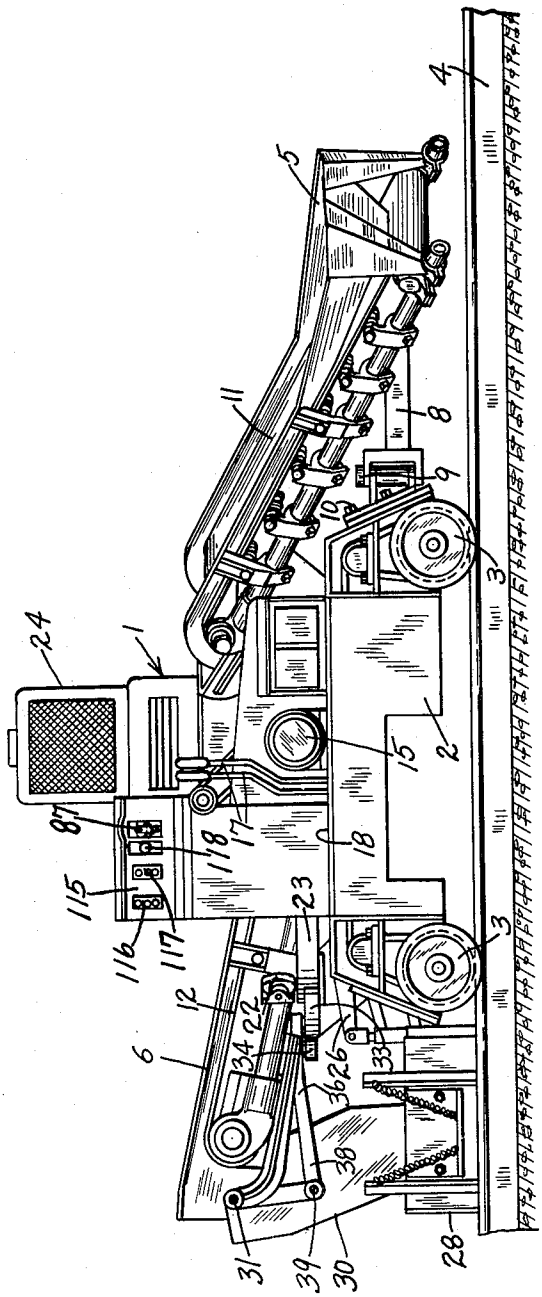
Nov. 15, 1960 J. R. SIBLEY ET AL 2,960,208

CONCRETE PAVING DISTRIBUTOR

Filed March 5, 1956 5 Sheets-Sheet 1

FIG. 1.



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FIG. 18.

