April 28, 1931. E. B. HACK 1,803,248

APPARATUS FOR SPRAYING OF BITUMEN ON ROADWAYS AND THE LIKE

Filed June 28, 1929 3 Sheets-Sheet. 1

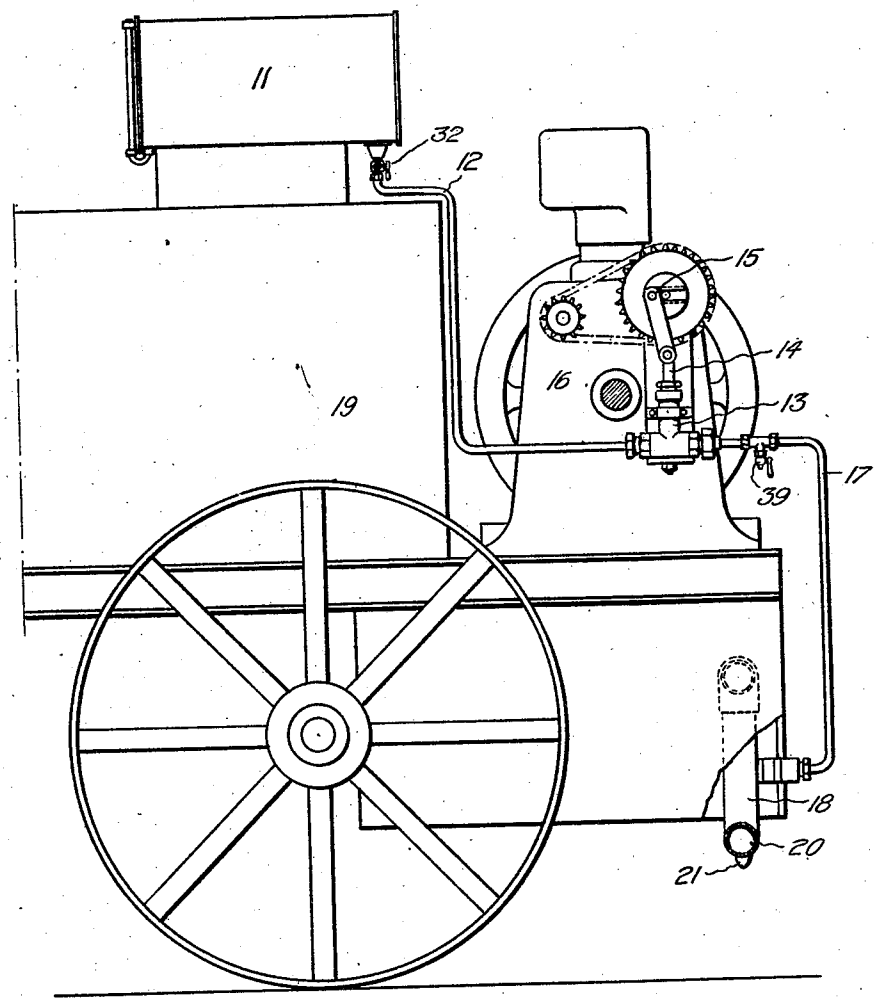


Fig. 1.

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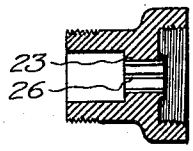


Fig. 4.

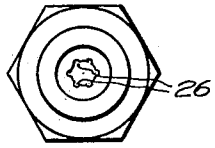


Fig. 5.

Fig. 2.

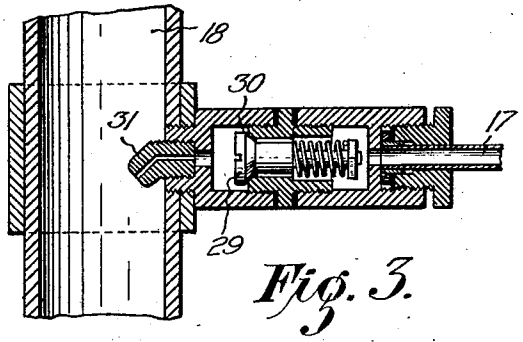


Fig. 3.

