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Rochfort

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[54] **CONCRETE LAYING MACHINE**

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[52] **U.S. Cl.** **404/84;** 404/98

[51] **Int. Cl.** **E01c 19/52**

[58] **Field of Search** ..... 404/84, 83, 96, 98, 105; 180/41; 280/6 R, 6 H, 126; 37/DIG. 20

[56] **References Cited**

UNITED STATES PATENTS

2,128,273	8/1938	Stevens	404/84 X
2,864,452	12/1958	Guntert	404/84 X
2,883,594	4/1959	Alberts	404/84 X
3,054,334	9/1962	Barber	404/108
3,161,117	12/1964	Supject	404/98 X
3,363,524	1/1968	Catenacci	404/98 X
3,377,933	4/1968	Dale	404/98
3,477,354	11/1969	Rink	404/105 X

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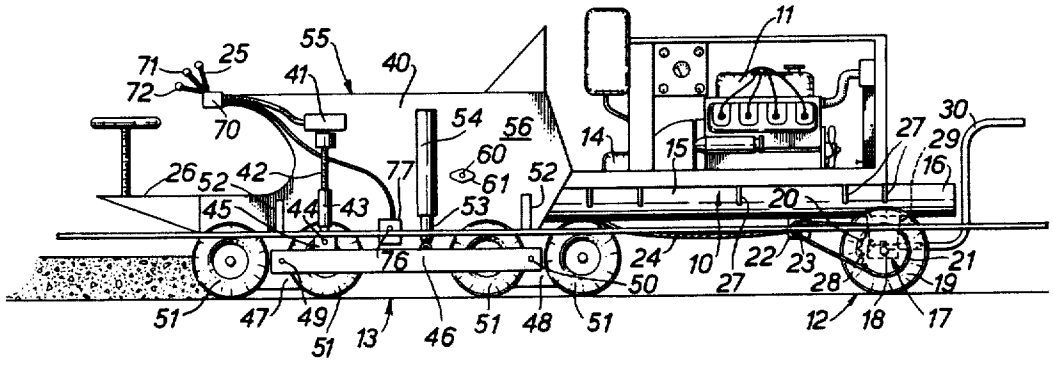
Attorney, Agent, or Firm—Steinberg & Blake

[57] **ABSTRACT**

A machine for laying a continuous run of concrete of constant section such as roadway kerbing.

The machine includes a body portion having a chamber adapted to receive concrete and discharge it rearwardly through an outlet to a mould adapted to shape the discharged concrete to a desired cross-section. A pair of height adjusting devices each support a side of the body above a respective supporting wheel assembly. The body is automatically maintained at a predetermined laying disposition by means of a sensing device adapted to sense deviations of the body from an external reference line. Upon deviation, the sensing device is arranged to operate the height adjusting devices to return the body to the correct disposition.

