracy.

In one known curb extrusion machine, an attempt has been made to overcome the difficulties resulting from an uneven ground surface by providing an externally positioned control line and a follower attached to the machine. By visually observing the position of the follower in relation to the control line, the machine operator is able to detect a deviation from the predetermined elevation and direction. Upon observing such deviation, the operator then manually adjusts the orientation of the machine to effect corrective action. This procedure is also unsatisfactory since an additional person is required to continually observe the follower, and adjustment often occurs after a substantial deviation has occurred.

Another known curb extrusion machine is driven by and supported upon two endless steel trackways or belts, one on each side, which extend substantially the full length of the machine. Steering is accomplished by varying the relative speed of the two tracks, but this produces a fishtailing movement which can deform the extruded curb. In addition, the above machine is incapable of turning on a radius shorter than about eighty feet, and thus it is unsuitable for many applications.

It is accordingly an object of the present invention to provide a curb forming machine which is adapted to continuously form a free standing concrete curb at a high rate of production and while utilizing a minimal labor force.

It is another object of the present invention to provide a curb forming machine which automatically compensates for an uneven ground surface by automatically maintaining the mold in a substantially level condition from side to side, and at a predetermined elevation represented by an external control line. It is also an object to provide means for adjusting the leveling mechanism such that the machine may maintain a somewhat non-level condition and thereby conform to a tapered ground surface.

It is another object of the present invention to provide a curb forming machine which automatically fol-

lows a predetermined direction, and which is supported by an independent wheel member at each of the four corners of the machine. In this connection, it is also an object of this invention to provide a steering mechanism adapted to turn the machine about a relatively short radius and without deforming the extruded curb.

It is a further object of the present invention to provide a curb forming machine having an adjustable width whereby molds of various size and configuration may be selectively mounted within the frame of the machine.

These and other objects and advantages of the present invention are achieved in the embodiment illustrated herein by the provision of a machine which comprises a generally rectangular frame having a supporting wheel member positioned at each of the four corners. Each of the wheel members is adjustably interconnected to the frame such that each wheel member may be selectively and independently raised or lowered with respect thereto. Elevation sensor means is carried by the frame and is adapted to generate an output signal coordinated to a displacement of the frame above or below a pre-selected elevation represented by an external control line, and elevation control means is provided which is responsive to the output signal from the elevation sensor means for raising or lowering selected ones of the wheel members to thereby maintain the elevation of the machine at a pre-selected elevation with respect to the control line. Level sensor means is also carried by the machine and is adapted to generate an output signal coordinated to the displacement of one side of the machine from a level condition with respect to the other side, and level control means is provided which is responsive to an output signal from the level sensor means for raising or lowering selected wheel members to reestablish a level condition between the two sides. Direction sensor means may also be carried by the frame which is adapted to generate an output signal coordinated to a deviation in the direction of movement of the machine from that of the external control line, and direction control means is then provided to change the direction of movement of the machine in accordance with the output signal from the direction sensor means.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which

FIG. 1 is a perspective view of a curb forming apparatus embodying the features of the present invention;

FIG. 2 is a perspective view, partly sectioned, illustrating the rear end of the machine shown in FIG. 1 and the curb formed thereby;

FIG. 3 is a schematic plan view of the frame and steering mechanism for the above apparatus;

FIG. 4 is a schematic side view of the apparatus and illustrating the structure for attaching the mold to the frame;

FIG. 5 is a schematic diagram of the drive mechanism for the above apparatus, with the wheels being laid apart for clarity of illustration;

FIG. 6 is a schematic diagram of the steering mechanism of the above apparatus;

FIG. 7 is a schematic diagram of the rear elevation and leveling controls for the above apparatus; and

FIG. 8 is a schematic diagram of the front elevation and leveling controls for the apparatus.

Referring more specifically to the drawings, the curb forming apparatus is indicated generally at 10 and will be seen to include a generally rectangular frame 12 having supporting wheel members 14, 15, 16 and 17 at each of the four corners. More particularly, the wheel members 14 and 15 are positioned at the front end of the apparatus, and the wheel members 16 and 17 are positioned at the rear end thereof. Also, the wheel members 14 and 16 define the near side of the apparatus and the wheel members 15 and 16 define the far side.

