Jan. 23, 1940. T. L. JOHNSON 2,187,879

ROADWAY MARKING

Filed July 16, 1938 4 Sheets-Sheet 1

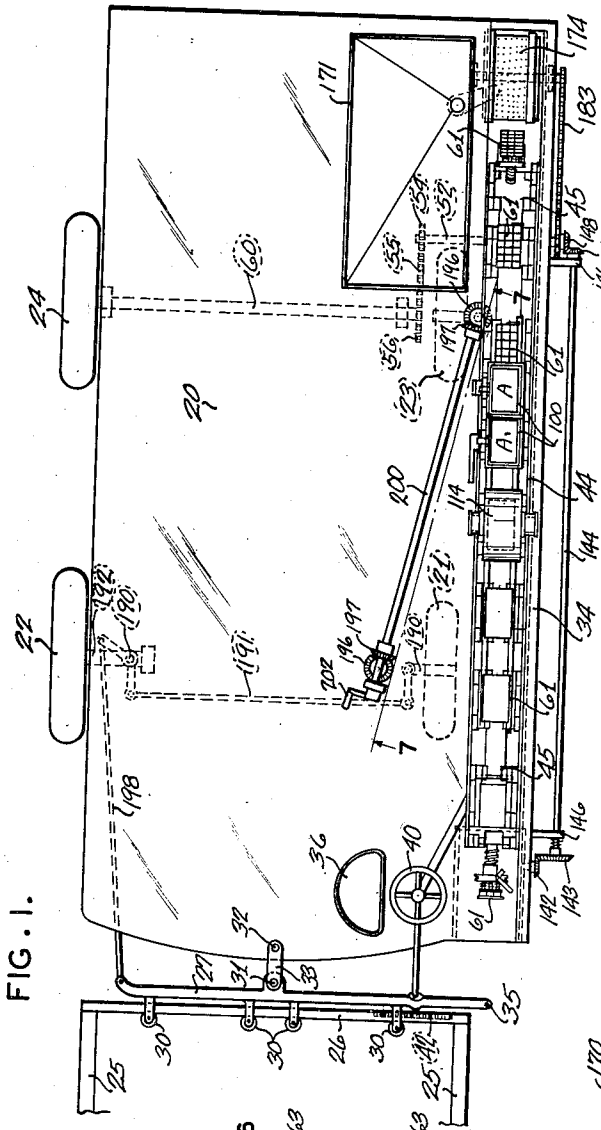


FIG. 1.

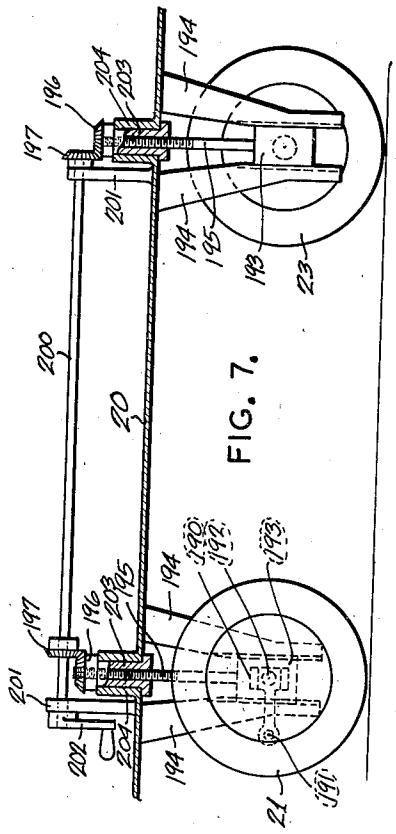


FIG. 7.

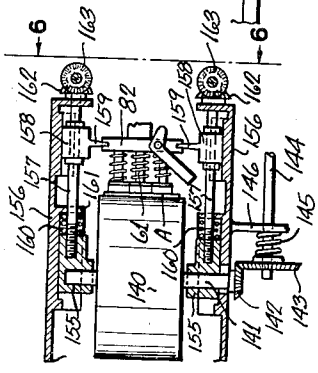


FIG. 5.

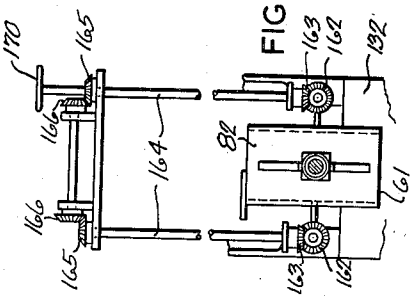


FIG. 6.

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ROADWAY MARKING

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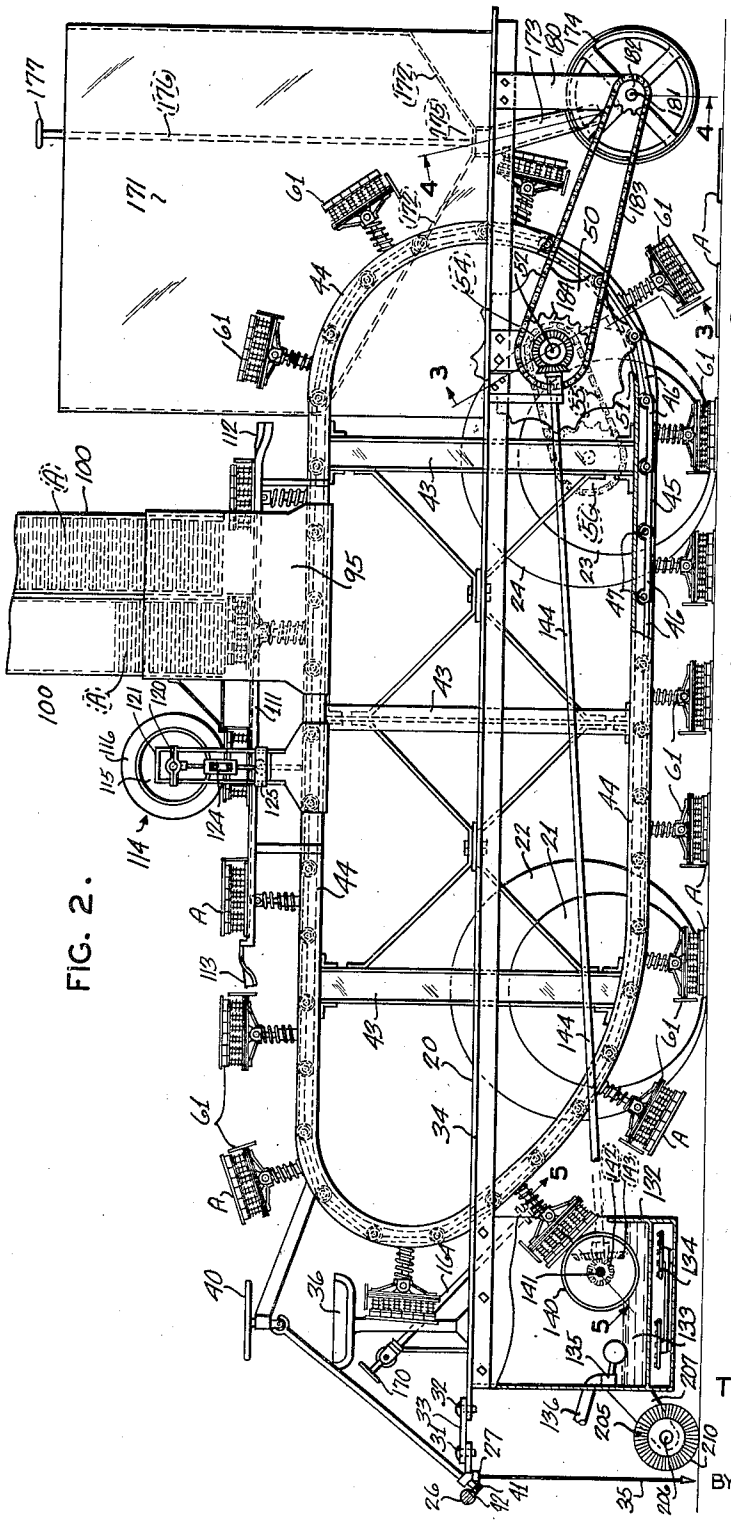


