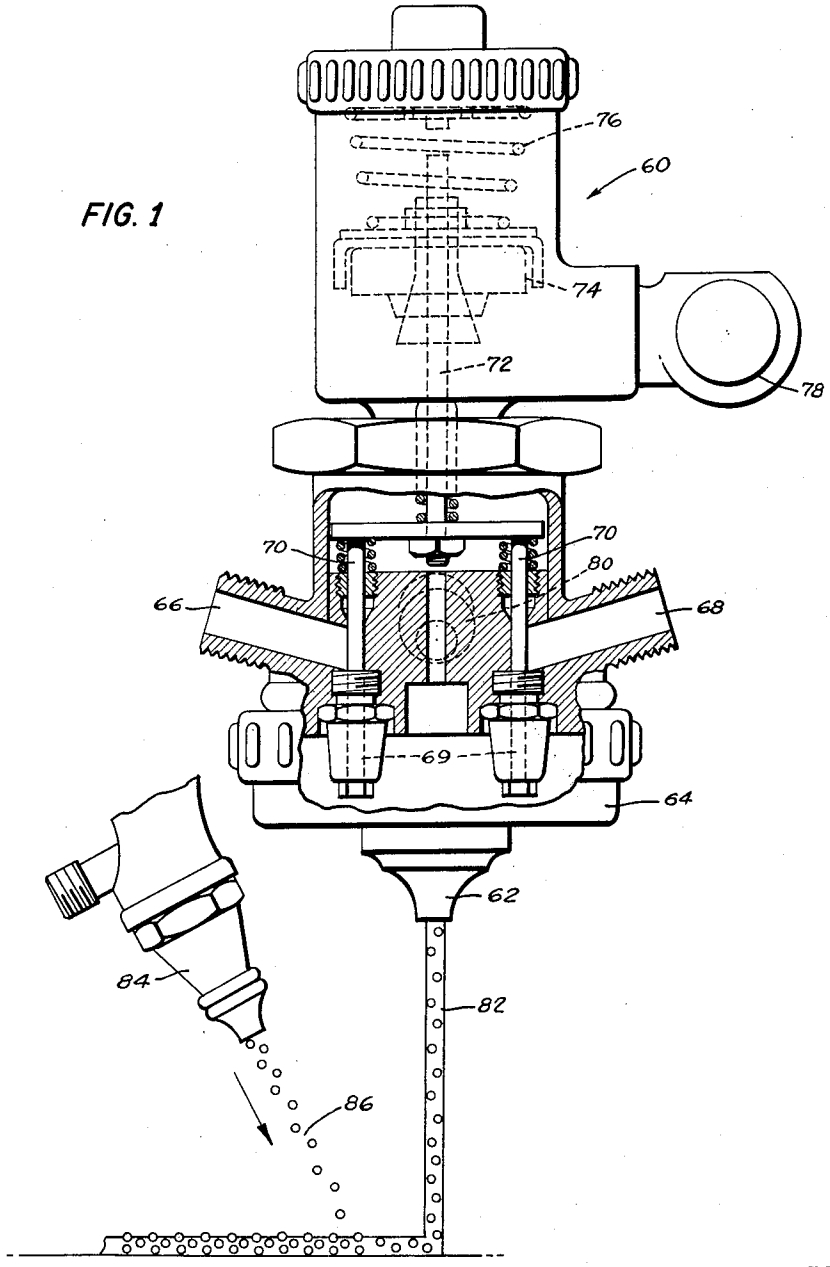
Oct. 9, 1962 R. W. WILSON 3,057,273

APPARATUS FOR MARKING A SURFACE

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