Each of the wheel members 14 - 17 comprises a frame 20 supporting a vertical post 22, spaced sprockets 24 and 25 (FIG. 5) carrying the endless trackway 26, and a reversible hydraulic motor 28 adapted to rotate the sprockets 24 and trackway to thereby propel the apparatus in either direction. Each motor 28 includes a forward hydraulic port 28a adapted to rotate the trackway in the forward direction, and a reverse port 28b adapted to rotate the trackway in the reverse direction. The posts 22 are each slidably received in a sleeve 30 which is fixedly carried by the frame 12 of the apparatus, and means is provided for adjustably interconnecting the various posts within their respective sleeves (and thus the wheels to the frame) such that each wheel may be independently raised or lowered with respect to the frame. This interconnecting means includes a vertically directed threaded stud 31 rotatably carried within the sleeve 30 and an internally threaded member 32 engaging the stud and fixedly carried by the post 22.

To concurrently power the hydraulic motors 28 and thereby propel the device in either direction, there is provided a hydraulic system schematically illustrated in FIG. 5. As illustrated, the system includes a prime mover 33 which typically comprises an internal combustion engine, and a hydraulic pump 34 driven by the engine 33 and operatively connected to the reservoir 36. The pump 34 is adapted to deliver pressurized fluid to the manually operable fluid control valve 38. As will be apparent, the valve 38 has a neutral position (as shown) wherein no fluid is delivered to the wheel motors 28, a lowered position for delivering the pressurized fluid through line 40 to the forward motor ports 28a, and a raised position for delivering the fluid through line 42 to the reverse motor ports 28b. Also, the pump 34 may include a speed control lever 44 of conventional design. By this arrangement, the operator of the apparatus may control the direction of movement of the device by actuating the valve 38, and may also vary the speed in either direction by controlling the lever 44.

As best seen in FIGS. 3 and 4, the frame 12 comprises two generally parallel side members 46 and 47 which are interconnected by a number of transverse members 48. As is shown, the transverse members 48 are adjustable in length such that the lateral spacing of the side members 46 and 47 may also be adjusted. If desired, a seat 50 and control panel 51 may be secured to the rear transverse member 48 as seen in FIG. 4.

A mold 52 is carried centrally within the frame 12 and is adapted to receive a paving material such as cement or asphalt and form the same into a continuous strip as the apparatus moves toward the right as seen in FIG. 4. More particularly, the mold 52 is removably connected to the frame 12 by a forward vertically adjustable connection 54 and a rear vertically adjustable

connection 56. These connections permit vertical adjustment of the mold with respect to the frame, and also permit the removal of the entire mold from the frame such that a mold of different size or configuration can be substituted therefor. Also, since the connecting members 48 of the frame are adjustable in length, molds having different lateral dimensions may be selectively carried within the frame.

The mold 52 comprises an upper hopper portion 58 which is adapted to receive a relatively large supply of the paving material from a delivery truck or the like, and a lower rearwardly extending mold portion 60 having an open bottom and an open rear end. The lower mold portion 60 is shaped to provide the desired configuration to the finished curb 62 as seen in FIG. 2. Also, a pair of conventional electrical vibrators 63 extend into the hopper portion 58 and are adapted to compact and densify the paving material in a manner well known in the art. The vibrators 63 may be powered by an electrical generator 64 operatively connected to the engine 33.

In order to automatically guide the apparatus along the prepared or graded ground surface 65 as seen in FIGS. 1 and 2, there is provided an external control line 66 positioned adjacent the edge of the surface 65. For the reasons to become apparent, the line 66 should be accurately positioned in relation to the desired direction and elevation of the finished curb 60.

