United States Patent [19]

Eigenmann

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[54] **LINE-MARKING DEVICE FOR ROAD SURFACE**

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[52] **U.S. Cl.** **404/94**
[51] **Int. Cl.** **E01c 19/12**
[58] **Field of Search** 404/94, 95, 93, 82, 79, 404/14

[56] **References Cited**

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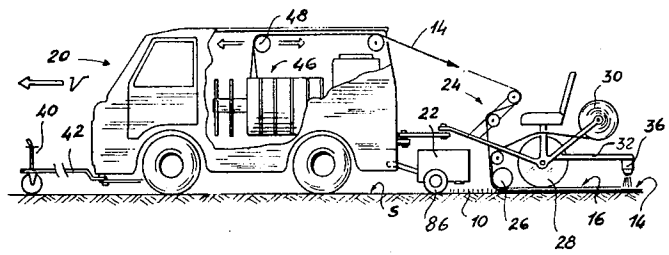
Primary Examiner—Marion Parsons, Jr.
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

The specification describes a device designed for travelling along a given path on a road surface for laying down on and adhesively securing to said surface a traffic-regulating line or similar mark means. The device comprises a service unit in form of a motor-van equipped with supply means and an operative unit trailed and supplied by the service unit and provided with means for forming on the road surface a primer layer wider than the line to be marked and having thermal energy, and with means for laying down and pressing a marking tape material on said primer layer, the thermal energy of which promotes a quick modification of state at the interface between said layer and tape to cause prompt adhesion of said tape to said layer and of said layer to said road surface.

