

June 4, 1946.

H. L. LEWIS

2,401,431

PAINTING MACHINE

Filed Nov. 23, 1942

3 Sheets-Sheet 1

Fig. 1.

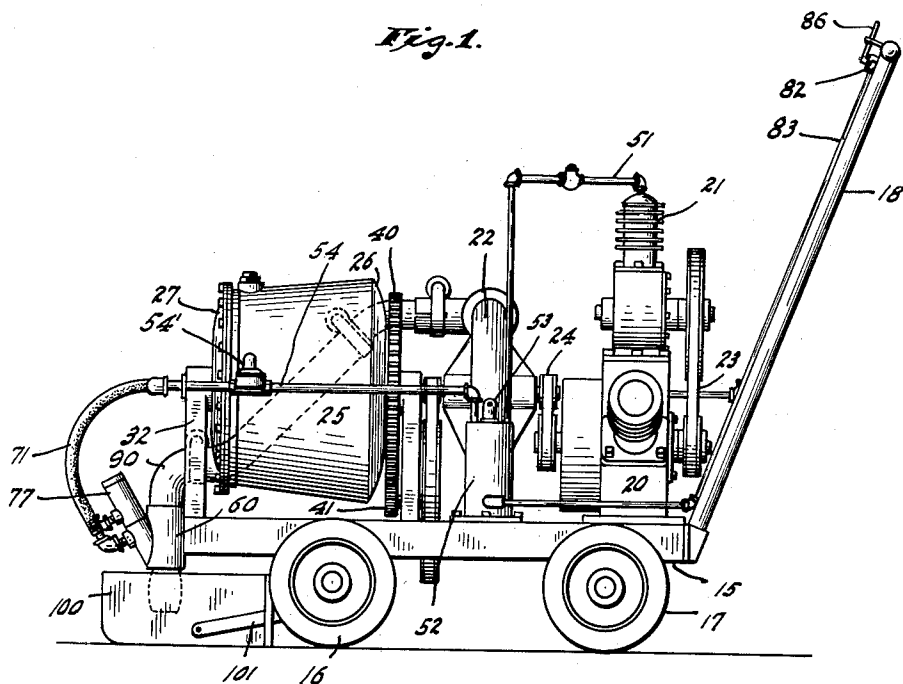
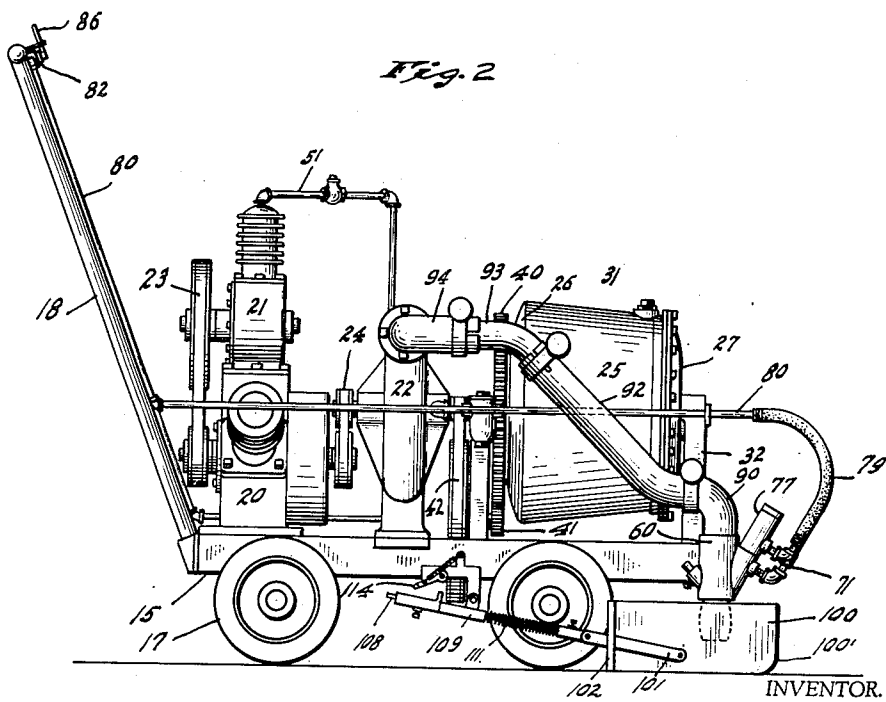


Fig. 2.