21 Claims, 4 Drawing Figures



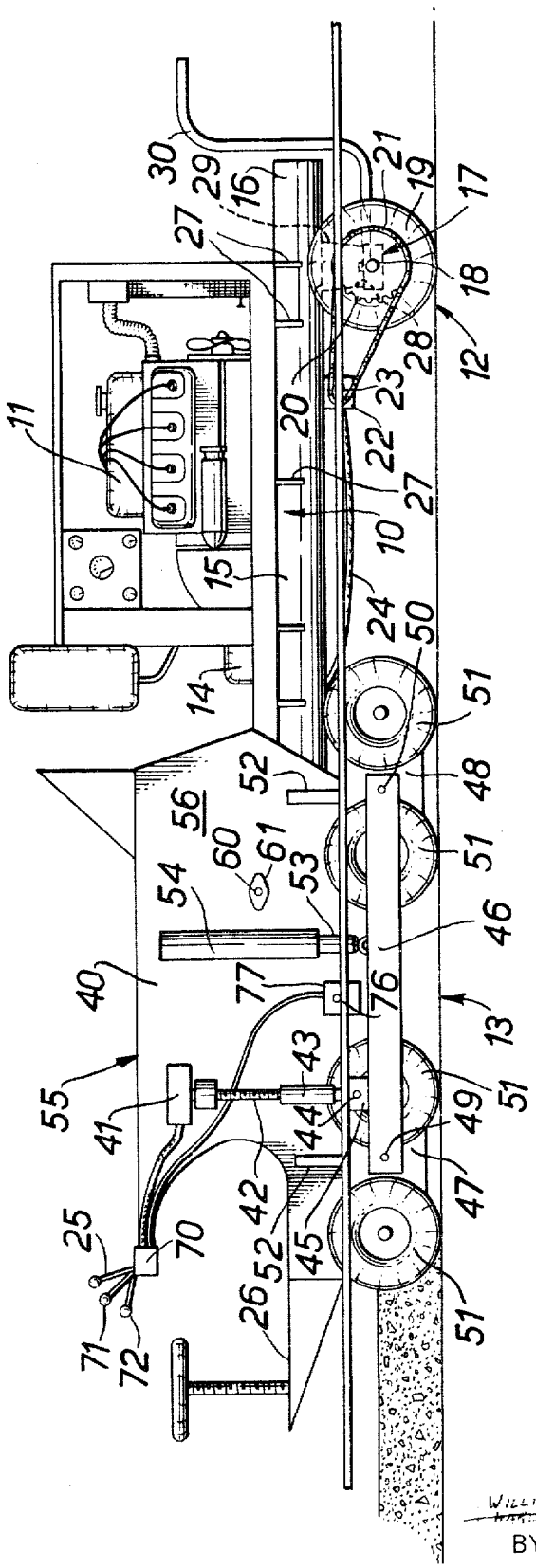


FIG.1.

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FIG. 2.

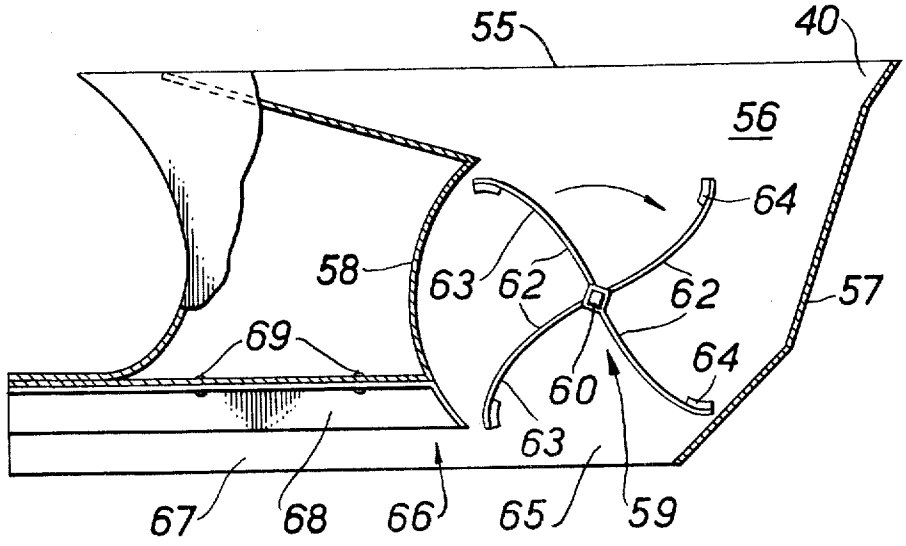
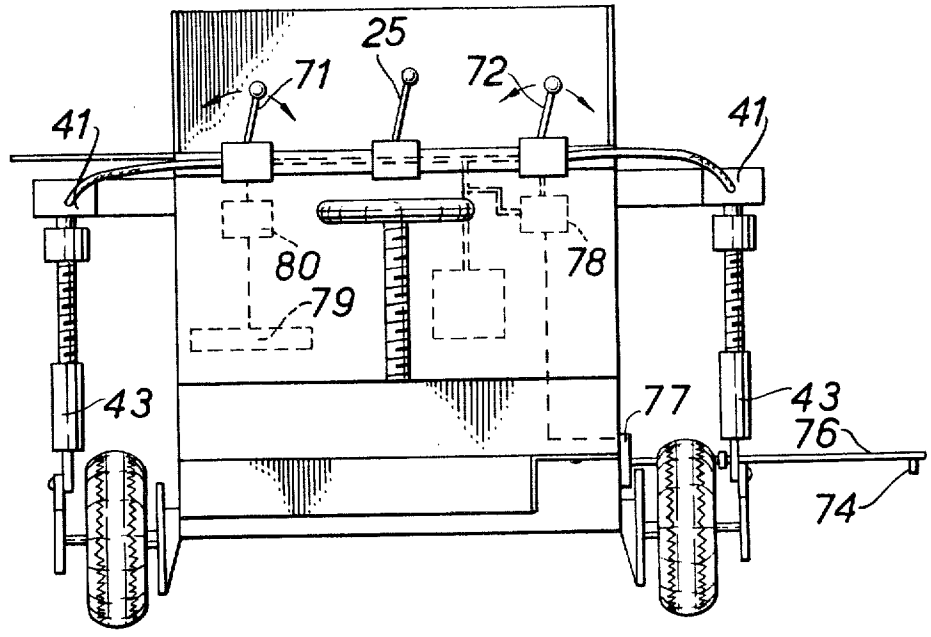