FIG. 2.

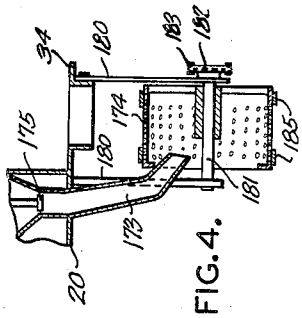


FIG. 4.

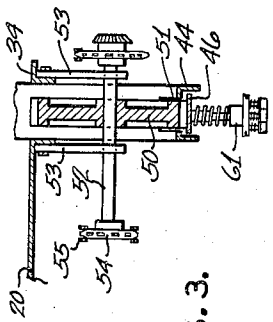


FIG. 3.

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ROADWAY MARKING

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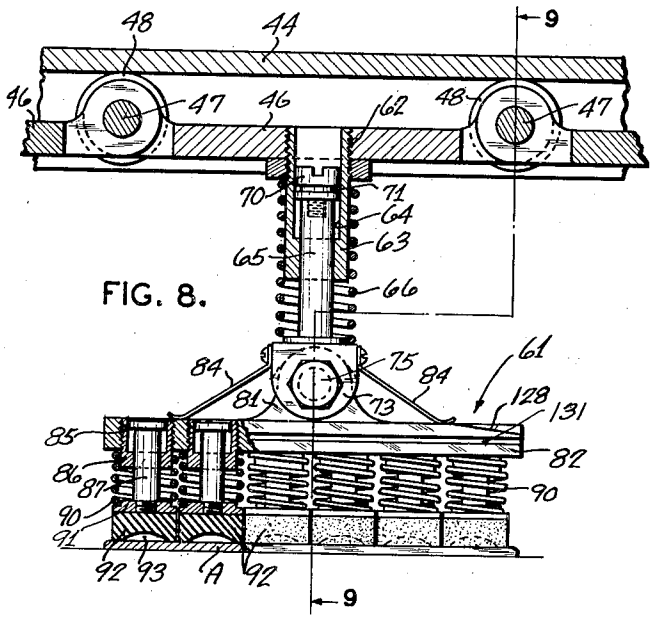


FIG. 8.

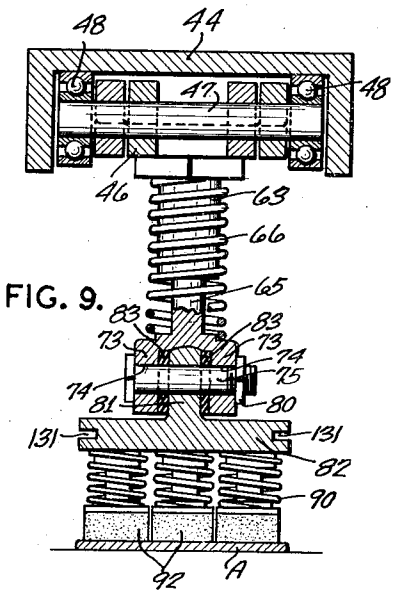


FIG. 9.

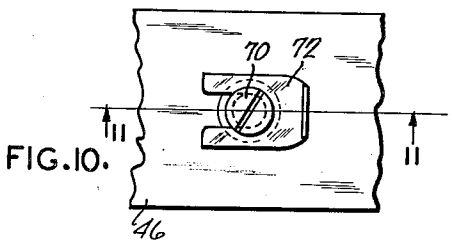


FIG. 10.

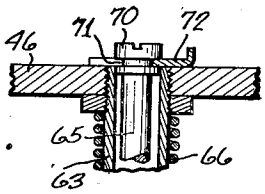


FIG. 11.

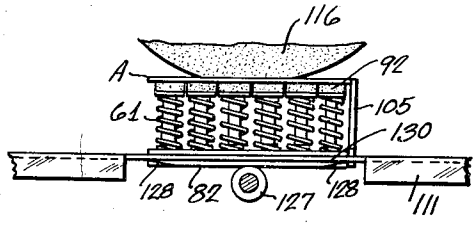


FIG. 13.

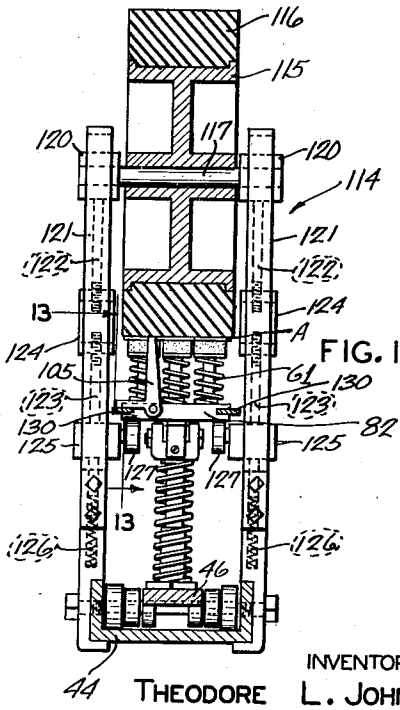


FIG. 12.