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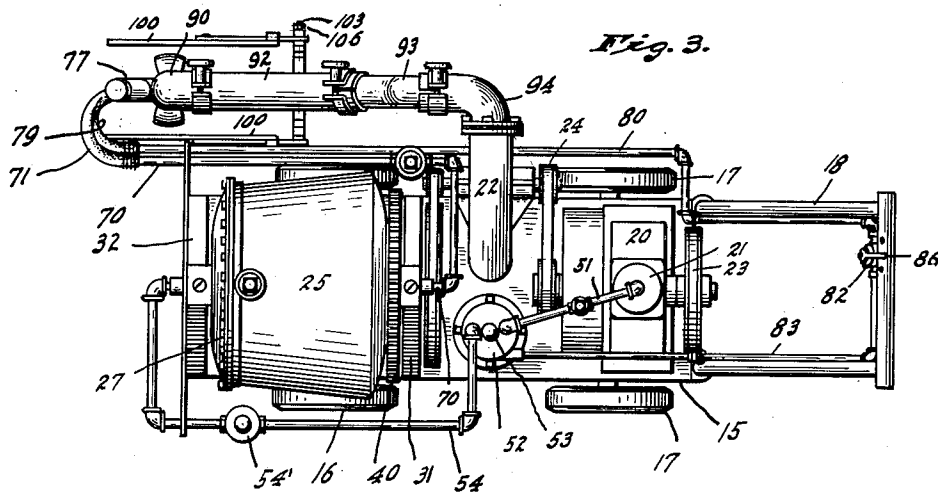


Fig. 4.

Fig. 5.

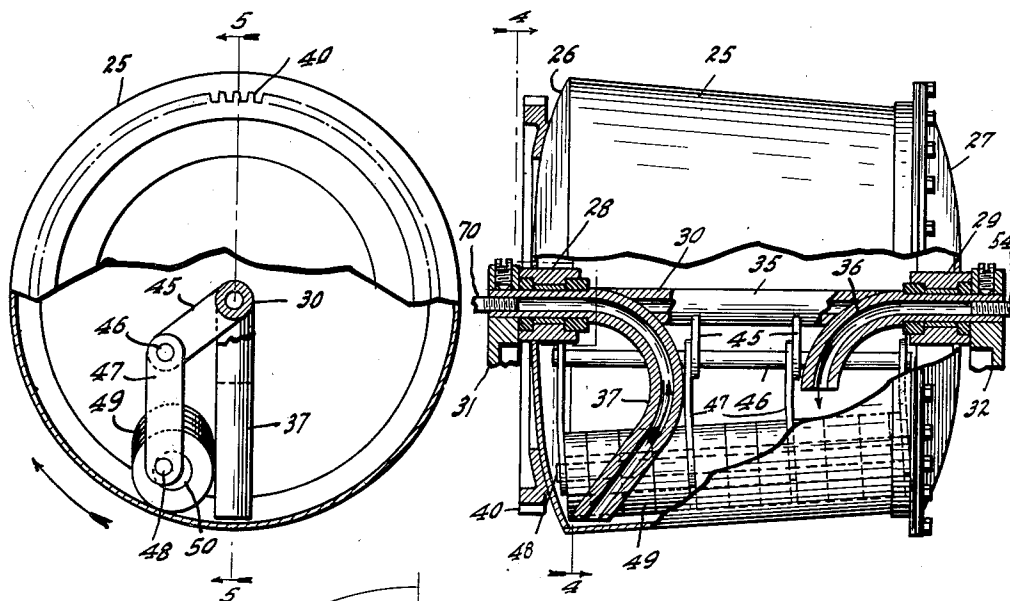
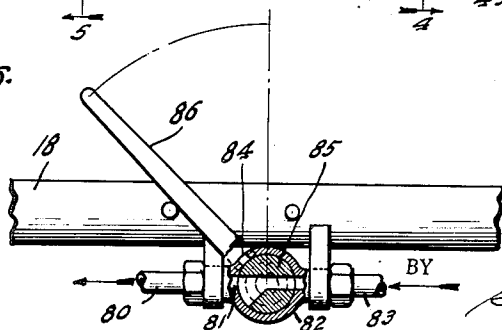


Fig. 6.