FIG. 4.

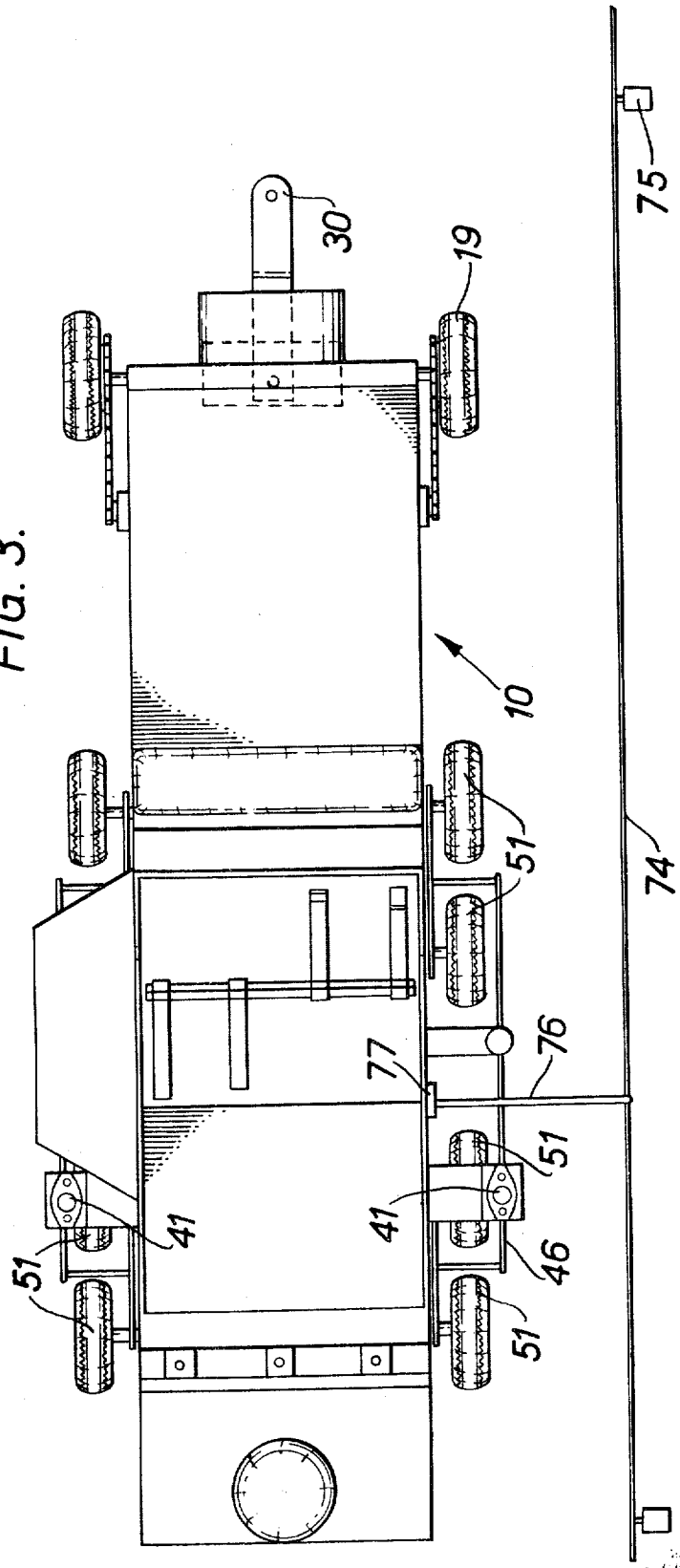


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FIG. 3.



