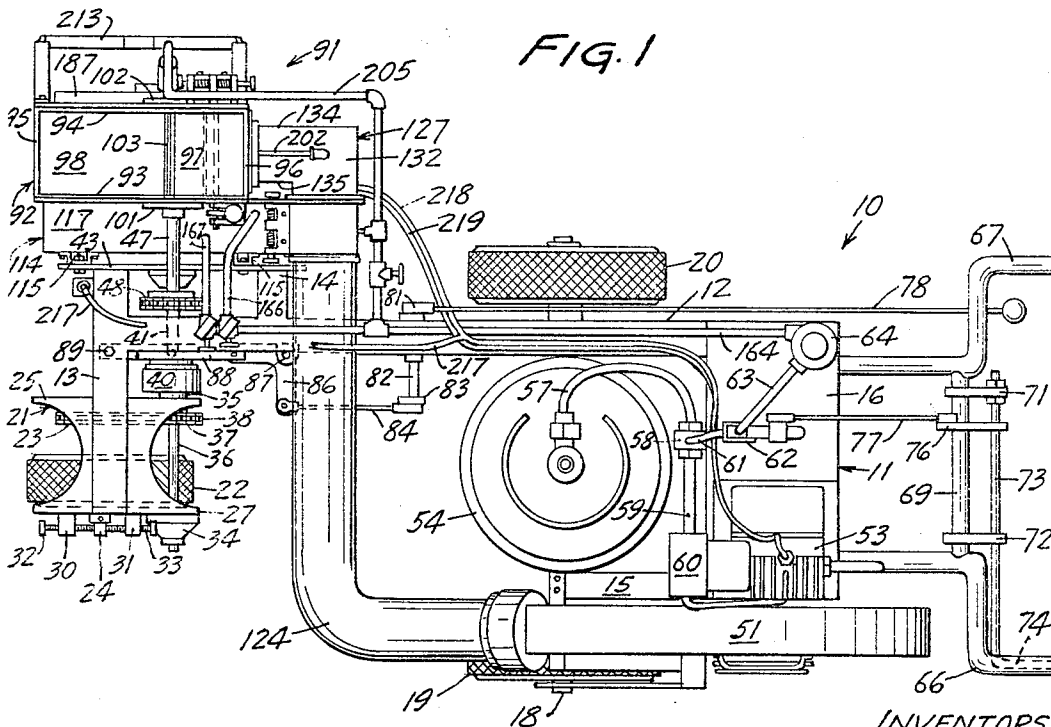
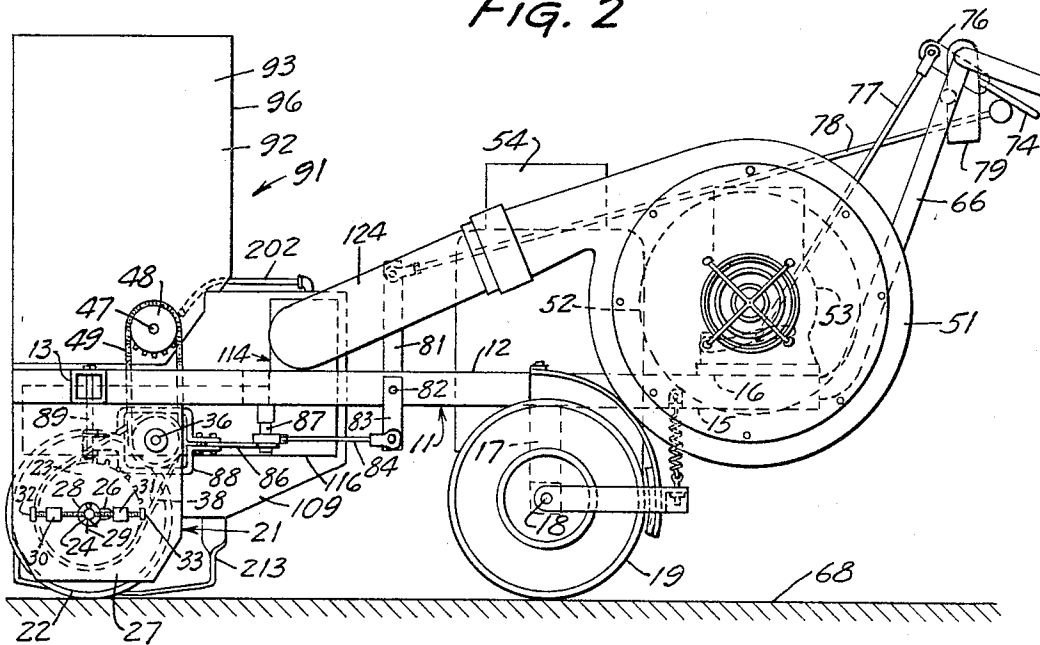


3,279,336

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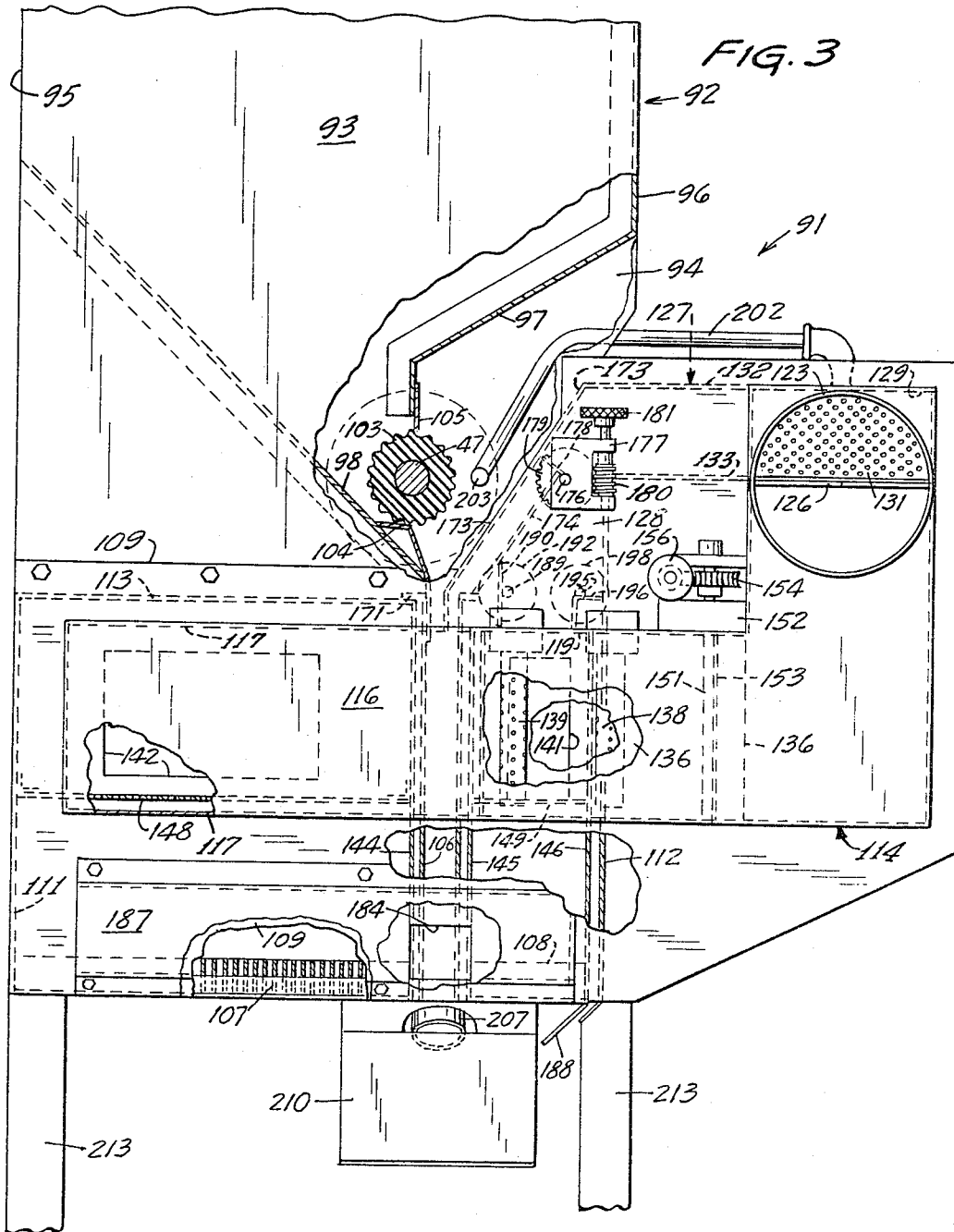
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MARKING MACHINE