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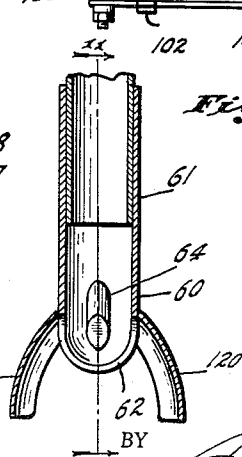
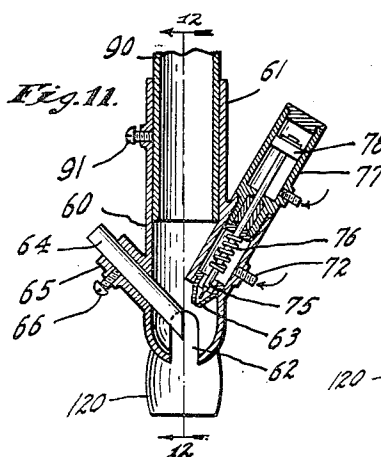
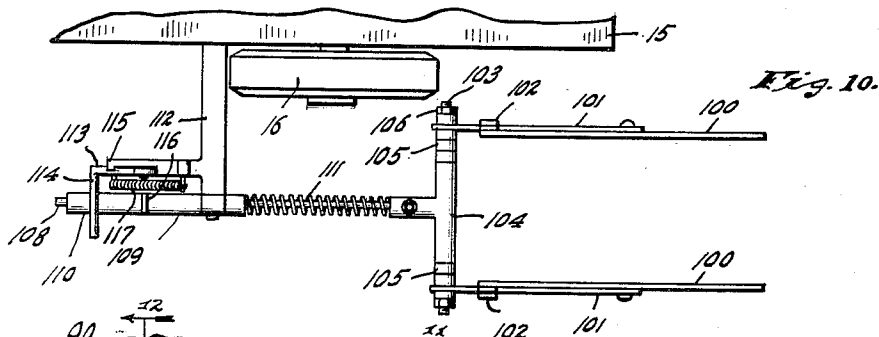
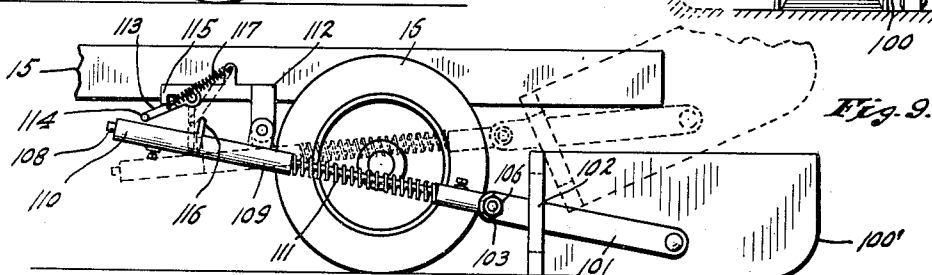
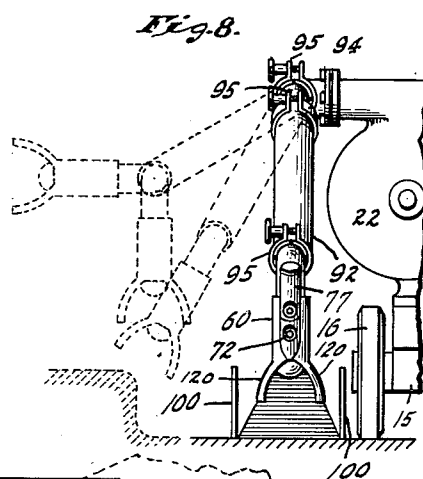
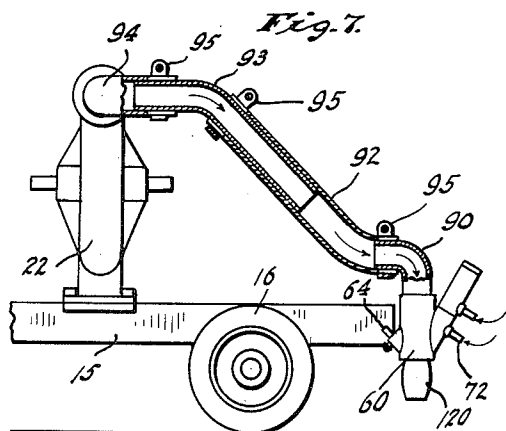
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,401,431

