Dec. 1, 1942. K. E. McCONNAUGHAY 2,303,486

MACHINE FOR MIXING AND LAYING PAVING MATERIAL

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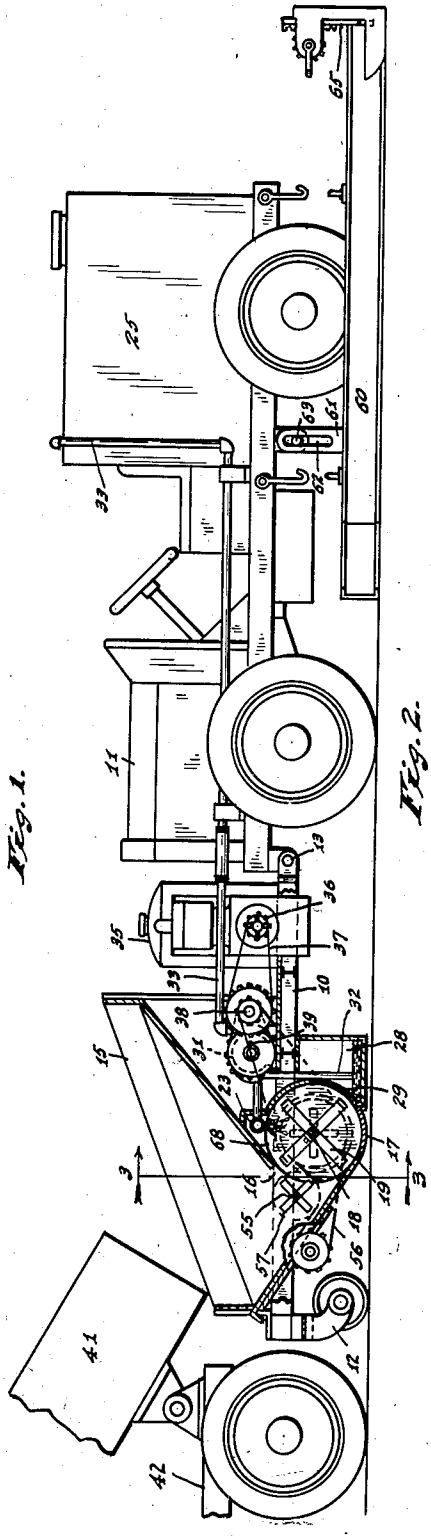

Fig. 1.