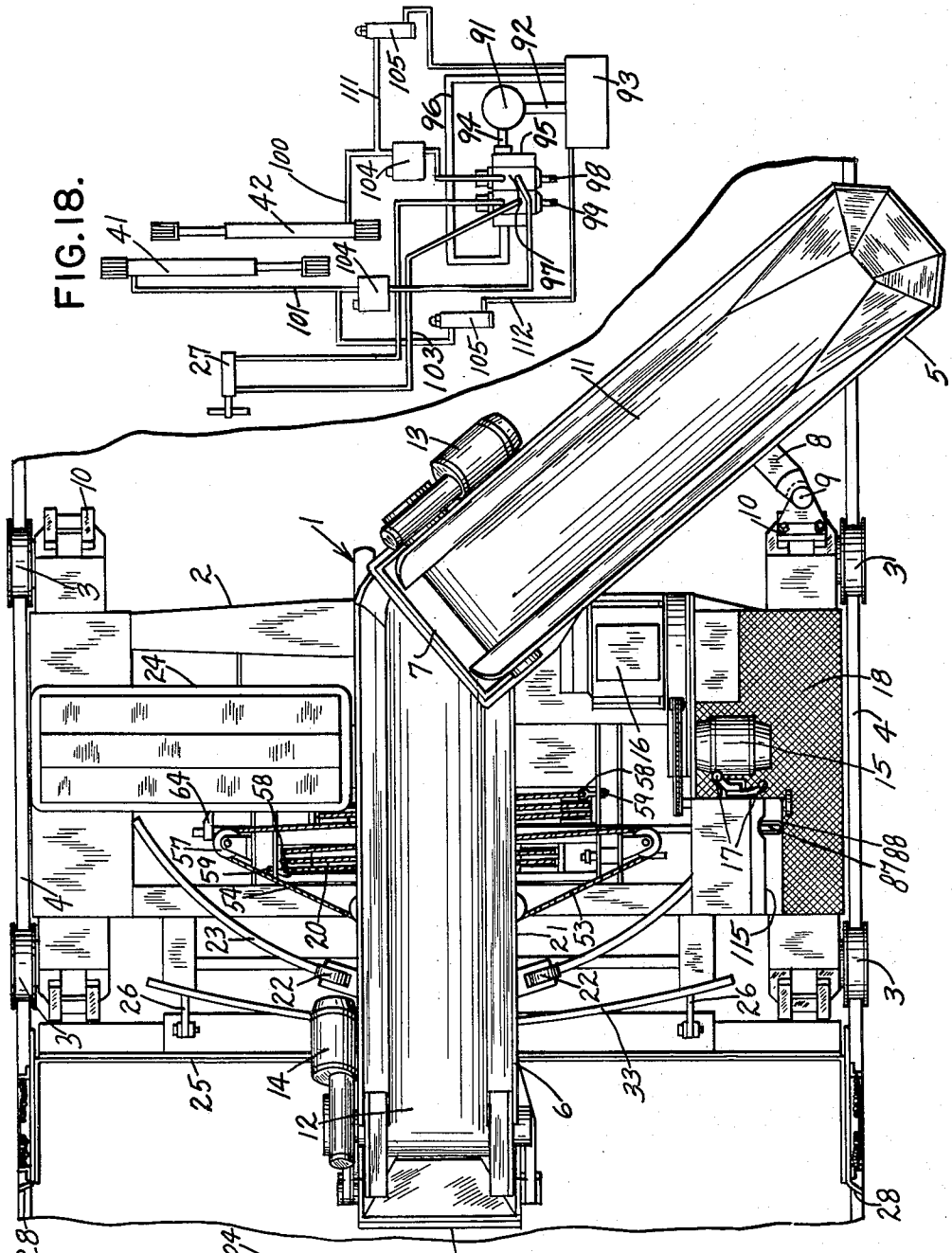


FIG. 2.

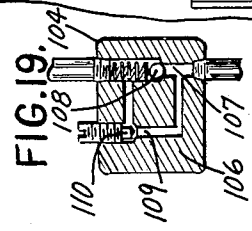


FIG. 19.

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CONCRETE PAVING DISTRIBUTOR

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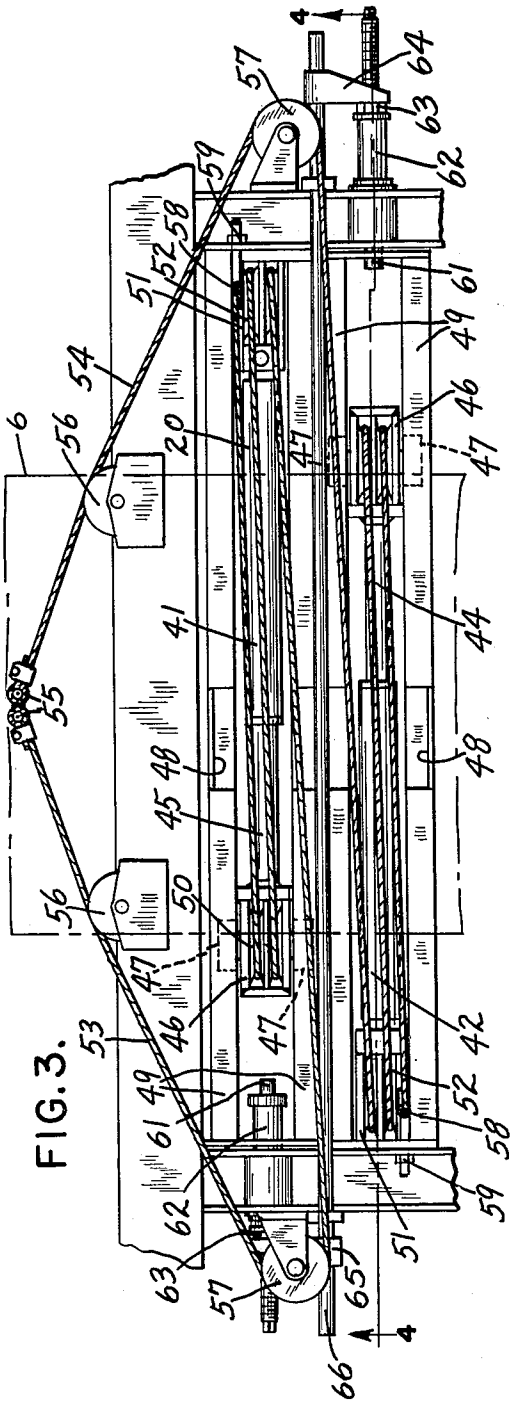


FIG. 3.

