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SPRAYING APPARATUS

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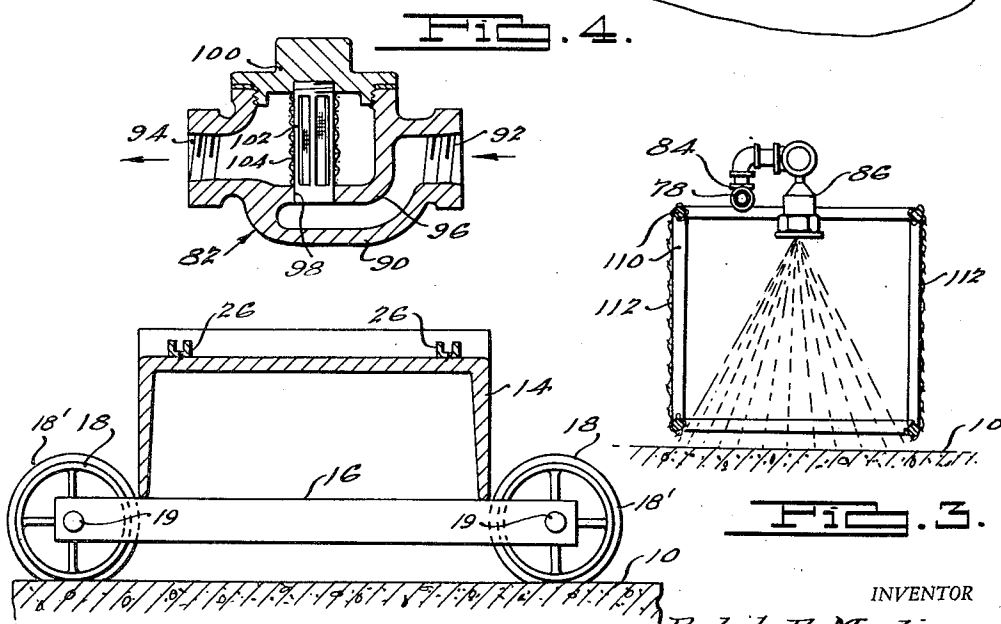
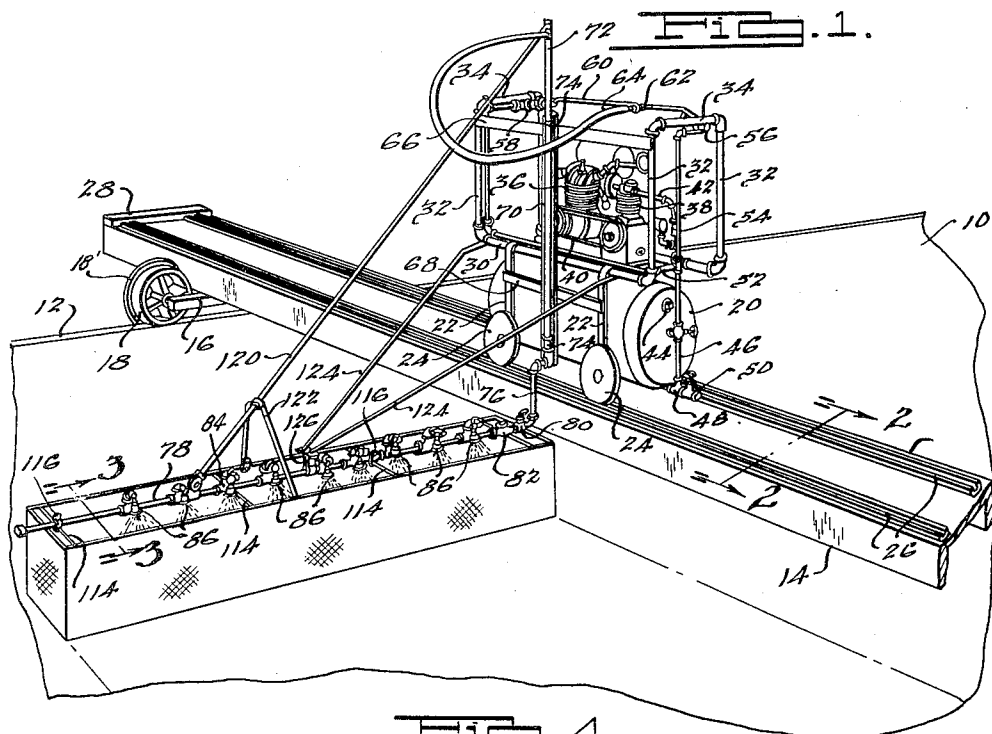


FIG. 2.