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4 Sheets-Sheet 2



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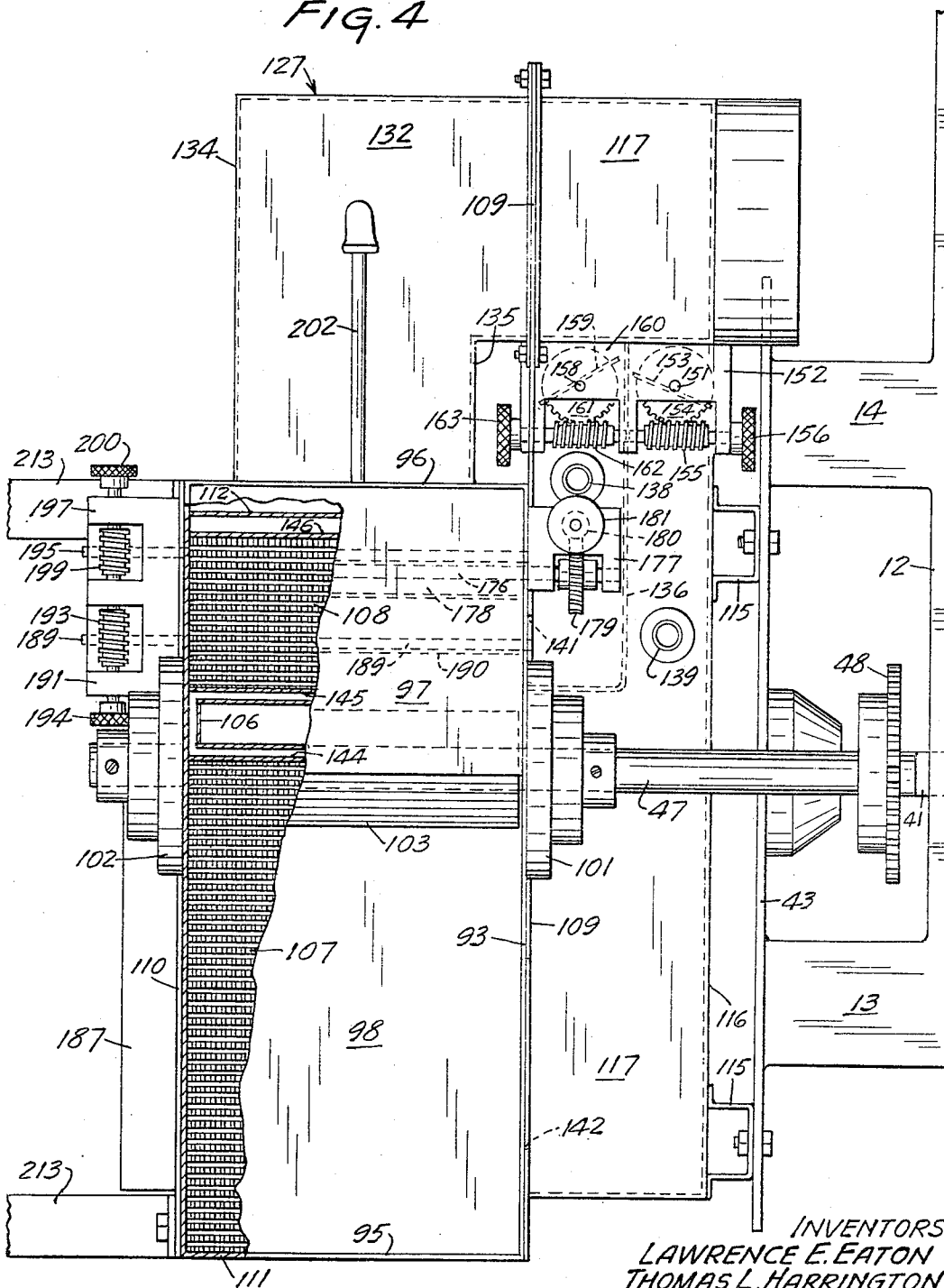
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MARKING MACHINE