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ROADWAY MARKING

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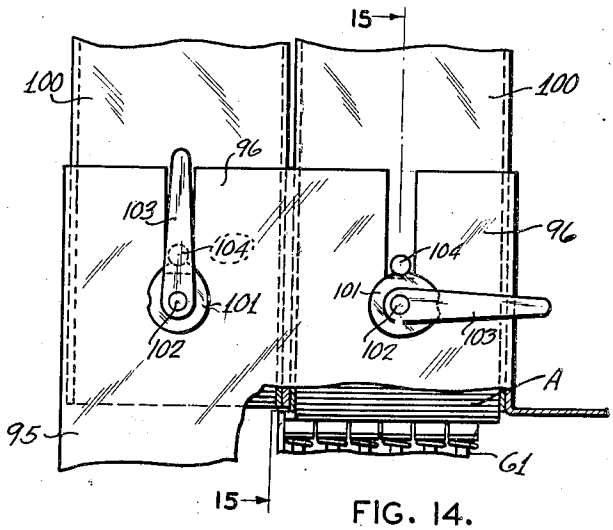


FIG. 14.

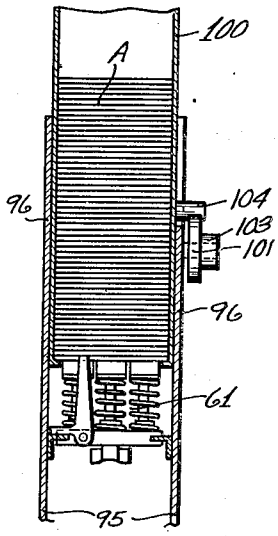


FIG. 15.

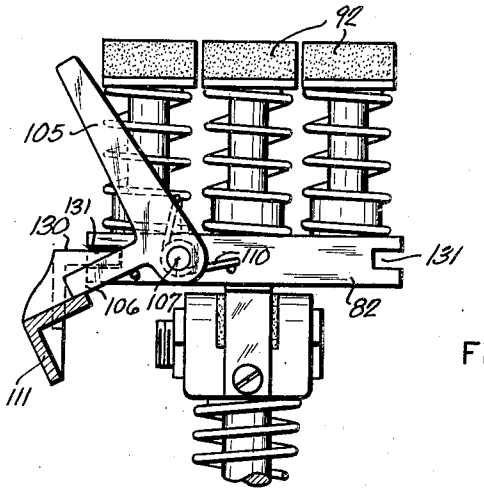


FIG. 16.

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Patented Jan. 23, 1940 2,187,879

UNITED STATES PATENT OFFICE

2,187,879

ROADWAY MARKING

Theodore L. Johnson, University City, Mo.

Application July 16, 1938, Serial No. 219,667

16 Claims. (Cl. 216—51)

This invention relates to improvements in roadway marking, and more particularly to improved apparatus and methods for effecting a mechanical application of roadway marker elements, to the surface of highway slabs, pavement, flooring, and all surfaces utilized for vehicular or pedestrian traffic.

The marking of metropolitan pavements and rural highways, for the delineation of traffic lanes, indication of safety zones, direction of turn indications, etc., has become of considerable importance not only as a safety measure now regarded as indispensable, but the process of marking is also of considerable importance when reckoned as an expense item, whether in the first instance incident to the laying of pavement or highway slab, or from the point of view of roadway maintenance costs. The more prevalent practice in establishing highway center markers, lane lines, etc., has consisted in the application of liquid marking material, such as paint, lacquers or the like. Such practice, however, presents a number of objections, among which are the fact that a painted line is picked up in part, or is smeared by vehicle traffic prior to complete drying of the line; another important objection is found in costs, as under even moderate traffic densities, a painted line requires renewal or retouching at frequent intervals.

It is accordingly a major object of the invention to provide an improved mechanism and method for effecting a practically permanent marking of roadways through the use of semi-solid marker units of a color contrasting with that of the roadway surface, and applicable to such surface at any time.

Yet another object of the invention is attained in an operative combination of agencies for effecting the complete application of marker units of the type referred to, with only a minimum of manual labor, and such that the method and mechanism utilized therewith result in a predetermined, regular spacing of the marker units in perfect alignment.

Still further objects of the invention are attained in improvements in the individual items of apparatus utilized in the assembly for mechanically laying roadway marker elements, such units including a magazine arrangement for single-feeding of the marker units; an improved arrangement for carrying the units from their source of supply to the zone of their application; improved means for pressing or applying the units to the carrier structure; improved means for coating the units with an adhesive substance for securement of the markers to a roadway surface, and an improved device for applying a grit or dusting material to the units after laying.

A still further and important object of the invention is attained in an improved method for the pressure-application of solid, yet flexible marker units or tile, to roadways and the like.

A further and important object of the invention is attained in the provision of an improved detachable marker-unit-holding device, susceptible of utilization with a carrier for marker slabs or the like, and which presents the advantage of detachable holding engagement of a tile element or the like, without danger of damage thereto incident to its application, and further so designed as to apply an equalized pressure on all parts of the marker tile or slab, irrespective of any reasonable inequalities in the roadway surface to which the marker is applied.