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CONCRETE LAYING MACHINE

This is a continuation, of application Ser. No. 101,405, filed Dec. 24, 1970, now abandoned.

This invention relates to machines for laying a continuous run of concrete of constant section, for example, gutters and kerbs, roadway median strips and the like. For convenience, reference will hereinafter be made to the application of the machine to the laying of a continuous run of guttering and kerbing, but it is to be understood that this is by way of example only and the invention is not limited thereto.

Various types of such concrete laying machines are known, and these suffer from the disadvantage that the run of concrete laid by the machine will be laid at a constant height above the prepared (or unprepared) bed upon which the run is laid. It is possible that the bed will be uneven or that the machine may sink into soft spots of the bed or rise over stones on the bed and should either of these occur then the laid run will not be 'level' along its top surface.

Another disadvantage of known machines is that adjustment of the extrusion orifice or mould outlet of the machine with respect to the datum level of the desired run is a complicated, generally manual, time consuming operation.

It is an object of this invention to provide an improved concrete laying machine which overcomes the disadvantages of known machines yet is of simple construction.

With the foregoing and other objects in view, a concrete laying machine according to the invention includes a body, a pair of supporting wheel assemblies, a pair of height adjusting devices each supporting a side of the body in vertically adjustable manner above one of the supporting wheel assemblies, actuating means operatively connected to each height adjusting device and each adapted to actuate the respective device to raise or lower a side of the body relative to the wheel assembly supporting it, means for propelling the machine, a chamber in the body adapted to receive concrete and discharge it rearwardly through an outlet of the chamber to a mould adapted to shape the discharged concrete to a desired cross-sectional configuration as the machine is propelled, and sensing means on the body adapted to sense an external reference line, the sensing means being further adapted upon deviation of one or both sides of the body from a predetermined vertical relationship with the external reference line to cause the or each actuating means to be operated to raise or lower the or each side of the body to return the or each side to its predetermined relationship with the external reference line.

In order that the invention may be more readily understood and put into practical effect reference will now be made to the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a concrete laying machine according to the invention;

FIG. 2 is a partly broken away sectional side elevational view of the machine shown in FIG. 1, showing the hopper and paddle assembly;

FIG. 3 is a plan view of the machine shown in FIG. 1; and

FIG. 4 is a schematic diagram of height adjustment arrangement.

The concrete laying machine shown in the drawings includes a main body assembly **10**, front wheel assembly **12** and rear supporting wheel assemblies generally

shown by numeral **13**. Mounted on the forward end of the main assembly **10** is an engine **11** which in this instance is a four cylinder petrol engine. The engine **11** is coupled to a hydraulic unit **14** in known manner to provide hydraulic pressure to a hydraulic receiver **15** forming part of a hydraulic circuit for the machine.

In the embodiment shown, the receiver **15** is mounted below the main frame by welded gusset plates **27**, beneath the engine and has mounted on its forward end **16** a pivotal connection for connection to the axle of the frong wheel assembly **12**.

The front wheel assembly **12** includes an axle **18** having at each end a steerable ground wheel **19**. Each wheel has a driving sprocket **20** rigidly attached thereto, and the sprocket **20** is driven by a chain **21** which in turn is driven by a hydraulic motor **22** having a suitable sprocket **23**. The motor **22** is connected to the hydraulic circuit by line **24**, control of the motor speed is by lever **25** mounted at the rear of the machine adjacent an operator's platform **26**.

The pivotal connection between the main frame and the front wheel assembly comprises a pair of pivot members extending substantially horizontally and at right angles from the centre of the axle **18**. Downwardly extending from the receiver **15** is a pair of attachment members **28, 29** spaced apart along the fore and aft line of the machine. Each attachment member has suitable bearing surfaces to receive the respective pivot members, such that one attachment member is forward of the axle **18** and the other is rearward of the axle **18**. The arrangement being such that the machine may be pivoted about the connection about an axis extending in the fore and aft line of the machine.