FIG. 1



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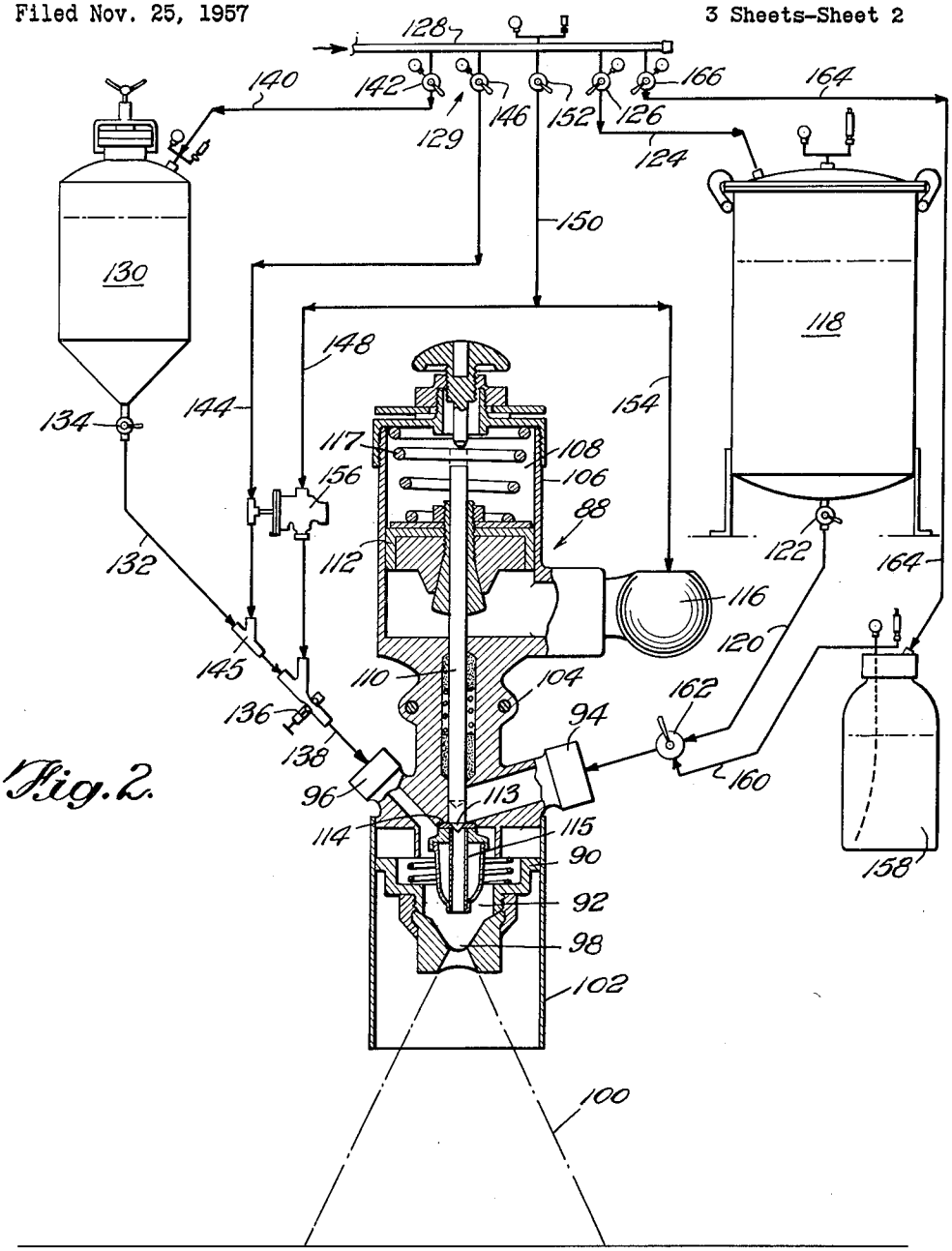


Fig. 2.