9 Claims, 7 Drawing Figures



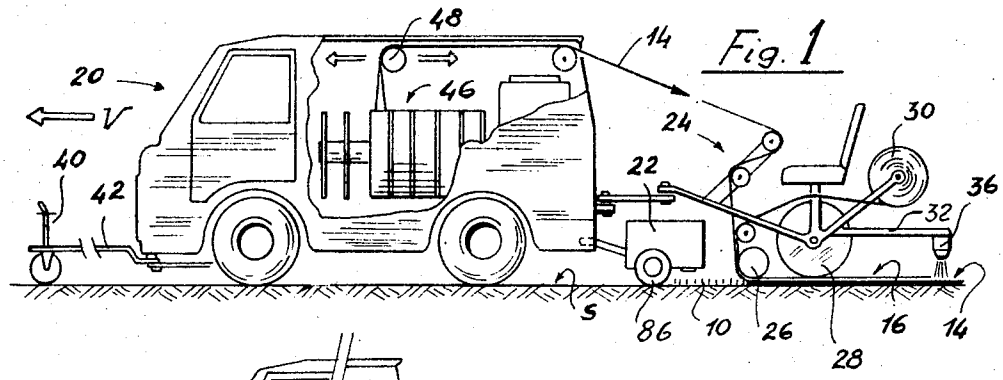


Fig. 1

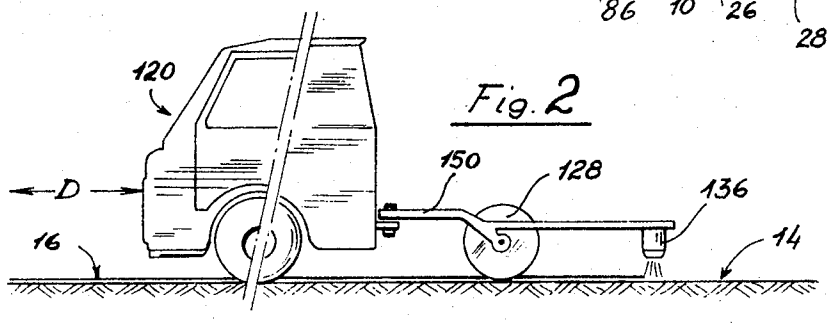


Fig. 2

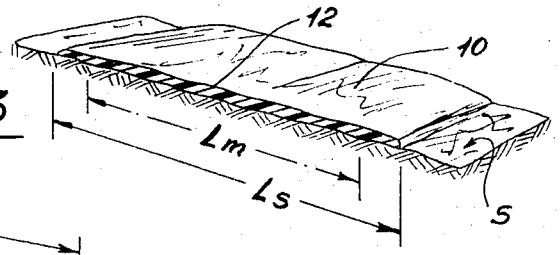


Fig. 3

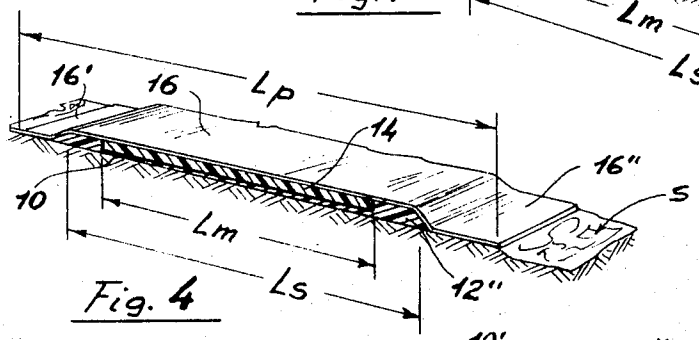


Fig. 4

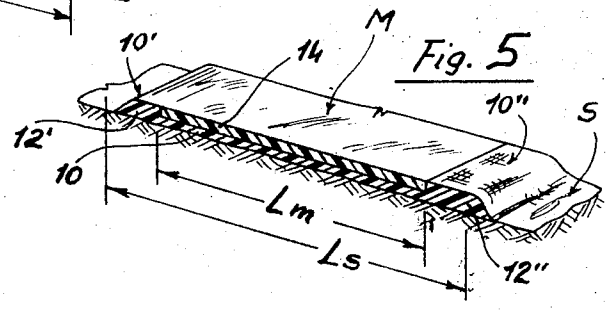
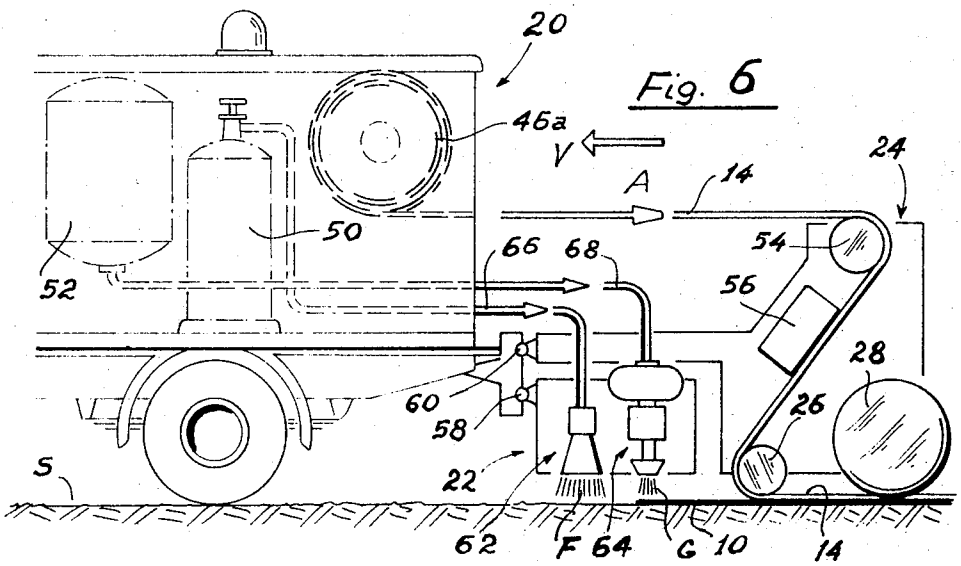


Fig. 5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46a
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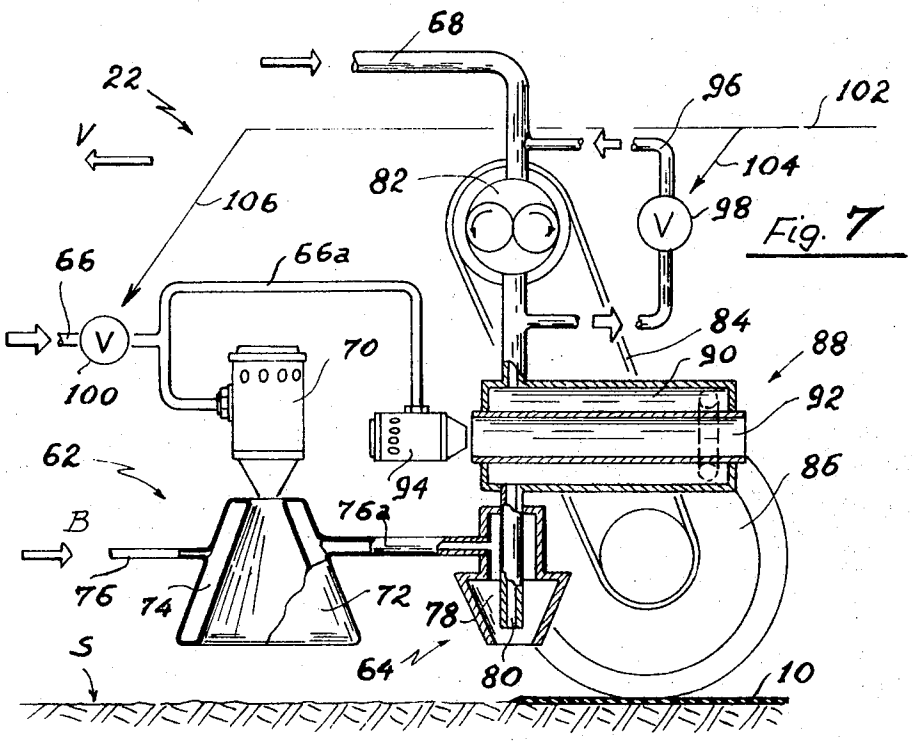
Fig. 6