Extending forwardly from the machine is a direction control member **30** having a pair of actuating levers each extending to a king pin connection between each wheel and the respective end of the axle. The arrangement of the levers and connection being such that the direction of the front wheels may be adjusted by movement of the control member **30**.

A concrete chamber **40** is mounted on the body at the rear of the engine **11**. A pair of height adjusting devices comprising, in this instance a threaded member **42** on the chamber operatively engaged in a correspondingly threaded tubular member or housing **43**, each support a side of the body above one of the supporting wheel assemblies **13**. The member **43** is pivotally mounted at **44** to bracket **45** on the assembly **13**. Actuating means, in this instance, a hydraulic motor **41** is adapted to drive the threaded member **42** whereby the or each side of the body may be raised or lowered.

The rear wheel assembly **13** comprises a major frame **46** having pivoted thereto at each end secondary frames **47** and **48**, the pivotal connection between the secondary frames **47** and **48** being shown by numerals **49** and **50**. Each secondary frame has tandem mounted thereon a pair of wheels **51**, the secondary frames being in fore and aft alignment so that the two pairs of tandem wheels are also in fore and aft alignment.

A pair of rubbing plates **52** are mounted on the hopper **40**, one opposite each secondary frame pivot as shown, to restrict any movement of the rear wheel assemblies. Pivoted to each major frame is a locating member **53** telescopic within a guide **54** mounted on the hopper.

The hopper **40** as shown in FIG. **2** includes an inlet **55** to receive concrete mix, for example from a truck

of ready-mixed concrete, side walls **56**, front wall **57** and rear wall **58**. Transversely mounted between the side walls **56** is a feeding means in the form of a paddle assembly generally shown by numeral **59**. The paddle assembly comprises an axle **60** mounted in bearings **61** and having extending substantially radially outward therefrom arms **62**. In some circumstances it is preferred that the bearing be adjustably mounted so that the paddle assembly may be vertically adjusted. The outer portion **63** of each arm is curved away from the indicated direction of rotation of the paddle assembly. A working face **64** at the outer end of each arm is substantially rectangular and in this instance is a steel plate measuring three inches by three inches. It will be appreciated that the arm and working face may be cast integrally.

An outlet **65** from the hopper **40** leads to a removable mould **66** mounted on the rear of the hopper **40** adapted to shape the discharged concrete to a desired cross-sectional configuration as the machine is propelled. In this instance the mould is suitable for a gutter and kerb run and comprises a lower portion **67** for forming the gutter and an upper portion **68** for forming the kerb. The mould is bolted on to the hopper **40** by means of bolts **69**. It will be seen that with the hopper containing cement, the working faces **64** will feed cement towards the outlet and then compact the cement into the face of the mould **66**. The shown configuration of the arms **62** permits the compacting action of the faces **64** to continue for a larger arc of the circle drawn out by the rotation of the extremity of the arms than that of a straight arm. Alternatively, the feeding means could be one or more auger assemblies mounted within the chamber and leading to the chamber outlet.

In cases where aeration of the shaped concrete is highly undesirable, for example, in climates experiencing zero and sub-zero temperatures, it is preferred that the feeding means be part of a concrete pump circuit leading from a suitable concrete supply to the chamber outlet.

As stated above, an operator's platform **26** is mounted to the rear of the hopper **40** to enable an operator to control the machine by manipulating the controls of a control panel **70**. The controls being **25** in respect of the forward movement of the machine, and **71** and **72** connected to the hydraulic motors **41** for tilting the hopper and mould about the pivotal connection **17**. A control lever is also provided for a further hydraulic motor adapted to drive the paddle assembly.

Alternatively, automatic height adjustment means may be employed to ensure that the machine is maintained in its predetermined transverse disposition, and at a predetermined working height above a prepared bed indicated at **73**. This is achieved by sensing means operatively associated with an external reference line, which may suitably be a metal guide strip as shown at **74** which is tensioned and supported by posts **75**, the guide strip **74** being a predetermined height above the prepared bed **73** and to the right hand side of the position where the kerb and gutter is to be laid so that it extends to one side of the machine.