FIG. 3.

FIG. 4.

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SPRAYING APPARATUS

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2 Claims. (Cl. 91—44)

This invention relates to spraying apparatus and particularly to apparatus of this type by means of which a spray of material may be applied in the uniform amount to an extended surface in a quick, easy, and accurate manner.

Objects of the invention include the provision of spraying apparatus including a bridge adapted to span a surface to be sprayed, and spraying apparatus including a plurality of spray nozzles movable over said bridge to cover said surface contiguous therewith with a uniform coating of material; the provision of a construction as above described in which the spraying apparatus per se is formed into a unit which is movable back and forth across the bridge as a unit; the provision of a construction as above described in which the spraying apparatus includes an engine driven air compressor and a material container into which the compressor exhausts for the purpose of applying pressure to the material therein, a plurality of spray nozzles mounted as a unit therewith and projecting laterally beyond the associated bridge, together with means securing all of the parts together and mounting them for movement lengthwise of the associated bridge; the provision of a construction as above described so constructed and arranged as to enable it to be operated from either end thereof; the provision of a construction as above described in which the spray nozzles are vertically adjustable as a unit with respect to the surface to be coated; the provision of a construction as above described including a plurality of spray nozzles fed from a common source together with means for preventing one or more of the nozzles from being plugged by foreign material; the provision of a construction as above described including a plurality of spray heads or nozzles arranged to simultaneously discharge a spray of highly mobile liquid upon a surface to be covered thereby, and a wind screen or shield arranged in surrounding relation to all of the nozzles to prevent deflection of the spray therefrom by wind or the like; and the provision of a construction as above described in which the bridge is provided with means for receiving and guiding the wheels of the spray unit during the movement of the spray unit longitudinally of the bridge.

Other objects of the invention include the provision of a construction as above described in which each end of the bridge is provided with rollers or the like arranged on axes extending longitudinally of the bridge, whereby the bridge and the spray unit carried thereby may be moved as a unit in a direction transverse to the length

of the bridge; the provision of a construction as above described in which the rollers at opposite ends of the bridge are spaced from each other by a distance equivalent to the retaining forms on opposite sides of a roadway and are formed for reception on and guiding movement by such retaining forms; the provision of a construction as last described in which the spray unit is movable back and forth across the bridge so as to enable material to be discharged therefrom upon the full width of the roadway between the retaining forms; and the provision of a construction as above described which is particularly adaptable to applying curing compounds or materials to the surface of unset concrete roadways.

The above being among the objects of the present invention the same consists in certain novel details of construction and combinations of parts to be hereinafter described with reference to the accompanying drawing, and then claimed, having the above and other objects in view.

In the accompanying drawing which illustrates a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a fragmentary perspective view of apparatus constructed in accordance with the present invention shown mounted on the retaining forms at opposite sides of a freshly laid concrete highway, a portion of the latter of which is indicated in the figure;

Fig. 2 is an enlarged transverse, sectional view of the bridge structure shown in Fig. 1 taken as on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged transverse, sectional view of the spray head and shield assembly of the structure shown in Fig. 1 and taken as on the line 3—3 thereof; and,

Fig. 4 is an enlarged vertical sectional view taken axially through the filter element employed between the spray heads and the material tank in the construction illustrated in Fig. 1.

In its broader aspects the present invention is applicable for use in any case where it is desired to spray a liquid coating upon a relatively extended and approximately horizontal surface, but inasmuch as it has been particularly designed for, and in its narrower aspects relates to, the application of a curing compound or material to the surface of a freshly laid and unset concrete roadway or highway, its description herein will be limited to the latter use. Those skilled in the art, however, will recognize this application to other and broader uses from the description herein given.

It is well known that in the practice of laying concrete roads, certain liquid compositions are applied to the freshly finished surfaces with the purpose in mind that the mixing water will be sealed in. These liquid compositions are called curing compounds, membrane seal coats, or liquid seal coats and are characterized by being able, to a greater or lesser degree, to prevent evaporation of water from freshly laid concrete surfaces. These compositions are further characterized by having a very low viscosity; in other words, they are very mobile.