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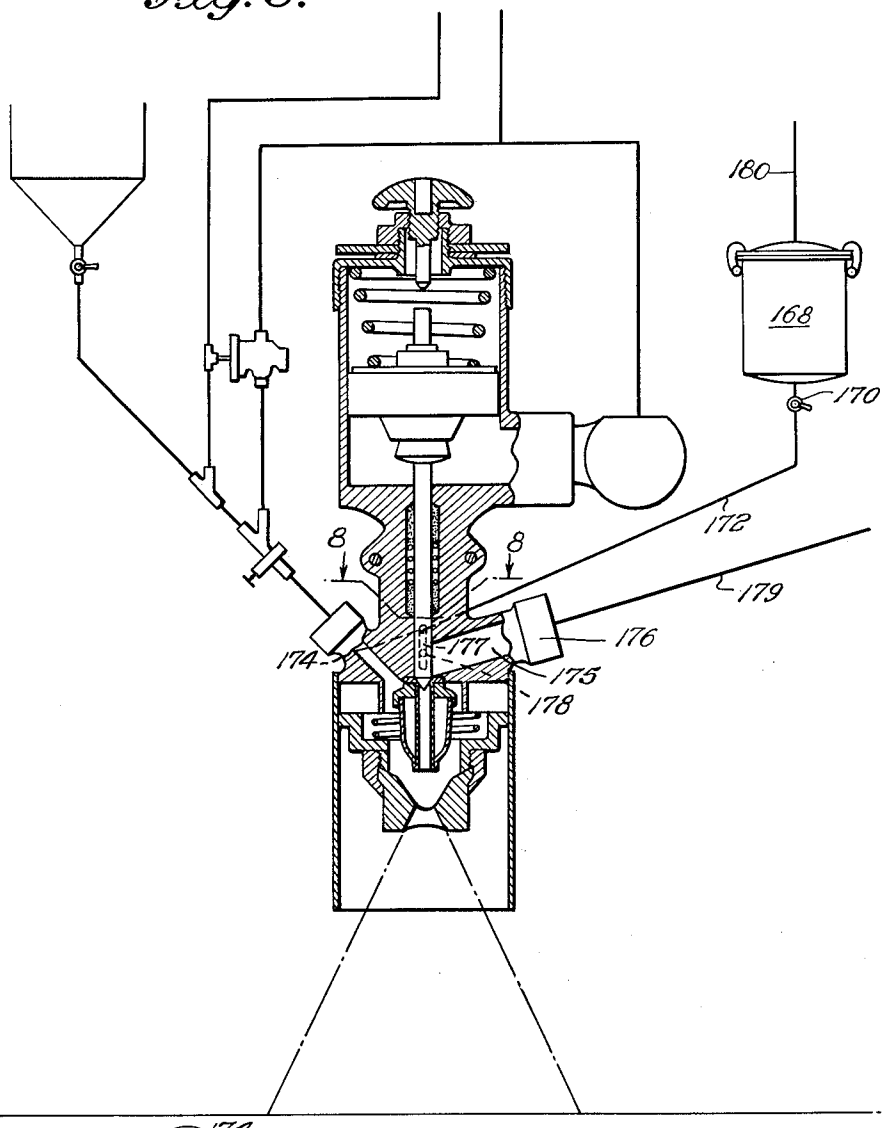
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APPARATUS FOR MARKING A SURFACE

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Fig. 3.



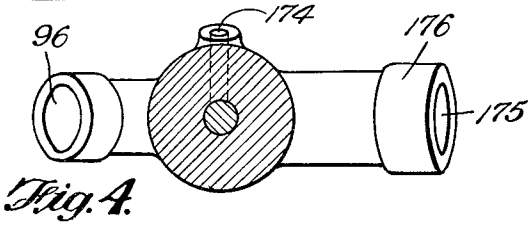


Fig. 4.

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APPARATUS FOR MARKING A SURFACE

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Filed Nov. 25, 1957, Ser. No. 698,440
9 Claims. (Cl. 94—44)

The present invention relates to surface coating apparatus for applying a coating to a surface. More particularly, the present invention relates to apparatus for applying a coating material to surfaces and the like wherein the coating material is intimately mixed with small particles of solid material.

This application is a continuation-in-part of copending application Serial No. 442,077 now Patent No. 2,821,890 entitled "Apparatus and Method for Marking a Surface," filed July 8, 1954.

A particular use of the present invention is in the application of markers to roads and highways. It is generally recognized in the art of applying road markers, such as center lines and lane margin lines, for example, that the use of reflecting elements, such as glass spheres, when mixed with a paint binder, is especially effective in promoting safety on the highway, particularly since the glass spheres have auto-collimating characteristics. Due to their auto-collimating characteristics, the small glass spheres are particularly effective in outlining the traffic lanes during night-time driving.

Prior to the instant invention, various techniques have been employed in applying the road markers, which generally consist of the paint binder mixed with the small glass spheres, and it has been the usual practice heretofore to apply the road marker in one of several methods. One of the methods employed heretofore was to first apply a paint binder to the road surface by ejecting the paint binder onto the road surface in an atomized mist from a spray gun, the spray gun being attached to a movable vehicle. The small glass spheres were then either dropped or ejected into the wet adhesive paint binder. The glass spheres were normally varied in diameter so that a portion of the spheres would be completely imbedded in the paint binder while a portion would project above the paint binder and thereby provide for immediate illumination. Thus, as the traffic wore down the traffic marking, the larger spheres would be removed by the traffic shock, but the imbedded spheres would then become visible. Another method employed heretofore in applying the road markers was to premix the paint and the glass spheres and then spray the paint binder and glass sphere mixture onto the road surface to effect the desired marking. It has been found through practice that although both of these known techniques have been found to be satisfactory in applying road markers, in the first method the spheres had a tendency to become dislodged due to continued heavy traffic impact.

