May 24, 1932. C. R. ARNOLD 1,859,324

MIXING AGGREGATES WITH ASPHALT AND COOLING

Filed Nov. 28, 1928

Fig. 1.

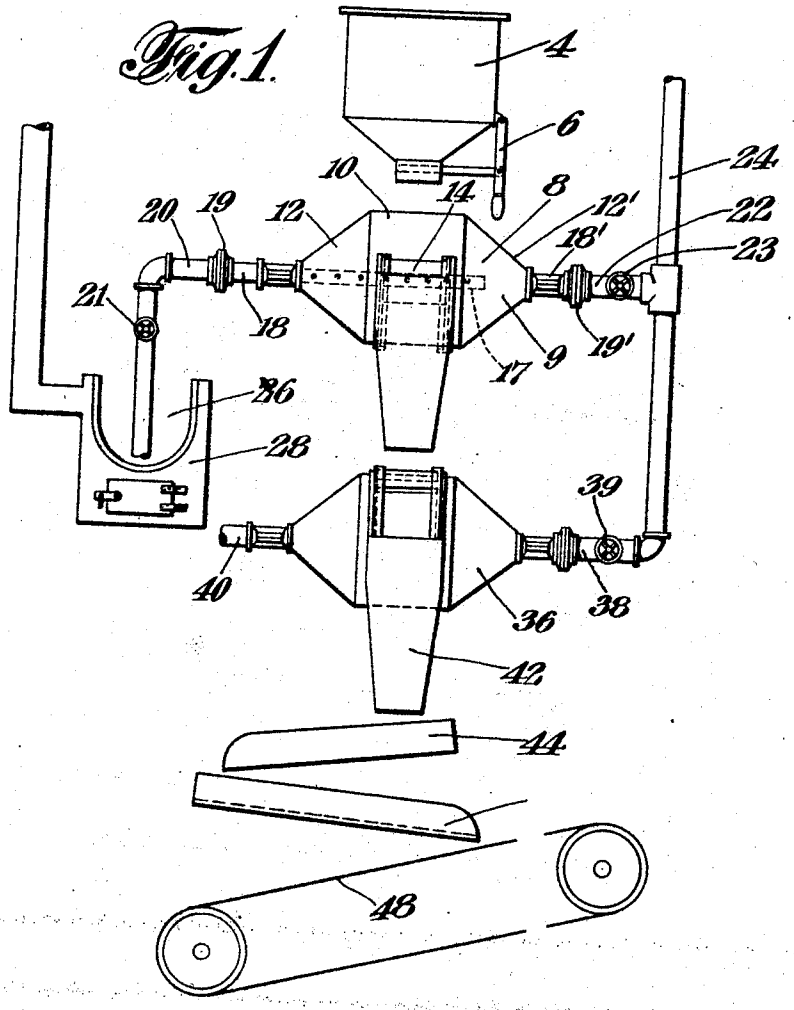
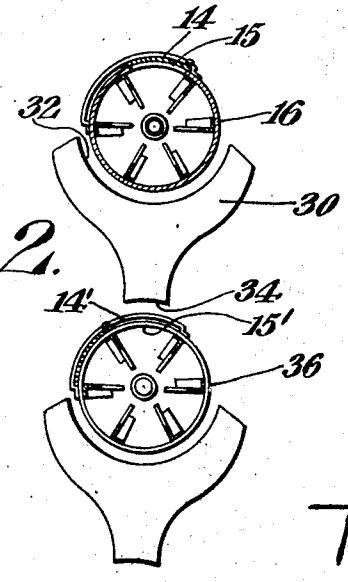


Fig. 2.



INVENTOR
C. R. Arnold
BY
Townsend & Decker
ATTORNEYS

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CRAIG R. ARNOLD, OF ATLANTA, GEORGIA

MIXING AGGREGATES WITH ASPHALT AND COOLING

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My invention relates to the method of and apparatus for producing a combination of asphalt or other bituminous binder with mineral aggregates such as sand or crushed stone adapted for use in road work or for other surfacing such as flooring, roofing, and the like.

My invention is particularly directed toward producing a mixture of mineral aggregates and oils, thoroughly mixed while maintained heated and thereafter cooled in a manner to permit the mixture to be stored cold and used cold at any time without reheating the same.

More specifically my invention contemplates mixing the heated ingredients, cooling them while agitating the particles of the mixture and separating them to prevent their permanent adherence to one another.

Other objects relate to the specific apparatus referred to below.

These and other objects will appear more fully from the following description when considered in connection with the drawings wherein:

Fig. 1 is a side elevation of one form which my apparatus may assume and

Fig. 2 is a transverse sectional view of the mixing drums and hoppers associated therewith.

In carrying out my invention it is essential that the mineral aggregates or sand be thoroughly mixed with the heated bituminous oils and that thereafter the mixture be cooled while the particles are being agitated and separated into relatively small portions. Thereafter the product may be stored without the liability of the portions of the mixture becoming so thoroughly bound together as to prevent their being used without being reheated.

