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METHOD FOR APPLYING ROAD MARKERS

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This invention relates to a new and useful process for applying road markers to the surfaces of roadways and more particularly to a method for applying buttons or markers to a roadway surface which results in a semi-permanent installation of said markers.

The present trend toward the marking of roadway surfaces with raised buttons has been precipitated by a number of factors. Paint lines must be reapplied approximately every six months. In wet weather paint lines become practically invisible, due to the sheet of water which covers the roadway surface. This latter fact is particularly true at night. Raised markers installed on the roadway surface are not obscured in wet, dark weather. While the process of this invention is primarily concerned with markers over which traffic will pass nevertheless it may also be used for larger obstacle type channeling or markers.

The markers with which the process is concerned are exposed to shocks and impacts delivered by automobile, truck and other tires passing thereover. Such impact loading requires that the marker be adhered to the roadway surface by an extremely high strength bond. Furthermore, it is axiomatic that the marker be installed in place in an absolute minimum amount of time so that sections of the roadway itself are not out of use for any prolonged period.

The use of heat to install markers in the manner hereafter described has a further advantage in that markers can be installed with equal facility during very cold, or very hot weather, or even in rain or light snowfall. Heating both the road surface and the marker assures uniformity of cure time and maximum cure of the adhesive. Thermosetting the adhesive usually produces a stronger bond on a variety of surfaces. Thus the process is useful for bonding markers to concrete, asphalt, steel bridge deck surfaces and the like.

The process of this invention utilizes a high strength, thermosetting synthetic resin cured by means of heat which is applied to both the surface of the roadway and the marker. The road surface and the marker are generally heated simultaneously. Thus, the thermosetting resin which is unheated before its application to the roadway is cured or set by heat from both the pavement surface and from the marker.

According to the invention the markers are heated by immersing them in a hot fluid. The fluid may be air, as an oven, or a liquid. Liquid immersion is preferred. The exact temperature may vary within a wide range, being limited on the high end only by temperatures which would damage the markers and on the low end by temperatures which in combination with an insufficiently heated road surface would not thermoset the adhesive.

Accordingly, it is an object of this invention to provide a process for installing traffic markers on roadway surfaces which is economical in cost and simple in its application.

Another object of this invention is to provide a process for installing markers which is fast and efficient.

Yet another object of this invention is a process for installing traffic markers which results in a bond between

marker and roadway surface which is generally stronger than the material of which the roadway is constructed.

Still another object of this invention is a process which may be used in hot, cold or wet weather.

An additional object of the invention is to provide a system to install markers on new roadway before it is opened to traffic and which is equally applicable to installation on roadways which are in use. In this latter case it is particularly important that the adhesive have rapid setting characteristics to reduce the time of traffic interference to a minimum.

An even further object of this invention is a process which is so simple that it allows installation crews to be trained rapidly and while on the job.

Yet a further object of this invention is to provide a process giving a bond which, after curing, is unaffected by wide variations in temperature or moisture conditions.

These, together with other objects and advantages which will become subsequently apparent, reside in the details of the process as more fully hereinafter described and claimed.

The markers may take any desired shape but must be substantially flat on the side which is to contact the roadway surface. The markers are, conventionally, round, flat on the bottom and convex on the upper side, thus forming roughly and for general comparison purposes, a spherical segment. Said markers will usually be made of a synthetic resin material, such as alkyd or polyester type resin, though for purposes of this process may be any type of solid and strong compositions capable of answering to the needs of a traffic marker. Other compositions which are used are glass, precast concrete, steel, and the like. Such needs include impact strength, reflective ability, wear properties and others.

The adhesive for bonding the markers to a roadway surface must provide primarily a high strength bond between the marker and roadway surface. Such adhesive may be any one of a number of well-known, high-strength materials. Polyepoxides, commonly referred to as epoxy resins, have been shown to give excellent results in providing lasting, high strength bonds. Such epoxy resin adhesives are usually the reaction products of bisphenol-A and epichlorohydrin and are provided in small containers to which is added a suitable catalyst just prior to the application to the road surface. Since the adhesive is a thermosetting material no heat is required prior to its actual application to the roadway surface.

