April 2, 1963 F. E. COFFMAN ETAL 3,083,913

APPARATUS FOR MARKING A SURFACE

Filed Aug. 21, 1961 2 Sheets-Sheet 1

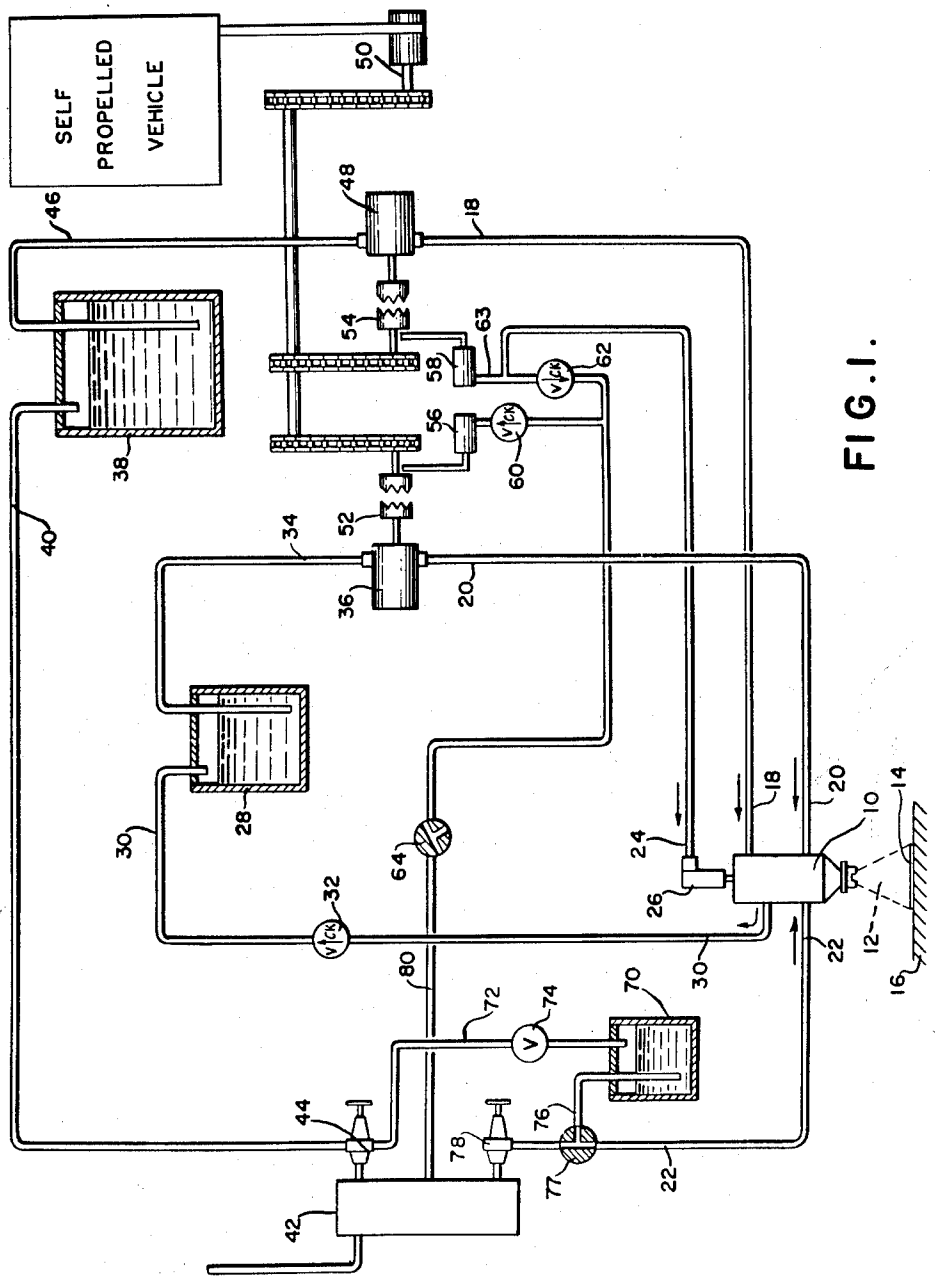


FIG. 1.