The foregoing and numerous other objects will appear from the following description of a presently preferred embodiment of the inventions, particularly when considered in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a tile-applying assembly and associated vehicle, embodying the elements of the invention; Fig. 2 is a side elevation, as viewed from the left hand side, of the device of Fig. 1, certain parts being shown in section for clearness; Fig. 3 is a sectional elevation of the tile-carrier drive as viewed along line 3—3 of Fig. 2; Fig. 4 is a sectional elevation of a grit-sifter assembly, as viewed along line 4—4 of Fig. 2; Fig. 5 is a sectional elevation showing certain parts of an adhesive-applicator structure as viewed along line 5—5 of Fig. 2; Fig. 6 is an elevation of the structure of Fig. 5, as viewed along line 6—6 thereof; Fig. 7 is a fragmentary sectional elevation as viewed along line 7—7 of Fig. 1 and particularly illustrating the means for raising and lowering two of the roadwheel elements of the assembly; Fig. 8 is a side elevation, partly in section, of one of the platen or foot structures utilized for holding the tile or marker element and carrying same between its zone of supply and its zone of application; Fig. 9 is an endwise section along staggered planes, as indicated by line 9—9 of Fig. 8; Fig. 10 is an elevational detail of a device as viewed in a horizontal plane, for holding one of the pressure feet or platens, in a retracted or inoperative position; Fig. 11 is a sectional view of the device of Fig. 10 as viewed along line 11—11 thereof; Fig. 12 is an enlarged sectional elevation, in a vertical plane, of a pressure-roll assembly util-

ized for the application of the individual tile or marker units, to the platen or feet elements by which they are carried to their zone of application to the roadway; Fig. 13 is an enlarged fragmentary detail of portions of the structure of Fig. 12, and as viewed along the staggered line 13—13 thereof; Fig. 14 is a side elevation partly broken away, of the tile magazine assembly appearing in Fig. 2, and particularly illustrating the means for raising and lowering portions of the magazines between feeding and inoperative positions; Fig. 15 is a fragmentary sectional elevation of the device of Fig. 14 as viewed along line 15—15 thereof, and Fig. 16 is an elevational detail, partly in section, to illustrate the action of a tile feeding arm carried by the individual platen or foot elements.

Referring now by characters of reference to the drawing, the example selected for present disclosure of structure, includes a four-wheel vehicle, a deck portion of which is indicated at 20, and which is provided with front wheels 21 and 22 and rear wheels 23 and 24. It is a preference to provide particularly the rear wheels with traction treads, for a purpose hereinafter better appearing. Although the vehicle carrying the mark-applying mechanism may be self-propelled, it is for simplicity shown as adapted to be tractively powered by a truck or tractor (not shown) provided with a hitch frame 25 including a transverse bar element 26, in the nature of a cross rail. This rail serves tractively to carry a parallel steering rail 27 which, through guide rollers 30, is transversely shiftably associated with the rail 26. The rail 27 is connected through pivots 31—32, and a link 33, with the frame structure of the marker vehicle, the longitudinal elements of which are indicated at 34, and one of which appears in Fig. 2. The frame members 34 serve among other structural purposes, to support the deck structure 20.

Provision is preferably made for following a temporary marker or roadway line, along which the permanent marker elements are to be applied by the present assembly. In order to enable the operator accurately to follow a course thus delineated, the forward end of the chassis of the marker vehicle is provided with a pointer member 35. It is of course contemplated that the driver of the tractor or truck will be able reasonably accurately to follow the line of delineation, but to enable the operator of the marker vehicle to care for minor deviations in course, there is provided adjacent the operator's seat 36, a steering wheel 40, serving to actuate a pinion 41 engaging a rack portion 42 on the adjacent surface of the rail 26 of the hitch assembly; thus by steering actuation of the wheel 40 the trailer or marker vehicle may be accurately kept in alignment, and enabled closely to follow either a straight or moderately curved line of application of the tile.

Referring now to the structure of the individual items of equipment and assembly thereof, associated with the chassis of the marker vehicle, it is first noted that the frame elements 34 in structural cooperation with a plurality of vertical supports 43, serve to carry a channeled track member 44. The track member is arranged in a substantially vertical plane and is closed upon itself to provide a continuous or endless track structure, as its channel is presented outwardly with respect to the orbital path defined thereby.

Operatively disposed within the channel member 44 is an endless chain 45 or equivalent articulate carrier structure, characterized by a plurality of evenly spaced links 46 intervening pivots 47 therefor, so that these units collectively constitute a chain structure of a width to work smoothly in the channel presented by the trackage 44. It is preferred that the pivots 47 be provided with ball bearing rollers 48, at each end, so as to minimize friction along the member 44.

Provision is made for the positive actuation of the chain or carrier structure 45, as through a specially formed sprocket 50 (Figs. 2 and 3) the toothed periphery of which extends through a slot 51 in the adjacent portion of the channel track 44. Sprocket 50 is secured to a short shaft 52 carried by bearing brackets 53 depending from the deck 20 of the vehicle, or supported by one of the frame elements 34 of the chassis. Shaft 52 carries and is secured to a drive sprocket 54, actuated through a chain 55, which engages sprocket 56 on the shaft or axle 60. The latter is in turn rotatably secured to and driven by the roadwheel 24, heretofore referred to. From this arrangement it will appear that as the marker vehicle is propelled, the engagement of wheel 24 with the roadway serves through axle or shaft 60, sprocket 56, chain 55, sprocket 54 and shaft 52, to actuate the large sprocket 50, which in turn causes an orbital movement of the endless chain 45, or the like, in a counterclockwise direction (Fig. 2).

Secured at uniform spaced intervals along, and projecting outwardly from the chain carrier 45, are a plurality of pressure-applicator assemblies 61, the details of structure of which best appear from Figs. 8 and 9.

Carried centrally of each of certain of the links 46 of the chain, as by threaded connection therewith appearing at 62, is a guide or plunger barrel 63 which includes a bore 64 which serves guidingly to receive and permit reciprocal movement of an arm 65. Surrounding this arm and barrel 63, is a compression spring 66, which operates to bias the arm 65 in a direction outwardly of the element 63, and away from the chain, to the extent permitted by a head portion 70 on the plunger, the head portion occupying a relatively enlarged part of the bore 64, and being provided with an annular slot 71 for the purpose of receiving a bifurcate retaining key 72. The latter is to permit the retention of the applicator assembly, in a relatively retracted or inoperative position when desired to reduce the number of shoes or platens in use at a given time, whereby to vary the spacing of the marker elements applied to the roadway, as will hereinafter more clearly appear. As is seen from Figs. 10 and 11, when it is desired to retain the assembly 61 in an out-of-action position, it is manually retracted against the loading of spring 66 to an extent to permit the insertion of the arms of the key 72 into engagement with the annular slot 71.