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APPARATUS FOR SPRAYING OF BITUMEN ON ROADWAYS AND THE LIKE

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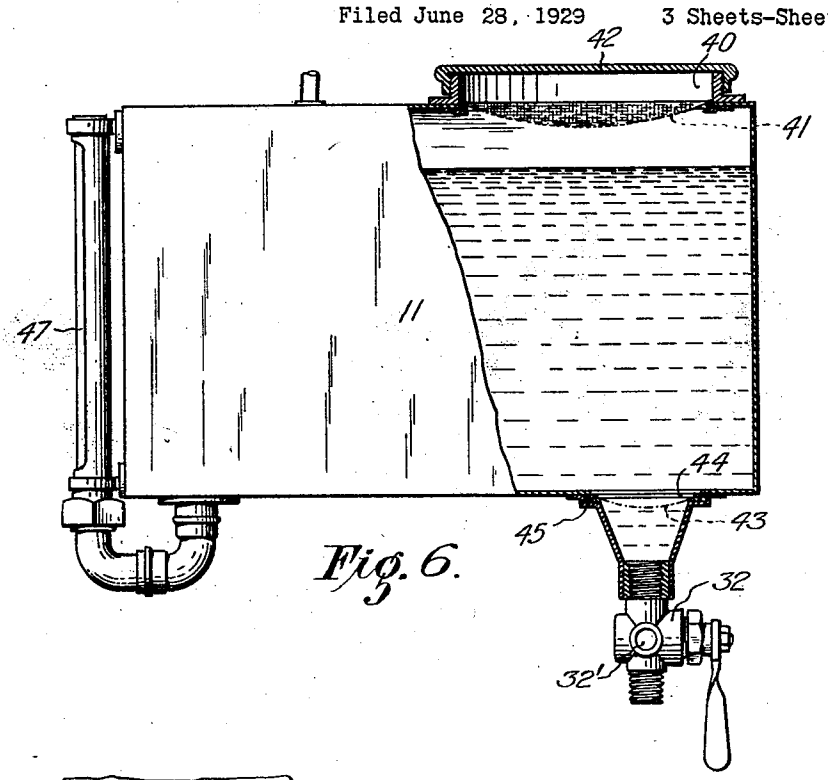


Fig. 6.

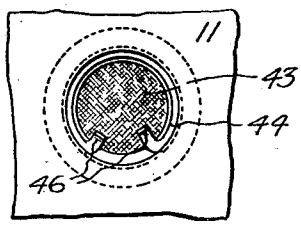


Fig. 7.

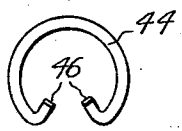


Fig. 8.

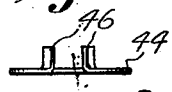


Fig. 9.

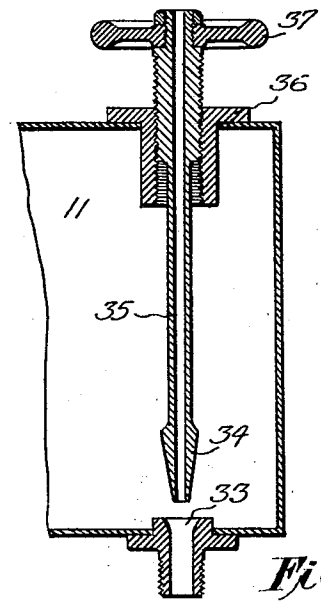


Fig. 10.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR SPRAYING OF BITUMEN ON ROADWAYS AND THE LIKE

Application filed June 28, 1929, Serial No. 374,577, and in Australia August 1, 1928.

This invention relates to improvements in or relating to the spraying of bitumen and similar material on roadways and the like and refers to a method of and apparatus for spreading heated bitumen evenly over broken stone, coarse gravel and or other material in the formation, repairing or surfacing of roadways, pavements and the like.

It has been found in practice that by subjecting heated bitumen to the action of certain reagents the volume of the bitumen will be temporarily increased and that it will cover a greater quantity of aggregates or road forming material and more effectually penetrate or spread over the same when applied in this condition.

According to one process a mass of molten bitumen at a temperature of 300° to 350° Fah. is preciptated on to a very small quantity of a reagent, which is used at normal temperature, and the resultant rise in a temperature of the reagent to approximately that of the bitumen causes an infinite number of small bubbles to be formed throughout the bitumen thereby creating a state of effervescence and resulting in a momentary change in the physical character of the bitumen. This is accompanied by an expansion in volume, and upon a subsequent agitation of the material there is a secondary expansion caused by the bursting and breaking up of the bubbles that remain in the body of the bitumen.

The expansion in volume—both primary and secondary—only lasts for a few minutes and it is during this period of increase in the volume and before the effervescence ceases that the material must be applied to the road material. While in this state the normal viscosity of the bitumen is reduced thereby obtaining a greater flowing power with the result that its percolation into the voids or interstices of the road materials is deeper and the interpenetration more uniform with a thinner film, and a better filling up of the interstitial spaces.