The sensing means includes a detector bar **76** which is pivotally mounted on and extends transversely away from the right hand side of the frame or hopper. At its inner end, the bar carries a mercury switch **77** which is electrically connected to a solenoid valve **78** which controls the supply of hydraulic fluid to the motor which raises the side of the frame from which the detector bar extends (in this instance the right hand side). The mercury switch is of a type that together with its electrical connection to the solenoid valve will be active to raise or lower the side of the frame depending upon downward or upward movement of the outer end of the bar which rests upon the strip. A second or compensating mercury switch **79** is mounted on the frame on the other side of the machine and operates a solenoid valve **80** associated with the other height adjustment motor in a similar fashion to the first mercury switch. Thus, as the right hand side is raised or lowered the machine will tilt from its predetermined disposition, and the second mercury switch will be active to raise or lower the other side of the machine. The compensating switch **79** may be so arranged to provide a predetermined tilted disposition of the body.

The strip **74** is preferably a steel strip of much greater width than thickness, and is positioned with the side faces vertical. The steel strip will follow contours more faithfully than a rope line which will change slope suddenly at each support. The strip is clamped to the rods **75** by adjustable clamps to permit rapid lay out of the strip or datum line indicator.

Alternatively, there may be provided a pair of detector bars each extending laterally from and operating a double acting limit-switch on either side of the body. Each bar is pivotal about its longitudinal axis through a small arc, and terminates at its outer end in a fork adapted to engage closely but slidably guide strips **74** on either side of the machine. The bars and switches are so arranged that when the sides of the body are at a predetermined relationship to the guides the switches are open. Each micro-switch is connected in the electrical circuit of the solenoid valves **78** and **80**. Should, for example, the body drop vertically, both detector bars will actuate their respective switches which in turn will cause the motors **41** to rotate the screws **42** to lift the body to its original position whereupon both detector bars will open their respective switches.

Should, for example, the left side of the body fall below the right side, the detector arm on that side will cause the motor **41** to be operated to drive the screw **42** to lift the left hand side of the machine back to its predetermined position. The body may be arranged in a predetermined tilted disposition by altering the position of the detector arms.

It may be preferred in some operating conditions that the machine should be automatically steered, in which case there is provided an automatic steering means including a sensor adapted to sense a steering guide and further adapted, upon deviation of the body from the course of the steering guide, to actuate steering means operatively connected to the steerable wheels to cause the body to be steered to such position that the body returns to the course of the steering guide.

In such cases, it is preferred that each supporting wheel assembly includes only one ground wheel, castored to a frame supporting the body in adjustable manner. Both wheels are interconnected to provide steerable wheels which may be in addition to, or in place of, the aforementioned front steerable wheels. The sensor is preferably in the form of a bar having a fork end slidably engaged on the guide line **74**. The other end of the bar operates a double-acting limit switch arranged to actuate a double-acting solenoid-operated hydraulic valve which is adapted to cause a hydraulic motor to be

brought into action to steer the rear steerable wheels. The bar, when in its normal or neutral position is adapted to maintain the limit switch open and upon deviation to either side to operate the limit switch so as to cause the steering to be corrected.

It will be appreciated that other forms of drive for the machine and ancilliary components may be employed, and other front and rear wheel assemblies may be used. It will be apparent that other modifications in details of design and construction may be made without departing from the scope and ambit of the invention, as defined by the appended claims.

What we claim is:

1. A concrete laying machine including a body, a pair of supporting wheel assemblies, a pair of height adjusting devices each supporting a side of the body in vertically adjustable manner above one of the supporting wheel assemblies, actuating means operatively connected to each height adjusting device and each adapted to actuate the respective device to raise or lower a side of the body relative to the wheel assembly supporting it, means for propelling the machine, a chamber in the body adapted to receive concrete and discharge it rearwardly through an outlet of the chamber to a mould adapted to shape the discharged concrete to a desired cross-sectional configuration as the machine is propelled, and sensing means on the body adapted to sense an external reference line, the sensing means being further adapted upon deviation of one or both sides of the body from a predetermined vertical relationship with the external reference line to cause the or each actuating means to be operated to raise or lower the or each side of the body to return the or each side to its predetermined relationship with the external reference line.

2. A concrete laying machine according to claim **1** wherein the sensing means is adapted to sense an external reference line extending along and parallel to the proposed course of travel of the machine and to one side of the machine, and wherein the sensing means is adapted upon sensed deviation of the side of the body adjacent the external reference line to cause the actuating means operatively connected to the height adjusting device supporting said adjacent side of the body to be operated to raise or lower the said adjacent side relative to the wheel assembly supporting that side and wherein compensating means are provided on the machine to cause the other actuating means to be operated to raise or lower the other side of the body in response to relative movement with respect to the said adjacent side of the body.