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FIG. 4



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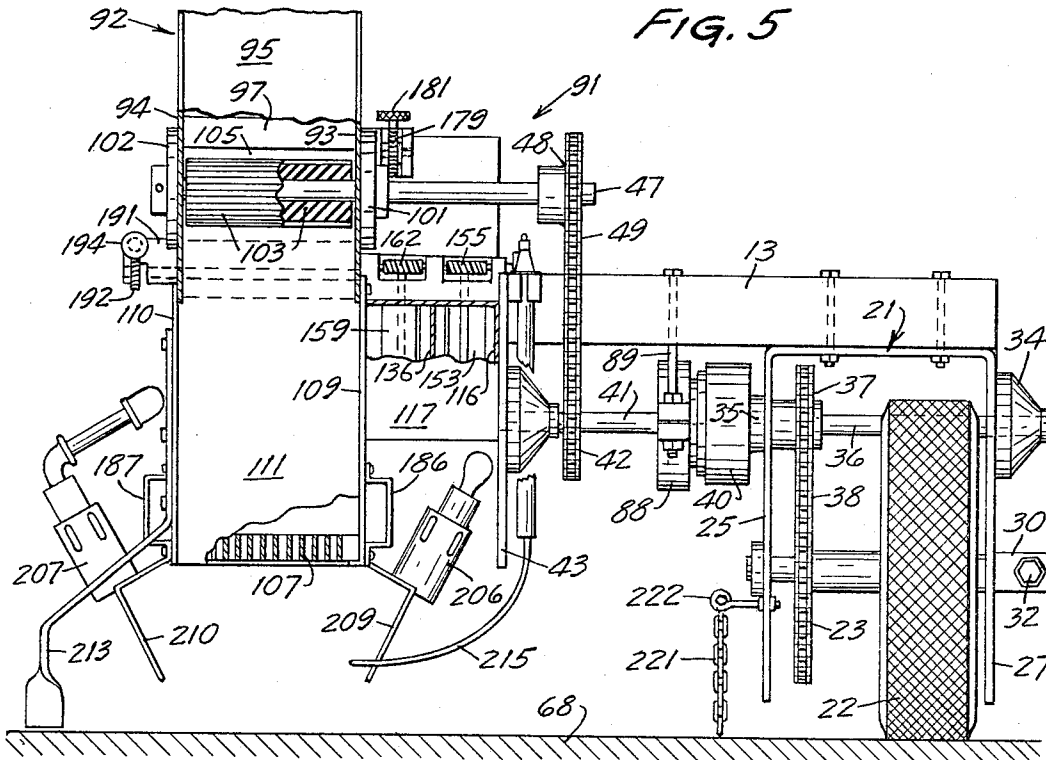
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3,279,336

MARKING MACHINE

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10 Claims. (Cl. 94-44)

This invention relates to an apparatus for applying a marking stripe to a street, road surface or the like to divide the same into zones etc.

There are many methods of laying a stripe or marking on a street to divide the same into zones, i.e., pedestrian walkways, parking zones and center lines. These methods have included such things as applying a pigmented paint by hand, spreading paint by a machine which may brush it or spray it, and spreading liquefied resinous materials by certain flow control and spreading means. In each of these prior methods a lot of effort and time is exhausted in preparing the material to use in making the stripe, preparing the surface to be marked and when using pigment type paints the new stripe must be barricaded until it has had sufficient time to dry before allowing traffic to pass thereover. The time required in the preparation of these striping materials, such as the mixing of paints, the liquefying of resinous materials, the transporting of it and discharging it into the machine which ultimately applies it to the street and the enormous amount of time necessary to clean the equipment after applying stripes of this nature has become exorbitant.

The present invention eliminates these problems and provides a novel apparatus for rapidly making streets or road surfaces. This new apparatus has many advantages over previously known street marking devices in that it substantially reduces the amount of time required to mark streets and also provides a mark which is ready to receive the traffic very soon after its application.

The novel apparatus utilizes a pair of grid-type gaseous fuel burners which use primary air for combustion to produce a uniform high-heat source for preheating the surface to be marked, liquefying the resinous material and post-heating the applied stripe.

An apparatus made in accordance with the present invention has the advantage of time saving in applying markings, as it requires substantially no pre-operational preparation or after use clean up.

Another advantage of the present invention is the provision of an apparatus for marking streets which is extremely easy to operate and which is clean during operation.

A further advantage of the present invention is the provision of a novel apparatus including a wheel supported frame which permits the same to be readily moved into position to apply a mark and to be easily maneuvered so that marks may be applied to the streets during traffic periods.

These and further advantages of the present invention will become more apparent after reading the following detailed description which refers to the accompanying drawing wherein:

FIGURE 1 is a plan view of the apparatus of the present invention;

FIGURE 2 is a side elevational view of the apparatus of the present invention;

FIGURE 3 is a fragmentary side elevational view with portions thereof broken away to show interior details and with some interior elements shown in dotted lines for purposes of clarification;

FIGURE 4 is a fragmentary plan view showing the

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coating apparatus of the present invention with parts broken away and interior elements shown in dotted lines; and

FIGURE 5 is a fragmentary front elevational view of the apparatus made in accordance with the present invention.

Referring now to the drawing and particularly FIGURES 1 and 2 thereof, there is illustrated a road-surface strip applying apparatus, generally designated 10, which is made in accordance with the present invention. The apparatus comprises a wheel supported framework 11 which includes a longitudinally extending tubular main support beam 12, a forward transverse tubular frame member 13, a forwardly disposed laterally extending frame member 14 and a rearwardly positioned longitudinally extending transversely spaced tubular support beam 15 joined to the beam 12 by a plate or deck 16 extending transversely of said beams at the rear thereof.

A U-shaped wheel supporting frame 17 is mounted below the framework 11 ahead of the deck 16 and supports a wheel supporting axle 18 on which a pair of wheels 19 and 20 including pneumatic tires are rotatably mounted. An inverted U-shaped bracket 21 is mounted below the transversely extending frame member 13 at the front of the apparatus 10. A steerable wheel 22, including a pneumatic tire and a hub to which is fixedly joined a sprocket wheel 23, is rotatably mounted on a shaft 24 carried by the bracket 21. The shaft 24 extends through a hole in one plate 25 of the inverted U-shaped bracket 21 and is suitably retained therein against axial movement while the opposite end of the shaft 24 projects outwardly through a slotted opening 26 in the depending plate 27 of said bracket 21. A washer 28 retained on the outer end of the shaft 24 by suitable retaining means such as a cotter pin 29 prevents the shaft 24 from moving axially toward the plate 25. Mounted on the outer surface of the plate 27 is a pair of threaded blocks 30 and 31 through which extend set screws 32 and 33, the opposed ends of which engage the shaft 24 to position the same within the slot 26 providing a steering adjustment for the wheel 22. The plates 25 and 27 also support suitable bearings 34 and 35 for a transversely extending drive shaft 36. The shaft 36 has a sprocket wheel 37 fixedly mounted thereon for rotation therewith and said sprocket wheel 37 is longitudinally aligned with the sprocket wheel 23 and is driven therefrom by a chain 38. The inner end of the shaft 36 carries a friction clutch 40, preferably a one way interruptable clutch through which is driven a shaft 41 carrying a sprocket wheel 42 (see FIGURE 5). The driven shaft 41 is suitably journaled at one end in a frame mounting plate 43 which extends downwardly from the transverse frame member 13 and the laterally extending frame member 14 and is connected at its opposite end with the clutch 40. A second driven shaft 47 which is positioned vertically above the shaft 41 and which will be described in greater detail hereinafter carries at its outer end a sprocket wheel 48 around which a drive chain 49 extends so as to drive said shaft 47 from the sprocket wheel 42 on driven shaft 41.