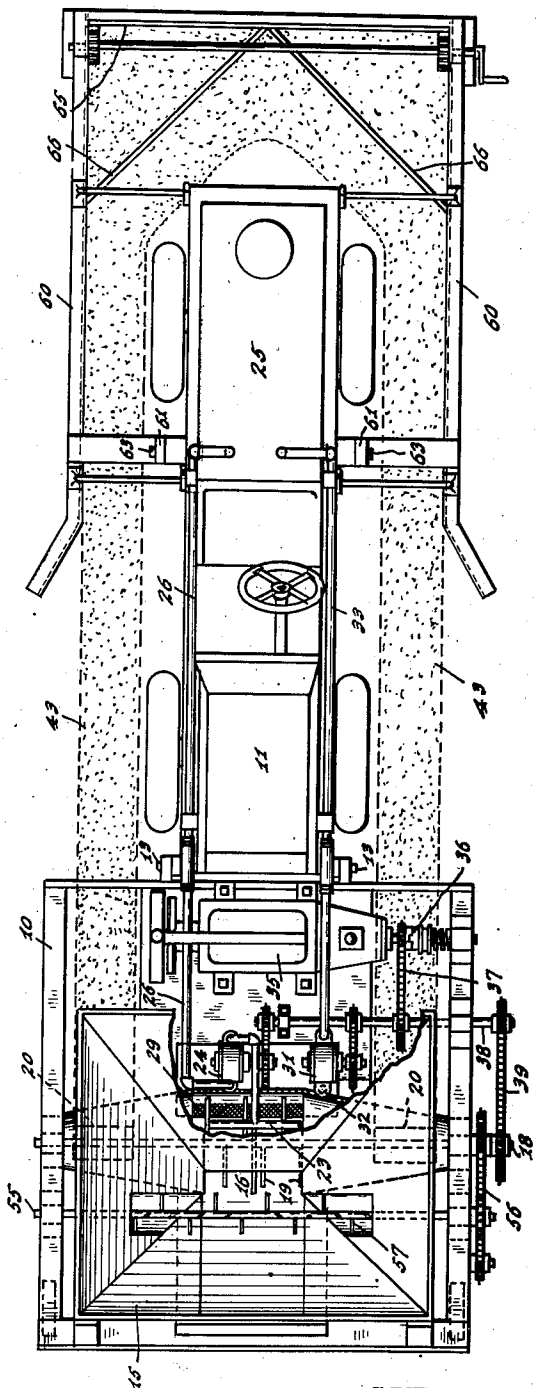

Fig. 2.

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Fig. 4.

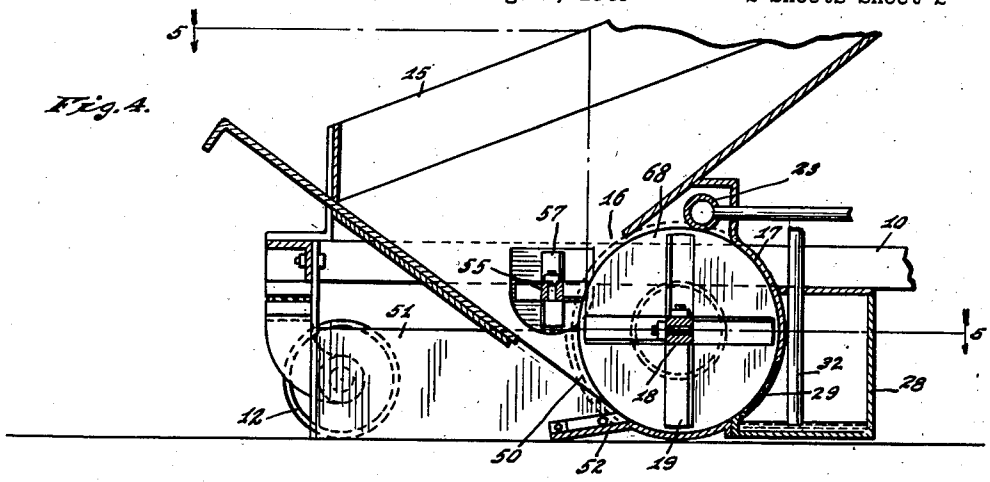


Fig. 5.

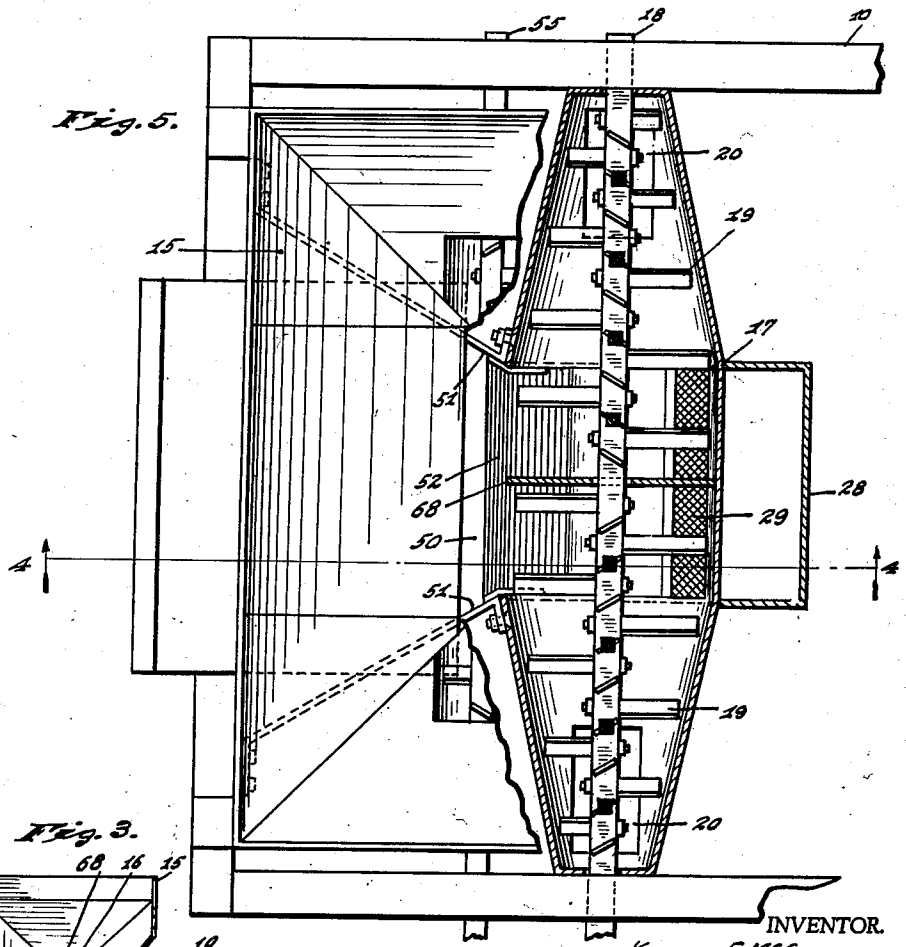
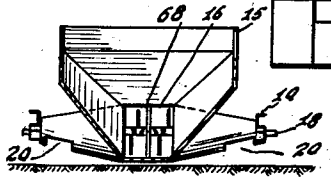