3. A concrete laying machine according to claim **2** wherein the compensating means includes an adjustable element which may be set to allow a predetermined tilted disposition of the body to be retained irrespective of any height adjustment movements of the sides of the body.

4. A concrete laying machine according to claim **1** wherein each height adjusting device includes a rotatable screw-threaded member receivable in a correspondingly threaded fixed member, drive means being provided for rotating the rotatable member in one direction or the other.

5. A concrete laying machine according to claim **4** wherein the drive means includes a hydraulic motor operable by a hydraulic system the circuit of which includes the actuating means which is constituted by valve means adapted to be operated by the sensing means to open, reverse and close the hydraulic circuit.

6. A concrete laying machine according to claim **5** wherein the valve means is adapted to be operated electrically by the sensing means.

7. A concrete laying machine according to claim **1** wherein the means for propelling the machine consist of a pair of steerable traction wheels mounted in front of the body and means for driving the traction wheels.

8. A concrete laying machine according to claim **1** wherein the supporting wheels are steerable and wherein means are provided to steer the supporting wheels.

9. A concrete laying machine according to claim **8** wherein automatic steering means are provided, such means including a steering sensor adapted to sense a steering guide and further adapted upon deviation of the body from the course of the steering guide to actuate steering means operatively connected to the steerable wheels to cause the body to be steered to such position that the body returns to said course.

10. A concrete laying machine according to claim **9** wherein the sensor is adapted to be slidably engaged with a guide strip and further adapted, when displaced to one side or the other of a neutral sensing position to actuate the steering means to steer the machine to such position that the sensor engaged with the guide strip will be restored to the neutral position.

11. A concrete laying machine according to claim **10** wherein the steering sensor is adapted, when moved to one side or the other of the neutral position, to operate an electrical switch device in the electrical circuit of an electrically operable hydraulic valve, which is connected in the hydraulic circuit of a hydraulic device operatively connected to the steerable traction wheels.

12. A concrete laying machine according to claim **1** and including feeding means within the chamber adapted to feed concrete therein to the outlet of the chamber and means to drive the feeding means.

13. A concrete laying machine according to claim **12** wherein the feeding means comprises a paddle assembly rotatably mounted within the chamber with its axis of rotation substantially horizontal and substantially at right angles to the direction of the concrete to be laid.

14. A concrete laying machine according to claim **13** wherein the paddle assembly is adjustably mounted so that the axis of rotation may be vertically adjusted.

15. A concrete laying machine according to claim **12** wherein the feeding means comprises an auger assembly rotatably mounted within the chamber and leading to the chamber outlet.

16. A concrete laying machine according to claim **12** wherein the feeding means is part of a concrete pump circuit leading from a concrete supply to the chamber outlet.

17. A concrete laying machine including a body, a pair of supporting tandem wheel assemblies independent from one another and spaced apart laterally of the machine, a pair of height adjusting devices supporting opposite sides, respectively, of the body in vertically adjustable manner above the supporting wheel assembly associated therewith, actuating means operatively connected to each height adjusting device and each adapted to actuate the respective device to raise or lower a side of the body relative to the wheel assembly supporting it, a steerable wheel assembly supporting the forward end of the machine, power means mounted

on the machine and operatively connected for propelling the same, a chamber in the body adapted to receive concrete and having a discharge opening in the bottom thereof directly facing the surface over which the machine travels and extending upwardly into a rear wall portion of the chamber, an open-bottom mold attached to the body providing said chamber and extending longitudinally rearwardly from the discharge opening of said chamber, said mold terminating at a trailing end adjacent the trailing end of respective ones of said tandem wheel assemblies shaping the discharged concrete to a desired cross-sectional configuration as the machine moves forwardly, a paddle assembly rotatably mounted in the chamber for rotation about an axis transverse to the direction of travel of the machine to agitate the concrete mixture therein and transfer said mixture through the outlet of the chamber into said mold, power means mounted on the machine and drivingly connected to the paddle assembly for rotatively driving the same and sensing means on the body adapted to sense an external reference line outside of said body, the sensing means being further adapted upon deviation of one side of the body from a predetermined vertical relationship with the external reference line to cause the actuating means to be operated to raise or lower the side of the body to return the side to its predetermined relationship with the external reference line.