In order to prepare the pavement for placing the markers, it is only necessary to brush away gravel, sand, other loose material or standing water prior to heating. When the pavement surface is free of loose material it is spot heated by radiant heat from a gas burner. Obviously, the spots or areas to be heated will be predetermined and will have been designated by chalk or paint or other means. In actual practice, a number of spots on the pavement will be heated simultaneously. It has been found that these markers may be installed over a wide range of ambient temperatures. Obviously, the colder the ambient temperature the longer the equipment will be required to heat the designated pavement spots. For instance, at temperatures of about 35° F. the pavement will be heated for about 30 seconds and for perhaps as much as a minute, or even 90 seconds. At the upper end of the temperature scale the pavement may need heating for as little as 5 to 10 seconds. The road surface temperature and the marker temperature should be at least high enough to provide a minimum temperature of 180° F. within the adhesive film after the marker is pressed in place. A rapid setting type of epoxy adhesive has been observed to develop enough strength to permit reopening

the road to traffic in five minutes under this condition. It is to be further noted that the pavement surface can be moist and even covered with a light film of water without hindering installation of this system. Installation of markers according to this process, however, should not be attempted in standing water.

The markers are usually heated during the time the pavement is being prepared, i.e., cleaned, chalked and heated. The markers are taken from a container and usually a number of them are placed in small holders. The holders are then placed in a heated oven or immersed in a tank of heating liquid maintained at about 275° F. and allowed to remain therein until the markers themselves have been heated to approximately the same temperature. Time required to raise the markers to the desired degree of heat is a minimum of about ten minutes. As heated markers are removed from the holders cold ones are substituted to maintain a continuous supply.

It should be mentioned that several disadvantages inhere in air heating the markers. The heat capacity of the air is low and transfer of heat from the air to the marker is slow. Furthermore, there is considerable variation in the temperature of the air in the oven and heated air is lost each time the oven is opened. Thus, maintaining the oven temperature becomes a problem. However, air can be and has been used in this process.

When liquid immersion heating is employed for heating the markers the liquid must be compatible with the bonding adhesive, should not discolor the marker and must not adversely react with the marker. A liquid which caused any appreciable dissolution of the marker surface would be unuseable.

Obviously such marker heating liquid must possess a high boiling point. To this end, it has been found that polyether polyglycols and various mixtures thereof give excellent results. Other polyglycols such as glycerol, ethylene glycol, diethylene glycol are also suitable. Dow Chemical Company's polyglycol E–300 is particularly efficient in the process and is preferred. As those skilled in the art will recognize other high boiling point liquids answering to the specific requirements of this process are not excluded.

When the markers are brought up to temperature and immediately after the equipment has heated the pavement spots a quantity of adhesive is placed on the pavement spot to which the marker is to be attached. As soon as the adhesive is down, a marker is placed on the bonding material and pressed down and rotated or twisted. In this way, an even distribution of the adhesive is effected between the pavement surface and the flat marker bottom. A certain amount of "squeeze-out" of the adhesive will result from this manner of installation. Heat from both the marker and the pavement accelerates the hardening or curing of the adhesive. In cold weather a bond sufficiently strong to resist traffic passing over the freshly placed marker will result in about ten minutes. In warm weather the bond may cure or set in as little as 2 minutes. It will be apparent that this rapid cure of the adhesive means that the crew need only tie up the pavement area for about 5 to 15 minutes. Thus, a distinct advantage is gained over paint striping and over slower setting marker systems. Hence, it will be seen that the employment of heat to both marker and pavement results in a rapid process for making a traffic marking system. The installed markers form a semi-permanent installation in that the traffic lanes and other lines will endure for 5 to 20 years.

It is felt that this process, together with the design of portable, semi-automatic equipment to serve this process is a great step forward in the road marking art.

The foregoing is considered as illustrative only of the principle of this invention. Since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the precise process shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed is:

1. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking predetermined spots on the roadway pavement, (b) simultaneously heating the markers to be applied to said roadway surface in a high boiling point polyglycol liquid maintained at a temperature of 275° F., until said markers are approximately the temperature of said liquid and heating said predetermined pavement spots, (c) applying an adhesive to said heated pavement spots for bonding said markers to said spots, (d) applying markers to said adhesives, and (e) allowing said adhesive to harden to complete the bonding of said markers to said spots.

2. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking predetermined spots on the roadway pavement which are to receive the markers, (b) heating the markers to be applied to said roadway surface in a high boiling polyglycol liquid maintained at a temperature of about 275° F., until said markers are approximately the temperature of said liquid, (c) heating said spots, (d) applying an adhesive to said pavement spots for bonding said markers to said spots, (e) applying markers to said adhesive, and (f) allowing said adhesive to harden to complete the bonding of said markers to said spots.

3. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement which is to receive the marker, (b) heating the marker to be applied to said spot to a temperature of about 275° F. in a high boiling polyglycol liquid, (c) heating said spot, (d) applying adhesive to said spot for bonding said marker to said spot, (e) pressing said marker onto said adhesive, and (f) allowing said adhesive to harden to complete the bonding of said marker to said spot.

4. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement which is to receive the marker, (b) heating the marker to be applied to said spot in a high boiling polyglycol fluid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said fluid, (c) heating said spot with a radiant heater, (d) applying adhesive to said spot for bonding said marker to said spot, (e) pressing the marker onto said adhesive, and (f) allowing said adhesive to harden to complete the bonding of said marker to said spot.

5. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement which is to receive the marker, (b) heating the marker to be applied to said spot in a high boiling polyglycol fluid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said fluid, (c) heating said spot with a radiant heater, (d) applying a thermosetting resin adhesive to said spot for bonding said marker to said spot, (e) pressing the marker onto said adhesive, and (f) allowing said adhesive to cure and harden to complete the bonding of said marker to said spot.

6. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyether polyglycol maintained at a temperature of about 275° F., until said marker is approximately the temperature of said polyglycol and at the same time heating said predetermined pavement spot, (c) applying an adhesive to said heated pavement spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive, and (e) allowing said

adhesive to harden to complete the bonding of said marker to said spot.

7. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyglycol liquid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said liquid, and at the same time heating said predetermined pavement spot, (c) applying an adhesive to said heated pavement spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive, and (e) allowing said adhesive to harden to complete the bonding of said marker to said spot.

8. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyether polyglycol liquid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said liquid, and at the same time heating said predetermined pavement spot, (c) applying an adhesive to said heated pavement spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive, and (e) allowing said adhesive to harden to complete the bonding of said marker to said spot.

9. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyglycol liquid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said liquid, and at the same time heating said predetermined pavement spot, (c) applying a thermosetting resin adhesive to said spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive so that the temperature of the adhesive between said marker and said spot achieves at least about 180° F., and (e) allowing said adhesive to cure and harden to complete the bonding of said marker to said spot.

10. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyglycol liquid maintained at a temperature of about 275° F. until said marker is approximately the temperature of said liquid, and at the same time heating said predetermined pavement spot, (c) applying an adhesive to said heated pavement spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive so that the temperature of the adhesive between said marker and said spot achieves a minimum of about 180° F., and (e) allowing said adhesive to harden to complete the bonding of said marker to said spot.

11. A process for applying traffic markers to roadway surfaces, comprising: (a) cleaning and marking a predetermined spot on the roadway pavement, (b) simultaneously heating the marker to be applied to said roadway surface in a high boiling polyether polyglycol liquid maintained at a temperature of about 275° F., until said marker is approximately the temperature of said liquid, and at the same time heating said predetermined spot, (c) applying a thermosetting resin adhesive to said spot for bonding said marker to said spot, (d) applying a heated marker to said adhesive so that the temperature of said adhesive between said marker and said spot achieves a minimum of about 180° F., and (e) allowing said adhesive to cure and harden to complete the bonding of said marker to said spot.

12. A process for applying traffic markers to roadway surfaces, comprising

(a) heating a supply of markers to be applied to the roadway surface in a high boiling polyglycol liquid maintained at a temperature of about 275° F., until said markers are approximately the temperature of said liquid,

(b) heating the application area of the roadway surface

(c) applying a thermosetting adhesive to said area

(d) applying said heated markers to said adhesive

(e) allowing said adhesive to cure and harden to complete the bonding of said markers to said area.

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