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CONSTRUCTION OF ASPHALT OVERLAYS ON RIGID CONCRETE PAVEMENTS

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PRIOR ART

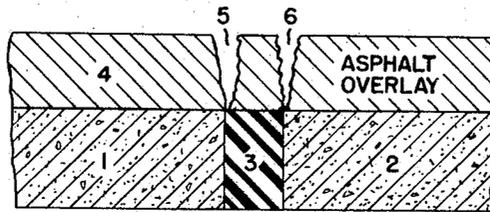


FIGURE-1

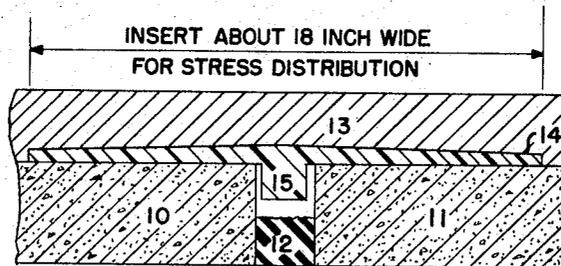


FIGURE-2

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1

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CONSTRUCTION OF ASPHALT OVERLAYS ON RIGID CONCRETE PAVEMENTS

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8 Claims. (Cl. 94—9)

The present invention is broadly concerned with improved pavement or road construction. The invention is more specifically concerned with an improved construction wherein asphalt overlays are positioned on rigid concrete or equivalent existing pavement. In accordance with the present invention, a high quality asphalt overlay structure is secured on a rigid concrete pavement by placing a layer of preformed plastic intermediate the asphalt layer and the concrete or equivalent pavement, particularly over the area where the expansion joints had been provided in the existing concrete pavement.

This invention is particularly applicable to the large expansion and contraction joints that are part of the original construction of a Portland cement pavement. Since the plastic insert is preformed, it cannot always be fitted to the many, irregular rupture cracks that occur in the concrete, although in many instances it can be used. The smaller rupture cracks seldom become evident in the asphalt overlay.

It is well known in the art to provide roadway pavement and the like using as a pavement composition an asphalt mixture which, in essence, comprises a binder such as asphalt and a mineral aggregate such as crushed stone. The two methods generally used in the preparation of bituminous pavements are one in which a layer of bituminous cutback or emulsion is sprayed on a road, a layer of mineral aggregate such as crushed stone, etc., spread upon it and the mixture compacted; and the other in which mineral aggregate such as crushed stone, etc., is first provided with a coating of bitumen by mixing the mineral aggregate mechanically with a bitumen or bituminous cutback or emulsion until an adhesive coat of the bitumen is formed on each piece of the mineral aggregate, the coated aggregate then being laid on the road and compacted. The present invention is primarily concerned with asphalt overlays of thicknesses exceeding 1 inch to 2 to 3 inches. For the more costly concrete pavements, it is not usual to construct a thin overlay of the spray-on, stone-cover type. Furthermore, use of the plastic insert which is about 1/4 inch thick requires an overlay of sufficient thickness to result in a smooth riding surface.

In general, the asphalt pavement technique is described in U.S. Patent 2,638,823 issued May 19, 1953 entitled "Asphalt Pavement," inventor: Joseph C. Roediger. Also, asphalt paving technique and design descriptions are given in publications of the Asphalt Institute: Manual Series 4 entitled, "Asphalt Handbook," and Specification Series #1 entitled "Specifications and Construction Methods for Asphalt Concrete."

It is well known in the art to construct rigid pavements such as concrete, cement and equivalent pavements and roadways by many techniques. However, pavements and roadways built in past years due to weathering, and weight and intensity of traffic in recent years have in many instances deteriorated appreciably. Thus, during the past few years a considerable quantity of asphalt paving mixture (hot mix type) has been used as an overlay, particularly on old Portland cement concrete pavements to restore desired riding qualities. One major problem is that when reconstructing in this manner the cracks in the old concrete, especially at the expansion joints which exist, are gradually transmitted upwardly through the

2

asphalt overlay. Considerable work has been done to overcome this problem. For instance, wire mesh and steel rod reinforcements have been installed in the asphalt pavement overlay. However, these techniques have not been successful due to the fact that the wire or rod gradually works upward through (cuts through) the mix, and frequently causes more severe cracking. Fastening the wire mesh to the old concrete pavement has helped to some degree but not sufficiently to remedy the situation. Also, the discontinuity of the wire in the asphalt results in different densification characteristics and cracking under heavy traffic conditions. The difficulty has been reduced by installing very thick asphalt overlays (four inches or more) but this method is not economic or positive.

In accordance with the present invention, a positive method is to place a layer of preformed plastic, preferably high melting but flexible polypropylene, or an equivalent polymer product intermediate the asphalt overlay and the supporting concrete pavement in the area of the abutting expansion joints. This plastic insert functions as an expansion stress distributor or bridge over the joint and below the asphalt pavement overlay.

Other satisfactory preformed plastics can be made from moldable plastic or polymer compositions having a melting point, preferably in the region of 250–300° F., although materials with melting points of 200° or higher can be used. This is necessary in order to avoid complete melting or loss of shape by the insert during installation of the asphalt pavement overlay. This premixed pavement, if of the hot mix type, is made at a temperature of 275–325° F. However, during trucking to the site and application, the usual mixture loses about 10–20° F. in temperature. Within 20 to 30 minutes after placement, the mixture temperature will fall to about 250° F. This period of heat exposure is sufficient to permit integral bonding of the paving mixture to the upper exposed surface of the plastic insert. As described later, a light dusting of sand, talc, mica, cement or other finely divided mineral powder is placed between the old concrete pavement and the insert to prevent intimate adhesion. However, the outer edges of the insert may be cemented to the concrete pavement if required to keep the insert in position as the asphalt paving mixture is being placed. Inserts can be made from plastics such as polypropylene, high density polyethylene, nylon, and polyacetal. Preference is for polypropylene since its melting point is generally controlled at the desired level. Other plastics can be used, either the above or by compounding with reinforcing fibers or mineral powders—provided the melting point requirements are met.