In the past these compounds have been applied to the surface of a road by forcing the same in liquid state and under pressure through a single small and manually controlled and supported spray nozzle, with the result that the liquid has been atomized or broken up into a fine or coarse mist, depending upon the type of nozzle, pressure, etc., and has been directed against the surface of the roadway and deposited thereon in the form of a relatively thin film. Heretofore, the common practice has been to apply these liquid curing compositions by means of the same or substantially the same type of apparatus as is used for applying insect sprays to trees, shrubs, or the like and the character of the operation will thus be readily understood.

It will be appreciated that the film applied to the surface of the road by such means is continuous and uniform only when the operator makes the same number of motions in the same period of time on one area as he does on another. Accordingly, it will be appreciated that such past practice has been a "hit and miss" affair, it being a quite common observation that certain areas will be practically devoid of curing compound while other areas will have a great excess thereof. The practical result of this prior procedure has been to a large extent, and in many cases, to nullify the purpose of the curing compound for, unless it is applied uniformly and at a rate as recommended by the manufacturer, the concrete may be improperly cured. A further disadvantage of the prior practice as above described is that the spray stream is easily deflected away from the work by wind or gusts of air which further contributes to the uneven and non-continuous nature of the applied coating.

In accordance with the present invention means are provided whereby such coating may be applied to the surface of a roadway in an even, continuous and unbroken manner resulting in a continuous coating of substantially constant thickness over the entire surface. Additionally, it permits such coating to be applied at a much faster rate than is possible with the conventional methods and in a manner considerably less tiresome to the workmen performing the operation. In carrying out the present invention a bridge is provided of slightly greater length than the width of the strip of roadway to be treated so that it may extend transversely across and beyond the entire width of the roadway. Its opposite ends are provided with wheels for reception on the retaining forms at the opposite sides of the roadway being formed not only to support the bridge above the surface of the roadway but also to permit it to be rolled bodily in the direction of the length of the roadway. Preferably such wheels are flanged so as to cooperate with the retaining forms to maintain the bridge in its proper position on the retaining forms and with respect to the roadway.

On the upper surface of the bridge thus provided is mounted a spray unit for bodily movement over the length of the bridge. This spray unit includes among other things a material receiving tank and a motor driven compressor for applying air pressure to the contents thereof together with a group of spray nozzles operatively connected to the material in the tank and arranged to project laterally over the side of the bridge and into cooperating relationship with respect to the surface of the roadway so that the material discharged therefrom will be directed against the surface of the roadway. The spray unit is preferably constructed so that the flow of material from the material tank to the spray heads may be controlled from either end of the same and a shield is preferably provided about the spray nozzles so as to minimize the effect of any wind that may be blowing on the spray discharged from the nozzles. The spray heads are preferably adjustable as a unit vertically with respect to the surface of the roadway and the shield is preferably vertically adjustable therewith so that they may be accommodated to the desired close relation with respect to the surface of the roadway. The spray unit is mounted upon rollers so that it may be readily moved from one end of the bridge to the opposite end thereof and means are preferably provided cooperating between the bridge and the spray unit to guide the spray unit in its movement over the bridge.

Any number of spray heads may, of course, be provided within practical limits but it may be stated that a sufficient number to cover a width of from five to ten feet has been found satisfactory in service.

It will be appreciated that in operation the device of the present invention is mounted on the side retaining forms of the roadway for movement longitudinally of the same and is preferably moved along the roadway and operated so as to coat the roadway with the curing compound as fast as the roadway is brought to a finally laid condition, or as shortly thereafter as is practical under the existing conditions, to prevent evaporation of the water therefrom.

Referring now to the accompanying drawing, the numeral 10 indicates a portion of a just completed and consequently unset concrete roadway. As is usual in such circumstances a retaining form 12 is positioned along each side of the roadway to provide a limiting stop for the outward flow of the concrete and to define the side edges thereof. The forms 12 are also conventionally employed for indicating the desired depth of the concrete to be applied and are, therefore, usually flush with the upper surface of the side edges of the roadway when the laying of the concrete is completed. The forms 12 may be either of wood or metal but are usually formed from steel and may be assumed to be formed from this metal for the purpose of the present description. It will be appreciated, of course, that the retaining forms 12 are parallel to each other and are ordinarily located in the same horizontal plane, particularly when located in a straight section of a roadway.