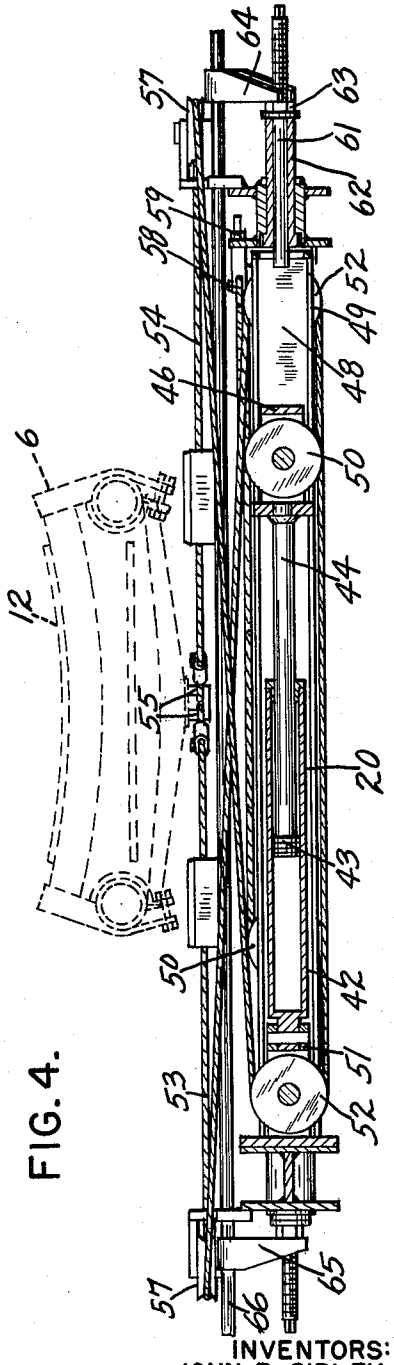


FIG. 4.

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CONCRETE PAVING DISTRIBUTOR

Filed March 5, 1956 5 Sheets-Sheet 4

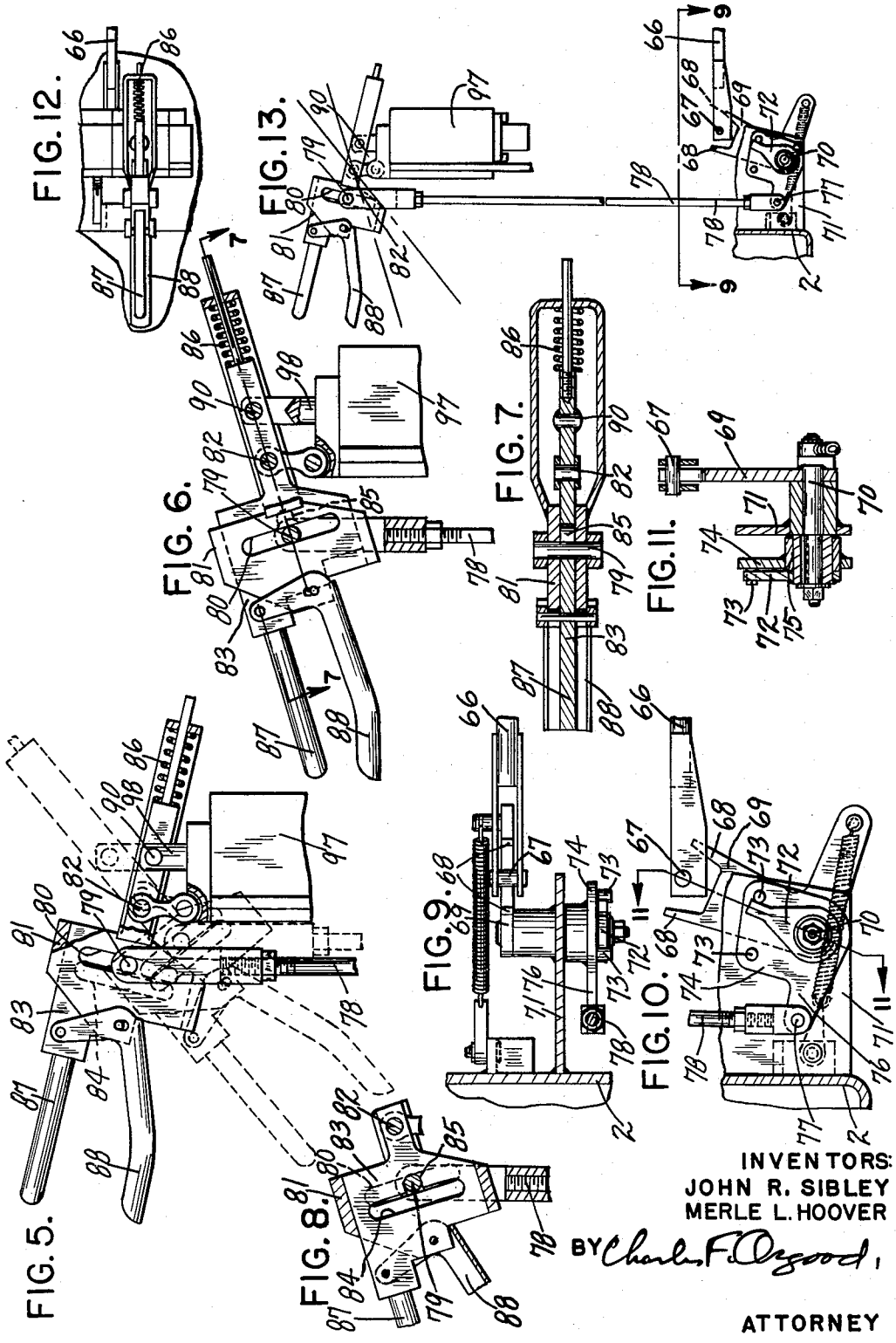


FIG. 12.
FIG. 13.
FIG. 6.
FIG. 7.
FIG. 11.
FIG. 5.
FIG. 9.
FIG. 10.
FIG. 8.

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FIG. 15.