Fig. 3.



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Patented Dec. 1, 1942 2,303,486

UNITED STATES PATENT OFFICE

2,303,486

MACHINE FOR MIXING AND LAYING PAVING MATERIAL

Kenneth E. McConnaughay, West Lafayette, Ind.

Application August 2, 1940, Serial No. 349,737

10 Claims. (Cl. 94—44)

My invention relates to machines for mixing and laying bituminous paving material. It is the principal object of my invention to produce an automotive machine which will mix aggregate with a bituminous binder to form a paving composition, which will discharge such composition in the form of two parallel windrows on the road surface as the machine moves therealong, and which will subsequently collect those windrows and distribute the paving composition in a sheet of the desired width and thickness.

In carrying out my invention, I employ a vehicular structure provided near its front end with an aggregate hopper which discharges near the center of a pug-mill mixer extending across the machine adjacent the hopper. The bottom walls of this mixer slope laterally of the vehicle upwardly and outwardly from the center, and the blades of the rotating element of the pug-mill are disposed to move the material therein outwardly in both directions along the inclined bottom walls to discharge openings in the outer ends thereof. Near the center of the mixer I dispose a spray-bar discharging a bituminous binder upon the aggregate in the mixer, such binder being mixed with the aggregate in the central portion of the mixer and as the material moves upwardly and outwardly along the inclined bottom wall thereof. Near the rear of the vehicle I provide means for collecting the two windrows formed by the paving material discharged from opposite ends of the mixer as the vehicle progresses along the road and also a distributing blade which distributes such paving material in the form of a sheet.

The accompanying drawings illustrate my invention: Fig. 1 is a side elevation of the machine in partial section; Fig. 2 is a plan view of the machine with a portion of the aggregate hopper broken away; Fig. 3 is a front elevation of the machine with the front wall of the hopper broken away; Fig. 4 is a fragmental vertical section on the line 4—4 of Fig. 5 illustrating how the machine can be adapted to employ aggregate distributed in a windrow on the surface to be paved; and Fig. 5 is a plan view of the structure illustrated in Fig. 4 with parts broken away and showing in section on the line 5—5 of Fig. 4.

In the drawings, I have illustrated the mixer as mounted on a carriage 10 disposed in front of a truck or other automotive vehicle 11. The front end of the carriage is supported on caster wheels 12, while its rear end is pivoted to the truck on a horizontal transverse axis 13, so that the carriage will be pushed along the road traversed by the truck 11.

Upon the carriage 10 there is disposed an aggregate hopper 15 having walls which slope toward an opening 16 communicating with the casing 17 of a pug-mill mixer extending transversely of the carriage. The casing 17 has a cylindrical central section and frusto-conical end sections; and extending axially through the three sections of the casing is a shaft 18 carrying a plurality of mixing and aggregate-moving blades 19. Over the central portion of the shaft 18, the blades 19 are of uniform length; but within the frusto-conical end portions of the casing 17, the length of the blades gradually decreases in conformity with the shape of those end portions. At the bottom of the casing 17, near each outer end thereof, there is provided a discharge opening 20.