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2 Sheets-Sheet 2

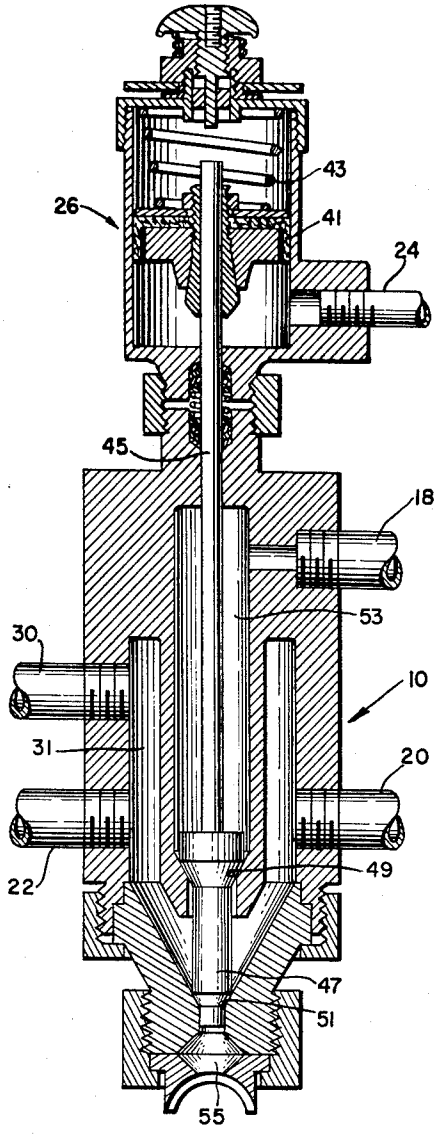


FIG. 2.

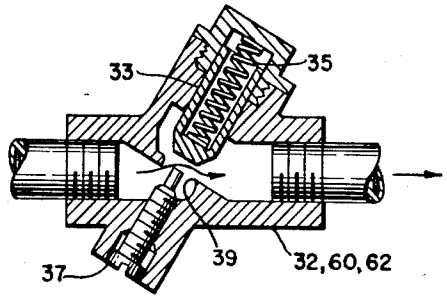


FIG. 3.

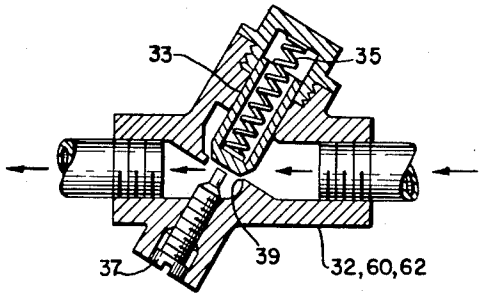


FIG. 4.

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United States Patent Office 3,083,913 Patented Apr. 2, 1963

3,083,913

APPARATUS FOR MARKING A SURFACE

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Filed Aug. 21, 1961, Ser. No. 132,641
4 Claims. (Cl. 239—150)

The present invention relates to surface marking apparatus and more particularly to a system for use in applying a coating material to surfaces where a plurality of materials from separate sources of supply are sprayed from a common spray gun.

This application is a continuation-in-part of copending application Serial No. 31,141 filed May 23, 1960, now abandoned.

A particular use of the present invention is in the application of markers to roads and highways. Recently, traffic paints have been developed for use as center lines and lane margin lines which are made up of a synthetic resin binder material which when mixed with an accelerator or catalyst material sets up or cures rapidly into a solid abrasion resistant marker. Due to the quick setting time of these materials, the accelerator must be added to the binder immediately before the binder reaches the surface to be coated. This is accomplished by conducting the two materials from separate sources of supply to a common spray gun from which the mixture is sprayed. In some cases, more than one additive is required to be added to the resin binder, such as dryers, hardeners, catalysts, or fillers.

Systems have heretofore been proposed which utilize two or more spray guns which spray together the materials to be mixed. This system has certain drawbacks.

It is an object of the present invention to provide a system adapted to be mounted on a self-propelled vehicle for simultaneously spraying a coating material and an additive thereto.

Still another object of the present invention is to provide a system for simultaneously spraying a coating material and an additive thereto with a simple control system for operation thereof.

Still another object of the present invention is to provide a system for spraying a plurality of materials simultaneously from a single spray gun, such system being adapted to be mounted on a self-propelled vehicle and to be operated from the take off shaft of the vehicle.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a diagrammatic illustration of the system constituting the present invention;

FIG. 2 is a cross sectional view of the spray gun and actuator;

FIG. 3 is a diagrammatic cross sectional view of the control valves in the free flow position; and

FIG. 4 is a similar view to FIG. 3 showing the control valves in the restricted flow position.

Referring to the drawings, the spray gun, diagrammatically indicated as 10, sprays the coating material 12 to form a traffic marker 14 on a roadway 16. The resin binder enters the spray gun 10 through conduit 18, and the additive, such as the accelerator, enters the spray gun through conduit 20. Atomizing air for use in spraying this material enters the gun through conduit 22 and the control air for actuating actuator 26 enters through conduit 24.