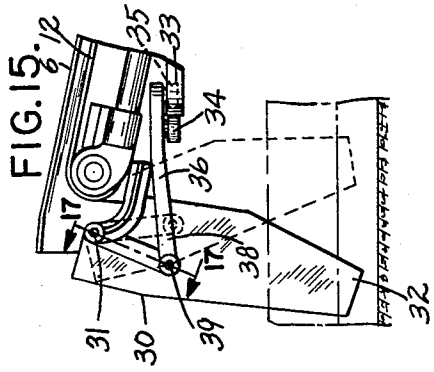


FIG. 16.

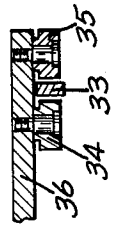


FIG. 17.

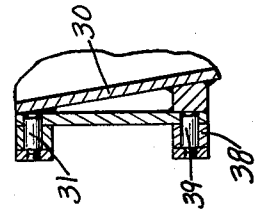
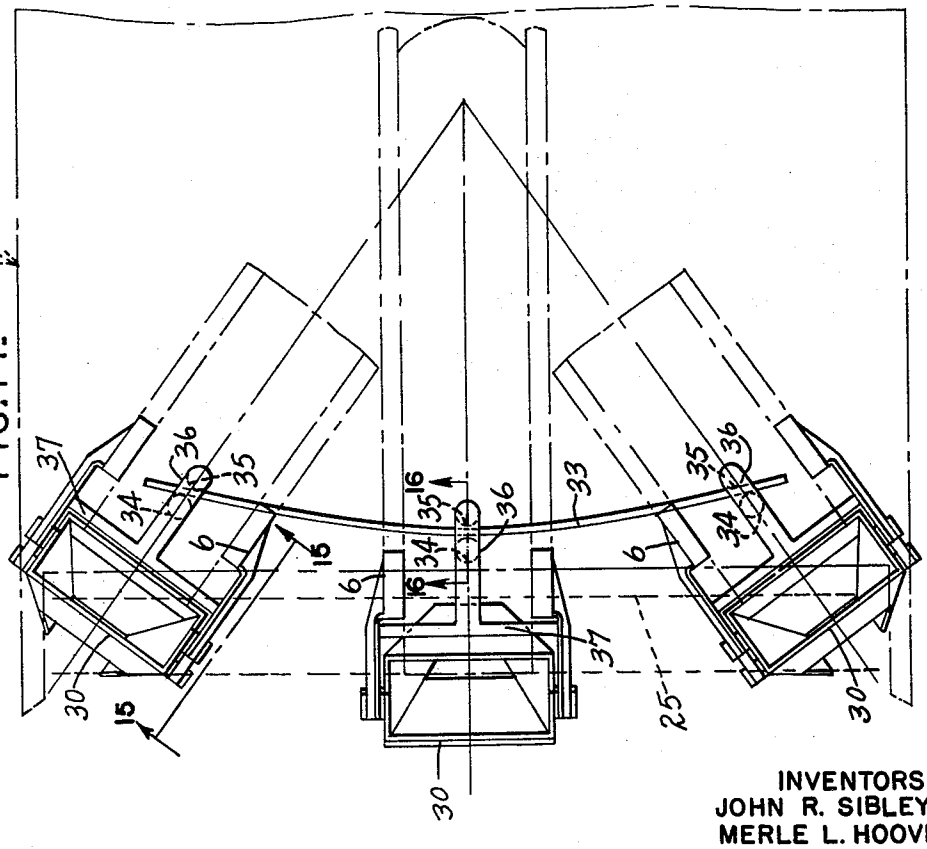


FIG. 14.



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CONCRETE PAVING DISTRIBUTOR

John R. Sibley and Merle L. Hoover, Franklin, Pa., assignors, by mesne assignments, to Chain Belt Company, Milwaukee, Wis., a corporation of Wisconsin

Filed Mar. 5, 1956, Ser. No. 569,463

13 Claims. (Cl. 198—73)

This invention relates to machines for paving roadways and particularly resides in a mechanism for distributing concrete mix over the width of the roadway in uniform thickness.

In known forms of concrete paving distributors the concrete mix is discharged into an elongated hopper which extends transversely in advance of the usual strike off plate and with such an arrangement the hopper not only frequently clogs but also the hopper, to some extent, obstructs the view of the operator so as to prevent proper observance of the leveling action of the strike off plate, and further the mix tends to pile up between the strike off plate and the elongated hopper in an objectionable manner. The machine of the present invention contemplates improvements over known types of paving distributors in that the concrete mix is uniformly distributed across the roadbed in advance of the strike off plate and that undue clogging and obstruction of view are substantially eliminated.

An object of this invention is to provide an improved road paving machine having novel features of construction whereby the paving operation is substantially expedited. Another object is to provide an improved concrete paving distributor whereby the concrete mix is uniformly distributed to the proper thickness across the roadbed. Yet another object is to provide an improved concrete paving distributor which is designed to receive concrete mix directly from a mobile mixer and to convey the mix to the distributing mechanism of the machine as the latter advances along the roadbed. A further object is to provide an improved swingable distributing conveyor having a pivoted discharge chute together with improved means for automatically swinging the chute about its pivot during swinging of the conveyor to cause the chute to travel along a straight path transversely of the machine. A still further object is to provide improved means for avoiding abrupt changes in the swinging motion of the distributing conveyor. Another object is to provide improved manual and automatic control means for the conveyor swinging means. These and other objects and advantages of the invention will however hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a side elevational view of a concrete paving machine in which an illustrative form of the invention is embodied.