18. A concrete laying machine according to claim **17** wherein the means for propelling the machine includes drive means for driving the wheels of said steerable wheel assembly.

19. A concrete laying machine according to claim **17** including automatic steering means for steering said steerable wheels, such means including a steering sensor adapted to sense a steering guide and further adapted upon deviation of the body from the course of the steering guide to actuate steering means operatively connected to the steerable wheels to cause the body to be steered to such position that the body returns to said course.

20. A concrete laying machine including a body, a pair of supporting wheel assemblies independent from one another and laterally spaced apart relative to the length of the machine, a pair of height adjusting devices supporting opposite sides, respectively, of the body in vertically adjustable manner above the supporting wheel assembly associated therewith, actuating means operaively connected to each height adjusting device and each adapted to actuate the respective device to raise or lower a side of the body relative to the wheel assembly supporting it, a chamber in the body adapted to receive concrete and having a discharge opening in the bottom thereof directly facing the surface over which the machine travels and extending upwardly into a rear wall portion of the chamber, an open-bottom mold attached to the body providing said chamber and extending longitudinally rearwardly from the discharge opening of said chamber, said mold shaping the discharged concrete to a desired cross-sectional configuration as the machine moves forwardly, a paddle assembly rotatably mounted in the chamber for rotation about an axis transverse to the direction of travel of the machine to agitate the concrete mixture therein and transfer said mixture through the discharge opening of the chamber into said mold, said paddle assembly comprising a shaft having a plurality of arms spaced apart from one another longitudinally along and circumferentially around said shaft, power means mounted on the machine and drivingly connected to the paddle assembly for driving the same, sensing means mounted on the body and extending laterally therefrom to engage a longitudinally extending reference line spaced from the machine, means operatively connected to said sensing means and responsive thereto to actuate one of the height adjusting means upon deviation of one side of the body from a predetermined relationship with the reference line, and compensating means mounted on said body actuating said other height adjusting means in response to adjustment in height by said one height adjusting means for maintaining a predetermined relationship of respective heights on opposite sides of the machine.

21. A concrete laying machine comprising:

a. a mobile main frame having a front ground wheel assembly adapted for steering the machine;

b. a hopper on said main frame for holding a supply of concrete mix and having an open bottom directly facing the surface over which the machine travels providing an outlet through which the concrete mix is discharged;

c. an open bottom downwardly facing mold secured to said main frame and extending rearwardly from the outlet of said hopper for receiving concrete mix discharged therefrom and shape the laid concrete to a desired cross-sectional shape as the machine moves forwardly;

d. feed means comprising a paddle assembly rotatably mounted in the hopper for rotation about an axis transverse to the direction of travel of the machine for feeding the concrete mix through the hopper outlet onto the surface over which the machine travels and into the mold;

e. power means mounted on the machine and drivingly connected to said paddle assembly;

f. a pair of rear ground-engaging wheel assemblies located respectively on opposite sides of the hopper, each of said rear ground-engaging wheel assemblies comprising two pairs of wheels disposed in tandem with each pair of tandem wheels independently pivotally connected to opposite ends of a major frame member;

g. height adjusting jack means supporting said main frame on said major frame;

h. means pivotally connecting said jack means to said major frame at a position between said pair of tandem wheels;

i. power means on the machine for propelling the same;

j. actuating means operatively connected to each height adjusting device, said actuating means being adapted to actuate the respective device to raise or to lower a side of said body relative to the wheel assembly supporting it;

k. sensing means on said body adapted to sense an external reference line and deviation of the body from a predetermined vertical relationship with respect to said external reference line causing the actuating means to be operated to return one side of said body to said predetermined relationship with respect to said external reference line;

l. compensating means on the machine to cause the other actuating means to be operated to raise or to lower the other side of the body in response to ad-

justment in height of said one side of the body to maintain the predetermined level of the machine transversely thereof; and

m. power means carried by the machine and operatively connected to said front wheel assembly to steer the machine in response to sensing the path of said external reference line.

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