The framework 11 supports a suitable source of forced air in the form of a centrifugal blower 51 having a fan 52. The blower 51 is driven by means of an internal combustion engine 53 mounted on the deck 16. A fuel supply for the engine 53 is provided in the form of a high pressure liquefied petroleum gas tank 54 mounted forwardly of the engine 53. The fuel tank 54 is supported in suitable frame (not shown) secured to the longitudinally extending beams 12 and 15 to position the tank above the axle 18.

A fuel line 57 extends from the tank 54 to a T 58 mounted adjacent the deck 16. From the T 58 a fuel line

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59 carries the gaseous fuel to a pressure reducing regulator 60 mounted above the engine 53 which serves to reduce the pressure of the gas in the line before it enters the engine. A second fuel line 61 leading from the T 58 is connected with the inlet side of an on-off valve 62. The outlet side of the valve 62 is connected by a fuel line 63 to another pressure regulator 64 mounted on the deck 16.

The valve 62 and the clutch 40 are operated by simple manual controls which are easily accessible to an operator of the apparatus 10. A pair of handles 66 and 67 are secured to the framework 11 beneath the deck 16 and are so positioned that an operator gripping the handles may push the framework over the road surface, designated by the numeral 68, see FIGURE 1. The handles 66 and 67 are joined by a reinforcing bar 69 extending between the upper ends thereof and the reinforcing bar 69 supports a pair of brackets 71 and 72 which are formed with openings journalling a transversely extending rod 73 which has one end thereof bent to form a trigger 74 positioned directly beneath the handle 66. A radially extending lever arm 76 is rigidly secured to the transverse rod 73 and has the free end thereof pivotally connected to a connecting rod 77 which in turn is pivotally connected to an actuating member for the on-off valve 62. When the operator grips the trigger 74 he can easily rotate the transverse rod 73 to operate the connecting rod 77 to control the flow of fuel through the valve 62 to the pressure regulator 64.

A push rod 78 extends downwardly from a bracket 79 to an upwardly extending radial arm 81 connected to a transverse shaft 82 which is rotatably supported in the longitudinal main support beam 12. Reciprocatory movement of the push rod 78 rotates the shaft 82 and swings a second radial arm 83 depending therefrom on the side of the beam 12 opposite the arm 81. The arm 83 is secured at its free end to a connecting rod 84 which in turn is connected to one end of a bell crank 86 which is mounted for pivotal movement on a vertical axis formed by a pin 87 fixedly supported to the main beam 12. The opposite end of the bell crank 86 is connected to a clutch actuating yoke 88 which is connected to the bell crank at one end and which is connected at its opposite end for pivotal movement about a vertical pin 89 extending through the transverse frame member 13 at the front of the framework 11. The push rod 78 and the trigger 74 thus provide the two controls for the operator necessary in manipulation of this strip-laying apparatus.

The actual stripe laying or coating subassembly 91 of the apparatus 10 is adjustably supported on the frame mounting plate 43 positioning the same in a generally offset relation with respect to the framework 11 and in such a manner that the stripe is laid off on the road surface 68 to one side of the entire apparatus 10. In this position it is easy for the operator to view the stripe as it is laid on the road surface 68 and to at all times have the burner units in view such that the operation thereof may be carefully watched.

The striping subassembly 91 generally comprises means in the form of a hopper 92 for storing a supply of material used in the striping operation, high-temperature burner means, means for discharging material from the hopper in an area intermediate the burner means to subject the material to heat from the burners, and means for reducing the tendency of the material to become dispersed when liquefied, affording the stripe applied to the road surface with good edge definition and with substantial uniformity across its width.

The hopper 92 has sufficient depth and is rectangularly shaped in plan as shown in FIGURE 1. The hopper is formed with side walls 93 and 94, front 95 and rear 96 end walls and is generally funnel-shaped in elevation due to the angular relationship of bottom panels 97 and 98. The bottom panels 97 and 98 serve to direct the material to a discharge opening defined between said panels in

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the bottom of the hopper. The driven shaft 47, mentioned hereinabove, is rotatably supported in large bearings which in turn are supported in bearing housings 101 and 102 secured to the side walls 93 and 94 of the hopper 92. The bearings in the housings 101 and 102 have a diameter considerably larger than the outer diameter of the shaft 47 and are sealed to prevent any material in the hopper 92 from getting into the bearing. A large collar is fitted into the inner rotating bearing race of each of the bearings and is keyed onto the shaft 47 adjacent each end of a feed or metering roll 103. This structure prevents material from falling between the ends of the rotated metering roll 103 and the side walls 93 and 94 tending to jam said roll. As best shown in FIGURE 3 the metering roll 103, which is formed of rubber-like material, is fitted on the shaft 47 for rotation therewith. The outer surface of the roll 103 is fluted to provide a plurality of axially extending material measuring and dispensing pockets for discharging the material from the hopper 92. A sheet metal plate 104 is positioned in the bottom of the hopper 92 and has a portion extending generally tangentially to the metering roll 103 to cooperate with the undulating surface of said roll 103 to limit to a definite measured amount the material in a dispensing pocket to be discharged from the hopper on each fractional increment of rotation of the metering roll 103. A second portion of the plate extends downwardly into the throat of a discharge chute 106 extending from the hopper 92 to a lower discharge opening between a pair of burners or burner grids 107 and 108. A second plate 105 secured to the bottom panel 97 and extending generally radial to the metering roll 103 across the hopper 92, seals the metering roll 103 to prevent the material in the hopper from pouring out above the roll. The side walls 93 and 94 of the hopper extend downwardly below the bottom panels 97 and 98 of the hopper 92 and support along the lowermost edges thereof a pair of side plates 109 and 110 which define the side walls of the burner chambers above the burner grids 107 and 108 and support the burner grids. The side plates 109 and 110 are joined together by transversely extending front and rear end plates 111 and 112, respectively. A generally horizontally disposed plate 113 positioned between the side plates 109 and 110 below the hopper 92 forms the top closure member for the burner chamber above the burner grid 107 and a plate 119 forms the top closure member above the burner grid 108. An intake manifold 114 disposed adjacent the side wall 93 and secured thereto defines the carburetor means for the forced air and fuel and directs the combustible mixture into the chambers above the burner grids. Brackets 115 secured to the manifold 114 provide means for adjustably attaching the coating subassembly 91 to the frame mounting plate 43.