Fig. 2 is a plan view of the paving machine shown in Fig. 1.

Fig. 3 is an enlarged detail view in plan showing the swinging mechanism for the distributing conveyor.

Fig. 4 is a transverse vertical section taken on line 4—4 of Fig. 3, showing details of one of the swing cylinders.

Fig. 5 is an enlarged side view of a portion of the

control mechanism for the conveyor swing cylinders showing the control lever in different positions.

Fig. 6 is a view similar to Fig. 5 with the control lever in a different position and with parts shown in vertical section.

Fig. 7 is a longitudinal section taken on line 7—7 of Fig. 6.

Fig. 8 is a fragmentary side view of the control lever showing the lock pin in cross section.

Fig. 9 is an enlarged horizontal section taken on line 9—9 of Fig. 13, showing the trip mechanism.

Fig. 10 is a side view of the trip mechanism shown in Fig. 9.

Fig. 11 is a detail section taken on line 11—11 of Fig. 10.

Fig. 12 is a detail view in plan of the control mechanism shown in Fig. 5.

Fig. 13 is a side view of the control mechanism shown in Fig. 12.

Fig. 14 is a schematic view in plan showing the swingable distributing conveyor in different operating positions.

Fig. 15 is a side view looking in the direction of the arrows of line 15—15 in Fig. 14 and showing the swingable discharge chute.

Fig. 16 is an enlarged detail vertical section taken on line 16—16 of Fig. 14.

Fig. 17 is an enlarged detail section taken on line 17—17 of Fig. 15.

Fig. 18 is a diagrammatic view showing the hydraulic fluid system.

Fig. 19 is a detail section illustrating one of the check valve and restricted orifice devices.

The improved road paving machine, as shown in the drawings, is generally designated 1 and includes a frame 2 mounted on propelling and guiding wheels 3 which travel alongside forms 4 disposed at the sides of the roadway to be paved. Mounted on the frame 2 is a conveyor 5 for receiving the concrete mix or aggregate discharged from a conventional mobile mixer which travels along one side of the paving machine, and the conveyor 5 discharges onto a distributing or discharge conveyor 6 which is swivelled at 7 to swing horizontally back and forth as later explained. The conveyor 5 has an adjustable mounting and may be positioned about the pivotal axis 7 of the conveyor 6 into angular positions at either side of the machine frame, and a transposable supporting arm 8 is attachable as at 9 to attaching means 10 at either side of the machine frame. These conveyors are desirably of the endless belt type with the discharge end of the receiving conveyor 5 overlying the receiving end of the distributing conveyor 6 and the conveyor belts 11 and 12 are respectively driven by motors 13 and 14, desirably of the electric type, through conventional speed reducers. A motor 15, likewise desirably an electric motor, drives through a conventional variable speed transmission 16 the propelling and guiding wheels 3 of the machine. Operating levers 17 arranged at an operator's station 18 on the machine frame are provided for controlling the forward and reverse drives of the transmission whereby the machine may be propelled in either direction.

Fluid cylinder and piston mechanisms 20 serve to swing the distributing conveyor 6 horizontally back and forth on its swivel mounting and the conveyor frame 21 carries wheels 22 which travel along an arcuate track 23 mounted on the framework. An internal combustion type engine 24 drives a conventional electric generator which supplies electric power to the several electric motors of the machine, and excess generator capacity may be employed to provide power for other purposes such as electric lighting. Extending transversely across

the front end of the machine frame 2 is a conventional strike off or spreading plate, or so-called screed 25, for leveling off the concrete mix to provide a relatively smooth top surface of the roadway and this strike off plate is adjustable vertically by pivoted arms 26 operated by a hydraulic lift cylinder and piston device 27 (Fig. 18). The screed 25 has vertically yieldable side portions 28 at its respective ends, the lower edges of which extend below the tops of the side forms 4 close to the inner sides of the latter. The side portions 28 are each constituted by a plate slidably mounted for vertical movement and provided with an out-turned forward edge notched to rest upon the top of the side form and serving to clear it of spilled concrete. Tension springs are connected to upstanding members on each side plate 28 in a manner to hold the plates down upon the tops of the side forms while permitting yielding movement thereof to accommodate irregularities in the forms.

The swingable distributing conveyor 6 discharges into a chute 30 which is suspended from the outer end of the conveyor frame and this chute is pivoted at 31 to rock back and forth so that as the conveyor is swung horizontally the bottom discharge end 32 of the chute follows a substantially straight path across the machine in advance of and in substantial parallelism with the screed plate 25.