PAINTING MACHINE

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Application November 23, 1942, Serial No. 466,578

10 Claims. (Cl. 91—12)

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It is the object of my invention to produce a machine which can be used for applying paint in the form of stripes to floors, sidewalks, pavements, walls, and curbs. More specifically, it is my object to produce a simple and compact machine in the form of a vehicle which will carry a supply of paint and the apparatus necessary to apply said paint in the form of a stripe as the vehicle moves along a supporting surface. A further object of my invention is to maintain the paint-supply in such a machine agitated in such a way as to prevent settling of the pigment and formation of a paint film on the walls of the paint container. Still another object of my invention is to produce a simple spray nozzle which will deliver paint in the form of a flat spray of substantially uniform width at the point where it impinges upon the surface to which the paint is to be applied. An additional object of my invention is to produce a machine which is adjustable to vary the width of the paint-stripe.

In carrying out my invention, I mount upon a suitable vehicle an engine or other source of power, an air compressor, a blower, and a paint drum containing the supply of paint to be used. Desirably, the paint drum is arranged for rotation about a horizontal axis and is provided internally with agitating means which keeps the paint agitated as the drum is revolved. The paint drum is hermetically sealed so that air supplied to it from compressor will force paint from it to a discharge nozzle which is also carried upon the vehicle. This nozzle is associated with a head to which air from the blower is led, the nozzle discharging obliquely into the head and impinging therein upon a flat surface which forms the stream of paint into a flat sheet-like spray that will be carried by the air stream discharged from the blower into contact with the surface to be painted. The discharge head is adjustably mounted upon the vehicle so that it can be supported in various positions and arranged to discharge at various angles in each position.

The accompanying drawings illustrate my invention: Figs. 1 and 2 are left and right side elevations of the complete machine; Fig. 3 is a plan view of the machine; Fig. 4 is an end elevation of the paint drum in partial section on the line 4—4 of Fig. 5; Fig. 5 is a side elevation of the paint drum in partial section on the line 5—5 of Fig. 4; Fig. 6 is a detailed view illustrating the valve by which discharge of paint is controlled; Fig. 7 is a fragmental side elevation in partial section illustrating means by which the

discharge head is supported and supplied with air; Fig. 8 is a fragmental front elevation of the machine illustrating some of the various possible positions of the discharge head; Fig. 9 is a fragmental side elevation similar to Fig. 2 but on an enlarged scale showing details of construction; Fig. 10 is a plan view of the structure illustrated in Fig. 9; Fig. 11 is a section on the line 11—11 of Fig. 12 showing details of the discharge head; and Fig. 12 is an axial section on the line 12—12 of Fig. 11.

The machine shown in the drawings and specifically described herein is adapted for hand manipulation, but it is to be understood that my invention is not limited in its application to hand propelled machines. The machine illustrated comprises a frame 15 supported on front wheels 16 and rear wheels 17. At the rear end of the frame 15, a propelling handle 18 extends obliquely upwardly and rearwardly to an appropriate height so that an operator can propel the machine ahead of him as he walks.

Upon the frame 15, and desirably near the rear thereof, I mount a source of power such as a gasoline engine 20 which is operatively connected to an air compressor 21 and a blower 22. Conveniently, the air compressor 21 is mounted upon the engine 20, while the blower 22 is mounted upon the frame 15 in advance of the engine. As shown, the air compressor 21 and the blower 22 are driven from the engine 20 by means of belt drives 23 and 24, although other forms of driving means may be used if desired.

Supported from the frame 15 in advance of the blower I have illustrated a paint drum 25 which is mounted for rotation about a horizontal axis extending longitudinally of the frame 15. The drum 25 is closed at one end by an end wall 26 while the opposite end is provided with a removable closure or cover 27. The end wall 26 and cover 27 are provided respectively with bearings 28 and 29 for the reception of a stationary shaft 30 supported at its ends beyond the drum in brackets 31 and 32 extending upwardly from the vehicle frame 15.