68
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86
B
76a
76
74
72
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S
64
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Fig. 7

LINE-MARKING DEVICE FOR ROAD SURFACE

BACKGROUND

1. The Field of the Invention

This invention concerns improvements relating to devices and apparatus, and to the methods for taking advantages therefrom, for producing continuous or interrupted traffic lane-dividing or other traffic-regulating marking on road and like surfaces. More particularly, this invention is concerned with methods and apparatuses designed for laying down on and adhesively securing to road surfaces strips of tape material. Still more particularly, this invention is concerned with improvements relating to the manner and means for quickly and effectively producing on an uneven and porous road surface a layer most adapted for forming an impervious and smooth surface for having the tape material laid thereon and most promptly adhesively and permanently secured thereto.

More specifically, this invention is also concerned with a new and improved apparatus adapted for displacement on the road surface along a path corresponding to the traffic-regulating line to be formed, the apparatus being adapted either for regular travel on roadway as a quite conventional road motor vehicle does, when not engaged in the marking operation, and for exceptionally fast and uninterrupted traffic-directing line formation, by uninterruptedly operating for also exceptionally extended lengths of marking.

2. The Prior Art

The road marking material in strip form, of essentially elasto-plastic composition and provided by manufacturers in spools or bobbins, is well known. The advantages of such materials, in comparison with road marking by painting signs on the road surfaces or by pouring hot-melt or otherwise fluidified marking compounds on the road surface, where the compounds set to form the marking, are well known to those skilled in the art, and further comments therabout are unnecessary.

Several road-marking apparatus and vehicles have been heretofore proposed and widely used for mechanically laying down and adhesively securing strip materials of the kind referred to above, generally of elasto-plastic nature, on and along given paths on road surfaces. some such apparatus and vehicles have been described and shown in the U.S. Pat. No. 3,007,838 and 3,155,564, granted in the United States of America to the inventor of this invention.

In view of providing for road surface porosity and unevenness, apparatus and methods for preliminary forming on said surface a smooth and impervious layer of bitumen-based composition have been also proposed and experienced. In the U.S. Pat. No. 3,262,375, of the same inventor, an example of such improved technology has been described and shown also.

Generally speaking, the prior art apparatus and methods are subject to several objections and limitations. The apparatus are pretty costly, bulky and complicated, and smaller and simpler ones has not proved to provide a desirable efficiency and fast operation either as the speed at which the tape laying vehicle is capable of travelling along the given path on the road to be marked and as the promptness and the sureness of adherence of the tape material on the road surface are concerned.

Further, it has been found as greatly desirable that the apparatus should meet the further following conditions:

1st — To be adapted to quite rapidly and conventionally travel on the roadway as an usual road motor-vehicle can. As a matter of fact, road marking is an operation which can be made here and there, even far from the place where the apparatus are usually recovered and worked for maintenance and preparation for operation, and in locations at substantial distance from each other;

2nd — To be capable of uninterruptedly laying down relevant lengths of marking tape, well over the length of tape wound on one bobbin or spool, and to require simple and minimum time-consuming operations for refuelling and reloading the materials necessary for service, that is the apparatus should be such to provide a high time/operation ratio, together with a minimum of traffic disturbance, that is of time during which the apparatus actually operates on the road;

3rd — To provide an extremely prompt setting of the marked line on the road surface, that is, most desirably, to operate so that the marked road surface can be re-opened to traffic, newly marked areas inclusive, as soon as the apparatus has been passed over and has the marked line laid on and secured to said areas; and

4th — To require, for its operation, few personnel, in particular a crew of two or possibly of three average skilled men, and to avoid or minimize laborious, fatiguing and dangerous manual operations, while refuelling and supplying the apparatus, made with the help of an additional crew, can be quickly made on the road.

