May 27, 1947. K. E. McCONNAUGHAY 2,421,345

MIXER

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Fig. 1.

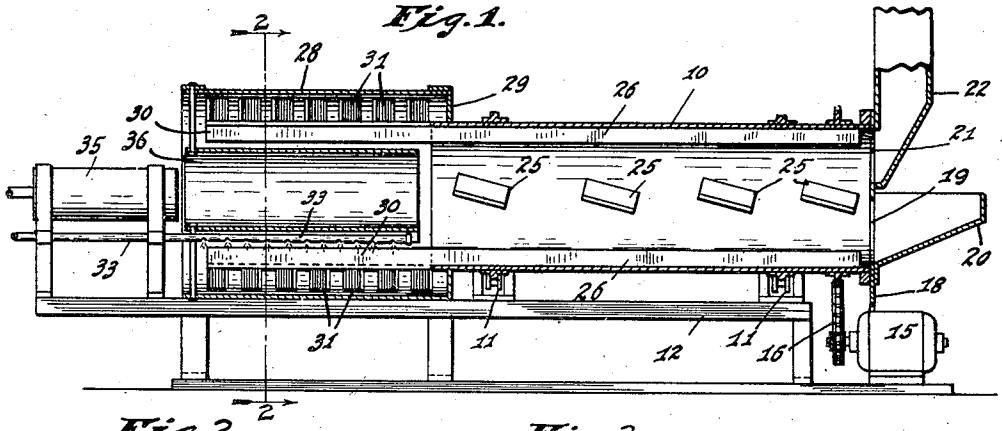


Fig. 2.

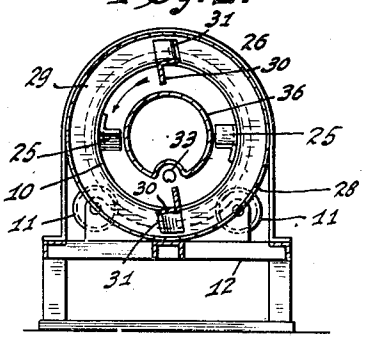


Fig. 3.

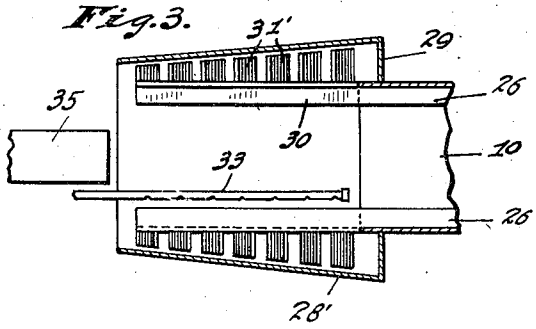


Fig. 4.

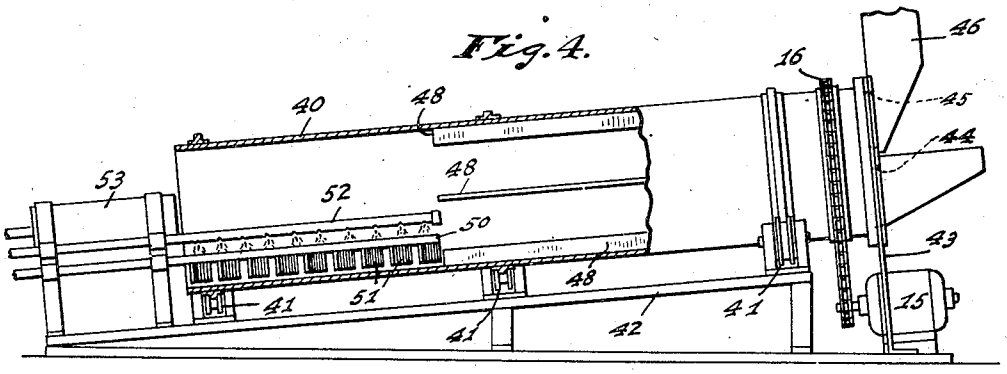
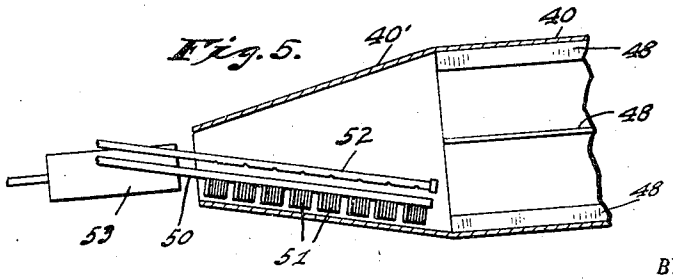


Fig. 5.



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MIXER

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6 Claims. (Cl. 259—158)

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My invention relates to a machine for producing a bituminous paving composition and more particularly to a machine suitable for use in performing the steps of drying aggregate, mixing the dried aggregate with a bituminous binder, and supplying heat to the binder and aggregate as they are being mixed together.