As previously indicated, paint is forced from the paint drum 25 by the action of air under pressure supplied thereto; and the shaft 30 is accordingly arranged to permit the introduction of air into the drum and the discharge of paint therefrom. Conveniently, the shaft 30 is a composite structure formed of an intermediate portion 35 welded to end portions in the form of elbows 36 and 37. The elbows 36 and 37, at least, are formed of pipe, desirably thick-walled

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pipe, and their outer ends are coaxial and machined to provide bearing portions for reception in the brackets 31 and 32 and in the bearings 28 and 29. The elbow 36, which as shown is the air inlet elbow, discharges laterally within the drum 25; while the other elbow 37 extends downwardly within the drum approximately to the lowermost point thereof. Conveniently, the drum 25 is frusto-conical in form, and the elbow 37 is located at the larger end of the drum so that substantially all the paint therein may be discharged through the elbow 37. As illustrated, the elbows 36 and 37 have bends of large radius, so that a flexible cleaning element can readily be inserted into and passed through them from outside the drum.

To the end wall 26 of the drum 25 I secure a ring gear 40 which meshes with a pinion 41 rotatably supported from the bracket 31 and adapted to be driven from the engine 20, as by means of a belt drive 42 interconnecting the shaft of the blower 22 and the pinion 41.

Between the elbows 36 and 37 there are secured to the intermediate shaft-portion 35 a pair of downwardly oblique arms 45 (Fig. 4) which serve to support a rod 46 that extends axially of the drum to points near the opposite ends thereof. To the rod 46 I secure a plurality of downwardly extending arms 47 of graduated length which serve to support the ends and intermediate portions of a second rod 48 that is generally parallel to the adjacent portion of the frusto-conical side wall of the drum 25. Upon the rod 48 is a series of rollers 49 having central openings 50 materially larger than the rod 48 so that they may rest upon and be supported by the frusto-conical wall of the drum 25. As the drum 25 revolves in the operation of the machine, the rolls 49 serve to break up any lumps of pigment in the paint and to prevent the building-up of a paint film on the drum-wall, while rotation of the drum keeps the paint agitated and the pigment uniformly suspended therein.

Air from the compressor 21 is supplied through a pipe 51 to a tank 52 equipped with a safety valve 53 adapted to open when the pressure within the tank attains a predetermined maximum. From the tank 52, air is conveyed through a pipe 54 to the inlet elbow 36 associated with the tank drum 25. It is usually advisable to provide in the pipe 54 a pressure-reducing valve 54'.

The discharge head 60, which is perhaps best illustrated in Figs. 11 and 12, comprises a hollow cylindrical body portion 61 having a hemispherical lower end provided with a transverse slot 62 of considerable width. Extending obliquely into the head 60 is a discharge nozzle 63 which discharges transversely of the slot 62 and at a point slightly above the upper ends thereof. In the side of the discharge head opposite the nozzle 63 there is mounted a deflector member 64 conveniently in the form of a round rod slidably received in a boss 65 on the side of the discharge head and adapted to be held in adjusted position by means of a set screw 66. The inner end of the deflector 64 is struck off obliquely so as to provide a substantially vertical end face located approximately on the axis of the head in position to receive the paint-jet discharged from the nozzle 63 and to form such jet into a relatively flat, diverging spray.

Paint is supplied to the nozzle 63 through a pipe 70, which is connected to the discharge elbow 37 of the paint drum 25, and through a flexible hose 71 (Fig. 3) which connects the end of

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the pipe 70 with a nipple 72 (Fig. 11) mounted in the side of the discharge head 60 and communicating with the nozzle 63. For the purpose of controlling the discharge of paint from the nozzle 63, there is desirably associated therewith an axially movable needle valve 75 biased toward closed position, as by a compression spring 76. Desirably, the valve member 75 is adapted for remote control, and to this end it extends through a stuffing box into a fluid-pressure cylinder 77 within which it is provided with a piston 78. The cylinder 77, at a point below the piston, is connected by a hose 79 and pipe 80 with the discharge port 81 (Fig. 6) of a three-way valve 82 conveniently mounted upon the handle 18, as will be clear from Figs. 3 and 6. The inlet port of the valve 82 is connected by a pipe 83 with the storage tank 52. In addition to the inlet and discharge ports, the casing of the valve 82 also has a vent port 84; and the movable valve member 85 of the valve can be moved under the control of an operating handle 86 to connect the discharge port 81 either to the supply port or to the vent port 84. With the discharge port 81 connected to the supply port, as in the position illustrated in Fig. 6, air under pressure will be supplied from the tank 52 through the pipes 83 and 80 and the hose 79 to the cylinder 77, thus forcing the piston 78 therein upwardly and opening the valve member 75 against the force of the spring 76. If the operating handle 86 of the valve 82 is moved to the dotted-line position shown in Fig. 6, the valve-port 81 will communicate with the vent port 84, while the inlet port of the valve will be closed; and in this position of the valve, the spring 76 will move the valve member 75 to closed position, air in the cylinder 77 be exhausted through the hose 79, pipe 80, and ports 81 and 84.