The means for automatically swinging the discharge chute as the distributing conveyor 6 swings horizontally comprises an arcuate cam member 33 secured to the framework and having its opposed cam surfaces engaged by rollers 34 and 35 as shown in Fig. 14. The rollers 34 and 35 are carried by the inner arm 36 of a yoke-shaped frame 37, the side yoke arms 38 of which are pivotally connected at 39 to the sides of the discharge chute. Thus as the distributing conveyor 6 is swung horizontally the discharge chute, through the cam and rollers, swings back and forth about its pivot between the full and dotted line positions shown in Fig. 15.

Now referring to Figs. 3 and 4 showing the detail structure of the swinging mechanism 20 for the distributing conveyor 6, it will be noted that arranged transversely of the machine frame and underlying the swingable distributing conveyor are parallel stationary horizontal fluid cylinders 41 and 42 suitably secured to the framework and respectively containing reciprocable pistons 43 having oppositely extending piston rods 44 and 45. These piston rods at their remote ends carry brackets 46 which have rollers 47 journaled thereon and these rollers travel in longitudinal guideways 48 provided by parallel guide members 49 on the framework. Carried by the piston rod brackets 46 are double sheaves 50. Journaled on brackets 51 on the framework at the remote ends of the fluid cylinders 41 and 42 are double sheaves 52. A pair of cables 53 and 54 are each attached at one end at 55 to the under side of the conveyor frame 21 and extend in opposite directions around guide sheaves 56 and 57, and are reeved about the sets of double sheaves 50 and 52, and the opposite ends of the cables are attached at 58 to adjustable connections 59 on the framework. Thus as pressure fluid is alternately supplied to the fluid cylinders 41 and 42, each of the cables 53 and 54 in turn is placed under tension while the other is slackened to effect swinging of the conveyor frame back and forth on its swiveled mounting. Evidently, the swinging means may assume various other conventional forms.

The valve shifting means for regulating fluid flow relative to the swing cylinders 41 and 42 may also assume various forms but herein, for illustrative purposes, comprises plungers 61 guided in tubular guides 62 on the framework and alternately engageable by the brackets 46 on the ends of the piston rods 44 and 45 respectively. The plungers 61 carry independently adjustable abutments 63 which engage with dogs 64 and 65 secured to the opposite end portions of a shiftable operating rod 66 suitably guided on the framework in parallelism with the swing cylinders and pistons. The operating rod 66 at its left-hand end, as viewed in Figs. 10 and 13, carries a pin 67 alternately engageable with spaced fingers 68 on a tripper lever 69. This tripper lever is secured to a horizontal shaft 70 journaled within a bracket 71 mounted on the framework. Also secured to the shaft 70 is a lever 72 engageable with spaced abutment pins 73 to constitute a lost motion mechanism. The abutment pins 73 with which the lever 72 is alternately engageable are secured to a swingable arm 74 pivotally mounted at 75 on the hub of the lever 72 (Fig. 11) and this arm has a lateral lever portion 76 pivotally connected at 77 to a vertical operating rod 78. As shown in Fig. 13, this rod 78 carries at its upper end a pin 79 which is movable vertically in a slot 80 of a compound lever 81. The lever 81 is pivotally mounted at 82 on the framework and the slot 80 is in a slidable portion having a longitudinal opening within which the lever is in the form of a vertical plate 83 having a slot 84 which is similar to and in Fig. 6 is shown in registry with the slot 80. The slot 84 has a lateral notch 85 for receiving the pin 79, when it is desired that the operating rod 78 effects swinging of the lever 81. A spring 86 urges the slidable part of the lever 81 relative to the plate 83 in direction to hold the pin 79 in the notch 85, and a handle 87 on the lever 81 is provided for manually swinging the lever. A cooperating lever 88 is pivotally mounted on the lever 81 and is pivotally connected to the slidable part so that it may be shifted forwardly against the action of the spring to release the notch 85 from the pin 79 so that the latter may move with the operating rod 78 freely back and forth relative to the lever 81 within the slot 80 without motion of the lever 81. The operator may grasp the handle 87 to swing the lever 81 when manual shifting is desired. The lever 81 is pivotally connected at 90 to the valve stem of a control valve device as later described.

As shown diagrammatically in Fig. 18, a conventional fluid pump 91 suitably driven by the engine 24 has its suction side connected by a conduit 92 to a tank 93 for containing fluid, desirably a liquid, and the discharge side of the pump is connected by a conduit 94 to the control valve device which is designated 95. A return conduit 96 connects the discharge passage of the valve device back to the tank. The valve device has a casing 97 secured to the framework and provided with bores for receiving shiftable control valves 98 and 99, desirably of the balanced spool type each having an operating stem. The bore containing the valve 98 is connected by conduits 100 and 101 to the remote ends of the fluid cylinders 41 and 42 while the bore containing the valve 99 is connected by conduits 102 and 103 to the opposite ends of the screed lift cylinder 27. The stem for the valve 99 has a usual operating handle while the stem for the valve 98 is pivotally connected at 90 to the operating lever 81.