It is therefore an object of this invention to provide a new and improved apparatus which is not subject to the objections of prior art means and which meets the above and other desirable conditions. It is further an object of the invention to provide a new and improved method for taking advantage of such apparatus and for effectively and quickly providing the preparation of the road surface to receive the tape material and promoting the prompt and most sure adhesion of the material to the thus prepared surface.

Another object of this invention is to provide a new and improved apparatus and method by which the laid down tape marking material is so arranged and secured to a tape receiving layer that the interface between said tape material and said layer, wherein an adhesive connection is provided, is fully protected against water, moisture, oils, gasoline and other destructive agents penetration, together with complete protection of the material side edges, that is of the parts which are most subject to wear and damage by the traffic.

According to the invention, the improved line-marking apparatus consists of the combination of a service unit and of at least one operative unit. The service unit comprises a suitably equipped and implemented self-propelled and load-carrying road vehicle, such as a motor-van, and the operative unit is provided with means adapted to form on the road surface a primer layer adapted to have the tape material laid on and adhedively secured to its upper face, and to lay and press said tape material on said face, while the said service and operative units run concurrently along a given path of the road surface, and the operative unit is continuously supplied by the service unit with the tape and the primer layer forming materials, as these same materials are transferred to the road surface to form the said

primer layer and the strip marking thereon. Further, the operative unit comprises heating means supplied with fuel by the service unit and arranged to overheat a primer layer forming a fluidified composition supplied by the service unit and pump and nozzle means for ejecting said overheated composition on selected areas of the road surface to form on said surface a primer layer wider than the marking tape, the excess heat of the thus formed primer layer being made use of for promoting an abrupt modification of the physical and/or chemical state of the material adjacent to the interface between the said primer layer and tape as said tape is being laid and pressed on said primer layer.

Preferably, the said service unit and operative unit are connected together by universal joints positioned to provide that the operative unit is trailed by the motor-van forming the service unit, for operating along the desired path, and the said motor-van has collimating means arranged at its fore end to facilitate steering of the van along such path, as defined by the traces or residual portion of a worn off traffic-directing line to be renewed, for example, or by signs or marks provided on the newly made or renewed covering of the road surface.

Further, the said service unit forming motor-van is equipped with means for rotatably supporting a plurality of spools or bobbins of marking tape, and with means for successively guidedly transferring the tape material as successively unwound from each individual spool to the operative unit for facilitating uninterrupted operation along relevant lengths of road. The service unit carries also suitable supplies of fuel (preferably liquified gas fuel), of pressurized air (preferably an air compressor) together with the materials and compound necessary to form the primer layer and to adhesively connect the marking tape thereon.

A composite apparatus as above is therefore designed for operating according to a new and improved method for effectively providing traffic-regulating lines on road surfaces. This method includes the steps of preliminarily forming a primer layer wider than the tape on the road surface, of providing excess heat in the thus formed layer, of applying and pressing the marking tape on this layer when still hot to promote a state transformation at the thus formed interface and consequently promoting essentially immediate adhesion of the tape on said layer, the pressing of said tape on the wider primer layer when still in essentially plastic state causing embedding of the tape in the layer, the side edge portions of which will sidewardly cover and protect the side edges of the laid down tape. Preferably, a covering sheet of paper or other laminar material is also laid down on the marking tape and the primer layer to temporarily protect such material and to prevent the pressing means, such as one or more rollers, to contact the still plastic primer layer edges.

These and other objects, features and advantages of the invention will become best apparent from the following detailed description of preferred embodiments of same invention, taken together with the accompanying drawings.

THE FIGURES OF THE DRAWINGS

FIG. **1** is a diagrammatical side view and partly a longitudinal sectional view of an apparatus constructed and operable according to the invention;

FIG. **2** is a fragmentary side view of an ancillary unit adapted to complement the apparatus of FIG. **1** to meet some modified procedures of road marking;

FIGS. **3, 4** and **5** are fragmentary perspective sectional views of the materials as laid down on and secured to the road surface at the various steps of road marking;

FIG. **6** is a vertical longitudinal sectional view of a preferred combination of means provided in the service and operative units, in a modified embodiment of the invention; and

FIG. **7** is a rather diagrammatical longitudinal sectional view of the means provided in a preferred form in the operative unit and designed for laying down the primer layer, preparatory to laying down and securing of the marking tape.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. **1** to **5**, the apparatus of the invention is designed to form a continuous or interrupted traffic-regulating line (or an equivalent marking) on a road surface S. This operation comprises forming first an uniform, impervious and essentially smooth surface **10**, of width L*s* wider than the width L*m* of the tape material to be laid down, by applying a primer layer **12** of suitable composition on said surface S. The tape material **14** is then laid and pressed on said primer layer **12**, and temporary protective sheet material **16** is applied above said tape **14** and the parts **12'** and **12''** of the primer layer **12**, extended sidewardly from the tape, the sheet material **16** being of width Lp greater than the width Ls of the primer layer to provide side portions **16'** and **16''** which directly contact the road surface S.