The manifold 114 is formed of sheet stock and is generally L-shaped in elevation. The manifold 114 is joined to the side plate 109 by suitable fastening means and includes a L-shaped side wall 116 which is joined to the side plate 109 by a plate 117 defining the top, front, bottom and rear closure members for said manifold. The side wall 116 of the manifold 114 is provided with a large circular flanged opening 123 to which is secured, by a suitable clamp, one end of a flexible air conduit 124 extending from the discharge end of the blower 51 to said opening. The opening 123 is divided by a plate 126 which serves to direct substantially one-half of the air from the blower down into the manifold 114 and to direct the other half of the air entering the opening 123 through an opening 129 in the plate 109 and into a duct generally designated 127. This duct 127 directs a portion of the air into a distribution chamber 128 formed between the side plates 109 and 110, the rear horizontal closure member or plate 119 and forwardly of the upper portion of the rear side plate 112. A foraminous plate or grill 131 is positioned in the opening 129 to cause a certain back

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pressure in the air conduit 124 to decrease the tendency of all the air going into the duct 127 and thus forcing substantially one-half of the air to flow downward into the manifold 114 under the direction of the curved plate 126. The duct 127 is defined by an upper generally L-shaped plate 132, a lower L-shaped plate 133 and angled side walls 134 and 135 and joins the opening 129 with a similar opening formed in the rear plate 112.

The manifold 114 has an angled plate or septum 136, which extends substantially longitudinally through the center of the manifold 114 to a point substantially midway thereof and then is bent and is joined to the side plate 109. This septum 136 serves to divide the manifold 114 into two separate manifolds, one serving the front burner grid 107 and one serving the rear burner grid 108. A fuel dispensing nozzle 138 extends downwardly through the portion of the plate 117 defining the upper wall of the manifold 114 and on one side of the septum 136. The gas nozzle 138 is formed with a suitable collar to hold the same in the plate 117 and with an elbow thereabove adapted to connect the nozzle 138 with a gas line 166 to be hereinafter described. The nozzle 138 serves to discharge the gaseous fuel into the primary air stream directed into the rear burner manifold and comprises a cylindrical member formed with a plurality of tiny perforations. Positioned on the other side of the septum 136 and fitted also in the plate 117 is a second gas nozzle 139. The gas nozzle 139 serves to supply fuel to be mixed with the forced primary air directed into the manifold chamber 114 leading to the forward burner grid 107.

The manifold 114 is connected with the rear burner grid 108 through an opening 141 in the plate 109 and with the front burner grid 107 by an opening 142. The openings 141 and 142 allow the mixture of primary air, i.e. having sufficient oxygen, and gas into the burner chambers directly above the burner grids and below the plate 113 and 119. A pair of transversely extending longitudinally spaced vertical plates 144 and 145 and an additional longitudinally spaced vertical plate 146 which is positioned in forwardly spaced relation to the rear plate 112 serve with the side walls 109 and 110 to define the burner chambers above the grids 107 and 108. The area between the front plate 116 and the vertical plate 144 defines the burner chamber above the front burner grid 107 and the area between the vertical plate 145 and the vertical plate 146 defines the burner chamber above the rear burner grid 108. The chamber for the front burner grid 107 is divided about half-way between the plate 113 and the top surface of the burner grid by a foraminous plate 148. This plate 148 serves to uniformly distribute the mixture of fuel and air before the same is forced therethrough to the burner and through the burner grid 107. The chamber above the rear burner grid is divided by a foraminous plate 149 and serves to distribute the fuel and air evenly before the same is forced through the said distribution plate 149 and through the burner grid 108. These distribution plates 148 and 149 are both positioned at a level below the openings 141 and 142 leading into the manifold chambers above the burner grids.

The burner grids 107 and 108 are rectangular in shape as shown in the drawings and have a depth or thickness of about 1 inch. The burner grid is formed of steel stringers or plates cut and matched together and of sufficient number to provide a grid having approximately only 25% open area which serves to lessen the probability of the flame on the bottom face of the grid from flashing back into the chamber and burning above the grid. The grid 107 is substantially longer, i.e. it has a length dimension greater, than that of the grid 108. This increased length of the front grid 107 provides means for preheating the road surface 68 to be marked. The rear burner grid 108 has the same transverse dimension as the burner 107 but is much shorter in length and functions as a post-heater as will be described in greater detail as this description proceeds. The burners formed with the grids 107 and 108 provide a very high heat capacity in the

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range of between 100,000 and 1,500,000 B.t.u.'s per hour and the mixture of the air and gas to the burners is regulated by air flow control valves or dampers in the air passages and by simple adjustable valves in the fuel lines to procure the optimum efficiency of the burners.

The air passageway in the manifold 114 leading to the front burner grid 107 and the passageway leading to the rear burner grid 108 are each provided with dampers. The damper for the front burner grid is in the form of a butterfly valve including a rod 151 which extends upwardly through the plate 117 and is journaled at its upper end in a block 152 which is secured to the upper surface of the plate 117. The lower end of the rod 151 has a valve plate 153 secured thereto which is adapted to close off the passageway between the side wall 116 and the septum 136 which defines the manifold leading to the front burner grid 107. The valve plate 153 has a small opening formed therein such that even in the closed position the damper will not entirely cut off the flow of air to the front burner, thus lessening the chance of a flash back when the burner is cut off by closing the main supply valve 62. The upper end of the damper rod 151 has a worm wheel 154 secured thereto and positioned in the block 152 such that the teeth thereon will mesh with the threads of a worm 155. The worm 155 is driven from a manually adjustable disk 156 which has a knurled surface so that it may be easily grasped and turned, thus adjusting the position of the damper plate 153. The damper for the rear burner grid 108 is very similar to that of the front burner and includes a rod 158 and a plate 159 secured to the lower portion of the rod to close the passageway between the septum 136 and side plate 109. The upper end of the rod 158 extends through the upper plate 117 and is journaled in a block 160. The upper end of the rod 158 also carries a worm wheel 161, the teeth of which mesh with the threads on a worm 162 which is adjustably driven by a disk 163 to permit manual adjustment of the damper plate 159 to control the flow of air into the rear burner.

A main gas line 164 extends from the regulator 64 along the main frame support beam 12 to the forward end of the framework 11. The main gas line is provided with a lateral line 166 extending to the gas nozzle 138 for the rear burner and has a lateral line 167 leading from the end thereof to the gas nozzle 139. Each lateral line 166 and 167 is provided with a manual flow control valve and pressure regulator to permit adjustment of the fuel supply and to indicate the amount of pressure in the lines to the gas nozzles.

The chute 106 which directs the material dispensed from the hopper 92 to an opening intermediate the burners is a tubular member which is rectangular in cross-section and has a transverse dimension, i.e. with respect to the apparatus 10, substantially equal to that of the burner grids and substantially equal to the width of the stripe which is to be applied to the road surface. In the illustrated embodiment the chute 106 has a transverse dimension which is about one-half inch less than the width of the line which can be applied by the apparatus 10. The chute 106 is preferably formed of a good heat conducting material, for example brass, and is supported at its upper edge by a narrow rectangular shaped plate 171 formed with an opening corresponding to the cross-sectional dimension of the chute 106. The plate 171 serves to mount the chute in an opening provided in the plate 113 which extends transversely between the plates 109 and 110. The chute 106 also fits between the plates 144 and 145 thus defining an air space around the chute 106.