Referring to the drawings wherein I have illustrated one form of apparatus for carrying out my process, the mineral aggregates preferably first heated and such for example as sand are first placed in a suitable hopper 4 preferably of the self weighing type and provided with means for discharging the mineral aggregates into the mixer. Such means is indicated diagrammatically at 6.

The apparatus includes a mixing drum 8 rotatable on an axis 9 during the use of the apparatus. The drum 8 is preferably of the form shown in the drawings and includes an enlarged cylindrical central portion 10 and cone shaped end portions 12 and 12′ converging toward the axis of rotation of the drum. The central or enlarged portion 10 of the drum is formed with a closure 14 movable to or from position to obstruct the central opening 15 of the drum. The inner surface of the drum 8 may be provided with suitable agitating blades 16 preferably placed upon the portion 10 as well as on the cone shaped portion 12 and 12′ so as to thoroughly mix the material within the drum and to have a constant tendency to throw the material toward the outer portion 10 and opening 15 of the drum for the purposes referred to below.

The outer ends of the cone shaped portions 12, 12′ terminate in hollow pipes 18, 18′ rotatably supported as indicated at 19, 19′. The rod 18 includes an inner discharge portion 17 extending substantially through the length of the drum 8 and apertured to permit the discharge of bituminous oils into the interior of the drum. An inlet pipe 20 formed with the closure valve 21 constitutes a continuation of the pipe 18. The outlet pipe 22 forms a continuation of the pipe 18, the pipe 22 likewise being provided with a closure valve 23. The outlet and inlet pipes 22 and 20 are provided respectively for producing a partial vacuum within the drum 8 useful for drawing the bituminous oils into the drum and for improving the resultant pavement material mixture.

A partial vacuum may thus be produced in the outlet pipe 22 and drum 8 by any suitable suction means attached to the conducting pipe 24. The inlet pipe 20 terminates within a vessel 26 provided for the purpose of heating the asphaltic oils as by means of the furnace 28, diagrammatically illustrated.

The entire central portion 10 of the drum 8 is surrounded by a hopper 30 formed with a receiving opening 32 so that the material may be discharged from the drum 8 by merely displacing the door 14 and thereafter rotating the drum. The hopper 30 includes a discharging spout 34 positioned to discharge

into the cooling drum 36 referred to below.

The cooling drum 36 is constructed substantially the same as the drum 8 except that the pipe 17 which introduces the bituminous oils into the interior thereof is omitted. The drum 36 is formed with a similar opening 15′ normally closed by the closure 14′ and rotates in the same manner as the drum 8. The outlet pipe 38 for the drum 36 is provided with a valve 39 and connects with the vacuum producing mechanism by means of the pipe 24. The inlet pipe 40 is not required to have a valve as it is permissible to allow a predetermined flow of air into and through the drum 36 at all times the drum is in use.

A hopper 42 surrounds the central portion of the drum 36 and is substantially the same as the hopper 30 so that further description thereof appears unnecessary.

The materials discharged from the hopper 42 fall upon the screens 44 and 46 where the same is separated into relatively small portions, the separated materials falling upon a conveyor belt 48 which transports the material to a suitable place of discharge.

The operation of the above apparatus is as follows:

The mineral aggregates, such as sand, are first placed within the hopper 4 and the rotation of the drum 8 is stopped with the opening 15 of the drum 8 directly beneath the discharge outlet of the hopper 4. The mineral aggregates are then introduced into the drum 8. The closure 14 is then moved to tightly close the opening 15 and the drum is rotated. The valve 23 is opened to provide a partial vacuum within the drum 8 and the valve 21 is opened to permit the desired amount of bituminous oils to be drawn into the hopper, after which the valve 21 is closed and the hopper 8 further rotated until the mineral aggregates and oils are thoroughly mixed while subjected to the partial vacuum produced at 24 and without the dissipation of any substantial portion of the initial heat. After the ingredients are thoroughly mixed the valve 23 is closed and the cover 14 removed, the drum 36 having been previously stopped in the position shown in Fig. 2 with the opening 15′ beneath the discharge opening 34 of the hopper 30.

Rotation of the drum 8 thereafter causes the discharge of all of the material from within the drum, the construction of which assures the passage of the mixture to the central portion of the drum for discharge into the hopper 30 and drum 36.

A new supply of mineral aggregates and oils is thereafter added to the drum 8 and the process repeated. The material introduced into the drum 36 is then cooled and agitated by rotation of the drum 36 while maintaining the partial vacuum and flow of air through this drum by opening valve 39. After the material in the drum 36 is cooled to substantially normal or atmospheric temperature the cover of this drum is removed and the material discharged into and through the hopper 42 where it passes through the screens 44 and 46 and onto the conveyor 48 from which it is discharged at a suitable point.

The above apparatus is found to produce a uniform product in which the separate portions of the mixture are not so firmly bound together even after storage as to prevent them from being used cold. The use of separate drum 8 and 36 adds materially to the efficiency of the apparatus since the drum 8 is normally maintained heated, it being at no time necessary to cool this drum. The cooling drum 36 is normally maintained relatively cool so as to hasten the cooling of the agitated mixture under the influence of the air flow through the pipes 38 and 40.