For the purpose of supporting the discharge head 60, the cylindrical body portion 61 of the latter telescopically receives the lower end of 90° elbow 90, being secured in place thereon as by means of a set screw 91. The other end of the elbow 90 is received in the horizontally bent end of an obliquely extending conduit 92, the opposite end of which receives one end of a 45° elbow 93 the opposite end of which is horizontal received within a third elbow 94 communicating with the discharge opening of the blower 22. The ends of the conduit 92 are split and provided with clamp-collars 95 by means of which their attachment to the elbows 90 and 93 may be made secure. The outer end of the elbow 94 is also desirably split and provided with a clamp collar 95, in order to secure it to the elbow 93.

The parts just described provide a mounting for the discharge head 60 which is capable of extensive adjustment, thus making it possible to employ a machine embodying my invention not only for the purpose of striping a pavement or floor, as illustrated in full lines in Fig. 8, but also for other uses. Thus, by loosening the clamp collar 95 at the lower end of the conduit 92 and rotating the elbow 90 therein, the head 60 can be arranged to discharge at any angle between the vertical and the horizontal. By rotating the elbow 93 in the elbow 94, the head 60 can be swung upwardly and outwardly relative to the frame of the vehicle, as indicated by the dotted-line showing in Fig. 8; and in any such position, the elbow 90 can be rotated in the conduit 92 to vary the vertical angle at which the head discharges. Desirably, the arms of the elbow 93 are

relatively long, thus making it possible to increase the range of adjustment by sliding the elbow 93 into and out of the elbow 94 and into and out of the conduit 92.

In applying stripes of paint to pavement, floors, and other horizontal surfaces it is sometimes desirable to confine the paint laterally and thus to define positively the margins of the painted stripe. For this purpose, I may employ the apparatus illustrated in Figs. 9 and 10. This apparatus comprises a pair of parallel vertical plates 100 which extend longitudinally of the vehicle on opposite sides of the head 60 and which are adapted to ride upon the pavement, floor, or other surface to be striped. Conveniently, the plates 100 are supported from the vehicle by means which permits them, when in operative position, to have a free vertical movement so that they may follow inequalities of the surface upon which they move; and such supporting means is desirably so arranged that the plates can be elevated out of contact with the supporting surface when it is not desired to use them.

The plate-supporting means illustrated in Figs. 9 and 10 comprises a pair of bars 101 which are pivotally attached respectively to the plates 100 on an axis slightly ahead of the center of gravity of the latter and which extend rearwardly through D-straps 102 secured in vertical position at the rear end of the plates. The rear end of each bar 101 is provided with a hole for the reception of a rod 103. The rod 103 is supported in a horizontal position extending laterally of the vehicle by passing through a T-head 104, carries a plurality of spacing collars 105, and has screw-threaded ends for the reception of nuts 106. By varying the arrangement of the spacing collars relative to the bars 101 and the T-head 104, the position of each plate 100 relative to the T-head 104 can be varied widely to alter the spacing of the plates 100 from each other as well as their lateral disposition relative to the T-head.

To the T-head 104 there is secured a rearwardly-extending rod 108 which is slidably received in a bearing 109 and which has secured to its rear end a stop-sleeve 110. A compression spring 111 acting between the bearing 109 and the T-head 104 urges the rod 108 forward to the limit provided by engagement of the stop sleeve 110 with the bearing 109. By this arrangement, I minimize the possibility of damage should either of the plates 100 strike an object impeding its forward movement and also make it possible to extend a stripe closer to any transversely extending wall or other obstruction than would otherwise be possible. To prevent slight inequalities in the floor or pavement obstructing forward movement of the plates 100, the front lower corners of those plates may be rounded off as indicated at 100' in Fig. 9.