The reagent used in carrying out the process may be in the form of a colloidal solution or any reagent which is capable of effecting a temporary increase in the volume of a mass of heated bitumen and satisfactory for the purpose in view.

Now the object of the present invention is to provide a simple and efficient means for enabling the above mentioned process of bitumen treatment to be employed in conjunction with ordinary spraying machines whereby the operations of road penetration and surfacing can be carried out continuously and a greater area covered and economy of bitumen to be effected.

I accomplish the abovementioned object by introducing the solution under pressure to the distributing manifold pipes of the spraying machine during the spraying operation and cutting off the supply of solution and passing air under pressure through the passage therefor upon the cessation of flow of the solution and spraying operation whereby the air pressure will prevent the ingress of bitumen to and a blockage of the said passage.

The apparatus embodied in the present invention consists briefly of a container for the solution mounted on the spraying machine, a delivery pipe passing from the container to the manifold discharge pipe leading from the bitumen tank to the spray pipe of the machine, a pump in the length of the delivery pipe, a valve in the end of the delivery pipe connected to the manifold discharge pipe, and a valve for controlling the flow of solution from the container to the delivery pipe and adapted when closed to place the said pipe in communication with the atmosphere.

In order that the invention, the object and nature of which have been set forth, may be readily understood, reference will now be had to the accompanying sheets of explanatory drawings wherein—

Figure 1 is a view in side elevation of the rear portion of a spraying machine fitted with improvements constructed in accordance with the present invention.

Figure 2 is a view in sectional elevation of the pump which is disposed between the solution container and the manifold discharge pipe.

Figure 3 is a view in sectional elevation of the connection between the delivery pipe and the manifold discharge pipe.

Figures 4 and 5 are views in sectional and end elevation, respectively, of a fitting for supporting the valves of the pump.

Figure 6 is a view in elevation partly in section of the container for the solution.

Figures 7, 8 and 9 are views illustrating a detail in the construction of portion of the container and hereinafter will be fully described.

Figure 10 is a view in sectional elevation of portion of a modified form of outlet valve in the container for the solution.

In these drawings the reference numeral 11 designates a drum or tank which is supported horizontally at an approved point above the spraying machine which may be of the type illustrated or of any other design.

The tank is adapted to contain the solution and an outlet in the bottom thereof is connected by a pipe 12 to a pump 13 the plunger 14 of which is adapted to be operated by a variable throw crank 15 from an engine 16 mounted on the machine or from any suitable operative part of the machine.

The discharge side of the pump is connected by a pipe 17 to the depending portion 18 of the manifold discharge pipe for directing the hot bitumen from a tank 19 to a transversely disposed distributing pipe 20 fitted with spraying nozzles 21 in the ordinary way.

A valve body is fitted to the inlet side of the barrel of the pump 13 and one end of the pipe 12 is connected to the valve body by means of a screwed union 22. The valve body is provided with a central partition 23 having an axially disposed bore loosely accommodating the stem of a suction valve 24 which is normally retained on its seat by a spring 25. The sides of the bore for accommodating the stem of the valve is provided with longitudinally disposed grooves 26 to permit of the solution flowing past the said valve when it is raised from its seat 27 upon the suction stroke of the pump. The opposite side or outlet of the pump is fitted with a valve body substantially similar to that accommodating the suction valve and a spring loaded discharge valve 28 is located therein and adapted to open upon the discharge stroke of the pump whereby the solution will be forced through the pipe 17.

The end of the pipe 17 adjacent to the manifold discharge pipe is connected by a union to a valve casing accommodating a spring loaded check valve. This valve may be provided with a conical shaped head 29 and seat 30 as illustrated in the drawings or it can be of any other approved design.

The opposite end of the valve casing screws into the manifold discharge pipe and is provided with a nipple 31 having a small bore and shaped or arranged to direct the solution downwardly towards the centre of the manifold discharge pipe.

The discharge and check valves will seat closely on the suction stroke of the pump when a minus pressure is created in the portion of the pipe between the pump and the manifold thereby preventing the ingress of bitumen to the said pipe and these valves will open upon the discharge stroke of the pump and force the solution into the said manifold where it will admix with the heated bitumen passing to the horizontally disposed portion thereof.

The flow of the solution to the discharge pipe 12 from the tank 11 is controlled by a two way valve 32 the body of which is provided with a through passage for placing the tank in communication with the pipe 12 and with a right angle branch 32′ which is open to the atmosphere.

The plug on the valve is constructed in such a way that the pipe 12 may be placed in communication with the tank or with the atmosphere as desired.