Upon removal of the sheeting **16** (FIG. **5**), the tape material **14** will thus provide a marking strip the surface M of which is flush with the surface **10'** and **10''** of the side portions **12'** and **12''** of the primer layer. Said side portions can also go over the lever of said marking surface M, as the said tape material **14** is downwardly pressed into the primer layer **12** when such layer is still in its plastic state. Therefore, the marking tape **14** will be completely protected at its side edges also, that is where moisture and oil penetration might occur and where the tape is most subject to be worn off or otherwise damaged by the traffic.

A - The method of operation

The above summarized steps of providing the road surface S with the marking strip area M (FIG. **5**) comprises, as its preferred procedure, the following sequence of operations:

i. The primer layer (FIG. **3**) is formed upon a completely dried and preliminarily heated road surface. This road surface preparation comprises directing towards the selected areas of said surface a jet of flame, as provided by a suitable burner. This jet ensures the elimination of water, moisture, lubricating oil and generally of any substance which could hinder the proper connection of the primer layer **12** with the road surface, and provides a warm means on and within which the primer layer material can intimately permeate, by deeply filling the pores and surface cavities;

ii. the composition prepared to form the primer layer **12** (a few examples of such compositions will be given below) is directed onto said heated road surface S from

above in metered amounts. This composition, supplied in fluidified and preferably pressurized state by the service unit, is preliminarily heated in a heat-exchanger in the operative unit, until an excess of heat is imparted to such composition, and then ejected under pressure onto the surface S for impingement thereon. The thus impinging and essentially fluid composition will intimately connect itself to said road surface;

iii. this composition comprises components adapted to react and provide an essentially thermo-setting material which promptly sets as such primer layer is formed, while the said excess of heat is at least partially transferred to the tape material laid down on said primer layer for promoting activation and setting of the adhesives (either in solid or in highly viscous state) provided at the lower face of the tape material, for promptly completing the adhesive connection of the tape to the primer layer;

iv. concurrently applying the protective sheeting **16** on the tape material;

v. pressing said tape material **14** and sheeting **16** on the still warm primer layer **12** until the thickness of the tape **14** will be commensurate with the primer layer (see FIG. **4**); and

vi. removing, if necessary, the protective sheeting **16.**

B - The line-marking apparatus

As shown in FIG. **1,** the apparatus comprises a service unit consisting of a suitably implemented motor-van generally indicated at **20,** and a twin operative unit consisting of a primer layer forming device **22** and of a tape material laying down and pressing device **24.** This latter device comprises at least a tape applying roller **26** and a suitably heavy pressure roller **28** to apply and press the tape material **14** on the primer layer face **10** provided by the device **22.**

The temporary protective sheet material **16** is laid down concurrently with the tape **14** and can be supplied, for example, by a spool **30** carried by same device **24.** This sheet material **16** may consist of a thin plastic film or preferably of a paper ribbon, which can be left on the road where it will be promptly torn off and eliminated by the traffic. Preferably, the apparatus comprises also means for providing such elimination, such as a burner **36** carried by a rearwardly extended brace **32** of same the device **24.** Such sheet material can be however recovered, such as by rewinding it about a spool, for example, if consisting of pretty costly and re-utilizable material, such as a pretty thick polyethylene sheeting.

Preferably the composition of the primer layer, the material of the marking tape and the adhesive are so selected to provide the most prompt setting of the marking, so that upon or shortly after the removal of the sheeting **16** the marking will not be damaged by traffic and the thus uncovered portions **10'** and **10''** of the primer will no more be tacky.

In the occurrence that such setting would require a time longer than that taken by the apparatus to travel the interval from the location (under roller **26**) of laying down the tape and the sheeting, to the location (under the action of means **36**) of removal of such sheeting, such removal might be provided by a separate vehicle and device. This might be the case, for example, when a more slowly setting primer composition has been made use of, or when a very fast progression of the apparatus is desired, or when the operation is being carried on in summertime or in any case in a hot climate which can delay heat dissipation.