It has also been found that when the glass spheres are premixed with the paint or binder and not applied immediately to the surface to be marked, the spheres which are initially suspended in the paint or binder solution have a tendency to settle with the pigment to the bottom of the premix container, thereby forming a wet concrete-like mass. If the mass is allowed to remain undisturbed for even a short period of time, it becomes more solid, with the result being that paint lines, valves, strainers and accessory equipment become clogged. If the premixed material is allowed to remain in its container from one striping season to the next, and the can is not up-ended periodically, the settled materials form a compact mass which is almost impossible to return to the

suspended state. Due to these difficulties normally encountered with the premix material, it has become the standard procedure to equip premix striping equipment with an agitator. If the agitator is air-operated by a portable unit, a relatively large compressor is required to supply the necessary amount of compressed air. If the agitator is mechanically operated, a larger engine is required for the striping machine, to perform the agitating operation in addition to propelling the unit. It is seen, therefore, that by utilizing the agitator with the premix material, the striping equipment is necessarily increased in size and weight.

In the copending application referred to above, a method of applying a road stripe and the apparatus therefor is described whereby the paint binder is sprayed onto the road surface to effect the desired marker and simultaneously therewith the glass spheres are applied from a separate source. In this manner, the spheres are thoroughly mixed with the paint binder as it is applied to the road and are sufficiently imbedded in the paint binder to prevent their becoming loosened due to traffic impact.

It is also seen that in other instances where a coating of paint that may be mixed with small particles is applied to a surface, the teaching of the present invention is applicable.

It is therefore an object of the present invention to provide means for applying a coating material to a surface and applying simultaneously therewith a stream of small particles from an independent source.

Still another object of the present invention is to provide road marking apparatus whereby a stream of small glass spheres is mixed with the stream of paint binder from an independent source, a mixture of paint binder and glass spheres thereby being formed and defining the finished marking material.

Still another object of the present invention is to teach a method of applying a road marking to a road surface a mixture of a paint binder and tiny glass spheres is simultaneously directed onto the surface of a road from independent sources.

Still another object of the present invention is to provide means for marking the surface of a road whereby an additional source of glass spheres is adapted to spray a suspended coating of glass spheres onto the freshly applied marker to effect a top or "flash" coat of spheres, thereby providing for immediate reflectivity of the marker.

Still another object of the present invention is to teach a method of applying a flash coat of spheres onto the top of the marker which has been applied to the surface of the road, the marker containing a paint binder and a multitude of tiny glass spheres.

Still another object is to provide road marking apparatus which includes a spray gun for receiving from independent sources a paint binder and small glass spheres, the spray gun ejecting the paint binder and spheres in an atomized spray to effect a premixed reflective coating on the surface being marked.

Still another object is to provide road marking apparatus wherein a catalyst is premixed with the spheres and paint binder, the premixed reflectorized compound setting instantaneously upon ejection from the spray gun.

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 shows the present invention in which a twin head spray gun is illustrated in partial section;

FIG. 2 is a diagrammatic illustration of a modified form of the invention shown in FIG. 1;

FIG. 3 is a diagrammatic illustration of a further modified form of the invention; and

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 3.

The road or traffic marker as applied by the present invention includes the well known auto-collimating reflecting element, in the present application being shown in the form of tiny glass spheres. The present invention utilizes two separate and distinct sources of the glass spheres, the spheres from each source varying in diameter, the purpose of which will be described hereinafter.

Referring now to the drawings and particularly to FIG. 1, the apparatus embodied herein is diagrammatically illustrated and comprises a spray gun which is generally indicated at **60** and which is provided with means for receiving in a common mixing chamber both the paint binder and the particles to be mixed therewith. The spray gun **60** includes a nozzle **62** which is integrally joined to a mixing chamber **64**, the mixing chamber receiving paint binder under pressure from an inlet **66** and small dry particles, such as glass spheres, under pressure from an inlet **68**. The inlets **66** and **68** are suitably connected to a supply of paint binder and spheres, respectively, and are interconnected to the mixing chamber **64** by ports **69**. In order to control the admission of the paint binder and dry glass spheres through ports **69**, needle valves **70** are positioned in the ports **69** and are adapted to be actuated by a piston rod **72**, the piston rod **72** being operatively connected to an air operated piston **74**. The piston **74** is biased by a spring **76** and is responsive to compressed air admitted through an inlet port **78**. An additional port **80** is provided in the body of the spray gun **60** and communicates with the mixing chamber **64** for the purpose of supplying compressed air for atomizing, mixing and ejecting the paint binder and spheres.