The shape of the drums 8 and 36 facilitates the discharge of material from the drums and tends to prevent the material from passing into the inlet or outlet pipes since the material is automatically moved toward the outer cylindrical portion 10 of the drum.

It will be understood that plenum or pressure greater than normal instead of partial vacuum may be applied to produce the cooling draft through the cooling drum.

Having now described my invention what I desire to secure as Letters Patent is:

1. The method of preparing a composition of matter for application in a cold state comprising mixing mineral aggregates and bituminous oils while maintained heated, agitating said mixture while artificially cooling the same and then separating the cooled products into relatively small portions.

2. The method of preparing a composition of matter for application in a cold state comprising mixing mineral aggregates and bituminous oils while maintained heated, agitating said mixture in a closed space while subjecting the same to an air flow through said space resulting in artificially cooling the same and subsequently separating the cooled products into relatively small portions.

3. The method of preparing a composition of matter for application in a cold state comprising mixing mineral aggregates and bituminous oils while maintained heated, agitating said mixture while subjecting the same to a partial vacuum and artificially cooling the same and separating the cooled products into relatively small portions.

4. The method of preparing a composition of matter for application in a cold state comprising mixing mineral aggregates and bituminous oils while maintained heated, agitating said mixture in a confined space while subjecting the same to an air flow through said space resulting in artificially cooling the same.

5. An apparatus for producing a composition of matter comprising a rotatable mixing

drum, means for introducing mineral aggregates and bituminous oils into the same, means for producing a partial vacuum in said drum during agitation of the contents by rotation of the drum, a rotatable cooling drum, means for passing the cooling agent through the drum during rotation and means for passing the mixture from the mixing drum to the cooling drum.

6. An apparatus for producing a composition of matter comprising a rotatable mixing drum, means for introducing mineral aggregates and bituminous oils into the same, a rotatable cooling drum, means for passing the mixture from the mixing drum to the cooling drum and means for producing an air flow through said cooling drum.

7. An apparatus for producing a composition of matter comprising a rotatable mixing drum, means for introducing mineral aggregates and bituminous oils into the same, a rotatable cooling drum, means for passing the mixture from the mixing drum to the cooling drum and means for producing a partial vacuum in said cooling drum.

8. An apparatus for producing a composition of matter comprising a rotatable mixing drum, means for introducing mineral aggregates and bituminous oils into the same, a rotatable cooling drum, means for passing the mixture from the mixing drum to the cooling drum and means for producing a partial vacuum in said drums.

9. An apparatus for producing a composition of matter comprising a rotatable mixing drum, means for introducing mineral aggregates and bituminous oils into the same, a rotatable cooling drum, means for passing the mixture from the mixing drum to the cooling drum, means for producing a partial vacuum in said drums, said means connecting with said drums coaxially of the latter.

10. An apparatus for producing a composition of matter comprising a rotatable mixing drum, means for introducing mineral aggregates and bituminous oils into the same, a rotatable cooling drum, said drums being formed with circumferentially enlarged central portions and cone shaped ends converging toward the axes thereof, means for passing the mixture from the mixing drum to the cooling drum, means for producing a partial vacuum in said drums, said means connecting with said drums coaxially of the latter adjacent the most restricted portions of said drums.

11. In a device of the character described, a rotatable mixing drum, said drum including a radially enlarged central portion provided with a central opening and closure therefor and converging end portions formed with openings constituting inlet and outlet means respectively, means for charging the drum through said central opening, a hopper surrounding the central portion of the drum and a cooling drum having an enlarged central portion and converging end portions arranged beneath said mixing drum and having a central opening and closure therefore in its enlarged portion in line with the discharging spout of said hopper.

12. In a device of the character described, a rotatable mixing drum, said drum including a radially enlarged central portion and converging end portions formed with openings constituting inlet and outlet means respectively, means for inducing circulation of the cooling agent in said drum through said inlet and outlet means while the drum is rotating and removable means formed on the central portion of said drum for providing access to the interior thereof and for permitting the discharge of the contents thereof and means for charging the drum through said central portion.

13. A method of preparing a composition of matter suitable for application in a cold state consisting in mixing a mineral aggregate and bituminous material in heated condition by agitating the mixture in a suitable container while subjected to a partial vacuum then delivering the mixture into another container wherein it is subjected to the action of a cooling agent circulating through it during agitation.

14. A method of preparing a composition of matter comprising a mineral aggregate and bituminous material consisting in agitating said aggregate and material while in heated condition in a suitable container and while subject to the influence of a vacuum then delivering the mixture into another container and agitating the mixture therein while said container is in sealed condition and during flow of air circulating through said container as a cooling agent for the mixture.

15. A method of preparing a composition of matter comprising a mineral aggregate and bituminous material consisting in mixing the aggregate and material in a suitable sealed container while in heated condition by rotation of said container and while subject to the influence of a vacuum therein then delivering the mixture into another rotatable container and cooling the same by agitation of the mixture in said container while sealed therein and while subjected to the cooling influence of a cooling agent circulated therethrough by producing a partial vacuum therein.

Signed at Atlanta in the county of Fulton and State of Georgia, this 20th day of November A. D. 1928.

CRAIG R. ARNOLD.