Within the central portion of the casing 17 I dispose a spray bar 23 connected to the discharge opening of a pump 24 which receives binder from a tank 25 conveniently mounted on the vehicle 11 and connected to the pump 24 by a conduit 26. In the rear wall of the casing 17, near the middle thereof, I provide an opening for the escape of excess bitumen into a tank 28 supported from the carriage 10, such opening extending to a point near the lowest point of the casing and being closed by a foraminous screen 29 which prevents the entrance of aggregate into the tank 28. A second pump 31 mounted on the carriage 10 has an inlet conduit 32 extending to a point near the bottom of the tank 28 and an outlet conduit 33 discharging into the tank 25 on the truck 11.

Desirably the mixer and the two pumps are driven from an engine 35 mounted on the carriage 10. As shown, the engine 35 is connected through a clutch 36 and chain-drive 37 with a countershaft 38 extending transversely of the carriage 10. The countershaft 38 is connected to the pumps 24 and 31 by any convenient driving connection, and is also connected to the mixer shaft 18 as by means of a chain drive 39.

Desirably, the front wall of the hopper 15 is relatively low so that the tilting body 41 of a dump truck 42 may discharge aggregate into it while the machine is at rest. With the hopper 15 full of aggregate, the engine 35 is started, the clutch 36 is engaged, and the truck 11 driven along the road pushing the carriage 10 ahead of it. Aggregate from the hopper enters the pug-mill mixer 17 through the opening 16 and receives bituminous binder discharged from the spray bar 23. As the shaft 18 rotates, the aggregate and binder are mixed to form the paving composition which, because of the inclination of the blades 19, is moved outwardly and upwardly along the in-

clined bottom wall of the frusto-conical end portions of the casing 17, being discharged through the openings 20 to form windrows 43 on opposite sides of the truck 11. The inlet of the pipe 32 is low enough to keep the liquid level in the mixer 17 well below the openings 20; and as a result, any excess binder on the aggregate is removed therefrom and flows downwardly along the inclined bottom walls of the frusto-conical portions of the mixer casing 17 into the tank 28, from which it is discharged through the pipe 32 and returned to the storage tank 25 on the truck 11.

An important feature of my invention resides in so mounting the blades 19 on the shaft 18 that their pitch may be changed. As will be clear from Figs. 3 and 4, each of the blades is provided with an integral shank which extends through a diametrical hole in the shaft 18 and which is screw-threaded at its end for the reception of a nut 45. By changing the pitch of the blades 19 at one end of the shaft 18 with relation to the pitch of the blades at the other end of the shaft, the distribution of the material between the openings 20 may be controlled. This is of particular advantage where the sheet of paving material to be laid is thicker at one edge than at the other or where the machine is operating along one side of a crowned road so that the axis of the mixer would be inclined to the horizontal and gravity would favor the movement of paving composition in one direction.

To adapt the machine for mixing aggregate distributed on the road surface in the form of a windrow, I provide the front wall of the hopper 15 near its bottom and adjacent the central portion of the mixer casing 17 with an opening 50 for the admission of aggregate on the road surface. At opposite sides of this opening 50 I dispose a pair of forwardly and outwardly diverging wings 51 adapted to gather aggregate on the road surface and move it inwardly for entrance into the mixer casing 17 through the opening 50. An apron 52 extending forwardly and downwardly from the lower edge of the opening 50 into contact with the road surface may be employed to elevate the aggregate into the casing 17 as the machine moves along the road.

To aid in feeding aggregate within the hopper 15 through the openings 16 into the mixer, I may mount within the hopper in front of such opening a transversely extending shaft 55 connected to the mixer shaft 18 as through a chain drive 56 and provided with helically inclined blades 57 which, as the shaft 55 rotates, tends to move aggregate inwardly of the hopper toward the opening 16.

The paving composition discharged in the form of windrows 43 may be left on the road surface for subsequent distribution; but I prefer to collect those windrows and distribute them in a sheet through the use of distributing mechanism carried by the vehicle 11. My invention is not concerned with any specific form of distributing mechanism, that shown in the drawings being merely by way of example. It comprises a frame including a pair of shoes 60 which desirably have a considerable extent longitudinally of the vehicle 11 and which extend rearwardly beyond the rear wheels of that vehicle. The frame including the shoes 60 is drawn over the road by the truck 11, as by being provided with uprights 61 having vertically extending slots 62 which receive alined pins 63 on the truck, the slotted connection thus effected permitting relative vertical movement of the truck-body and the shoes.