In accordance with the present invention a bridge 14 is extended transversely across the roadway 10 and its ends project a slight distance beyond the retaining forms 12. The bridge 14 may be of any suitable construction and formed from any desired material but for the purpose of

illustration it is shown as of inverted channel section and is assumed to be formed of metal.

Under each end of the bridge 14 are located and rigidly secured to the bridge 14 a pair of transversely extending bar members 16 which preferably extend beyond the opposite sides of the bridge 14. Each pair of bar members 16 are laterally spaced from one another centrally above the corresponding retainer form 12 and a wheel 18 is received between the corresponding ends of each pair of bar members 16 and each is rotatably secured to both of the associated bar members 16 by means of an axle 19. The wheels 18 are preferably provided with a flange 18' on their outer faces so as to engage the outer edge of the corresponding forms 12 and thus maintain the wheels 18 on the retaining forms 12 and maintain the bridge 14 centrally of the roadway 10. The bridge 14 is, therefore, supported in upwardly spaced relation with respect to the roadway 10 and for bodily movement longitudinally over the same.

Mounted on the bridge 14 for a movement lengthwise thereof is a spray unit which in the particular construction shown is built up on a material tank 20 of cylindrical formation arranged with its axis horizontal and longitudinally of the bridge 14. A pair of vertically extending spaced metal bars 22 are welded to each side of the tank 20 adjacent the corresponding ends thereof and a wheel 24 is rotatably secured to the lower end of each bar 22 in supporting relation with respect to the latter. The axes of all the wheels 24 are, of course, parallel to each other and the wheels 24 on each side of the tank 20 in alignment with each other so as to support the tank 20 and parts carried thereby for movement longitudinally of the bridge 14. Any suitable means may be provided for guiding the wheels 24 in their rolling movement over the length of the bridge 14 and as a matter of illustration such guiding means is shown as comprising a pair of transversely spaced upwardly opening channel members 26 suitably secured as by welding or the like to the upper face of the bridge 14 adjacent opposite side edges thereof. The channels 26 are spaced the same distance as the lateral spacing of the rollers 24 on opposite sides of the tank 20 and such wheels or rollers are received therein. Cross-bars 28 are provided at opposite ends of the bridge 14 in order to provide a stop for engagement with the wheels or rollers 24 to prevent the spray unit from running off the ends of the bridge 14.

The upper ends of the bars 22 at the corresponding ends of the tank 20 are preferably connected together and receive thereon a frame, shown as being formed of lengths of pipe and pipe fittings and including lower horizontal runs 30 on each side of the tank 20 terminating at each end in upwardly extending runs 32, the upper ends of which at each end of the tank 20 are connected together by means of a cross-bar 34. Within the framework thus provided is mounted a small air-cooled gasoline engine of conventional construction and an air compressor 38 of conventional construction connected to the engine 36 for driving movement therefrom by means of a conventional belt drive 40. The discharge side of the compressor 38 is connected to the material tank 20 by means of a pipe or tube 42 so as to enable the interior of the tank 20 to be placed under pressure.

The tank 20 is provided with a filler plug 44 adjacent the top thereof and in such position as

to insure a material body of air remaining in the tank 20 after the same has been filled with curing compound to its capacity while in the position shown. A discharge pipe 46 is connected into the bottom of the tank through a fitting 48, the latter also being connected to a valve 50 through which the tank may be emptied independently of the spray nozzles whenever the occasion requires. The discharge pipe 46 extends upwardly as shown to the level of the lower runs 30 of the framework where it branches into two branches 52 and 54. The branch 54 extends directly upwardly to approximately the level of the frame cross-bars 34 and thence to the left, as viewed in Fig. 1, to approximately the plane of the right-hand vertical runs 32 of the framework where it is provided with a control valve 56. The run 32 is extended forwardly along the lefthand frame run 30, as viewed in Fig. 1, to the opposite end of the unit, then vertically to approximately the plane of the corresponding cross-bar 34 and thence across the same where it is provided with a control valve 58. The control valves 56 and 58 are connected together by means of a pipe or tube 60 the latter of which is centrally provided with a T 62 to one end of which a flexible tube 64 is secured.