The structure for maintaining the frame 12 and mold 52 at a predetermined elevation in relation to the control line 66 includes elevation sensor means comprising the front control line follower 68 carried by the near side of the frame 12 adjacent the wheel member 14, and the rear control line follower 69 carried by the near side of the frame adjacent the wheel member 16. Thus the follower 68 is designed to register the displacement of the front end of the apparatus (and thus the front portion of the mold 50) above or below the desired elevation, and the rear follower 69 registers the displacement of the rear end of the apparatus (and thus rear end of the mold 50) from the desired elevation.

Each of the control line followers 68 and 69 includes a horizontally directed arm 72 which is adapted to contact the control line 66. The arm 72 has a neutral position indicating that the frame and mold 50 are at the proper elevation. In addition, the followers are adapted to generate an electrical output signal which is indicative of the direction of displacement of the respective arm from its neutral position, and which is also proportional to the extent of such displacement. Generally, this is accomplished by means of a precision potentiometer which is rotated either up or down in response to movement of the arm 72. Wire followers of this type are well known to those skilled in the art and are manufactured and sold for example by Moog, Inc., East Aurora, New York, under designation Model 86-117.

As indicated above, each of the wheel members is adjustably interconnected to the frame 12 by means of the stud 31 and threaded member 32 such that each wheel member may be selectively raised or lowered with respect to the frame. To control the elevation of the wheel members, there is provided elevation control means which is responsive to the output signals of the wire followers 68 and 69 to rotate selected studs to raise or lower selected wheels and thereby maintain the desired elevation. Specifically, the elevation control means associated with the front portion of the machine

is shown schematically in FIG. 8. This front elevation control means is responsive to the output signal from the follower 68 and is designed to raise or lower the wheel member 14 to thereby maintain the elevation of that portion of the frame 12 and mold adjacent the wheel member 14 at a preselected elevation in relation to the elevation of the control line 66. The front elevation control means comprises a reversible hydraulic motor 75 operatively connected to the stud 31 associated with wheel member 14, the motor 75 having separate forward and reverse ports 75a and 75b respectively. Hydraulic pump means is provided for selectively supplying pressurized hydraulic fluid to one of the motor ports to thereby rotate the stud, and comprises the hydraulic pump 76 and flow control valve 78 positioned between the pump 76 and ports of motor 75. The valve 78 is operatively connected through an electrical transducer or converter 80 to the line follower 68. The converter 80 is conventional, and may for example comprise Model 82-254 manufactured by Moog, Inc. The valve 78 is also conventional and may for example comprise a four way sliding spool valve in which the output flow is proportional to the electrical input current from the converter 80. Moog, Inc. manufactures a valve of this type under the designation Series 76.

The elevation control means associated with the rear portion of the machine and the rear follower 69 is shown in FIG. 7. The system is generally similar to that described above and comprises a reversible hydraulic motor 82 connected to the stud of wheel member 16, a hydraulic pump 84 driven by the engine 33, and a separate flow control valve 86 for selectively directing the pressurized fluid through one of the ports 82a and 82b of motor 82. The valve 86 is connected to the follower 69 via the converter 88 in a manner similar to the arrangement described above.

Level sensor means, comprising the front level sensor 90 carried by the front end of the frame intermediate the wheel members 14 and 15 and rear level sensor 92 carried by the rear end of the frame intermediate the wheel members 16 and 17, is provided for generating output signals coordinated to a displacement of one side of the apparatus from a level condition with respect to the other side. Each of the level sensors are of similar construction, and generally comprise a dampened pendulum 94 which is adapted to provide a gravity vertical reference defining a neutral or level position of the frame. In addition, the sensors 90 and 92 include means for generating an electrical signal indicative of the direction of pendulum displacement caused by a non-level condition, and which is also proportional to the extent of the angular displacement from its neutral position. Such sensors are commercially available and may for example comprise Model 86-121 manufactured by Moog, Inc. A manually controlled adjustment 96 may also be provided for each level sensor which is adapted to vary the effective neutral position of the pendulum 94 and thereby permit the apparatus to maintain a preselected non-level condition during movement along the ground surface. As will be apparent, this feature is desirable when it is desired to form the curb on a "crowned" or non-level ground surface. Thus in many cases it may be desirable to place the curb squarely on a crowned surface even though the curb itself may not be level from side to side.