The lower end of the plunger 65 is furcated, and its arms 73 apertured as at 74 to receive a bolt 75, which through a nut 80, serves pivotally to carry an apertured projection 81, the latter being an upstanding boss on the base plate portion 82 of the foot or platen structure. Disposed between the inside faces of the arm 73 and the outside faces of boss 81, are resilient washer elements 83 which permit a substantial, lateral deviation of the foot or platen from its normal vertical plane, whereby to permit a certain adaptability in position of the platen to care for inequalities in roadway surface. At the same time it will appear that the platen is free to

oscillate about the bolt 75 as a pivot, so that the platen is susceptible of a practically universal movement, within limits, so as to provide for certainty of adaptability to any form of roadway inequalities. The last mentioned movement about the pivot or bolt 75, is yieldably opposed by a pair of spring arms 84 formed of a relatively rigid stock, and which tend yieldably to oppose endwise rocking movement, of the foot in either direction.

The preferred details of the pressure foot structure are best shown by Fig. 8, wherein it is seen that the base block 82 is provided with a plurality, shown as 18, of tapped openings 85, into each of which is threadedly inserted a cupped plug 86 for the yieldably slidable and guided retention of an associated plunger 87. Disposed about a projecting portion of each of the plugs 86, and also embracing the plunger 87, is a coil compression spring 90, the upper end of which abuts the block 82, and the opposite end of which engages and seats upon a metal collar 91 threaded for engagement with the plunger 87, and to which is vulcanized and securely bonded, a rubber suction cup element 92, the cup of which is shown at 93. Since the structural arrangement of each of the rubber-faced holding plungers is the same throughout, the foregoing description of one will suffice for all. It will be noted that the stock of which the suction cup 92—93 is formed, is of substantial resilience, and yet such as to withstand protracted exposure to reasonably high temperatures. It will further appear that upon endwise pressure on the plunger 87 when the cup 92 is applied to a marker tile or slab element A, the flattening effect of the cup on the upper tile surface is such as to cause a secure retention of the tile by the individual cupped faces of the pressure foot.

It is of course possible to utilize a single rubber facing (not shown) secured directly to the base element 82 of the foot, and to provide such facing with a plurality of cups. It is preferred, however, for the purpose of equalizing pressure on the different unit areas of the marker tile or slab, to utilize a plurality of the individual suction-cup-forming elements such as 92, whereby, even though substantial inequalities may be encountered on the roadway surface, yet all areas of the tile will be subjected to a substantially uniform pressure, or at least a pressure sufficient to force all parts of the tile firmly against the roadway. It is understood of course that the novelty in construction and method of usage of the pressure foot assembly, is not confined to its functional combination with the remaining elements herein described, since, for example, the pressure foot might be used even for direct manual application of the tile marker units without the operative association of any of the remaining elements in combination or assembly therewith.

Supported as to the upper portion or pass of the trackage 44, are a pair of flange elements 95. The members 95 are formed of a heavy gauge sheet metal, and with side wall portions 96, coact to form an open top enclosure for the reception of magazines 100, a pair of which are preferably provided, and each containing a stack of the marker slabs or tile A. It is preferred, of course, that only one of the magazines be disposed in operative position, at a given time, the dual arrangement thereof permitting removal of either for filling, while the other is in tile-feeding position. As a convenient means of lifting the magazines 100 through the short vertical distance between operative and inoperative positions, there is provided on each of the structures defined by walls 95, a magazine lifting cam 101 having a fixed pivot carried by the associated wall as indicated at 102, each cam being provided with an actuating handle 103. Projecting laterally of the lower wall portion of each magazine is a pin 104, which is positioned to be engaged by the associated cam 101, whereby, through a small angular movement of the handle 103, the associated magazine may be lifted from, or permitted to drop to an operative position wherein the tile therein are arranged to be picked up, one at a time, by the pressure feet as they pass thereover.

The provision for accomplishing the last mentioned single-delivery of the tile, is best shown by Fig. 16 and consists of an L-shaped or dog-leg lever, the longer arm of which is indicated at 105, and the shorter arm at 106, the lever being pivoted as through a pin 107 to the trailing end margins of the body plate 82 of each of the pressure feet or platens. About the pivot 107 is provided a small torsion spring 110, so located as to tend to bias the arm 105 counter-clockwise (Fig. 16), or to an inoperative position. As a device for positively impelling the arm 105 of the pickup lever, to an operative position, there is provided a stationary camming element 111 provided at its right hand end (Fig. 2) with an angularly twisted camming surface 112, and on its opposite end 113 with a similar surface reversely disposed.

It will appear from the arrangement of the pressure feet assemblies 61 on the chain, that, with the chain moving in its orbit in a counter-clockwise direction (Fig. 2), as a given foot approaches the operative magazine, the lever 105—106 is gradually rotated through the effect of the camming surface 112, so as to bring the free end of arm 105 of the lever into slightly projecting relation to, and then being upwardly beyond, the tile-holding surface of the foot. This relation appears in Fig. 15, and the lever is approaching this position in Fig. 16. The projection of the lever arm 105 is just sufficient for it to engage the rear edge of only one of the tile, the lever being on the trailing edge of the foot structure. Upon continued movement of the foot, the end of lever 105 serves to carry the tile to the left of the magazine assembly, to a zone wherein the tile is subjected to a moderate pressure to effect a positive suction engagement of the tile by the plungers of the feet.

A device for effecting the last noted operation is indicated generally at 114, the details of which are better shown by Figs. 12 and 13, as including a pressure-roller 115 provided with a peripheral surfacing 116 as of a reasonably compressible rubber stock. The roll 115 is mounted on a shaft 117 therefor, the ends of which are journalled in movable bearing blocks 120 each slidably disposed in a bracket frame 121. Provision is made for biasing the pressure roller 115 in a downward direction, as through threaded rods 122 and 123, connected as through a turnbuckle adjustment 124 to a crosshead 125 which is in turn connected to a compression spring or the like 126. It is seen from Figs. 12 and 13, that the inner ends of the crosshead elements 125, each carry a roller 127. These rollers serve, when the pressure foot and tile are brought under the pressure roll 115, to coact with end cam surfaces 128 on the base block 82, which

is so shaped between the cams as to bias the rollers 127, downwardly, and hence serve to move the pressure roll downwardly upon the tile. Since the adjustment and spring tensioning assemblies are the same on the opposite sides of the pressure roller, the foregoing description of either serves to cover both thereof, it being understood that the adjustment of spring loading may be effected through the elements 124, to care for wear on the roller and differences in thickness of the marker or tile elements.

It will have appeared that, as one of the pressure feet is brought, by movement of the chain 45, to a position beneath the pressure roller with the marker tile thereon, the tile is subjected to a regulated pressure by the roll, thus forcing the marker firmly into contact and into slightly-deforming engagement with the individual suction cup elements 92—93.