It is understood that the spray gun **60** and the conventional equipment associated therewith, such as the compressor and prime mover, are adapted to be mounted on a vehicle preferably of the self-propelled type, the vehicle also carrying a supply of paint binder and a separate supply of small particles such as glass spheres. The spray gun inlet **66** is connected to the supply of paint binder, and the inlet **68** is connected to the supply of small particles.

In operation, the paint binder or coating material is admitted under pressure through the inlet **66** and the dry glass spheres or other particles are admitted under pressure through the inlet **68**. The needle valves **70** are controlled by the piston **74** which is responsive to air admitted through port **78**, the movement of the diaphragm causing the paint binder and spheres to be admitted into the mixing chamber **64**. Air under pressure is introduced into the mixing chamber **64** through the port **80** and is adapted to thoroughly mix the paint binder and spheres and then eject the mixture in an atomized stream **82** onto the surface to be marked. It is seen that the spray gun **60** thoroughly mixes the paint and spheres internally in the mixing chamber **64** and then ejects the mixture in the atomized stream **82** which is applied to the roadway or surface and thereby defines a traffic line or road marker. The width of the marker is determined by the height of the spray gun from the surface as well as the shape of the nozzle.

It is desirable in applying the road marker that the reflectivity of the marker be produced immediately upon the application thereof. For this purpose, a second spray gun **84** is carried by the moving vehicle and is positioned to the rear of the spray gun **60** with respect to the direction of travel of the vehicle. Dry glass spheres indicated at **86** under the force of compressed air are ejected in a fan-like pattern from the spray gun **84** onto the surface of the road marker and become imbedded in the paint binder approximately one-third their diameter above the surface thereof. The dry glass spheres **86** which are ejected from the spray gun **84** are preferably formed of a larger diameter than those ejected in the premixed stream from the spray gun **60**. Thus, the larger diameter spheres **86**, which are applied to the top surface of the road marker, are immediately visible and therefore produce instant reflectivity for the road marker. The larger diameter spheres **86** ejected in a fan-shaped pattern from the spray gun **84** are sufficiently retained in the top portion of the paint binder by capillary action, whereby the paint binder creeps around the surface of the spheres to firmly anchor them to the upper portion of the marker. The larger spheres **86** are retained in place until the line is worn sufficiently by the moving traffic to expose the smaller diameter spheres. However, as the larger diameter spheres are thrown out of the binder by the moving traffic, the smaller diameter spheres, which are firmly mixed with the paint binder, become visible and thus the reflectivity of the road marker remains effective until the paint binder is finally removed through excessive traffic wear.

Referring now to FIG. 2, a modified system for applying the premixed reflective surface marking is diagrammatically illustrated and includes a spray gun generally indicated at **88**. The spray gun **88** is generally similar to the spray gun **60** shown in FIG. 1 and is adapted to eject the premixed marking material therefrom in an atomized spray. The spray gun **88** includes a lower nozzle portion **90** that is formed with a mixing chamber **92** with which a paint binder inlet port **94** and a sphere inlet port **96** communicate. The mixing chamber **92** in turn communicates with a restricted orifice or nozzle **98** which directs the mixture of paint binder and glass spheres outwardly in a fan-shaped pattern **100**. Engaging the lower nozzle portion **90** is a circular shroud **102** that extends somewhat below the nozzle **98** and thereby acts to confine the spray pattern **100** ejected from the nozzle orifice. Joined to the lower nozzle portion **90** by a narrow neck portion **104** is a tubular portion **106** in which is located a control chamber **108**. A control rod **110** is operatively connected to a piston **112** located in the control chamber **108** and extends downwardly through the neck portion **104** terminating in a needle valve **113**. The needle valve **113** engages a valve seat **114** that is positioned at the uppermost end of a distributing tube **115**, the distributing tube **115** being adapted to receive the paint binder and direct it into the mixing chamber **92**. As shown the piston **112** is biased by a spring **117** that abuts against the upper end of the tubular portion **106** and is responsive to air under pressure that is admitted to the control chamber through an air inlet port **116**. In the system illustrated in FIG. 2, the glass spheres are propelled into the chamber **92** by air at line pressure and thus the additional air pressure for ejecting the mixture as shown in FIG. 1 is unnecessary.