Associated with the fluid conduits 100 and 101 are combined check valve and restrictor devices 104 and conventional relief valves 105, which cooperate with the inherently flexible cables 53 and 54 to provide a relatively smooth cushioned reversal in movement of the swingable conveyor, thereby to reduce the throwing of the cement mix laterally with substantial force toward the side forms 4. Each of the devices 104, as shown in Fig. 19, comprises a casing 106 having a passage 107 extending between branches of either of the conduits 100 or 101 and containing a check valve 108. A bypass passage 109 communicates with the passage 107 at opposite sides of the check valve and contains an adjustable valve 110 which provides a restricted orifice. The relief valves 105 are connected in conduits 111 and 112 which lead from the conduits 100 and 101 back to the tank 93. The pressure fluid flows from the valve 98 past the check valve 108 alternately to the fluid cylinders 41 and 42 depending upon the direction of swing of the conveyor and when the pistons are retracted fluid is

forced from the cylinders through the restricted orifices provided by the valves **110**, with the check valves **108** held closed. Thus a cushioned reversing movement of the conveyor is effected by relief valve action, by taking advantage of the elasticity of the cables, and by locating the cable connections at an advantageous point on the conveyor while cable tension under varying conditions is maintained by adjustably restricting fluid flow. Also the manual control **87**, **88** associated with the automatic control for the reversing valve makes for ready regulation of the swinging movements of the conveyor, substantially increasing the overall operating efficiency of the machine.

When the lever **81** is in automatic control position with the pin **79** in the notch **85** the control valve **98** is automatically shifted at the end of the piston strokes of the swing cylinders so that the distributing conveyor **6** is repeatedly swung back and forth on its swivel mounting during the distributing operation. When it is desired manually to shift the valve **98** the lever **88** may be grasped by the operator to move the slidable part of the lever **81** and the slot **80** relative to the notch **85** to free the pin **79** therefrom, and at that time the pin **79** may reciprocate freely in the slot **80** while the lever **81** remains relatively stationary. The lever **81** may then be swung manually to shift the control valve **98** to regulate the flow of fluid to the swing cylinders, as desired.

A control panel **115** is arranged on the framework at the operator's station **18** (Fig. 1) and control devices **116**, **117** and **118** are provided where the operator may control the several motors and the speed of the engine, as desired. As previously mentioned, the drive of the propelling wheels and the transmission speed and the direction of wheel drive may also be controlled from the operator's station.

As a result of this invention an improved road paving machine is provided having improved distributing means for the concrete mix whereby the mix is distributed in uniform depth across the roadbed. By the provision of the automatic swinging means rapidly swinging the distributing conveyor back and forth together with the swingable discharge chute, mix is delivered to the roadbed without undue splashing and in uniform amounts across the machine in advance of the leveling screed. By the provision of the hydraulic swing cylinders, the cable connections, the associated arrangement of the relief valves and restrictors, and the advantageous manner of connection of the cables with the conveyor, relatively smooth swinging of the distributing conveyor is obtained thereby substantially eliminating abrupt changes in direction of the conveyor at the ends of the swinging strokes and as a result avoiding undesirable throwing of the cement mix laterally in the direction of conveyor swing and minimizing side reaction forces against the side forms due to reversal in the swinging motion of the conveyor. The manual control feature, in cooperation with the automatic reversing valve control, improves the distributing function by enabling improved regulation of the conveyor movements. The wide range of variable speeds for the machine propelling wheels provides for further improved machine-operation by insuring uniform deposition of material at any desired depth, width or rate of feed. The improved distributing conveyor and its pivoted discharge chute, together with the automatic swinging means for the discharge chute coordinated with the swinging motion of the conveyor, provide for the even distribution of the concrete mix across the roadway instead of the usual dumping of batches which require considerable spreading. The arrangement of the distributing means not only leaves the view of the screed relatively unobstructed but also eliminates undue clogging which frequently occurs in machines of the hopper spreader type. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in the foregoing specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended **claims.**

What we claim as new and desire to secure by Letters Patent is:

1. In a road paving machine, a mobile base movable over a roadbed to be paved, a conveyor pivotally mounted on said base to swing rapidly back and forth about an upright axis, a pivoted discharge chute suspended from the outer discharge end of said conveyor to swing back and forth about a horizontal axis, and means for coordinating the swinging movement of said chute with said conveyor swing whereby the bottom discharge end of said chute traverses a substantially straight path.

2. In a road paving machine, a mobile base movable over a roadbed to be paved, a distributing conveyor swingable horizontally back and forth from one side of the roadbed to the other, means for automatically swinging said conveyor, a discharge chute pivotally suspended from the end of said conveyor in a manner to be swingable in the vertical plane of said conveyor, cam means on said base, and chute swinging means engaging said cam means whereby the discharge end of said chute is caused to swing in a manner to traverse a straight path across the roadbed as said conveyor is swung back and forth.

3. A road paving machine having a mobile base movable along forms at the sides of a roadbed to be paved with concrete mix, said base extending transversely of the roadbed between the side forms, conveying means movably mounted on said base for receiving, conveying and discharging the concrete mix, means for uniformly discharging the mix received from said conveying means along the roadbed close to the latter and in advance of said base including a depending discharge means pivotally attached to the outer discharge end of said movably mounted conveying means, means for swinging the outer discharge end of said movably mounted conveying means back and forth transversely of the roadbed, and means engaging said pivotally attached depending discharge means as it moves rapidly back and forth to swing it along a straight path in parallelism with said base and transversely of the roadbed as said base advances along the forms.