In order to permit the plates 100 to be raised from the supporting surface when it is not desired to use them, the bearing 109 is pivotally supported upon a horizontal transverse axis from a bracket 112 carried by the vehicle frame 15. Also pivoted to the bracket 112 on a horizontal transverse axis is a pedal 113 having a laterally extending portion 114 disposed immediately above the stop-sleeve 110. Movement of the pedal 113 about its pivotal mounting in the bracket 112 is limited by an abutment 115 on such bracket and an abutment 116 on the stop-sleeve. A tension spring 117 acting between an eccentric point on the pedal 113 and the bracket 112 is so arranged that its center-line crosses the axis of pivotal

mounting of the pedal 113 as the latter moves from engagement with the abutment 115 into engagement with the abutment 116 on the stop-sleeve 110.

In the full-line position of the pedal 113 illustrated in Fig. 9, such pedal is held by the spring 117 in engagement with the abutment 115 and out of contact with the sleeve 110. Accordingly, the rod 108 and bars 101 are free to swing as a unit about the axis of pivotal mounting of the bearing 109, while the plates are also capable of individual swinging movement about their axis of pivotal connection to the bars 101, thus permitting the plates to follow inequalities in the supporting surface. If it is desired to operate the device with the plates 100 out of contact with the supporting surface, the operator merely depresses the outer end of the pedal 113, thus bringing the transversely extending portion 114 thereof into contact with the sleeve 110 and forcing the entire assembly of plates 100, rods 108, etc., to rotate about the axis of pivotal mounting of the bearing 109 into the dotted-line position illustrated in Fig. 9. In this position, the spring 117 holds the pedal 113 in contact with the abutment 116, and thus maintains the plates 100 in elevated position. When the plates 100 are raised, their rear ends drop under the influence of gravity to the limit of movement permitted by the D-straps 102, as will be clear from Fig. 9.

When the machine is in operation, the air supplied to the head 60 from the blower 22 is discharged from the slot 62 radially of the hemispherical lower end of the head, or in the form of a fan-shaped jet. The stream of paint leaving the deflector 64, while generally flat and divergent in form, diverges less than the air jet discharged from the slot 62; and the action of the air on the paint stream therefore tends to spread the latter. Because of the divergent character of the paint stream, the width of the stripe it produces can be varied by varying the distance between the head 60 and the surface to which the paint is applied; and such distance can be controlled by appropriate adjustment of the joints in the air-conduit 92-93-94. In addition to increasing the divergence of the paint spray, the air stream also blows dust and loose dirt from the surface to be painted and aids in propelling the paint against such surface with considerable force so that all cracks and depressions will be filled.

As a result of the spreading action of the air on the paint stream some discrete drops of paint might be directed outwardly beyond the limits of the body of the paint spray where they would strike the plates 100 or, in the absence of such plates, would strike the surface to be painted beyond the limits of the stripe, thus creating an undesirable appearance. To prevent this I apply to the head 60 in the plane of the slot 62 two inwardly and downwardly curved air-deflecting wings 120, shown in Figs. 8, 11, and 12. These wings are desirably concave inwardly in cross-section and are considerably wider than the slot 62. They serve to intercept air discharged near the ends of the slot 62 and to deflect such air toward the edges of the paint spray so as to return to the body of the spray any discrete paint drops which are beyond the edges of such spray-body. The lower ends of the wings 120 should lie close to but beyond the edges of the fan-shaped body of the paint spray, and therefore the distance between them should obviously not be less

than the widest stripe which the machine is to produce.

In operation, the head 88 is first adjusted to the position necessary to produce a stripe of the desired width and disposition, and is secured in that position by tightening the clamp-collars 95. If the stripe is to be formed on a horizontal surface, the collars 105 and bars 101 are so arranged on the rod 103 that the plates 100 will lie on that surface at the edges of the stripe to be produced. With the engine running and the plates 100 in contact with the supporting surface as the result of tripping the pedal 113, the valve-handle 86 is moved from the dotted-line to the full-line position of Fig. 6 to open the paint-valve 75, and the machine is pushed along the supporting surface along the path the stripe is to follow. Paint is forced from the drum 25 by compressed air supplied thereto through the pipe 54, is discharged from the nozzle 63, and strikes the deflector 64 to be formed into a substantially continuous, fan-shaped sheet as previously described. As the operator continues to push the machine, the paint-sheet, striking the supporting surface, forms the desired stripe. At the point where the stripe is to stop, the operator moves the valve-handle 86 to the dotted-line position of Fig. 6, thus closing the paint-valve 75 and stopping the discharge of paint. If another stripe is to be produced immediately, the engine may be left running while the machine, desirably with the plates 100 elevated, is moved to the position where such stripe is to start; otherwise, the engine is stopped.