The glass spheres and paint binder are independently stored, the paint binder being retained in a paint tank **118**. The paint tank **118** is conveniently mounted on the striping machine and is interconnected to the port **94** by means of a paint conduit **120**, the flow of paint binder into the conduit **120** being controlled by an outlet valve **122** located at the bottom of the paint tank. Communicating with the interior of the paint tank **118** at the upper end thereof is an air conduit or line **124** that is adapted to conduct air under pressure into the paint tank **118** and thereby acts as an ejecting medium for forcing the paint binder through the outlet valve **122**. The air line **124** communicates with a pressure regulating valve **126** that is mounted on a control panel **129**, the control panel **129**, in turn, being conveniently mounted on the striping machine and positioned adjacent the operator of the striping machine. A source (not shown) of compressed air also communicates with a main air header **128**, the main air header **128** supplying air under pressure to the air line **126** and to other air conduits for operating the spray gun and for feeding the glass spheres through the port **96**.

The glass spheres which are premixed with the paint

binder in the chamber 92 are stored in a tank 130 and are directed toward the spray gun 88 through a conduit 132 that communicates with a valve 134 located at the lower end of the tank 130. Interconnected to the conduit 132 through a variable restrictor coupling or squeeze valve 136 is a conduit 138 that communicates with the port 96 and is adapted to direct the spheres under pressure therethrough and into the spray gun mixing chamber 92. In order to expel the glass spheres under pressure from the tank 130, an air conduit or line 140 is connected thereto at the top thereof and is interconnected to the main air header 128 through a regulating valve 142 which is mounted on the control panel 129.

Since it is desirable to direct a stream of the glass spheres suspended in air into the spray gun, an air conduit 144 is provided and communicates with the air line 132 through a coupling 145 located adjacent the upstream side of the squeeze valve 88. The air conduit 144 is supplied with air under pressure (30 to 40 p.s.i.) in regulated amounts by a regulating valve 146 that is also in communication with the main air header 128. It is seen that the atomizing air from the line 144 mixes with the glass spheres upstream of the squeeze valve 136 and the glass spheres suspended in the air are then propelled through conduit 138 and into the spray gun 88 by air under pressure that is directed to the squeeze valve 136 by way of an air line or conduit 148. The conduit 148 communicates with an air line 150 that is connected to a regulating valve 152, the regulating valve 152 being mounted on the control panel 128 and communicating with the main air header. The air line 150 directs compressed air at line pressure, that is, approximately 125 p.s.i., into the conduit 148, the pressure of the air at line pressure being sufficient to propel the suspended glass spheres into the spray gun mixing chamber 92. The air line 150 also communicates with a conduit 154 that is connected to the port 116. Air at line pressure thus enters the chamber 108 at the same time that it is introduced into contact with the atomized glass spheres. The diaphragm operated control rod 110 is thus moved upwardly and the atomized spheres are sprayed under pressure through the nozzle 98 in the atomized fan-shaped stream 100.

Since it is desirable to inject the glass spheres into the spray gun 88 while suspended in air, the flow of control air through the conduit 148 is controlled by a diaphragm control valve 156, the diaphragm of which is responsive to air under pressure passing through the conduit 144. It is seen therefore that by controlling the flow of air through the conduit 144 by the regulating valve 146, the flow of the control air to the spray gun 88 may be regulated. By providing the diaphragm control valve 156, atomizing air may be admitted into the conduit 132 from where the spheres and air mixture are directed into the mixing chamber 92. However, the control air may be withheld from operating the control rod 110 and from ejecting the mixture of paint and spheres from the chamber 92 by simply keeping the regulating valve 152 in a closed position. Even though the regulating valve 152 may be opened it is seen that the control air will not pass through the diaphragm control valve 156 unless the atomizing air is passing therethrough. It is seen therefore that the control of regulating valve 146 controls the paint striping operation.

Oftentimes it is desirable to cleanse the interior of the spray gun, and particularly the mixing chamber 92, since under certain operating conditions, the glass spheres and paint binder have a tendency to adhere and thus clog the orifice 98. In order to automatically clean the spray gun, a cleaning circuit is provided and includes a container 158 having a cleaning fluid located therein. A feed line 160 communicates with the container and extends outwardly therefrom, being joined to a three-way control valve 162, the control valve 162 being interposed in the paint conduit 120. Also communicating with the interior of the container 158 is an air conduit 164 which is connected to a regulating valve 166 mounted on the panel 128, the regulating valve 166 communicating with the main air header. It is seen that after the striping operation has been completed, or halted for a brief interval, the spray gun mixing chamber 92, nozzle 98 and associated elements may be thoroughly cleansed by moving the three-way control valve 162 into the position to direct cleaning fluid to the line 120. The regulating valve 166 is then opened to enable air under pressure to expel the cleaning fluid from the container 158 into the feed line 160 and then into the spray gun 88 by way of the port 94.