Such separate vehicle can consist of a separate motor-van **120** (FIG. **2**) pulling an ancillary device **150** which carries the burner **136** (or other sheeting eliminating means) and preferably a further pressing roller **128** to complete the pressure and flattening of the marking material before leaving it subject to the traffic.

The service unit is provided with means for facilitating the displacement along the required path. Such means include for example a sight or collimator **40** supported well forward of the vehicle fore end by a brace **42,** for example, connected to the steering mechanism of the motor-van, so that the driver of the van can precisely follow a tracing line. This sight can obviously be sidewardly displaced with respect to the vehicle if the primer layer forming and the tape material laying devices **22** and **24** are in turn positioned to form the said layer and marking laterally of the tracks of the same service vehicle **20.**

As above discussed, the said service van **20** is designed for actually servicing the devices **22** and **24** in operation, in addition to pulling the same and to provide transportation for the same devices, to and from the various locations where the marking operations are to be and have been made. Therefore, the van **20** is provided with means for rotatably supporting a plurality **46** of spools of marking tape **14.** Preferably, such spools are co-axially supported about a mandrel arranged horizontally and longitudinally in the motor-van body. Above said plurality **46** a guide roller **48,** rotatable about a horizontal axis transversal to the van, is displaceably supported, in the direction indicated by the arrows in FIG. **1,** for selectively positioning it above the spool being actually unwound for supplying the device **24** with the tape material **14.** Therefore, the apparatus can substantially uninterruptedly operate for providing very substantial lengths of marking, simply by joining the trailing end portion of a tape stock unwound from the emptied spool to the leading end portion of another stock of tape unwound from a spool adjacent to the emptied one.

While the arrangement of spools, as shown in FIG. **1,** is preferred in view of the saving of space, it requires somewhat of a torsion (of 90°) of the tape from the actually unwinding spool and the guide roller **48.** The van **20** might have tape spools differently arranged thereon, for example rotatably supported about individual mandrels transversal to the van, such as shown at **46a** in FIG. **6,** wherein there is also shown a tape being pulled in direction A from the spool to a guide roller **54** carried by the device **24,** the pull, and therefore the supplying of the tape, being simply ensured by the displacement of the apparatus in direction V, owing to the fact that the portion of same tape, already laid down on the primer layer **10,** is secured thereto and provides the necessary pulling action. When the laying down of the tape has been discontinued, by simply engaging the tape (manually or mechanically) under the applying roller **26** the required pull and laying down of the marking tape will be restored.

FIG. **6** illustrates also how the essential components of the apparatus can be preferably arranged in the various units. For providing the most simple, lightweight and transportable operative units, all and any source or

supply of materials and media which can be transferred from one to another unit are advantageously arranged on and trasported by the service unit, that is the motor-van **20.**

Thus, within said van **20,** additionally to the spools of tape material, there are arranged the supplies of the materials to be made use of for providing the primer layer and the means for heating same. Such arrangements can be easily conceived by those skilled in the art and therefore do not require any detailed description.

Thus, for example, the service van **20** has arranged therein one or more bottles or cylinders such as at **50** for fuel, such as liquified fuel gas, one or more preferably pressurized containers or tanks such as at **52** for the composition or the compositions provided for primer layer formation, bottles or a compressor for applying pressurized air, storage batteries or a motor-generator for supplying electrical energy and so on.

FIG. **6** illustrates also the basic components of the operative unit which, according to the example, comprises two separate devices **22** and **24,** individually connected to and pulled by the service unit by means of articulated joints **58** and respectively **60,** positioned so that the device **22** will form the primer layer exactly on the areas where the device **24** will lay down the marking tape **14,** irrespective of the direction (straight or curve) of travel of the trailing service unit.

Basically, the device **24** comprises at least a roller for laying down and pressing the tape on the primer layer. Preferably, it comprises two rollers **26** and **28** (as shown in FIG. **1** also) for laying down and respectively for pressing. It may comprise a device **56** (individually known in the art) for applying a highly viscous adhesive to the face of tape **14** just before its contact with the primer layer, if such tape is not provided with an adhesive in solid and non-tacky state on its lower face, such adhesive being of the type susceptible of activation under the action of heat and/or of the chemicals comprised in the not yet set primer layer. As shown in FIG. **1,** the device **24** can be provided with the above discussed means **32** and **36** and with a heat for accomodating the crew which controls and provides for the necessary actions.