At the rear end of the shoes I mount a transversely arranged distributing blade 65 adapted to be raised or lowered to control the thickness of the sheet in which the paving material is distributed. To prevent too great an accumulation of paving material at the ends of the blade 65, I may provide a pair of rearwardly converging auxiliary blades 66 the lower edges of which are spaced above the road surface to engage the upper portions of the windrows 43 and move the paving material therein toward the center of the distributing blade.

The rate at which the finished paving composition is discharged from each end of the mixer is, as above indicated, controlled by adjusting the pitch of the blades in each half of the mixer casing. To facilitate control of the distribution of finished paving between the two discharge openings 20, the mixer may be provided with a central transverse partition 68 dividing the casing 17 into two halves.

I claim as my invention:

1. In a machine for mixing and laying bituminous paving material, a self-propelled, wheel-supported structure, a pug-mill mixer extending transversely of said structure near the front end thereof, said mixer having a casing provided near its center with an opening for the admission of aggregate and with a bottom wall which slopes upwardly and outwardly in both directions from its center, said casing having discharge openings in its outer ends, said mixer including a rotatable shaft provided with blades pitched to move material outwardly and upwardly along said bottom wall to said discharge openings, means discharging a liquid bituminous binder into said casing near the center thereof, and means for removing excess binder from said casing to maintain the liquid level therein below said discharge openings.

2. The invention set forth in claim 1 with the addition that the pitch of said blades is adjustable.

3. The invention set forth in claim 1 with the addition of an aggregate hopper disposed on said structure in advance of said mixer and arranged to discharge into said casing through the opening at the center thereof.

4. The invention set forth in claim 1 with the addition that the aggregate-receiving opening in said casing is located in the forward wall thereof, and gathering blades disposed on opposite sides of said opening and diverging forwardly therefrom to gather and direct into said opening aggregate on the surface of the road as the machine is moved therealong.

5. In a machine for mixing and laying bituminous paving material, a self-propelled, wheel-supported structure, a mixer extending transversely of said structure near the front end thereof, said mixer having a casing provided near its center with an opening for the admission of aggregate and with a bottom wall which slopes upwardly and outwardly in both directions from its center, said casing having discharge openings in its outer ends, means within said casing for mixing material therein and moving such material outwardly in both directions from the center of the casing to said discharge openings, means discharging a liquid bituminous binder into said casing near the center thereof, and means for removing excess binder from said casing to maintain the liquid level therein below said discharge openings.

6. The invention set forth in claim 5 with the addition that said mixing and moving means is adjustable to vary the distribution between said discharge openings of material discharged therethrough.

7. The invention set forth in claim 5 with the addition of means near the rear of said structure for collecting and distributing the material discharged from said discharge openings.

8. The invention set forth in claim 1 with the addition of an aggregate hopper disposed on said structure in advance of said mixer and arranged to discharge into said casing through the opening at the center thereof, and a rotating shaft extending across said hopper adjacent the aggregate-receiving opening of said casing, said shaft being provided with helically pitched blades arranged to move aggregate from the sides of the hopper toward said aggregate-receiving opening.

9. In a machine for mixing and laying bituminous paving material, a self-propelled, wheel-supported structure, a pug-mill mixer extending transversely of said structure near the front end thereof, said mixer having a casing provided near its center with an opening for the admission of aggregate and with a bottom wall which slopes upwardly and outwardly in both directions from its center, said casing having discharge openings in its outer ends, said mixer including a rotatable shaft provided with blades pitched to move material outwardly and upwardly along said bottom wall to said discharge openings, and means discharging a liquid bituminous binder into said casing near the center thereof.

10. In a machine for mixing and laying bituminous paving material, a self-propelled, wheel-supported structure, a mixer extending transversely of said structure near the front end thereof, said mixer having a casing provided near its center with an opening for the admission of aggregate and with a bottom wall which slopes upwardly and outwardly in both directions from its center, said casing having discharge openings in its outer ends, means within said casing for mixing material therein and moving such material outwardly in both directions from the center of the casing to said discharge openings, and means discharging a liquid bituminous binder into said casing near the center thereof.

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