Referring now to FIGS. 3 and 4, a further modified form of the invention is illustrated and includes substantially the same elements that are described above in connection with FIG. 2. In the form of the invention shown in FIGS. 3 and 4, it is contemplated to apply a mixture of glass beads and plastic compound to the road surface for instantaneous setting as distinguished from the usual compound or mixture of glass beads and paint binder. The plastic compound to be utilized in the instantaneous setting technique may be in a semi-dry or semi-wet or molasses-like or even jelly-like state, depend upon the striping requirements; and is introduced into the gun 88 under pressure through an inlet port 176. Atomizing air is intermixed with the glass spheres in the air conduit 132 and the atomized spheres are propelled into the mixing chamber 92 by operating or control air which is directed to the squeeze valve 136 by way of the air line 144. A catalyst or reacting agent is utilized with the plastic compound to produce rapid setting, the catalyst being stored in a convenient receptacle or tank 168. Communicating with the tank 168 through a stop valve 170 located at the bottom of the tank 168 is a conduit 172. The other end of the conduit 172 communicates with a port 174 formed in the lower portion 90 of the spray gun 88, the port 174 being positioned immediately above passage 175 that communicates with the inlet port 176. Formed in the stem 110 is a slot 177 with which an opening 178 communicates. The opening 178 communicates with the passage 175 and it is seen that the plastic compound forced through an inlet conduit 179 and into the port 176 is thus caused to be intimately mixed with the catalyst and glass beads prior to the application thereof to the surface being marked. The catalyst is forced out of the tank 168 and into the conduit 172 by air under pressure that is directed to the tank 168 by way of the air line 180. The air line 180 is connected to a regulating valve (not shown) that communicates with the main air supply header. It is seen that the glass spheres are suspended in air and premixed with the plastic compound and catalyst in the spray gun mixing chamber and the premixed material is then sprayed onto the surface to be marked.

From the foregoing, it is seen that by utilizing the apparatus and method described herein, a surface may be coated with a paint material completely mixed with particles in a relatively short period of time. Although the present invention discloses spray guns applying the coating in a fan-shaped pattern of restricted width, it is considered within the scope of the invention to utilize any type of spraying equipment wherein a motive fluid is adapted to eject the particles into the stream of the coating material, the mixture then being applied to a surface.

The present invention has particular application with road marking equipment and for applying traffic lines on road surfaces. From the description of the apparatus and method set forth above, it will be seen that a road marker for marking traffic lanes on the surface of a road is quickly and simply applied by the present invention. The auto-collimating effect produced by employing small glass spheres with the paint binder is

achieved by mixing the spheres and the paint stream just before it is applied to the road surface. The spheres are thus firmly imbedded into the paint binder and as traffic wears away the surface of the road marker, the spheres will be constantly visible. In the initial application of the road marker, a flash coat of the spheres is applied on the top surface of the marker and thereby produces instant reflectivity clearly visible under all driving conditions.

It will also be understood that the present invention contemplates the premixing of the paint binder and glass spheres but avoids the method of premixing the paint binder and glass spheres before entry thereof into a common spray gun. Normally, when the spheres are premixed with paint binder, a certain amount of agitation is necessary prior to the striping operation. However, since the dry glass spheres are contained in a separate receptacle, the agitation is no longer required. It has further been found that by utilizing the present invention, the life of the marker is extended and, in addition, a more consistent marker may be applied to the road surface.

It should be clearly understood that a second spray gun for glass beads, similar to spray gun 84 in FIG. 1, may be incorporated in the modifications of the invention illustrated in FIGS. 2 and 3. The second spray gun, as in FIG. 1, would be positioned to the rear of the first spray gun with respect to the direction of travel of the vehicle.

In accordance with the instant invention, it is further to be understood that the apparatus and method herein described may be used for the purpose of mixing pigment or colored particles with the binder for decorative or other coating purposes in such fashion that pigment or particles which may or may not be of contrasting color may be mixed with the binder immediately prior to application of the binder to the surface to be coated or decorated. For example, a marbleized effect has been obtained by introducing pink calcimine into the atomized paint spray, the resulting decoration being a fairly good imitation of Italian marble. Not only may this decorative effect be obtained on horizontal surfaces, but it may also be applied vertically to obtain decoration of vertical surfaces. It is to be understood that for decorative purposes when colored pigments are used, a hand gun of the same design as shown in FIG. 5 would be applicable.

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.