It will have appeared as desirable, due to the pivotal mounting of the block 82 of the foot on its supporting arm, to position the foot against rocking movement while subjected to the action of the pressure roll. This is accomplished through the interengagement of flange elements 130 (Figs. 12, 15 and 16) with one or both of a pair of lateral grooves 131 in the block element 82. The manner of this interengagement is such that, even though the line of pressure of the roll 115 is gradually translated from one end to the other of the slab, the pressure foot is nevertheless held in horizontal position throughout such pressure.

The individual tile or marker elements now having been applied, each in its turn, to one of the platen or feet assemblies 61, the continued movement of the carrier chain 45 serves to bring them farther to the left and downwardly over the forward end of the trackage 44 as it appears in Fig. 2. Preferably located near the forward lower portion of the track, is a device arranged to subject the then-exposed face of the tile to the application of a suitable adhesive by which it is to be permanently secured to the pavement or roadway. This adhesive preferably consists of an asphaltic cement or the like, the specific composition of which is not material to the present invention, but it may be noted as a preference to utilize a material for this purpose which is capable of withstanding the highest roadway temperature without excess fluidity, and yet which will not become too brittle or friable, under extreme low temperatures. Such compositions usually require heating to attain the fluidity requisite for even application to the tile as an adhesive, and for this purpose there is provided a cement tank 132 suitable for the reception of a body or bath of the cementing material 133. To enable maintenance of the bath at a predetermined uniform temperature, the lower portion of container 132 is provided with oil burners or the like 134, and a uniform level of the material 133 in the container is desirably maintained through a float valve 135 controlling the inlet or supply of the cement through a flexible conduit 136, directed to a source of supply of the preheated cement, carried as by the towing vehicle (not shown).

Rotatably mounted within the container 132, is a cement applicator, in the present instance including a drum 140, carried by a shaft 141 and arranged to be continually rotated at a low speed as through a bevel pinion 142 driven by a bevel gear 143 slidably carried on a shaft 144, and kept in mesh with the pinion 142 as through a spring 145. The shaft 144 is rotatably supported through a plurality of bearing hangers 146, one of which is shown by Fig. 2, and the opposite end of the shaft actuated through a bevel pinion 147, engaging a companion bevel gear 148 (Figs. 2 and 3) carried and driven by shaft 52 heretofore described, and hence ultimately deriving its energy of actuation from the shaft or axle 60 and the road wheel 24.

It has been found desirable to effect a rather close regulation of spacing between the surface of drum 140 and the tile or marker elements, incident to the application of adhesive thereto. This requirement results from the desirability of coating all of the area of the lower surface of the tile, and yet avoiding any appreciable excess of the adhesive or cement. Such excess obviously adversely affects the cost of cement per mile of roadway marked. For the purpose of insuring a complete coating without excess, it has been found most desirable to move the tile in a direction tangential to, and barely in contact with the surface of the applicator drum 140, this relation clearly appearing from Fig. 2.

So as to provide for manual regulation of distance spacing of the drum 140 with respect to the tile when applied thereto, there are provided a pair of slidable bearing block elements 155 carried in a frame structure 156. To each block is fitted a short screw shaft 157, and to each of the members 157 is secured a collar 158 carrying an arm 159, which serves, when the pressure foot brings the tile to adhesive-receiving position, as a feeler gauge. This effect is attained through the guiding effect of the arms 159, which then enter the lateral grooves 131 on the base member 82 of the pressure foot. It will thus appear that, as one of the foot or platen structures is brought to a position over the drum, the tangential adhesive-wiping action of the foot and tile over the surface of the drum serves to impart the optimum amount of coating thereto. It will be noted from Fig. 5 that the distance arms 157 are each surrounded by a coil spring 160, working between the associated bearing block 155, and an abutment 161.

By reason of the threaded relation of the arms or shafts 157 with the bearing blocks 155, provision of a manual adjustment is made, whereby to compensate for different thicknesses of tile, wear on the pressure foot assemblies, etc. This is accomplished through rotation of the shafts 157, each of which is provided with a bevel gear 162, the gears 162 being enmeshed with and actuated by companion gears 163 (Figs. 5 and 6), the latter being in turn carried by shafts 164 capable of manual rotation through bevel pinions 165, the latter being carried by shafts 164, and through enmeshing gear elements 166, capable of uniform and concurrent rotation through a hand wheel or the like 170, located so as to be accessible to the operator on the deck of the vehicle. It may be noted that the collars 158 carrying the feeler gauges 159, are axially secured to the shafts 157, but that the latter are free to rotate therein, without disturbing the angular positions of the gauges 159.

Since the adhesive is necessarily applied in appreciable thickness to the tile prior to pressing the latter into place on the pavement or roadway surface, it has been found conducive to permanency of the position of the marker, and to enhance the setting or drying effect of the cement, to dust or sift on the markers after laying, a pulverulent solid such as chat or gravel. Provision for this purpose is found in a grit maga-

zine 171, provided with a tapered bottom 172, the slope of which exceeds the normal angle of repose of the grit, the bottom walls being directed into a funnel-like delivery spout 173 (Figs. 2 and 4), thence into a sifter drum 174, the peripheral portion of which is suitably perforated. Delivery of the grit from the bin 171 into the drum is controlled as by a valve 175, provided with a stem or shaft 176 and a manual control extending above the bin and indicated at 177. While possible to effect a delivery of the grit directly from a spout such as 173, directly onto the markers, it is preferred, for more even distribution, to utilize the revolvable drum 174 as shown; the latter when utilized, is carried as by a pair of hangers 180 suspended from an overhanging portion of the frame, for example, one or both of the extended sill members 34. A drum shaft 181 is journalled in the hanger arms 180, and is provided with a driven sprocket 182 actuated by a chain 183 which engages a driving sprocket 184 on the shaft 52, which is power-driven as before noted, through the axle or shaft 60 and road wheel 24. It is a preference to construct the drum 174 of a width to distribute the gravel or other dusting material over a width of roadway corresponding to, say, a double row of the marker elements. However, since in some cases only a single row of the elements is to be laid, it is of course desirable then to confine the strip of grit application, to the necessary minimum. In order to provide for an adjustment in accordance with the width of strip to be dusted, there are provided a pair of contractile sheet metal bands 185 adjustably embracing the periphery of the drum, and arranged so that, upon loosening their holding screws, they may be brought closer together or increasingly spaced, or if desired, entirely, removed for regulating the area of emission of the grit or gravel by the drum.