According to the preferred embodiment, the device **22** comprises a first burner **62** providing a jet of flame F on the road surface S and a nozzle assembly **64** to direct metered amounts of the compound G onto the heated surface for forming the primer layer **10,** said burner and assembly being supplied by the service units through suitable flexible ducts **66** and respectively **68.**

FIG. **7** illustrates a preferred embodiment of the essential operative elements of the device **22.** The first burner **62** comprises a burner body **70** co-axially located above a frusto-conical flame diffuser **72** wherein secondary air is supplied to the flame. Such diffuser **72** has metal twin walls forming an interspace **74** wherein pressurized air (supplied by the service unit) is fed through a duct **76,** in direction B. This air cools the diffuser and protects it against overheating and, upon having been heated in said interspace **74,** is then fed, through a duct extension **76***a*, into a chamber **78** arranged about the nozzle **80** from which the primer layer compound is caused to issue. This chamber **78** has a downwardly open passage co-axial to said nozzle so that the issued compound will be confined within a hot gaseous medium which prevents anticipated heat dissipation from such compound to provide the desired excess heat in the formed primer layer **10.**

The device comprises also a metering pump **82** for feeding metered amounts of the fluidified compound, supplied through duct **68,** to the nozzle **80.** Such pump is preferably actuated by a transmission **84** driven by a road engaging wheel **86** (see FIG. **1** also), so that the out-put of the pump will be proportional to the displacement of the apparatus in direction V, that is to the length of the actually formed layer is given width Ls (see FIGS. **3** to **5**).

The excess heat is imparted to the pumped compound by causing it to pass within a heat-exchanger **88.** This heat exchanger has an outer shell forming an interspace **90** wherein the compound passes and is heated by a flame issued by another burner **94** within an inner tubular shell **92;** the said other burner **94** is fuelled through a side extension **66***a* of the duct **66** from the service unit. A valve **98** in a by-pass **96** of pump **82** and a valve **100** in the duct **66** can discontinue the operation of the device, upon control applied by means of suitable control means, diagrammatically indicated at **102, 104** and **106.**

It is evident that such valves **98** and **100** (such as remotely pneumatically or electrically actuated valves) will be so controlled by conventional control means (such as diagrammatically indicated) that valves **98** will open, to by-pass and feed back the out-put of pump **82,** while valve **100** will close the fuel supply to burners **70** and **94.** Further, the discontinuing of the operation of device **22,** concurrent with discontinuing of laying-down of the tape material, will usually occur for brief times. Therefore, the valve **100** will not completely close the fuel supply (a by-pass of small cross-sectional area, not shown, might be provided for) so that a minimal amount of fuel will be maintained to the burners, for keeping them alive for subsequent full activation, and for continuously supplying heat to the amount of compound standing in the interspace **90,** ready for the same re-activation.

The prompt setting of the primer layer and the priming of the adhesion of the marking tape material on said layer depend from a suitable selection of the primer layer forming compound. For example, such compound can consist of a solution of polymeric resins and elastomers in a low boiling solvent, which will be promptly eliminated by the applied heat, and/or by cross-linkage compounds the cross-linking of which can be promoted or accelerated by heat. The cross-linking or anyway the setting can be also provided by contacting two separate compounds just upstream of the nozzle **80** or even on the surface S, one of such compounds containing for example a catalyzer and/or an accelerator for the other compound.

The prompt adherence of the tape can be promoted by the contact of the same tape with the just applied primer layer. Such layer can prime the adhesive in various manners. For example, the solvent of the layer, while being eliminated, can dissolve an adhesive component of the tape at the interface. At the same interface, somewhat of a plastification of the tape can be promoted to provide the desired adhesion, and even a chemical bond can be promoted by heat and/or promoters at the said interface as the contact between the tape material and the primer layer occurs.

Several primer layer forming compounds which can promote an abrupt modification of state at the interface between such layer and the overlaid tape material, when an active heat-exchange occurs at said interface, can be made use of. Two Examples of such compounds follow, one of such Examples relating to an "one component" primer, that is a composition adapted to become active under heating only, while the other Example describes a "two component" primer, wherein two compounds are to be contacted just upstream of the nozzle or on the heated road surface. It is evident that for making use of a two-component primer the means **52, 68** and **78** to **94** would be at least partially duplicated. In the following Examples, the various components are given in parts by weight.