Figure 10 illustrates a modified form of valve for controlling and cutting off the flow of the solution to the delivery pipe 12 from the tank 11. This form of valve comprises a conical seat 33 arranged at the upper end of the delivery pipe and a conical or needle valve 34 mounted on a tubular spindle 35 passing vertically through the tank 11 and having a threaded upper end engaged by a nut 36 fitted to the top of the said tank.

The projecting upper end of the tubular spindle 35 or the screwed portion thereof is provided with a hand wheel 37 or lever for convenience of operation. This type of valve is readily adjusted to permit of a required outlet for the solution from the tank 11 and when closed the air will pass readily down the tubular spindle to the delivery pipe 12 and be forced by the pump into the manifold discharge pipe.

It will be obvious that the valve employed to control or cut off the flow of solution from the tank 11 is preferably of a type which will remain in its adjusted position and will not be affected by the oscillations and jars to which it may be subjected when the spraying machine is in operation.

A drain cock 39 can be arranged in the length of the pipe 17 adjacent to the pump the manipulation of which will enable the operator to readily determine whether the pump is functioning correctly. The tank or container is provided with a large filling orifice 40 provided with a gauze strainer 41 and a removable cap 42.

The opening in the lower part of the tank or container communicating with the upper end of the pipe 12 is provided with a gauze strainer 43 which is detachably secured in position by an open spring ring 44 in an annular groove 45 and the said ring can be provided with upwardly projecting lugs 46 which may be conveniently grasped and pressed together when it is desired to release

the same from the groove in order to remove the said strainer. The tank or container may be provided with a gauge 47 for clearly indicating the quantity of solution contained therein.

The advantage of making provision for forcing air under pressure through the delivery pipe upon the cessation of flow of solution is that it prevents all liability of bitumen entering the lower end of the said pipe and causing a blockage of the retaining valve which might result from bitumen coming into contact therewith.

The solution when introduced into the bitumen discharge pipe sets up an ebullition of gaseous bubbles therein and the agitation or disturbance created in the bitumen as it is sprayed from the nozzles of the spray pipe causes a substantial increase in the effervescence thereby increasing the volume of the bitumen and enabling it to more effectually penetrate the aggregates laid on a road bed or spread freely over the surface of a roadway or the like.

The invention is exceedingly simple, is easy to operate and in use will be found thoroughly efficient for the purpose for which it has been devised.

I claim:—

1. In apparatus for spraying heated bitumen upon roadways and the like, comprising a source of supply of bitumen, spray pipes and a discharge pipe leading from said source of supply to said spray pipes, the combination of a tank for containing a solution adapted to effervesce the heated bitumen, a delivery pipe passing from the tank to a discharge pipe leading to the spray pipes of the apparatus, a pump disposed in the length of the pipe connecting the tank to the discharge pipe, a suction valve on one side, and a discharge valve on the opposite side of the pump, a check valve at the lower end of the solution delivery pipe, and a valve adapted to control or cut off the flow of solution from the tank and for admitting air under pressure to the said pipe when the solution is cut off.

2. In apparatus for spraying heated bitumen upon roadways and the like, comprising a source of supply of bitumen, spray pipes and a discharge pipe leading from said source of supply to said spray pipes, the combination of a tank adapted to contain a solution for mixing with and effervescing the heated bitumen, a pipe connecting the tank to the suction side of a pump, a two way valve in the length of the pipe adapted to place the tank in communication with the pump when the valve is opened and to place the pump in communication with the atmosphere when the valve is closed, a discharge valve on the opposite side of the pump, a pipe connecting the discharge valve of the pump to a valve casing fitted to the manifold distributing pipe of the spraying machine, a check valve in the valve casing, and a nozzle projecting from the valve casing into the discharge pipe.

3. An apparatus according to claim 2, wherein the nozzle is adapted to direct the solution passing therethrough downwardly towards the centre of the manifold discharge pipe.

4. In an apparatus according to claim 1, a valve seat in the bottom of the tank communicating with the delivery pipe, a tapered needle valve passing through the tank and adapted to be moved to and from the seat, and a passage passing longitudinally through the needle valve whereby when the valve is closed on its seat the delivery pipe will be placed in communication with the atmosphere.

5. An apparatus according to claim 1, a valve seat fitted to the bottom of the tank and connected to the delivery pipe, a tapered needle valve having a hollow spindle connected thereto, a screwed upper end on the hollow spindle engaging a nut fitted to the top of the tank, and means for imparting rotation to the spindle to move the valve to and from its seat.

In witness whereof I hereunto affix my signature.

ERNEST BARTON HACK.