A plate 173 is secured between the side plates 109 and 110 and closes off the forward end of the distribution chamber 128 which receives the air directed through the duct 127. This plate 173 extends at an incline and has the lower end thereof extending through the opening in the plate 171 down into the chute 106 in spaced relation with respect to the rear wall of said chute 106. Mounted adjacent the plate 173 is a second plate 174 which is parallel to the plate 173 and extends from the plate 171

upward to a position short of the upper edge of plate 173 to define an aspirating passageway with the plate 173 down in the chute 106. This passageway defined between the plates 173 and 174, as best seen in FIGURE 3, permits some of the forced air from the distribution chamber 128 to be directed into the chute 106, serving to aspirate the material as it is dispensed from the hopper by the metering roll 103. This forced aspirating air as it is driven into the chute 106 serves to uniformly disperse the marking material within the chute and move the same downward through the lower discharge opening intermediate the burner grids 107 and 108.

A damper is also provided for this aspirating air passageway and includes a damper rod 176 which extends between the plates 109 and 110 and has one end thereof journaled in a block 177 secured to the plate 109. The rod 176 carries a plate 178 which when in the position shown in FIGURE 3 closes the entrance to the passageway defined by the plates 173 and 174 and can be placed in any adjusted position to control the amount of air permitted in the chute 106. One end of the rod 176 which is journaled in the block 177, carries a worm wheel 179, the gears of which mesh with the threads on a worm 180 rotated by a manually adjustable disk 181.

The air in the distribution chamber 128 also serves two additional functions. One of these additional functions is cooling the walls of the chute 106 such that the marking material as it is metered through said chute will not tend to become molten and stick to said chute. The cooling jacket around the chute 106 is defined by the vertical plates 144 and 145 and the side plates 109 and 110. The cooling fluid enters the jacket above the upper edge of the plate 145 where it joins the top plate 119. The fluid as it enters the cooling chamber is then forced around the chute 106 and escapes from the cooling jacket through openings 184 (only one of which is shown in the drawing) formed in the side plates 109 and 110 adjacent the lower edges thereof. The openings 184 open into longitudinally extending air passageways which are formed by channel-shaped shields 186 and 187 mounted on the side plates 109 and 110. These shields 186 and 187 extend longitudinally along the side plates 109 and 110 and prevent the cooling fluid escaping from the cooling jacket from interfering in any way with the movement of the material which is discharged through the opening in the bottom of the chute 106 or from interfering with the burner operation. The bottom of the cooling jacket is enclosed by a plate not shown which also serves to position the bottom of the chute 106 between the vertical plates 144 and 145 and the burner grids 107 and 108.

The amount of cooling air directed into the cooling jacket is regulated by an adjustable damper including a rod 189 extending between the side plates 109 and 110 and which carries therebetween a damper plate 190 adapted to be positioned to close off the opening by blocking the passage between the plate 174 and the upper plate 119 above the burner grid 108. The rod 189 is journaled in a block 191 and has secured thereto a worm wheel 192, the gears of which mesh with the threads on a worm 193 which is rotated by a manually adjustable disk 194 positioned on the outer side of the plate 110.

The second function for the air remaining in the distribution chamber 128 is to afford means for driving away the carbonaceous residue which may result from the operation of the burners and burning of the marking material to keep the same from settling on the freshly laid stripe. In effect the air is used to direct the residue back into the flame of the burners where it is burned up or forced out the front of the machine. The "soot" removing means is in the form of a passageway from the distribution chamber 128 to an opening behind the burner grid 108. The passageway is formed between the vertical plate 146 and the rear plate 112 which extends transversely between the side plates 109 and 110. The rear plate 112 terminates at its lowermost edge in a bent forwardly extending portion and this serves to direct the air forwardly and

downwardly toward the strip applied to the road surface. An additional deflector 188 may be mounted below the vertical plate 146 to further control the soot removing and solidifying air if desired. The amount of air directed into the soot removing passageway defined by the rear plate 112 and the vertical plate 146 is regulated by a damper including a rod 195 extending between the side plates 109 and 110 and which supports therebetween a right angle plate 196 which has one flange thereof adapted to abut the rear wall 112 and the other flange adapted to abut the upper plate 119 above the rear burner grid 108. The rod 195 extends outwardly from the plate 110 and is journaled in a block 197 and has secured thereto a worm wheel 198, the gears of which mesh with the threads of a worm 199 adjustably rotated by a disk 200.

An air supply line 202 extends upwardly out of the upper surface of the duct 127 and downwardly toward the metering roll 103 between the bottom panel 97 of the hopper 92 and the plate 173 on the distribution chamber 128. This air conduit 202 terminates in an air nozzle 203 including a tubular member extending parallel with the axis of the metering roll 103 which is formed with a number of openings each of which are directed generally radially toward said metering roll 103. As air is discharged out of the openings in the nozzle 203 it impinges on the metering roll 103 to thus clean the flutes of the metering roll.

A third lateral fuel line 205 provided with a manual flow control valve leads from the main fuel line 164 to a pair of atmospheric burners 206 and 207, one—206—of which is disposed in transversely spaced relation with one end of the discharge opening of the chute 106 adjacent the side plate 109 on the other—207—of which is disposed in transversely spaced relation with respect to the other end of the discharge opening of the chute 106 adjacent the side plate 110. Branch lines extend from the lateral fuel line 205 to each of the burners 206 and 207 supplying gaseous fuel thereto. The burners 206 and 207 are mounted at an acute angle with respect to the side plates 109 and 110 which support the area grid-type burners 107 and 108. The atmospheric burners 206 and 207 form part of an edge defining means which functions to contain the material as it is discharged from the chute 106 and is carried toward the road surface 68. The edge defining means serves to provide a stripe which has greater edge definition than would be possible without the use of such means and additionally to provide a stripe which has a uniformity in width and depth of material which is not obtained without the use of means for containing the material and the heat from the burners in the space immediately above the stripe. A pair of inclined shields or deflectors 209 and 210 are mounted on the side plates 109 and 110 respectively and extend downwardly to a position below the discharge opening of the chute 106. The lower edges of the deflectors 209 and 210 are spaced transversely of each other a distance equal to the width of the stripe desired. The angle of inclination of the deflectors with respect to the road surface corresponds to the angle of the side atmospheric burners 206 and 207 and the burners are so mounted with respect to the deflectors 209 and 210 that the flame emitted from said burners passes downward along each face of the deflectors 209 and 210. The controlled flow of heated gas over the deflectors serves to contain the material and serves to substantially reduce the tendency of any of the material to collect on the deflectors. The heated gas directed over the deflectors also maintains any material which drops on the deflectors in a molten state so it will drip therefrom onto the stripe. The material that is used in marking may become charred during the melting as it may burn instead of just transferring from the marking material to a liquid state and this carbonaceous residue would collect on the deflectors and build up on the faces thereof if the burners 206 and 207 did not direct heated gases across the faces of the deflectors.