Tank 28 acts as a source of supply of the accelerator which is pressurized by atomizing air pressure through take off conduit 30 from the spray gun 10 which enters

tank 28 above the level of accelerator therein. The conduit 30 is connected inside the gun 10 to the atomizing air chamber 31, and a flow control valve 32 is used in the conduit 30 to prevent a rapid bleed off of pressure when the atomizing air is shut off, particularly when cleaning the gun tip.

Details of the flow control valve 32 are shown in FIGS. 3 and 4. The pressure of the flowing stream in the free flow direction indicated by the arrow in valve 32 (FIG. 1) acts on the cup sleeve 33 to compress the spring 35 and permit free flow. An adjusting screw 37 may be set to regulate the amount of flow. In the reverse, or restricted direction, shown in FIG. 4, the spring 35 is not affected and acts to restrict the opening between the cup sleeve 33 and the valve seat 30 thereof, causing restricted flow in that direction. Conduit 34 extends below the level of accelerator in the tank 28 and conducts the accelerator from the tank 28 to pump 36 and thence through conduit 20 to the spray gun 10.

Tank 38 acts as a source of supply for the resin binder which is pressurized by air under pressure entering tank 38 above the level of resin therein through conduit 40 leading from the air manifold 42 through regulator 44. An air compressor, not shown, mounted on the vehicle compresses the air fed to the manifold 42. Conduit 46 extends below the level of resin in the tank 38 and conducts the resin binder from the tank 38 through pump 48 to conduit 18 leading to the spray gun 10.

The self-propelled vehicle and the means for mounting the spray gun and other equipment thereon is not shown in the drawings. Any conventional vehicle suitable for use in marking pavements is contemplated.

A take off shaft 50 from the vehicle traction system drives the pumps 36 and 48 through a system of sprockets and mechanical clutches 52 and 54. The clutches are operated by small air cylinders 56 and 58, respectively. The flow control valves 60 and 62 and valve 64 control the action of the air cylinders 56 and 58. The conduit 24 for the control air to the spray gun 10 connects with conduit 63 by a connecting T between the air cylinder 58 and the flow control valve 62. The flow control valves 60 and 62 are similar in structure to flow control valve 32 as shown in FIGS. 3 and 4 and permit free flow as in FIG. 3 in the direction indicated by the arrow, and restricted flow as in FIG. 4 in the direction opposite to the arrow.

Thus it will be seen that both the pumps 36 and 48 and the spray gun 10 are controlled by actuation of the valve 64.

A tank 70 holds a solvent or cleaning material which is pressurized by air in conduit 72 leading from regulator 44 and passing through valve 74 to the tank 70 above the level of liquid therein. The solvent or cleaning material for the gun 10 flows from the tank 70 through conduit 76 and valve 77 into the conduit 22 leading to the gun 10. The atomizing air from the manifold 42 passes through regulator 78 and thence through valve 77 into conduit 22 leading to the gun 10.

The control air flows from the manifold through control valve 64 to the flow control valves 60 and 62. A portion of the control air flowing through control valve 62 then passes through conduit 24 to the gun actuator 26.

The traction take-off shaft 50 may be connected to the vehicle traction system by any conventional method such as those shown in Patent Numbers 1,702,585 and 2,515,-865. In the drawing, the vehicle and its connection to the take-off shaft 50 are shown schematically.

In operation, the traction system take-off shaft 50 and the sprockets rotate continuously at a speed proportional to the forward velocity of the road striper vehicle. In this way, the thickness of the sprayed marker will always be uniform. The sprockets connecting with clutch

52 and with clutch 54 respectively are sized so as to maintain the speed of pumps 36 and 48 proportional to the desired ratio of the two material components in the final mixture.

Air from the compressor mounted on the machine passes to the manifold 42 and thence to the regulators 44 and 78 and the valve 64. The regulator 78 controls the pressure of the atomizing air passing to the spray gun 10. The regulator 44 controls the pressure of the air to pressurize the resin in the tank 38 and the cleaner in the tank 70.

When the main control valve 64 is opened, air is admitted immediately through the flow control valve 60 since the air flows in the free flow direction of FIG. 3, to air cylinder 56 which acts to engage clutch 52 and thus start the pump 36 for pumping the accelerator from the tank 28 to the spray gun. The tank 28 has been pressurized by atomizing air from the spray gun passing through conduit 30 and valve 32 to the tank. Thus, as soon as control valve 64 is opened, the accelerator is pumped and sprayed from the spray gun by the atomizing air.