To effect leveling of the apparatus upon a signal from the sensors 90 and 92, there is provided level control means for selectively actuating the interconnecting means associated with the far side wheel members 15 and 17. The level control means associated with the sensor 90 and front wheel member 15 includes a reversible hydraulic motor 98 operatively connected to the stud and having separate forward and reverse ports 98a and 98b respectively. In addition, hydraulic pump means is provided which comprises the pump 76 and separate flow control valve 100 for selectively supplying pressurized hydraulic fluid to one of the ports of motor 98. A converter 101 similar to those described above is positioned between the valve 100 and level sensor 90. The valve 100 is preferably similar to those described above, and comprises a four-way sliding spool valve in which the output flow is proportional to the electrical input current. Thus, the power delivered to the motor 98 is proportional to the extent of displacement of the pendulum 94 of sensor 90.

The level control means associated with the rear portion of the machine and sensor 92 is shown in FIG. 7 and will be seen to be generally similar to that described above with respect to the sensor 90. Specifically, the rear level control means comprises the hydraulic motor 102 connected to the stud of wheel member 17, and the hydraulic pump means includes the hydraulic pump 84, and the four-way valve 104. A converter 106 is similarly positioned between the valve 104 and sensor 92.

As best seen in FIGS. 1 and 6, direction sensor means is carried by the frame for generating an output signal coordinated to a deviation in the direction of movement of the apparatus from a predetermined direction corresponding to that of the control line 66. Such direction sensor means comprises a line follower 108 similar in construction to the followers 68 and 69 but wherein the control arm 109 is vertically directed for lateral movement. Direction control means is provided which is responsive to the output signal from the line follower 108 to selectively change the direction of the front pair of wheels and thereby cause the apparatus to turn and re-establish its predetermined direction. Specifically, the direction control means comprises the post 22 and sleeve 30 mounting interconnections associated with the front pair of wheel members 14 and 15 wherein such wheels are each rotatable about the vertical axis corresponding to the axis of its post and sleeve. A tie rod 110 operatively connects the front pair of wheels to provide for concurrent rotation about these axes, and hydraulic means is provided for rotating the front wheels about their respective axes. Such hydraulic means comprises the cylinders 112 and 114 carried by the frame 12, a piston 115 slidably carried in the cylinder 112 and operatively connected to the post 22 of wheel member 15, and a piston 117 slidably carried in the cylinder 114 and operatively connected to the post 22 of wheel member 14. Each cylinder includes a front port 112a and 114a respectively on one side of the piston, and a rear port 112b and 114b on the opposite side thereof. A hydraulic pump 120 and flow control valve 122 are provided for selectively supplying pressurized hydraulic fluid through line 122 to ports 112b and 114a, or through line 123 to ports 114b and 112a. By this arrangement, the pistons may be translated in opposite directions within their respective cylinders to concurrently rotate the wheel members 14 and 15

about a pair of vertical axes defined by the post and sleeve of each wheel. The flow control valve 122 is similar in construction to the above described four-way sliding spool valves wherein the output flow is proportional to the electrical input, and a converter 125 as described above is interposed between the valve 122 and sensor 108.

It is believed that the operation of the apparatus 10 will be apparent from the above description. Generally, however, that the apparatus is propelled along the ground surface 65 by the engine 33 acting through pump 34 and valve 38 to the wheel motors 28. The speed may be accurately controlled in either the forward or reverse directions by the control lever 44, and it will be apparent that the apparatus is able to climb a relatively steep grade by reason of the traction developed by the four-wheel drive arrangement.

If the apparatus rises above the predetermined elevation, either one or both of the sensors 68 and 69 will register the deviation and signal either one or both of the motors 75 and 82 to appropriately adjust the elevation of the wheel members 14 and 16. Such movement by these wheels will undoubtedly cause the far side to become non-level with respect to the near side, which in turn will result in one or both of the sensors 90 and 92 taking corrective action by actuating either one or both of the motors 98 and 102. While duplicate elevation and leveling control systems (i.e. front and rear) have been illustrated herein, it will be apparent that in many applications a single system will be adequate, particularly where the apparatus has a relatively short length. However, when the apparatus is large and the mold 52 has a relatively long length, the illustrated duplicate system is preferable.