A bar 66 is extended between the upper ends of the lefthand vertical run 32 of the framework as viewed in Fig. 1 and is rigidly secured thereto, and a similar but shorter bar 68 is extended between the vertically extending bars 22 on the same side of the tank 20. A vertically extending channel 70 is secured centrally to the bars 66 and 68 with the lower end thereof vertically spaced with respect to the cooperating guide channel 26 on the bridge 14. The channel of the channel member 70 opens outwardly and vertically slidably receives therein a tube or pipe 72 which is secured in its vertically adjustable position in the channel 70 by means of conventional U-bolts 74 which surround the pipe 72 and serve to draw it into clamped relation with respect to the channel 70. The flexible tube 64 is connected to the upper end of the pipe 72.

The lower end of the pipe 72 is connected through a pair of elbows and a nipple to a short vertical length of pipe 76 which extends downwardly along the side of the bridge 14. The lower end of the pipe 76 is connected to a pipe line 78 which extends outwardly from the corresponding side of the bridge 14 in perpendicular relationship thereto and in parallel relation with respect to the surface of the road 10. The pipe line 78 is connected into the pipe 76 through a shut off valve 80 and a strainer filter member 82. At spaced intervals over its length the pipeline 78 is provided with T fittings 84 therein each of which, as best brought out in Fig. 3, is connected through a plurality of nipples and fittings to a conventional type of nozzle or spray head 86 directed downwardly towards the surface of the road 10 as viewed in Fig. 3. The nozzles 86 are so spaced from one another longitudinally of the pipe line 78 that the spray from adjacent nozzles overlap each other lengthwise of the pipe line 78 so as to insure complete coverage of the road surface over the length of the pipeline 78 within which the nozzles 86 are located.

It will be appreciated, of course, that in a construction of this type, if a particle of foreign material of sufficient size to block the opening in any one of the nozzles 86 was permitted to pass into the pipeline 78 where it could pass into one of the nozzles 86 and block it, it would immedi-

ately prevent complete coverage of the road surface by the apparatus described. This is the reason that the strainer or filter member 82 is connected into the pipe line 78 at the entrance end of the same. While any suitable form of strainer or filter element may be employed capable of effectively filtering out any piece of foreign material of a size sufficiently large to block any one of the nozzles 86, one suitable type of construction for the same is illustrated in Fig. 4 and comprises a hollow main body portion 90 having an inlet passage 92 and an outlet passage 94. The passages 92 and 94 are separated from one another by an intermediate wall 96 provided with a cylindrical opening 98 therein. The body 90 is provided with an open side closed by a cover or cap 100 to which is secured and sealed a filter or strainer member comprising a cage 102 surrounded by a fine wire mesh screen 104. The lower end of the cage 102 is hollow but circumferentially unbroken and closely fits into the opening 98. The liquid flowing through the inlet port 92 thus flows up through the opening 98 centrally of the screen 104 and thence radially outwardly therethrough to the outlet port 94. Upon removing the cap or cover 100 the screen 104 may be removed therewith for cleaning at suitable intervals.

In order to prevent any wind, when blowing, from affecting the proper placement of the spray from the various spray heads 86, these spray heads are preferably surrounded by a wind screen. As best illustrated in Fig. 3, this wind screen comprises a metallic frame indicated generally at 110 and of rectangular construction the sides of which are closed by a fabric or other covering 112 suitably secured to the frame. As best brought out in Fig. 1, at intervals over its length the frame is provided with cross-members 114 between the upper side members thereof and to which cross-members are secured brackets 116 which are engaged about the pipeline 78. As best brought out in Fig. 3, the lower edge of the wind screen thus provided is normally arranged in upwardly spaced but relatively close relation with respect to the upper surface of the roadway 10 being treated and is of sufficient width as to be out of interfering relationship with respect to the spray being directed downwardly onto the road surface through the spray heads or nozzles 86. It will be appreciated that the wind screen thus described provides a volume of relatively quiet air within it regardless of wind blowing outside of it and thus insures the spray from the heads 86 being properly and evenly applied to the road surface.