It is the object of my invention to produce a machine which will dry aggregate, mix it with a bituminous binder, and supply heat to the aggregate and a binder as they are being mixed. A further object of my invention is to produce such a machine in which a single source of heated air or gases supplies heat both to the mixture of aggregate and binder and to the aggregate alone before it comes into contact with the binder. Another object of my invention is to produce a machine of the type just described which can be simply constructed and economically operated.

In carrying out my invention, I employ a rotatable drum adapted to receive aggregate at one end. Near the opposite end of the drum I provide binder-supplying means and means, operative by virtue of drum-rotation, to mix the aggregate and binder. A burner or other suitable source of hot air or hot gases is located at the discharge end of the mixing means in the position to discharge its heated air or heated gases into the drum and above the material being mixed by the mixing means.

The accompanying drawing illustrates my invention: Fig. 1 is a vertical axial section through one form of mixer; Fig. 2 is a transverse vertical section on the line 2—2 of Fig. 1; Fig. 3 is a fragmental vertical axial section showing a modification of the mixer of Figs. 1 and 2; Fig. 4 is a side elevation, in partial section, illustrating a modified form of mixer; and Fig. 5 is a fragmental vertical section illustrating a modification of the mixer shown in Fig. 4.

The mixer illustrated in Figs. 1 and 2 comprises a drum 10 supported for rotation about a horizontal axis by rollers 11 on a frame 12. The drum is adapted to be rotated by any convenient means, the means illustrated comprising an electric motor 15 operatively connected to the drum by a chain drive 16.

A vertical plate 18 supported from the frame 12 covers the inlet end of the drum and is provided opposite the lower portion of the drum with an opening 19 through which aggregate may be admitted to the drum from a hopper or chute 20. Opposite the upper portion of the drum 10, the plate 18 is provided with an exhaust opening 21 communicating with an exhaust stack 22.

The drum 10 is provided interiorly with flights which are adapted both to lift and dump aggregate so that it will drop across the interior of the drum and to cause the aggregate to be fed through the drum to the discharge end thereof.

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As shown, the flights include relatively short flights 25 set at a slight helical angle and two elongated flights 26 parallel to the drum-axis.

At the discharge end of the drum I mount on the frame 12 a cylindrical casing 28. Such casing is generally co-axial with the drum 10, but is of larger diameter than the drum. The drum desirably extends into the casing 28 for a short distance, and the annular space between the casing and drum is substantially closed by an annular wall 29.

Carried by the drum are a plurality of blade-supporting members 30 which may be continuations of the flights 26 and which extend axially from the discharge end of the drum into the casing 28. Each of the members 30 carries a series of helically disposed mixing blades 31 adapted to mix material in the lower portion of the housing 28 and to cause it to be fed axially of the housing toward the discharge end thereof. Binder for mixing with the aggregate may be supplied thereto by a spray bar 33 extending into the housing 28 from the discharge end thereof.

At the discharge end of the housing 28 I mount on the frame 12 a burner 35 or other means for supplying heated air to the housing 28 and drum 10. Desirably, this burner is mounted in an axial position to discharge a stream of air through the housing and drum toward the exhaust opening 21.

In the operation of the device illustrated in Figs. 1 and 2, aggregate is supplied to the drum 10 through the opening 19. As the drum rotates, such aggregate is repeatedly elevated by the flights 25 and dropped through the stream of heated air emanating from the burner 35. At the same time, because of the helical inclination of the flights 25, the aggregate is caused to progress axially through the drum. When the aggregate is discharged from the end of the drum into the housing 28, it comes into association with a bituminous binder supplied through the pipe 33. The blades 31, which rotate with the drum 10, serve to mix the aggregate and binder together and to feed the mixture toward and out of the discharge end of the housing. It will be obvious that during the mixing operation the mixture will receive considerable heat from the stream of hot gases and air discharged by the burner 35.

If it is considered desirable to prevent any possibility of direct contact between the bituminous mixture and the products of combustion from the burner 35, as might be the case where the binder contains a volatile solvent, I may mount within the housing 28 an annular shield serving as a conduit for the gases discharged by the burner 35. As shown in Figs. 1 and 2, this shield may take the form of a sheet-metal cylinder 36 supported from the frame 12 and extending sufficiently far into the housing 28 to confine the hot gases during their passage through that part of

the housing in which the mixing operation is performed.

The modification of the invention illustrated in Fig. 3 is substantially the same as shown in Figs. 1 and 2 except that the cylindrical housing 28 is replaced by a conical housing 28' disposed with its larger end toward the drum 10. With this arrangement, the bottom wall of the housing 28' slopes upwardly toward the discharge end of the housing, thereby preventing unmixed binder from running out of the housing under the influence of gravity and making it possible to maintain adjacent the inlet end of the housing a pool of excess binder. In this construction, the mixing blades 31' carried by the members 30 are similar to the blades 31 but are made of gradually decreasing length toward the discharge end of the housing.