Should the apparatus deviate from its designated direction of movement, the sensor 108 will actuate the valve 122 to rotate the front wheel members in the appropriate direction. Since rotation occurs about a vertical axis extending upwardly from each front wheel member, it will be appreciated that the entire device may be turned about a relatively short radius, which in actual practice may be as short as 20 feet. Also, it is apparent that there will be no significant fishtailing at the rear portion of the machine and thus there will be no deformation of the extruded curb.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

That which is claimed:

1. A self-propelled apparatus for forming a continuous strip of paving material such as a curb, gutter, or the like along a prepared ground surface having an external control line, said apparatus comprising
 - a generally rectangular frame defining a front end, a rear end, a near side, a far side, and four corners,
 - a supporting wheel member positioned at each of the four corners of the frame,
 - means for adjustably interconnecting the supporting wheel members and frame such that each of the wheel members may be selectively and independently raised or lowered with respect to the frame,
 - power means carried by said frame for rotating at least two wheel members to propel the apparatus along the ground surface,

mold means carried centrally within said frame for receiving the paving material and forming the same into a continuous strip as the apparatus moves along the ground surface,

elevation sensor means including a first control line follower carried by the near side of said frame adjacent one near side wheel member for generating an output signal proportional to a displacement of that portion of the frame and mold means adjacent said one near side wheel member above or below a preselected elevation represented by the external control line, and a second control line follower carried by the near side of said frame adjacent the other near side wheel member for generating an output signal proportional to a displacement of that portion of the frame and mold means adjacent said other near side wheel member above or below a preselected elevation represented by the external control line,

first elevation control means carried by said frame and responsive to the output signal from said first control line follower for selectively actuating said interconnecting means associated with said one near side wheel member to selectively raise or lower such wheel and thereby maintain the elevation of that portion of the frame and mold means adjacent said one near side wheel member at a preselected elevation in relation to the elevation of the control line,

second elevation control means carried by said frame and responsive to the output signal from said second control line follower for selectively actuating said interconnecting means associated with said other near side wheel member to selectively raise or lower such wheel and thereby maintain the elevation of that portion of the frame and mold means adjacent said other near side wheel member at a preselected elevation in relation to the elevation of the control line,

level sensor means including a first level sensor carried by the frame adjacent said one near side wheel member for generating an output signal proportional to a displacement of the far side of the apparatus from a level condition with respect to the near side and a second level sensor carried by the frame adjacent said other near side wheel member for generating an output signal proportional to the displacement of the far side of the apparatus from a level condition with respect to the near side,

first level control means carried by said frame and responsive to the output signal from said first level sensor for selectively actuating said interconnecting means associated with the far side wheel member opposite said one near side wheel member to raise or lower such far side wheel member to re-establish a level condition between the two sides, and

second level control means carried by said frame and responsive to the output signal from said second level sensor for selectively actuating said interconnecting means associated with the far side wheel member opposite said other near side wheel member to raise or lower such far side wheel member to re-establish a level condition between the two sides,

whereby said first and second level sensors act independently from each other to provide accurate

control of the elevation of the far side of the apparatus with respect to that of the near side.

2. The apparatus as defined in claim 1 wherein said means for adjustably interconnecting each of the wheel members and frame includes a vertically directed externally threaded stud rotatably carried by one of either the wheel member or frame, and an internally threaded member engaging said stud and fixedly carried by the other of either the wheel member or frame, such that rotation of said stud vertically translates the wheel in relation to said frame.

3. The apparatus as defined in claim 2 wherein each of said first and second control line followers comprises a horizontally directed arm adapted to contact the control line and having a preselected neutral position, and means for generating an electrical signal indicative of the direction of displacement of the arm from its neutral position and which is also proportional to the extent of such displacement.