What is claimed is:

1. In apparatus for applying a coating to a surface, a spray gun having a first inlet port, a second inlet port, a mixing chamber, a nozzle, and means for controlling the opening of said nozzles to control the ejection of said coating through said nozzle, means for directing a paint material through said first port, means for directing glass spheres from an independent source through said second port, said paint material and spheres being premixed in said mixing chamber to form said coating, a source of control air under pressure, means for directing air under pressure from said source into said mixing chamber for expelling the premixed material through said nozzle, and means for directing air under pressure from said source into contact with said control means, whereby said control means opens said nozzle for the expulsion of said premixed material.

2. In apparatus for applying a coating to a surface as set forth in claim 1, which includes means for conducting a catalyst material into said mixing chamber, said paint material, spheres and catalyst material being mixed in said mixing chamber to form an instantaneous setting reflectorized coating when applied to a surface.

3. In apparatus for applying a coating to a surface as set forth in claim 1, which includes means for suspending said spheres in air prior to entry thereof into said mixing chamber, said means for directing air under pressure from said source into said mixing chamber connecting into said means for directing glass spheres between said source of spheres and said second inlet port whereby said air under pressure enters said mixing chamber with said spheres and expels the mixture from said mixing chamber.

4. In apparatus in accordance with claim 1 which includes means for conducting a catalyst material into said paint material at a point before it is admitted into said mixing chamber, said paint material, spheres and catalyst material being mixed in said mixing chamber to form an instantaneous setting reflectorized coating when applied to a surface.

5. Apparatus for applying a coating to a surface comprising a spray gun, said spray gun including a first inlet port, a second inlet port, a third inlet port, a mixing chamber, a nozzle, and means for controlling the opening of said nozzle to control the ejection of said coating through said nozzle, means for directing a paint material through said first port, means for directing particles from an independent source through said second port, said paint material and particles being premixed in said mixing chamber to form said coating, a source of control air under pressure, means for directing said control air from said source through said third inlet port into said mixing chamber for expelling the premixed material through said nozzle, means for directing control air from said source to said controlling means for opening said nozzle and ejecting the mixture of coating material and particles from said nozzle onto the surface to be marked, a second spray gun positioned behind the first-named spray gun with respect to the direction of travel of said apparatus, said second spray gun ejecting a suspended stream of particles onto the coating applied to said surface, said last-named particles being imbedded in said coating and projecting upwardly therefrom, thereby being instantly visible.

6. In apparatus for applying a coating to a surface as set forth in claim 5 which includes means for suspending said particles in air prior to entry thereof into said mixing chamber, said third inlet port connecting into said means for directing the particles between said source of said particles and said second inlet port, whereby said air under pressure for expelling the mixture from said mixing chamber enters said mixing chamber with said particles.

7. Apparatus for applying a coating to a surface as set forth in claim 6 which includes valve means responsive to the flow of said atomizing air for controlling the flow of said control air to said mixing chamber thereby controlling the ejection of the coating mixture from said nozzle.

8. Apparatus for applying a coating to a surface comprising a spray gun, said spray gun including a first inlet port, a second inlet port, a mixing chamber, a nozzle, and means for controlling the opening of said nozzle to control the ejection of said coating through said nozzle, means for directing a paint material through said first port, means for directing particles from an independent source through said second port, a source of control air under pressure, means for directing said control air from said source into said mixing chamber for expelling the premixed material through said nozzle, means for directing control air from said source to said controlling means for opening said nozzle and ejecting the mixture of coating material and particles from said nozzle onto the surface to be marked, a third port formed in said spray gun, and means communicating with said third port for supplying a catalyst under pressure thereto, said catalyst premixing with said particles and paint material in said mixing chamber to form an instantaneous setting reflectorized coating when applied to said surface.

9. In apparatus for applying a coating to a surface, a

mobile frame, a spray gun mounted on said frame for movement therewith over said surface, said spray gun including a first inlet means formed therein, means communicating with said first inlet means for directing a coating material to said spray gun, second inlet means formed in said spray gun, means communicating with said second inlet means for directing particles from an independent source to said spray gun, third inlet means formed in said spray gun, means communicating with said third inlet means for directing a catalyst material to said spray gun, fourth inlet means to said spray gun, means communicating with said fourth inlet means for directing air under pressure to said spray gun for expelling said coating material, particles and catalyst material, and means in said spray gun for receiving said coating material, said particles and said catalyst for the mixing thereof prior to the expelling of the mixture from said gun onto said surface, whereby an instantaneous setting coating is formed on said surface as said frame moves thereover.

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