I claim as my invention:

1. A machine of the type described, comprising a wheel-supported frame, a discharge head adjustably supported on said frame and having an air passage extending therethrough, a deflector positioned in said passage and having a paint-receiving surface disposed generally longitudinally of said passage, a paint nozzle discharging obliquely into said passage, said deflector being disposed with its deflecting surface on the axis of said nozzle, whereby the paint-jet discharged from the nozzle will impinge upon said deflecting surface, means for supplying air to said passage, and means for supplying paint under pressure to said nozzle.

2. In a machine of the type described, a discharge head having an air passage and an elongated air-discharge opening curved in a longitudinal plane of the passage to form a divergent air-jet, means for supplying air to said passage, and means for forming within said passage a generally flat jet of paint coplanar with said air-discharge opening and directed thereinto axially of the passage.

3. The invention set forth in claim 2 with the addition of downwardly projecting air-deflecting wings mounted on said head adjacent the ends of said discharge opening to deflect toward said jet of paint air discharged from said air discharge opening adjacent the ends thereof.

4. In a machine of the type described, a discharge head having an air passage and an elongated air-discharge opening curved in a longitudinal plane of the passage to form a divergent air-jet, means for supplying air to said passage, a paint deflector having within said passage a paint-deflecting surface disposed substantially on the axis of the passage and coplanar with said air-discharge opening, and means for directing a jet of paint obliquely against said paint-deflecting surface.

5. A machine of the type described, comprising a wheeled vehicle, means carried by said vehicle for forming a downwardly directed jet of paint, said jet being approximately flat and fan-shaped and disposed in a plane transverse to the direction of movement of said vehicle, said jet being adapted to form a stripe of paint on the surface over which the vehicle moves, a pair of vertical plates extending longitudinally of the vehicle on opposite sides of said paint-jet, and means supporting said plates from said vehicle, said means being adjustable alternatively to support said plates either in contact with the surface upon which the vehicle rests or in an elevated position above such surface, said plates being so disposed laterally of the vehicle that when in their lower position their lower edges will be substantially coincident with the edges of such jet at the point where said jet strikes such surface.

6. The invention set forth in claim 5 with the addition that said jet-forming means is vertically adjustable to vary the width of said jet at the point where it strikes the surface over which the vehicle moves, said plate-supporting means including provisions for varying the distance between said plates whereby to maintain their lower edges in approximate coincidence with the edges of the stripe produced by said jet.

7. A machine of the type described, comprising a wheeled vehicle, means carried by said vehicle for forming a flat, fan-shaped jet of paint disposed in a plane extending transversely of the vehicle and adapted to form a stripe on a surface it strikes as the vehicle is moved, and a pair of plates extending normally to such surface and longitudinally of the vehicle on opposite sides of the paint-jet, said plates being so disposed that they are approximately coincident with the edges of such jet at the point where said jet strikes such surface.

8. In a machine of the type described, a wheeled vehicle, a paint container supported from said vehicle for rotation about a horizontal axis, a plurality of rollers disposed within said container, means loosely supporting said rollers in the lowermost portion of said container in frictional engagement with the side wall thereof, a paint nozzle, means for rotating said container, and means for supplying paint to said nozzle from said container as the latter rotates.

9. The invention set forth in claim 8 with the addition that said container is sealed, said paint-supplying means comprising an air compressor mounted on said vehicle for supplying air under pressure to said container, and a conduit for conveying paint from said container to said nozzle, said conduit including a portion extending from a point in the lowermost portion of the container upwardly and thence axially through an end wall of the container to said nozzle.

10. In a machine of the type described, a discharge head having an air passage extending therethrough, a deflector positioned in said passage and having a paint-receiving surface disposed generally longitudinally of said passage, a paint nozzle discharging obliquely into said passage, said deflector being disposed with its deflecting surface on the axis of said nozzle, whereby the paint-jet discharged from the nozzle will impinge upon said deflecting surface, means for supplying air to said passage, and means for forcing paint through said nozzle.

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