Example 1:		
Bitumen 40/60	parts	160
Hydrocarbon resin (such as "ESKOREZ 1101", by ESSO)	parts	10
Nitrile rubber (such as "CHEMIGUM N 600", by GOODYEAR)	parts	5
Coumarone-indene resin	parts	10
Low-boiling solvent (such as methylene chloride)	parts	55
Example 2:		
Compound A:		
Epoxy resin (such as "EPIKOTE 815" by SHELL)	parts	60
Phenol	parts	6
Pit-coal tar	parts	16
Baryte	parts	18
Compound B:		
Polyamino-amidic resin (such as "VERSAMID 140" by GENERAL MILLS)	parts	8
Pit-coal tar	parts	10
Hardener (such as "K 54" by ANCHOR)	parts	5
Styrene monomer	parts	20
Cobalt naphthenate	parts	0.3
Bitumen 80/120	parts	6.7

I claim:

1. An arrangement for applying traffic-regulating indicia to road surfaces, comprising a vehicle adapted to be driven over a road surface and including a plurality of support means for supporting a plurality of strips of marker material to be applied over the road surface so as to form at least one traffic-regulating indicium, said vehicle further including guide means for guiding each of said strips for application thereof to the road surface, and said support means and said guide means having a first relative position in which said guide means co-operates with one of said support means for guiding one of said strips, and a second relative position in which said guide means co-operates with another of said support means for guiding another of said strips, said support means and said guide means being relatively movable between said first and second relative positions so as to guide first said one of said strips from said first support means and thereafter said another of said strips from said other support means; and an applicator unit operatively associated with said guide means and being effective for applying said strips subsequently to the road surface.

2. An arrangement as defined in claim **1,** said indicium further comprising a layer of a primer substance intermediate the road surface and said strip material, and said applicator unit including means for heating said substance, and means for applying the heated substance over the road surface; and wherein said vehicle comprises storage means for accommodating said substance, and a source of energy for said heating means.

3. An arrangement as defined in claim **1,** said applicator unit comprising means for heating the road surface prior to application of said indicium thereover; and wherein said vehicle includes a source of energy for said heating means.

4. An arrangement as defined in claim **1,** wherein said guide means is movably mounted.

5. An arrangement as defined in claim **1,** said strip material being in form of a plurality of rolls; and wherein said supporting means comprises a shaft extending in a first direction and adapted to rotatably support at least some of said rolls, said guide means including a guide roller rotatably mounted about an axis extending in a second direction transverse to said first direction.

6. An arrangement as defined in claim **1,** said indicium comprising a layer of a primer substance intermediate the road surface and said strip material, and said applicator unit including nozzle means for directing said substance over the road surface, pump means for conveying measured quantities of said substance to said nozzle means, heat-exchange means intermediate said pump means and said nozzle means for heating said substance prior to application thereof over the road surface, and burner means adapted to direct a flame against the road surface for heating the same prior to application of said substance thereover; and wherein said vehicle comprises storage means for accommodating said substance communicating with said pump means, and a source of energy for said heat-exchange means.

7. An arrangement as defined in claim **6,** said applicator unit comprising flame diffuser means for the flame generated by said burner means and including wall means defining an enclosed space adapted to be heated by the flame, and a downwardly open chamber surrounding said nozzle means and communicating with said enclosed space; and wherein said vehicle includes a source of pressurized gas communicating with said enclosed space, whereby to permit heating of said gas in said enclosed space and subsequent flow of the heated gas into said chamber to thereby prevent heat dissipation from the heated substance passing through said nozzle means.

8. An arrangement as defined in claim **1,** wherein said applicator unit comprises supply and guide means for applying a temporary protective layer over said indicium, and means for removing said temporary layer from said indicium.

9. An arrangement for applying traffic-regulating indicia to road surfaces, comprising a vehicle adapted to be driven over a road surface and including a plurality of support means for supporting a plurality of strips of marker material to be applied over the road surface so as to form at least one traffic-regulating indicium, said vehicle further including guide means for guiding each of said strips for application thereof to the road surface, and said support means and said guide means having a first relative position in which said guide means co-operates with one of said support means for guiding one of said strips, and a second relative position in which said guide means co-operates with another of said support means for guiding another of said strips, said support means and said guide means being relatively movable between said first and second relative

positions so as to guide first said one of said strips from said first support means and thereafter said another of said strips from said other support means, and said vehicle also comprising storage means for accommodating a primer substance to be applied over the road surface intermediate the latter and said strip material, and at least one source of energy; a first applicator unit hingedly connected to said vehicle and comprising first heating means for heating the road surface prior to application of said one indicium thereover, second heating means for heating said primer substance, and means for applying the heated primer substance over the road surface, said first and second heating means being supplied with energy from said vehicle; and a second applicator unit hingedly connected to said vehicle separately from said first applicator unit and being effective for applying said strips over the road surface, said second applicator unit comprising supply and guide means for applying a temporary protective layer over said one indicium, and means for removing said temporary layer from said one indicium.

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