Provision is desirably made for the tractive transportation of the marker assembly vehicle from place to place, intervening the periods of its operation for applying the markers. To facilitate this haulage with the marker applicator agencies inactive, there is provided an arrangement, best appearing in Fig. 7, for raising and lowering road wheels 21 and 23. It will have been noted that the front wheels of the chassis are provided with steering knuckles 190, these knuckles being connected by a tie rod 191 and the wheels proper journalled on the short shaft sections 192, steering actuation of these wheels being cared for by a link 193, pivotally connected to member 27, above described. As to the rear wheel assembly of the vehicle, it is preferred to provide wheel 24 as a "tight" wheel secured to the axle 60 for driving propulsion of the various mechanism heretofore described, and to mount wheel 23 in free rotating relation on the axle. The bearing arrangement is such as to permit the relatively slight lifting and lowering of the left hand road wheel relative to the chassis, without disturbance of bearing function. It will be noted from Fig. 7 that the shaft portions 192 and 60 are each carried in a slidable block or cross-head 193, the latter being mounted for vertical movement in guide frames 194, a pair of which dependingly extend below the chassis and deck 20, for the slidable reception of the heads 193. Secured to, and extending upwardly from the crossheads, are a pair of threaded shafts, one for each wheel, and indicated at 195. For each shaft 195 is provided a bevel pinion 196, with the pair of which are associated companion bevel gears 197, carried by a horizontal adjustment shaft 200. The latter shaft is carried by bearing arms 201, and is provided with a hand crank 202. The shafts 195 each extend through a cooperating threaded bushing 203, the bushings being carried in sockets or wells 204, and each secured to one of the pinions 196. It will be apparent from the foregoing description, and from Fig. 7, that as the crank 202 is actuated in one direction it exerts, similarly to a screw jack, a lifting action on the paired road wheels on the left side of the vehicle, and that when the crank is oppositely rotated, it will exert a similar lowering action on the wheels, whereby they may be selectively brought into operative or inoperative relation. Clearly, when this pair of wheels are raised relative to the chassis it will permit a lowering of this side of the chassis sufficiently to permit the pressure feet carrying the tile, to be brought into firm pressure-applying relation to the tile and roadway. Either by a simple form of clutch (not shown) or by removing the chain connection to axle 60, the chain 45 and other mechanism may desirably be rendered inactive during the inoperative haulage period referred to.

In case the marker-applying mechanism is to be employed for the application of tile units or the like to roadway surfaces which have been in use for some time, it is desirable to clean the strip of roadway to which the units are adhesively applied, this cleaning resulting in an obvious advantage of a better and more uniform adhesion of the tile with the subjacent surface. Such operation, when necessary, is conveniently cared for as by a rotary brush 205 mounted on a shaft 206 journalled in arms projecting at an angle forwardly of the chassis proper, the bush bearing arms being indicated at 207. The brush may be directly impelled as by a traction wheel 210, through which the shaft and brush are directly actuated, as shown for simplicity of illustration. However, if desired, the brush may be reversely rotated with a somewhat improved sweeping action, and power-driven as from shaft 144 by intervening gearing (not shown). In either case, it has been found expedient to mount the shaft 206 and the brush, for rotation with their axis at an acute angle to the direction of vehicle movement, so that the sweeping action of the brush serves to divert the dirt and foreign matter from the roadway laterally of the zone of application of the tile. The operation of the brush assembly will be evident from the arrangement of the brush with respect to the traction wheel.

The operation of the various elements of mechanism preferably employed in the present assembly, is thought to have been apparent from the foregoing description of the several units, but the cycle of operative sequence of the several items of apparatus may be briefly reviewed by noting that, as a given one of the pressure feet approaches the tile-filled magazine, the longer arm 105 of the ejector lever, carried by the trailing end of the associated foot frame 82, is gradually cammed about its pivot 107 in a clockwise direction (Fig. 16) so that the extreme end of the lever projects beyond the suction cup elements 92 a distance just sufficient to displace, by endwise movement, one of the tile or marker elements from the magazine. As the chain 45 carries the foot beyond the magazine, the foot and tile thereon are held in a definitely horizontal position by interengagement of the grooves 131 by the flange elements 130 of the rail structure 111. Continued movement of the foot by chain 45, serves to bring the tile beneath the pressure roll 115 against

the loading of the springs 126 and the resilience of the rubber surface 116 of the roll. The effect of this is to squeeze the tile tightly onto the resilient surfaces of the several cooperating cup elements 92, and to bring their suction cups into firm holding engagement with the then lower surface of the tile.

As the pressure foot is brought toward the forward end and downwardly of the trackage 44 which serves guidingly to engage the moving chain, the foot carrying the tile is moved so as to bring the tile into tangential wiping engagement with, and to impart a rotating effect to the cement applicator drum 140. During this movement, the interengagement of the feeler or gauge members 159 with the grooves 131, serves to bring the applicator roll to exactly the right spacing, such that the tile picks up the desired quantity of adhesive in its rolling movement over the periphery of the drum, it being understood that any relatively preliminary or coarse adjustment of this space will have been made through manipulation of the hand wheel 170 and associated mechanism, as above described. Due to the motion of the vehicle and of the feet or platen members carrying the tile, each of the feet is brought gradually into engagement with the pavement, as will clearly appear from Fig. 2. This action preferably involves first, a gentle contact of the rear margin of the tile or marker, following which the marker is firmly pressed, over its whole surface. Thereafter, the pressure foot is first lifted from the rear edge of the tile, then from the intermediate portion and finally from the leading edge of the tile or marker. There thus results what may be referred to as a heel-and-toe action of the platen on the tile, which has the advantage of gradually displacing any air bubbles or pockets from the space between the cement-coated tile and the pavement surface. During the pressing operation on the tile, it will appear that if the roadway surface be relatively free of irregularities and practically planar in form, the application of the marker through the foot will result in a relatively even compression of the several cups 92 and springs 90 and 66. However, in case the marker is applied over a high road joint, or is presented to an irregular surface, the differential compression of the several springs 90, will nevertheless assure a practically even distribution of pressure over the entire surface of the tile. It is noted parenthetically that the preferred markers are of such composition as to enable them to conform without breakage, to any reasonable irregularities, and to enable their application with uniform adhesion in spite of any ordinary surface inequalities.