4. A road paving machine as set forth in claim 3 wherein said depending discharge means is pivotally suspended at the outer discharge end of said conveying means, and said swinging means provided for swinging said suspended discharge means about its pivot includes a cam member shaped to cause said discharge means to traverse said straight path.

5. A road paving machine as set forth in claim 4 wherein said conveying means has a horizontally swingable discharge portion from which said discharge means is pivotally suspended and said swinging means for said discharge means is coordinated with the swinging motion of said swingable discharge portion of said conveying means.

6. A road paving machine as set forth in claim 5 wherein said swingable discharge means is in the form of a substantially upright discharge chute having its bottom discharge opening close to the roadbed.

7. A road paving machine comprising a mobile base, a horizontally swingable distributing conveyor pivotally mounted on said base to swing relative thereto, fluid operated cylinder and piston devices operatively connected to swing said conveyor back and forth about its pivot, automatic valve means responsive to the swinging motion of said conveyor for reversing the direction of swing, reversing control means actuated at the end of each swinging stroke, and manual control means operatively associated with said reversing control means and said auto-

matic valve means and operative selectively to connect said reversing control means for automatic control of said automatic valve means or to actuate said valve means at will thereby to provide for manual regulation of conveyor swing.

8. A road paving machine as set forth in claim 7 wherein said automatic valve control includes a rocking control member and said manual control includes manual means operable at will for interrupting rocking movement of said control member by its automatic means.

9. In a machine for distributing plastic concrete in paving roadways and the like, a machine frame arranged for movement along a roadway strip being paved, said frame being in position to extend transversely of the strip being paved and arranged to move over the surface of a layer of plastic concrete deposited ahead of it, a conveyor for concrete pivotally mounted at its receiving end on said frame with its discharging end projecting ahead of said frame and arranged for swinging movement from side to side of the strip being paved, a placing chute pivotally suspended from said discharging end of said swinging conveyor in position to guide the plastic concrete descending from said conveyor onto the roadway strip, power actuated means arranged to swing said conveyor back and forth across the roadway, and guiding means on said frame operative to guide the transverse movement of said pivotally suspended placing chute in a manner to cause its lower end to follow a substantially straight line path across the roadway strip in advance of said frame, whereby plastic concrete from said conveyor may be deposited evenly in successive ribbons ahead of said frame to form a layer of pavement as said machine progresses along the roadway strip.

10. The combination as set forth in claim 9 wherein said straight line distribution guiding means includes a cam carried by said frame and a cooperating follower operatively connected to said pivotally suspended placing chute.

11. In a machine for distributing plastic concrete in paving roadways and the like, a machine frame arranged for movement along a roadway strip being paved, said frame being in position to extend transversely of the strip being paved and arranged to pass over a layer of plastic concrete deposited ahead of it, a conveyor for concrete pivotally mounted at its receiving end on said frame with its discharging end projecting ahead of said frame and arranged for swinging movement from side to side of the strip being paved, a placing chute pivotally suspended from said discharging end of said swinging conveyor and arranged for pivoting movement to guide the plastic concrete descending from said conveyor onto the roadway strip, means arranged to swing said conveyor back and forth across the roadway to distribute the concrete, and guiding means on said frame operative to pivot said pivotally suspended placing chute in conjunction with its transverse swinging movement in a manner to cause its lower end to follow a substantially straight line path across the roadway strip in advance of and parallel with said frame, whereby plastic concrete from said conveyor may be deposited evenly in successive ribbons ahead of said frame to form a layer of pavement as said machine progresses along the roadway strip.

12. In a machine for distributing plastic concrete in paving roadways and the like, a machine frame arranged for movement along a roadway strip being paved, a conveyor for plastic concrete pivotally mounted at its receiving end on a vertical axis on said frame with its discharging end projecting over and arranged for swinging movement from side to side of the roadway strip being paved, a placing chute pivotally suspended from said projecting discharging end of said swinging conveyor in position to receive and guide plastic concrete descending from said conveyor onto the roadway strip, power actuated means arranged to swing said conveyor to traverse said placing chute back and forth across the roadway strip, and guiding means on said frame operative to guide the traversing movement of said pivotally suspended placing chute in a manner to cause its lower end to follow a substantially straight line path across the roadway strip, whereby plastic concrete from said conveyor may be deposited in successive transverse ribbons of pavement as said machine progresses along the roadway strip being paved.

13. A road paving machine comprising a mobile base movable along a roadbed being paved, a distributing conveyor pivotally mounted on said base for horizontal swinging movement about a vertical axis with its outer discharge end traversing back and forth from side to side of the roadbed, a discharge chute pivotally suspended from said swinging outer discharge end of said conveyor for swinging movement in a vertical plane extending radially from said vertical pivot axis, and means coordinating the swinging movement of said discharge chute with the swinging movement of said conveyor in a manner to cause the lower discharge end of said chute to traverse a substantially straight path across the roadbed.

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