In the modification illustrated in Fig. 4, a drum 40 is supported for rotation about an inclined axis by rollers 41 mounted on a frame 42. The upper end of the drum, which is the inlet end, has associated with it a plate 43 similar in purpose and construction to the plate 18 of Fig. 1 and provided with an aggregate-receiving opening 44 and an exhaust opening 45, the latter communicating with a stack 46.

Because of the inclined position of the drum 40, it is unnecessary to provide therein any means for feeding aggregate therethrough. It is still desired, however, that the aggregate be repeatedly elevated and dropped through the stream of heated air and gases within the drum; and for this purpose I provide the drum interiorly with longitudinally extending flights 48. These flights extend from the inlet end of the drum to the point at which the aggregate-drying operation is to terminate and the mixing operation is to begin. The drum, however, extends for a considerable distance beyond this point.

Supported from the frame 42 at the discharge end of the drum 40, and extending axially inwardly of the drum, is a blade-supporting member 50 which, within the drum, carries a series of downwardly extending mixing blades 51 adapted to mix and stir aggregate in the lower portion of the drum. Binder for mixing with the aggregate is supplied by a spray-bar 52 extending axially into the drum from the discharge end thereof. A burner 53 or other source of heated air is disposed similarly to the burner 35 of Fig. 1 to discharge axially into the drum toward the exhaust opening 45.

The operation of the machine shown in Fig. 4 is substantially the same as that of the machine shown in Figs. 1 and 2. The mixing operation, however, instead of being performed by rotating blades in a stationary drum, is performed by stationary blades located within the rotating drum 40.

Because of the inclined position of the cylindrical drum 40, any excess binder supplied from the spray bar 52 would run out of the drum under the influence of gravity. To prevent this, I may use the construction shown in Fig. 5. In such construction, the drum 40 is cylindrical from its inlet end to the point at which the flights 48 terminate. The remainder of the drum, between such point and the discharge end, is of conical form, as indicated at 40'. The taper of the conical portion 40' is such that at its bottom it slopes upwardly toward the discharge opening, thus preventing the escape of any excess binder.

I claim as my invention:

1. In a mixer for preparing a bituminous paving composition, a rotatable drum having an inlet end for the reception of aggregate and a discharge end, said drum being provided near its inlet end with internal flights which lift aggregate and permit it to drop across the interior of the drum as the drum rotates, means for supplying a bituminous binder to aggregate passing through the drum, said binder-supply means discharging into said drum at points located wholly beyond said flights in the direction of aggregate-movement through the drum whereby none of the material lifted by said flights will contain binder, means operative in the rotation of the drum for mixing the aggregate and binder together below the drum-axis, and means for forming and directing a stream of heated gases above the mixing aggregate and binder and axially through the drum toward the inlet end thereof.

2. The invention set forth in claim 1 with the addition of a stationary housing into which the discharge end of said drum extends, said housing having an arcuate bottom substantially concentric with the drum, said mixing means comprising a series of mixing blades carried by said drum and extending into said housing.

3. The invention set forth in claim 1 with the addition that said mixing means comprises a stationary blade-support extending axially into said drum from the discharge end thereof and a series of stationary mixing blades carried by said blade-support and projecting downwardly therefrom into proximity to the inner surface of the drum.

4. In a mixer for preparing a bituminous paving composition, a rotatable drum having an inlet end for the reception of aggregate and a discharge end, said drum being provided near its inlet end with internal flights which lift aggregate and permit it to drop across the interior of the drum as the drum rotates, means for supplying a bituminous binder to aggregate passing through the drum, said binder-supply means discharging into said drum at points located wholly beyond said flights in the direction of aggregate-movement through the drum whereby none of the material lifted by said flights will contain binder, means for mixing the aggregate and binder together below the drum-axis, and means for forming and directing a stream of heated gases above the mixing aggregate and binder and axially through the drum toward the inlet end thereof.

5. The invention set forth in claim 1 with the addition of a stationary housing into which the discharge end of said drum extends, said housing having an arcuate bottom substantially concentric with the drum and sloping upwardly away from the drum, said mixing means comprising a series of mixing blades carried by said drum and extending into said housing.

6. In a mixer for preparing a bituminous paving composition, a rotatable drum having an inlet end for the reception of aggregate and a discharge end, said drum being provided near its inlet end with internal flights which lift aggregate and permit it to drop across the interior of the drum as the drum rotates, means located axially beyond said flights for supplying a bituminous binder to aggregate passing through the drum, means operative in the rotation of the drum for mixing the aggregate and binder together below the drum-axis, and means for forming and directing a stream of heated gases above the mixing aggregate and binder and axially

through the drum toward the inlet end thereof, said mixing means including a blade-support, an aggregate-support, and mixing blades on the blade-support in position to engage aggregate on the aggregate-support, one of said supports being rotatable with the drum and the other being stationary.

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