It will be apparent from the relation of the grit drum 174 rearwardly of the zone of pressure application of the marker, that the drum serves to cover the marker entirely, and also any moderate extrusion of liquid adhesive about the edges thereof, some small amount of which is usually inevitable.

It will have appeared from the foregoing description that the invention serves to attain a distinctly novel and advantageous result, in that it enables an improved method of application of solid marker units or tile to a roadway surface, by a practically full automatic mechanism, enabling this operation to be conducted at a much lower cost than heretofore possible by hand application, assuring the disposition of the marker elements in true alignment, and in all other respects fully attaining each of the objects hereinabove expressed as well as the many advantages implied from the more detailed portions of the disclosure.

Although the invention has been described by making specific reference to a preferred exemplary embodiment and practice, the description is to be understood solely in an instructive and not in any limiting sense, since numerous changes may be made in the several items of apparatus, and in their combinations and sub-combinations, all without departing from the full intended scope of the invention as defined by the claims hereunto appended.

I claim as my invention:

1. In a mobile device for applying plastic tile or the like, as roadway markers, a vehicle frame, a track carried by the frame, a tile carrier operable on the track, means for applying tile to the carrier, means along the track for coating the tile with an adhesive substance, and a plurality of applicator members on the carrier adapted for pressing the tile into place substantially along a line defined by the track.

2. In a device for applying tile markers or the like to a roadway, a vehicle structure, an endless track disposed in a substantially vertical plane and carried by the vehicle structure, an endless chain operable on the track, means for supplying marker elements to the chain, means along the track for coating the markers with an adhesive, and means carried by the chain for applying and pressing the tile into place along the roadway.

3. In a movable apparatus for applying tile markers to a roadway or the like, a vehicle frame, an endless chain operable in substantially a vertical plane on the frame, a magazine for marker units, means carried by the chain for removing the units from the magazine, one at a time, whereby they are picked up by the chain incident to its travel, means along the track for coating the markers with an adhesive, and an applicator member carried by the chain and adapted for pressing an individual marker into place along a line on the roadway.

4. In combination in a mobile device for applying roadway marker tile or the like and including a vehicle, a chain mounted for orbital movement on the vehicle, a magazine for the marker elements, overlying a portion of the path of the chain, a plurality of spaced, retractible tile-engaging elements carried by the chain, each adapted when in operative position, to coact with the magazine to effect the delivery of tile to the chain, and means associated with the chain and movable therewith, for pressing the markers into final position on the roadway.

5. In a device for laying tile elements substantially in a line on a horizontal surface, an endless carrier arranged for movement substantially in a vertical orbit, holders for the individual marker elements, mounted on the carrier, a magazine along a portion of the carrier for applying the individual tile to the carrier, means beyond the magazine in the path of travel of the carrier, said means adapted for effecting a transfer of the individual markers from the carrier to the roadway, and subjecting the markers to pressure when applied to the roadway.

6. In a device for applying a line of solid marker elements to a roadway or the like, an endless chain, means for moving the chain in a vertical orbit over the roadway, holders on the chain for carrying the individual marker elements, and a

resiliently mounted pressure roll relative to which the markers are moved by the chain, and means for effecting a transfer of the markers from the holders onto a roadway surface.

7. In a mobile device for applying plastic tile or the like as roadway markers, a vehicle frame, a tile carrier operable on the frame, a source of supply of the individual marker tile, means along the path of the tile carrier for applying a liquid adhesive substance thereto, and means for pressing the tile into place substantially along one pass of the carrier.

8. The herein described method of applying a semi-rigid marker element to a roadway or like surface, which consists in mechanically coating one face of the marker with an adhesive substance, applying the marker with its coated surface presented toward the roadway, first mechanically pressing one margin thereof onto the roadway surface, continuing the application pressure lengthwise of the marker, and finally freeing the marker of application pressure at its opposite margin.

9. The herein described method of applying an adhesively coated element for marking roadways or the like, which consists in mechanically subjecting the marker element to a pressure rockingly applied between the leading and trailing margins of the marker.

10. In a device for the pressure application of a solid marker element to a roadway or the like, a foot structure provided with a marker-retaining seat of an area at least approximating that of the marker element, and an arm projecting upwardly from the foot structure, for manipulation thereof in applying a marker, the seat portion of the foot structure being formed of a plurality of individually reciprocable, marker engaging elements.

11. In a device for the pressure-application of a solid marker element to a roadway or the like, a foot structure provided with a marker retaining seat of an area at least approximating that of the marker element, the seat being comprised of a plurality of individually actuable, spring-pressed marker-holding elements, and an arm projecting upwardly from the foot structure, for manipulation thereof in applying a marker, the arm being resiliently connected to the foot structure.

12. In a device adapted for the pressure-application of a solid marking tile to a pavement or the like, a foot or platen portion adapted as a carrier for the tile, and having a resilient facing adapted to engage the tile and characterized by an imperforate, concavely recessed or indented portion in its tile-engaging surface, and adapted to serve as a suction retaining surface.

13. An applicator device for effecting a pressure-deposition of a roadway marker tile or the like, and including a rockable foot portion, a plurality of spring-pressed plungers on the foot portion, each plunger being faced with a layer of a resilient, compressible material formed for suction-holding engagement with a marker element.

14. In a device for applying plastic roadway marker tile or the like, a platen structure for holding the tile prior to and during its application, the platen structure including a frame, a plurality of individually actuable plunger elements carried by the frame, a rubber suction cup or the like associated with each plunger and adapted for engagement with the tile, spring means tending to urge the individual plungers toward a common bottom plane of the platen, and an arm projecting from the frame and adapted for imparting a rocking movement thereto incident to the transfer of a tile marker to a roadway or the like, from the platen.

15. In a device for effecting a pressure-application of road marker tile or the like to a paved surface, a foot or platen structure formed for releasable engagement with a tile element, a plunger projecting from the upper surface of the foot or platen and pivotally connected thereto, a guide member in which the plunger is adapted to operate, and spring means between the plunger and guide, constituting a resilient connection therebetween.

16. In a pressure applicator for roadway marker tiles and the like, a pressure foot embodying holding means for releasable engagement with the tile to be applied, a foot-actuating arm, and a connection between the foot and the arm, providing a limited universal pivoting movement between the foot and the arm, whereby, responsively to a predetermined movement of the arm, the foot and tile are enabled to conform to inequalities in the road surface.

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