A skid 213 is mounted on the side wall 110 and ex-

tends downwardly below the side burner 207 and the deflector 210 and serves to protect the deflector 210 as the apparatus is moved over rough road surfaces and serves, together with the wheel 22 to support the burner grids 107 and 108 and chute discharge opening at a preselected distance above the road surface 68. As mentioned hereinabove the entire coating assembly 91 is vertically adjustable on the frame mounting plate 43 and with the illustrated embodiment the preferred spatial relationship of the grids above the road surface is between about 4½ and about 6 inches.

An igniter is provided for and positioned adjacent each of the burner grids 107 and 108 and the front burner igniter 215 and the rear igniter 216 are connected by suitable electrical conductors 217 and 218, respectively, to a magneto (not shown) driven from the internal combustion engine 53. A ground line 219 also extends from the plate 109 to the magneto affording a constant spark at the burner faces for the rapid ignition of said burners when the gas valve 62 is turned on by actuation of the operator trigger 74. The atmospheric burners 206 and 207 are ignited from the area burners 107 and 108.

As best shown in FIGURE 5, a plurality of short lengths of link chain 221 are fastened at their upper ends to a rod 222 mounted on the inside plate 25 of the wheel supporting frame 21. These lengths of chain provide a flexible, rugged heat shield for the pneumatic tire 22.

In the apparatus shown the burner grids 107 and 108 are positioned to heat a path on the road surface at least as wide as the stripe to be applied thereto and the specific position or plane in which the grids 107 and 108 are disposed may vary so long as the road surface 68 is preheated to a temperature in a range between 150° F. and 400° F., and possibly as high as 500° F. before the marking material is deposited thereon. It is considered advantageous, however, that the burners be substantially continuous in nature from the front of the burner through the area in which the material is dispensed such that when the material is deposited on the road surface the surface has not had an opportunity to be cooled after the preheating burner has passed thereover. The high heat area burners defined by the grids 107 and 108 burn ideally with a blue flame producing high-heat very readily and when the fuel supply is cut off by closing the on-off control valve 62 the burners are rapidly extinguished and the grids do not retain a great amount of heat after the burners are extinguished. The heat from the front burner grid 107 provides the preheating function as the apparatus 10 is moved across the road surface 68 and with this burner extending to a position adjacent the discharge opening of the chute 106, the material as it is discharged therefrom toward the road surface is heated by the flame from the face of burner grid 107 and from the face of the burner grid 108 which is positioned directly behind the discharge opening. When the hot material drops on the preheated road surface it wets the entire road surface 68 and the preheating prevents premature solidification permitting the molten material to form a bond with said surface. The post-heater or heat supplied from the burner grid 108, which is of a length within a range of about ¼ to ⅓ the length of the burner grid 107, serves to melt and smooth out the surface of the applied strip. The air discharged from between the rear plate 112 and the shield 188 serves to blow away any carbonaceous residue which results from the melting and drives the same back into the burners to be burned and particularly carried away so it does not adhere to the freshly applied stripe.

Suitable material for use with the illustrated apparatus, i.e. as the supply item, is resinous particulate material capable of passing a screen of 20 mesh and largely incapable of passing a screen of 200 mesh. Generally, at least 80% of the particles of particulate should be retained on a screen of 200 mesh. Smaller particles are difficult to direct for proper impingement upon a roadway or pave-

ment and may even be consumed by the heating means. A basic portion of the particulate is organic and even resinous. The organic phase of the material serves to wet the pavement as well as to coalesce to form applied particulate material into a paint type marking. To the basic organic portion of the particulate may be added a variety of pigment materials (e.g. titanium dioxide, chrome yellow, phthalocyanine green) for coloration, as well as other materials of a non-melting nature (e.g. glass beads, glass cullet, sand, etc.) for properties such as the additions impart to the composition of particulate.

Applied particulate solidifies after the machine moves therepast such that stripes may be made at busy intersections with each change of the traffic light and the passing automobiles or pedestrians will not smear or mar the stripe in any way.

The present invention has been described and illustrated by reference to a specific apparatus embodying the same, but it will be appreciated that certain changes and modifications may be made therein without departing from the invention, and all such changes or modifications are contemplated as may come within the scope of the appended claims.

What is claimed is:

1. A strip-laying machine including a wheel supported frame, blower means mounted on said frame for providing a supply of forced air, a supply hopper and dispensing means for dispensing dry particulate material therefrom, said dispensing means comprising a chute extending downwardly from said hopper and having a lower discharge opening, means for directing forced air from said blower means into said chute to distribute said material therewithin such that it is discharged uniformly therefrom, jacket means surrounding said chute for directing forced air around said chute for cooling said chute, a pair of fuel burners positioned forwardly and rearwardly of said dispensing chute discharge opening in relationship to the wheel supported frame, and means connecting said dispensing means with said wheel supported frame affording the discharge of a measured amount of particulate material from said dispensing means into said chute in response to movement of said frame across the surface to be marked.

2. A machine as defined in claim 1 including means for directing forced air from said blower means toward a said surface to be marked from a position rearward of said burners to keep carbonaceous residue from settling on the strip applied to the surface.

3. An apparatus for laying and bonding a polymeric resinous material to a road surface to form a uniform stripe of a definite width thereon comprising in combination a wheel supported frame, a pair of burner grids supported on said frame in a fore and aft relationship to each other and adapted to be in vertically spaced relation to the surface to be marked, said burner grids being adapted to heat a path on the road surface at least as wide as the stripe of resinous material to be applied thereto, blower means mounted on said frame for supplying air under pressure to said burner grids, means for driving said blower means, fuel supply means for said burner grids, a hopper, discharge means leading from said hopper to a position between said burner grids such that material dispensed therefrom may be reduced to a molten state as it is carried toward the road surface, said discharge means having a width substantially equal to the width of the stripe desired on the road surface, means defining a jacket for directing a cooling fluid past said discharge means to restrict the temperature thereof and prevent liquefaction of the material within said discharge means, means for dispensing a predetermined amount of material from said discharge means in response to movement of said wheel supported frame along the road surface to be marked, and means for containing said material and heat in the area beneath said discharge means to afford good edge definition for the stripe applied.