4. The apparatus as defined in claim 3 wherein each of said first and second level sensors comprises a dampened pendulum adapted to provide a gravity vertical reference defining a neutral position relative to said frame, and means for generating an electrical signal indicative of the direction of displacement of the pendulum from said neutral position and which is proportional to the extent of such displacement.

5. The apparatus as defined in claim 4 wherein each of said first and second elevation control means and each of said first and second level control means includes a reversible hydraulic motor operatively connected to the associated stud and having separate forward and reverse ports.

6. The apparatus as defined in claim 5 further comprising first hydraulic pump means carried by said frame for selectively supplying pressurized fluid to the motor ports of said first elevation control means and said first level control means, said first hydraulic pump means comprising a first hydraulic pump, a first flow control valve positioned between said first hydraulic pump and the motor ports of said first elevation control means, and a second flow control valve positioned between said first hydraulic pump and the motor ports of said first level control means, each of said first and second valves including means for selectively directing the pressurized fluid through one of the motor ports at a rate proportional to the signal from the associated sensor means.

7. The apparatus as defined in claim 6 further comprising second hydraulic pump means carried by said frame for selectively supplying pressurized fluid to the motor ports of said second elevation control means and said second level control means, said second hydraulic pump means comprising a second hydraulic pump, a third flow control valve positioned between said second hydraulic pump and the motor ports of said second elevation control means, and a fourth flow control valve positioned between said second hydraulic pump and the motor ports of said second level control means, each of said third and fourth valves including means for selectively directing the pressurized fluid through one of the motor ports at a rate proportional to the signal from the associated sensor means.

8. The apparatus as defined in claim 4 wherein each of said first and second level sensors further comprises

manually controlled adjustment means for varying the neutral position of said pendulum to thereby permit the apparatus to maintain a preselected non-level condition during movement along the ground surface.

9. The apparatus as defined in claim 1 further including direction sensor means carried by said frame for generating an output signal coordinated to a deviation in the direction of movement of the apparatus from a predetermined direction corresponding to the direction of the external control line, and

direction control means responsive to the output signal from said direction sensor means for selectively changing the direction of one pair of end wheel members to cause the apparatus to turn and re-establish the predetermined direction.

10. The apparatus as defined in claim 9 wherein said direction sensor means comprises a control line follower having a vertically directed arm adapted to contact the control line and having a preselected neutral position, and means for generating an electrical signal indicative of the direction of displacement of the arm from its neutral position and which is proportional to the extent of such displacement.

11. The apparatus as defined in claim 10 wherein said direction control means comprises means mounting the front end pair of wheel members for rotation about a pair of vertical axes with one of said axes extending upwardly from each wheel member, a tie rod operatively connecting said front end pair of wheel members to provide concurrent rotation of the wheel members about said axes, and steering hydraulic means for rotating said wheel members about their respective axes.

12. The apparatus as defined in claim 11 wherein said steering hydraulic means comprises a hydraulic cylinder carried by said frame and having separate forward and reverse ports, a piston carried in said cylinder and operatively connected to said wheel member mounting means, and hydraulic pump means for supplying pressurized hydraulic fluid to said cylinder ports and including a hydraulic pump and a flow control valve positioned between said hydraulic pump and said hydraulic cylinder, said flow control valve including means for selectively directing the pressurized fluid through one of said cylinder ports at a rate proportional to the signal from said direction sensor means.

13. The apparatus as defined in claim 1 wherein said power means includes a reversible hydraulic motor operatively connected to each wheel member, each of said motors including separate forward and reverse ports, and hydraulic pump means for concurrently supplying pressurized hydraulic fluid to either the forward or reverse ports of all of said motors and including a hydraulic pump and a manually operated flow control valve interposed between said hydraulic pump and motors.

14. The apparatus as defined in claim 1 wherein said mold means comprises an upper hopper portion adapted to receive the paving material, and a lower mold portion having an open bottom and open rear end.

15. The apparatus as defined in claim 14 wherein said mold means further comprises vibrating means for compacting and densifying the paving material received therein.

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