The outer end of the pipeline 78 and the wind screen just described are preferably braced against sagging at their outer ends. In the construction shown in Fig. 1 this is accomplished by extending a rod 120 from the upper end of the pipe 72 to the pipeline 78 adjacent the outer end thereof and suitably securing it to both of them. An additional brace rod 122 is extended between the rod 120 and the opposite sides of the wind screen as indicated in Fig. 1 to maintain the wind screen horizontal and from turning about the axis of the pipe-line 78. Additionally, in order to maintain the pipeline 78 in perpendicular relationship with respect to the length of the bridge 14 a pair of brace rods 124 are extended from opposite ends of the framework on the tank 20 to a bracket 126 secured to the pipeline 78 approximately midway between the opposite ends thereof.

It will be appreciated from the foregoing that the spray unit including the material tank 20 and all of the parts secured thereto comprises a unitary assemblage supported by the rollers 24 and movable as a unit over the length of the guide tracks 26 from one end of the bridge 14 to the opposite end thereof. It will be further appreciated that if the unit is operated to direct spray of material from the material tank 20 through the nozzles 86 upon the surface of the road the road surface will be covered uniformly by the spray material from the nozzle 86 for a length equal to the combined length of coverage of the spray heads 86 longitudinally of the pipeline 78 for the full width of the roadway each time the unit is passed over the length of the bridge 14. In actual operation the unit is operated across the width of the roadway, the bridge 14 is then moved along the retainer forms 12 a distance equal to the width of the sprayed strip, and the unit is moved back across the bridge while it is being operated to discharge the spray onto the road surface, and these operations are repeated as long as the occasion demands. Accordingly, it will be appreciated that by the use of this apparatus a curing compound may be applied to the surface of a roadway in a uniform and completely continuous condition.

By the use of the particular framework described and particularly because of the provision of the cross-bars 34 which serve as handles, it will be appreciated that a workman may operate the spray unit over the length of the bridge while at either end thereof. The provision of the two valves 56 and 58 at opposite ends of the unit permit the workman to control the application of the spray to the road surface regardless of which end of the unit he is at. This feature is of material advantage inasmuch as it eliminates the requirement of the workman climbing over the spray unit to get from one end thereof to the opposite end as would be the case if the control of the spray was at one end only. It will be appreciated, of course, that either the valve 56 or the valve 58 may be employed to control the flow of the compound from the material tank 20 to the spray nozzles 86 and that when the unit reaches one side of the roadway the valve will be closed off to discontinue the spray of the compound onto the surface of the roadway until the bridge 14 has been moved down the roadway to the position required for spraying the next strip of the same. The shut-off valve 80 is preferably employed so that when the spraying operation is discontinued for any material length of time the possibility of any drip from the nozzles 86 may be effectively eliminated.

Having thus described my invention what I claim by Letters Patent is:

1. In a device of the type described, in combination, an elongated bridge member, wheels under opposite ends of said bridge member arranged with their axes in parallel relation with respect to the length of said bridge member for supporting said bridge member above a surface to be treated, a spray unit including a material supply tank and a motor driven compressor connected to said material supply tank, wheels rotatably supporting said tank and compressor on said bridge member for movement longitudinally thereof, means on said bridge member cooperating with the last mentioned wheels for guiding said spray unit in its movement longitudinally of said bridge member, a plurality of spray heads operatively connected with said material tank and projecting laterally beyond one side of said bridge

member, means securing said spray nozzles in vertically adjusted position fixedly with respect to said spray unit, and a wind guard surrounding said spray head as a unit and movable bodily therewith.

2. In a device of the type described, in combination, an elongated bridge member, wheels under opposite ends of said bridge member arranged with their axes in parallel relation with respect to the length of said bridge member for supporting said bridge member above a surface to be treated, a spray unit including a material supply tank and a motor driven compressor connected to said material supply tank, wheels ro-

5 tatably supporting said tank and compressor on said bridge member for movement longitudinally thereof, means on said bridge member cooperating with the last-mentioned wheels for guiding said spray unit in its movement longitudinally of said bridge member, material spreading means operatively connected with said material tank and projecting laterally beyond one side of said bridge member, means securing said spreading means in position with respect to said spray unit, and a wind guard surrounding said spreading means as a unit and movable bodily therewith.

10
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