At the same time that control valve 64 is opened, air is also admitted to flow control valve 62, but in this case, the flow control valve 62 restricts the air going to the air cylinder 58 and spray gun actuator 26 as indicated in FIG. 4, thus delaying the flow of the resin binder until after the accelerator has begun to be sprayed. In this manner, one insures that the resin binder is never sprayed before the accelerator. Operation of air cylinder 58 engages the clutch 54 and operates the pump 48 for pumping the resin binder from tank 38 to the spray gun. The air passing through conduit 24 actuates the gun actuator 26 to permit the flow of resin binder through the spray gun chamber 53 to be mixed in nozzle 55 with the accelerator already flowing through chamber 31 and spray out a mixture of the resin binder and accelerator in the proper proportions controlled by the pump speeds.

The air entering the actuator 26 through conduit 24 acts on a piston 41 to raise it. The piston 41 is lowered when the air flow is discontinued by the spring 43. The piston 41 is connected by a rod 45 to the valve portion 47 which seats on valve seats 49 and 51 when the piston is in its lowermost position. The air pressure on the piston 41 raises the piston against the action of the spring 43 and thereby opens the valve 47.

When the main control valve 64 is closed, the air in the control system is exhausted, thus releasing the clutches 52, 54 to stop the flow of resin binder and accelerator, and also to close the actuator 26 for the spray gun. During this operation, the flow control valve 60 restricts the flow of air from air cylinder 56, thus allowing the flow of the resin binder to shut off before the flow of the accelerator. It is thus seen that the accelerator starts to flow first and shuts off last.

The valve 32 prevents the rapid bleed off of pressure, particularly when the gun is being cleaned. During this operation, valves 74 and 77 are opened to permit the flow of cleaner from the tank 70 through conduit 22 and thence through the spray gun.

The above described system has many advantages over previously proposed systems for this operation. The system acts to meter the proportions of accelerator and resin binder in the proper ratio for optimum curing and quality of the product. The ratio may be varied for different materials. The ratio will remain constant until varied, regardless of the viscosity of the material. The quantity of material pumped to the spray gun is proportional to the speed of the striping machine resulting in a line of constant thickness. By driving each pump independently, it is possible to adjust or clean each system without altering the other or mixing the materials.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and, therefore, the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

We claim:

1. In an apparatus for applying a coating composition to a surface from a self-propelled vehicle equipped with a spray gun, a source of supply for a first ingredient of said coating composition, a source of supply for a second ingredient of said coating composition, means for connecting said first source of supply with said spray gun and means for connecting said second source of supply with said spray gun, the improvements comprising a first pump located in said first connecting means, a second pump located in said second connecting means, control means for actuating said two pumps so that said first pump always starts to pump said first ingredient to said spray gun before the second pump begins to pump the second ingredient thereto and so that the first pump stops pumping said first ingredient to the spray gun after the second pump has stopped operation, and means for actuating said pumps proportionally to the speed of movement of said vehicle so that the amount of the composition sprayed is proportional to the speed of said vehicle.

2. Apparatus in accordance with claim 1 including means for regulating the proportional speeds of said pumps to meter the proportions of said first and second ingredients sprayed.

3. Apparatus in accordance with claim 1 wherein said means for actuating said pumps proportionally to the speed of movement of said vehicle includes a take-off shaft which rotates proportionally to the forward speed of said vehicle and means for operatively connecting said take-off shaft to said pumps so that said pumps are actuated proportionally to the speed of the vehicle, and wherein said control means for actuating said two pumps includes a first clutch provided between the take-off shaft and said first pump, a second clutch between the take-off shaft and said second pump, and pneumatic means for actuating said clutches in a predetermined order when the coating composition is to be sprayed so that one pump always starts first and stops last.

4. Apparatus in accordance with claim 3 wherein said pneumatic means for actuating said clutches in a predetermined order includes a source of supply of compressed gas, a first flow control valve between said source of supply of compressed gas and said first clutch, a second flow control valve between said source of supply of compressed gas and said second clutch, said clutches being adapted to become actuated by pressure of compressed gas, said first flow control valve permitting unrestricted flow of compressed gas towards said first clutch and restricted flow from said first clutch, and said second flow control valve permitting restricted flow of compressed gas towards said second clutch and unrestricted flow from said second clutch thereby delaying operation of said second clutch until after operation of said first clutch and permitting disconnection of said second clutch before disconnection of said first clutch.

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