4. An apparatus for applying and bonding a polymeric resinous material to a road surface to form a uniform stripe of a definite width thereon comprising in combination a wheel supported frame, burner means supported on said frame and extending in a fore and aft relationship and adapted to be in vertically spaced relation to the surface to be marked, said burner means being adapted to heat a path of the road surface at least as wide as the stripe of resinous material to be applied thereto, blower means mounted on said frame for supplying forced combustion supporting air to said burner means, means for driving said blower means, fuel supply means for said burner means, a hopper, discharge means leading from said hopper to a position intermediate said burner means, said discharge means having a width nearing the width of the stripe of material to be applied to the road surface, jacket means for directing a cooling fluid to said discharge means to prevent liquefaction of the material within said discharge means, means for metering a predetermined amount of material from said hopper into said discharge means in response to movement of said wheel supported frame along the road surface to be marked, and edge defining means positioned adjacent the ends of said discharge means for guiding the material discharged from said discharge means to form a said stripe of definite width.

5. An apparatus as described in claim 4 wherein said edge defining means includes means for controlling the flow of gaseous fluid and for directing the same toward the surface to be marked for containing the particulate material and reducing the tendency thereof to spread before contacting the said surface.

6. An apparatus as described in claim 4 wherein said edge defining means includes shield means depending below said burner means toward said surface to be marked and spaced transversely a distance substantially equal to the width of stripe desired.

7. An apparatus for forming a uniform band of polymeric resinous material on the road surface to divide the same into definite zones wherein said bands have a definite width, said apparatus comprising an elongate wheel supported frame, a pair of burner grids supported on said frame, one in front of the other, and adapted to be placed in vertically spaced relation to the surface to be marked when said machine is moved thereover, the forward most of said burner grids having an overall dimension in the direction of movement greater than the corresponding dimension of the rear burner grid of said pair of burner grids and said burner grids being adapted to heat a path on the road surface at least as wide as the band of resinous material to be applied thereto, a hopper, means defining a discharge passageway, metering means for discharging a predetermined amount of material from said hopper into said discharge passageway, said passageway extending from said metering means to a position between said burner grids, said passageway having a generally rectangular configuration at the bottom thereof with a length substantially as great as the width of the band of material to be applied to the road surface, a cooling jacket surrounding said means defining said discharge passageway to prevent heat from said burner grids from causing liquefaction of the material in said discharge passageway, blower means mounted on said frame for supplying air under pressure to said burner grids and for distributing and moving the material metered from said hopper through said discharge passageway against any convection air currents caused by the burners which tend to flow upward through said passageway, fuel supply means for said burner grids, and means driving said metering means in response to movement of said wheel supported frame along the surface to be marked.

8. An apparatus for applying a polymeric resinous material to a road surface to form a colored uniform stripe of definite width thereon comprising a frame, wheel means supporting said frame, a hopper mounted on said frame

for containing a supply of dry particulate polymeric resinous material, at least a pair of area heating burner means supported by said frame below said hopper, said burner means being mounted in fore and aft spaced relationship to each other and in a position wherein said burner means are adapted to heat a path on the road surface at least as wide as the stripe of resinous material to be applied thereto, the foremost burner means of said at least a pair having an overall length dimension greater than that of the other of said at least a pair to afford means for preheating a path on the road surface, means defining a discharge passageway extending from said hopper to a position between said burner means and terminating thereat in a long narrow rectangular opening having a length substantially equal to the width of the stripe to be applied, means driven from said wheel means for dispensing a measured amount of material in said passageway in response to movement of said frame over the road surface, a cooling jacket surrounding said discharge passageway to prevent heat from said burner means from causing liquefaction of the material in said discharge passageway, blower means mounted on said frame for supplying primary air to said burner means and for distributing and moving the material dispensed from said hopper through said discharge passageway, fuel supply means for said burner means, and edge defining means comprising a pair of shields extending downwardly below said burner means and said discharge opening and extending transversely to said opening with the lower edges of said shields being spaced apart a width substantially equal to the width of the stripe to be applied and a pair of burners positioned with respect to said shields for directing hot air over the faces of said shields for containing the particulate material as it is discharged toward the road surface from said discharge opening and through the burning gases from said burner means.

9. An apparatus for laying and bonding a polymeric resinous material to a road surface to form a colored uniform stripe of definite width thereon comprising a frame, wheel means supporting said frame, a hopper mounted on said frame for containing a supply of dry particulate polymeric resinous material, a pair of area heating grid-type burners supported by said frame below said hopper, said burners being mounted in fore and aft spaced relationship to each other and in a position wherein said burners are adapted to heat a path on the road surface at least as wide as the stripe of resinous material to be applied thereto, the foremost burner of said pair having an overall length dimension greater than that of the other of said pair to afford means for preheating a path on the road surface, means defining a discharge passageway extending from said hopper to a position between said burners and terminating thereat in a long narrow rectangular opening having a length substantially equal to the width of the stripe to be applied, means for dispensing a measured amount of particulate material into said passageway in response to movement of said frame over the road surface, a cooling jacket surrounding said discharge passageway to prevent heat from said burners from causing a melting of the material in said discharge passageway, blower means mounted on said frame for supplying air under pressure to said burners and for distributing and moving the material dispensed from said hopper through said discharge passageway, fuel supply means for said burners, edge defining means comprising a pair of planar shields extending downwardly below said burners and said discharge opening and extending transversely to said opening with the lower edges of said shields being spaced apart a width substantially equal to the width of the stripe to be applied and a pair of atmospheric burners positioned with respect to said shields for directing hot air over the inner faces of said shields for containing the particulate material in the area below the burners as it is discharged toward the road surface from said discharge opening and through the hot

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gases from said grid-type burners, and means for directing a stream of forced air from said blower means onto the material after the same reaches the surface to be marked to keep any carbonaceous residue from settling thereon.

10. An apparatus for applying a polymeric resinous particulate material to a road surface to form a line thereon comprising a wheel supported frame, at least a pair of area heating grid-type burner means supported by said frame in a fore and aft relationship to each other and in vertically spaced parallel relation to the surface to be marked, a hopper for supporting a supply of a said material, discharge means leading from said hopper to a position between said burner means, means for metering a predetermined amount of material from said hopper into said discharge means in response to movement of said wheel supported frame along the surface to be marked, means for directing forced air into said discharge means for moving material metered from said hopper through said discharge means, means for directing a cooling fluid around said discharge means for restricting the temperature of said discharge means to

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avoid melting of any material as the same passes through said discharge means, blower means mounted on said frame for supplying forced combustion supporting air to said burners and to said means for moving said material through said discharge means, and means for supplying fuel to said burners.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,279,336

October 18, 1966

Lawrence E. Eaton et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 34, for "making" read -- marking --; column 2, line 50, after "5" insert a parenthesis; line 68, after "in" insert -- a --; column 3, line 13, for "he" read -- the --; column 11, line 8, for "of" read -- on --.

Signed and sealed this 5th day of September 1967.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

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