The expansion joint bridging section of the insert is preferably 1/8 to 3/8 inch thick, as for example 1/4 inch thick and preferably 12 to 24 inches such as about 18 inches wide. The material may be furnished in lengths suitable for the type of concrete pavement being reconstructed, usually 10 to 12 foot lengths are adequate for the expansion joints; longer lengths are used for the center line joints. The nub or tongue that serves to position the insert in the joint shall be 1/4 to 3/4 inch wide, such as about 1/2 inch wide and about 1 to 2 inches deep. In any instance, the width of the tongue should be 1/8 to 3/8 inch, such as approximately 1/4 inch less than the joint width to permit easy application, and to permit some play to accommodate opening and closing of the joint due to thermal effects.

Since the preferred width for the insert is about 18 inches, this will span the joint by about 9 inches per side. Although the major objective is to bridge the joint, this additional width is very desirable so as to allow for actual movement of the concrete slab during the thermal changes occurring from the cold to the hot weather periods.

The present invention may be readily understood by

3

reference to the figures illustrating embodiments of this structure. FIGURE 1 illustrates the present practice which results in cracking which is transmitted upwardly from the expansion joint. FIGURE 2 illustrates the method of the present invention wherein the stress is uniformly distributed, thereby avoiding the cracking of the asphalt overlays.

Referring specifically to FIGURE 1, two concrete road slabs, 1 and 2, are shown in profile having in between the respective ends thereof an expansion joint 3. Generally, these expansion joints are preformed expansion joint fillers which are positioned between the slabs of Portland cement concrete when the original pavement is constructed. Materials of this type may be bonded cork, sponge rubber or bituminous mastic conforming to ASTM Specifications D 994, D 1751 and D 1752. In accordance with the conventional technique, the asphalt overlay is positioned over the existing concrete slabs. Based upon experience, cracks 5 and 6 develop above the expansion joint through the overlay, causing deterioration of the asphalt overlay. In time, water gets into the cracks 5 and 6, freezes, expands and causes rapid deterioration of the asphalt overlay.

Referring specifically to FIGURE 2, the slabs 10 and 11 contain thereinbetween an expansion joint 12. An asphalt overlay 13 is positioned over the respective slabs. In accordance with the present invention, a plastic insert 14 is positioned between the overlay and the plastic slabs. A preferred adaptation is to clean out a portion of the old expansion material 12 and permit the center lip or nub 15 of the plastic insert to seat in between the ends of the respective slabs 10 and 11. This center insert 15 fits into the existing expansion joint which is cleaned out normally. The insert may be cemented to the concrete pavement along the outer edges using a liquid cement of atactic polypropylene, epoxy or similar material. However, cement is used only if it is necessary to retain the insert in the proper position during the application of the asphalt overlay. The preferred practice is to have no bond between the bottom face of the insert and the old concrete pavement. This will tend to distribute more uniformly the contraction and expansion of the pavement slabs.

The central area must not be cemented and shall be preferably about 18 inches in width so any expansion or contraction at the old expansion joint will be distributed along this entire length rather than having a stress concentrated only at the joint area. The edges as pointed out may be cemented down to ensure that the plastic insert will remain in place as the asphalt paving machine rides forward over the old movement. To ensure that the central area of the plastic insert does not adhere to the old concrete, it is preferred that a thin layer of fine sand, mica, talc, etc., be dusted over the area of the cement which the insert will cover before the insert is installed. As an added precaution, the old expansion joint 12 should be cleaned out to sufficient depth so there will be at least $\frac{1}{2}$ inch

4

clearance up to the nub or lip 15 of the insert 14. This will prevent upward displacement of the insert where the concrete expands and forces the old expansion filler 12 upward.

5 What is claimed is:

1. Improved method of installing an asphalt overlay on a plurality of pre-existing cement roadbase sections which comprises positioning a pre-formed plastic between said existing roadway and said asphalt overlay along the line of juncture of said cement sections and applying said asphalt overlay so that the upper surface of said pre-formed plastic is integrally bonded to said asphalt overlay, said pre-formed plastic having a tongue element which is disposed downwardly between said cement road base sections.

2. Process as defined by claim 1 wherein said pre-formed plastic has a melting point in the range from about 200° to 300° F.

3. Process as defined by claim 1 wherein the area between said plastic and said pre-existing cement roadway is dusted with a material selected from the class consisting of sand, talc and mica.

4. Improved roadway which comprises lower sections of pre-existing cement roadway, an asphalt overlay on said cement sections and a pre-formed plastic integrally bonded to said asphalt overlay and intermediate said asphalt overlay and said cement sections along the line of abutment of said sections, said pre-formed plastic being characterized by having a tongue element extending downwardly between said sections.

5. Roadway as defined by claim 4 wherein said plastic has a melting point in the range from about 200° to 300° F.

6. Roadway as defined by claim 5 wherein a dusting powder is placed intermediate said cement sections and said plastic.

7. Roadway as defined by claim 6 wherein said plastic has a thickness in the range from $\frac{1}{8}$ to $\frac{3}{8}$ inch and a width from about 12 to 24 inches extending over the abutting edges of said sections.

8. Roadway as defined by claim 7 wherein said plastic is glued to said cement sections along the lateral edges thereof.

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