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C. ELLIS

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GLASS FABRIC ROAD

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Fig. 1.

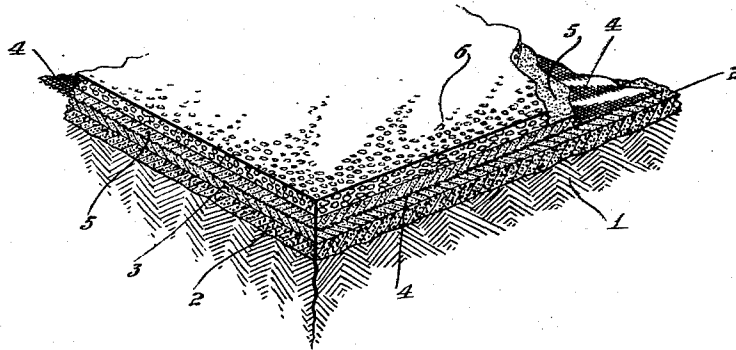
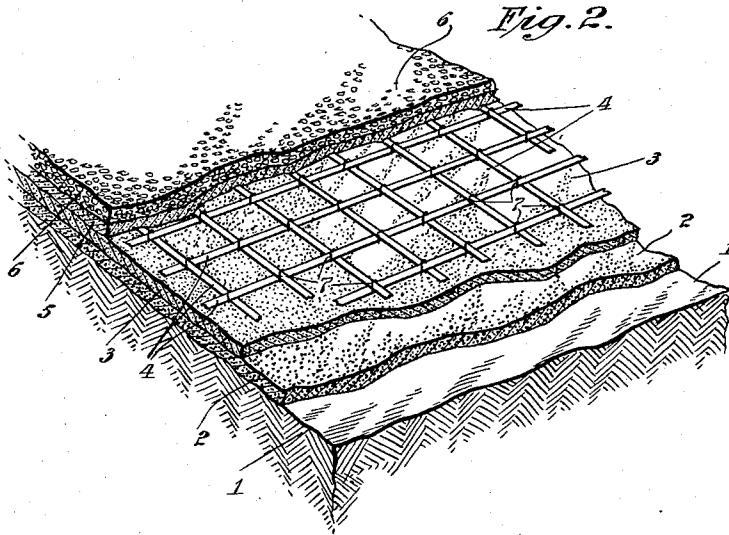


Fig. 2.



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GLASS FABRIC ROAD

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5 Claims. (Cl. 94-7)

This invention relates to the construction of asphalt roads and particularly to those roads on which the asphalt layer or coating is reinforced and bonded by means of a vitreous, siliceous binding agent.

Py incorporating a vitreous siliceous binding or reinforcing agent with asphalt, my invention has for one object the elimination of, or to a large degree the prevention of, cracks in the asphalt due to the upward pressure, or heaving, of the road surface. Such distortion is brought about in cold weather when the temperature is about freezing (32° F.) or lower, and is due to the freezing or congealing of water or moisture in the ground. Movement of the asphalt surface, although small, is nevertheless sufficient to effect cracking and subsequent disintegration of the road. The presence of a binding or reinforcing agent in the asphaltic or bituminous portion may offer considerable resistance to such upward thrusts or movements and therefore considerably lessen the tendency towards cracks appearing on the road surface.

Another object of my invention involves the reduction of disintegration or breaking of the road surface. Such wearing of the road is particularly apt to occur at places where cracking, occasioned either by excessive freezing and thawing due to wide temperature changes or by heavy traffic, has taken place. The continued running of automobiles, for example, over such openings in the road surface may result in the course of a short time in many small portions of the asphaltic material breaking off and becoming dislodged, eventually giving rise to the formation of holes or other type of depressions. By incorporating a binding or reinforcing agent to which the bituminous material firmly adheres or attaches itself this sloughing off or loss of small portions of the road surface may be eliminated to a large degree.

It is well known that when atmospheric temperature is high, e. g., in the summer, asphalt surfaces of roads often become soft, and there is considerable creeping or flowing of such surfaces due to the passage of vehicles, or other traffic, over them. Retention of this flow or creeping through adherence of the asphalt to the vitreous, siliceous bonding agent is also within the scope of my invention.

It will be recognized that diminution in destruction of the road surface as a result of incorporation of a vitreous, siliceous bonding agent, according to my invention, will be accompanied also by a decrease in upkeep cost of the road.

This latter item is particularly important as it may amount in some instances to as much as one thousand dollars per mile of road.

As previously pointed out, the reinforcing agent particularly applicable to my invention is made of vitreous, siliceous material. Preferably such siliceous substances, of which glass is an example, is spun into thin fiber-like strands and the latter then woven into the shape of cloth (or fabric) or of narrow tape-like strips. When fashioned in this manner, the siliceous materials possess a desirable degree of flexibility thereby facilitating their handling. In some instances other synthetic or naturally occurring siliceous and vitreous materials, e. g., rock wool, blast furnace slag wool, asbestos and the like may be employed.

These silica-containing bodies, applicable for my purpose, are characterized by their stability towards disintegrating actions such as atmospheric oxidation, and insolubility in many liquids, as for example water. These properties of durability render such bonding agents particularly applicable for my purpose. Furthermore, when employed in the forms mentioned above (i. e., as fabric or as ribbon-like strips) they possess a desirable degree of flexibility less likely to be broken or torn due to small movements in the roadbed either during the laying of the asphalt coating or because of expansion of the latter, for example in the summer when considerable increases in atmospheric temperatures may take place.

If in the form of cloth or fabric, the siliceous reinforcement may be employed as such. When tapes or ribbons are employed these may be laid, if desired, in a criss-cross manner upon the roadbed before applying the asphalt. In the latter instance, it is preferable that the strips be fastened to one another at the various points of intersections. This may be accomplished, for example, by means of small wire staples. In this manner any movement or slipping of the narrow bands of reinforcing material is prevented.

As the bituminous substances I may employ any of those commonly used in road making such as natural asphalts, petroleum asphalts (which may be obtained either as distillation residues or by air-blowing of heavy petroleum fractions), gilsonite, grahamite, coal-tar pitch, and the like. These may be employed as such, generally in a molten state in order to secure even distribution over the surface to which they are applied, or they may be blended with a liquid medium, often designated cut-backs, whereby a bituminous or

asphaltic composition is obtained which is molten or liquid at much lower temperatures than would otherwise be required. Such cut-backs are generally liquids of sufficiently low volatility that the asphaltic surface of the road slowly hardens because of the gradual evaporation of the cut-back. An example of the latter is the gas oil fraction from the distillation of crude petroleum. Higher- or lower-boiling fractions, e. g., lubricating oils or kerosene, respectively, may be used in some cases.

My invention may be illustrated by the accompanying drawing, which is diagrammatic in character. The relative thickness of some strata shown therein, in order that I may clearly indicate the construction of the road, is greater than would be necessary in practice. The same reference figures are employed to designate the same parts in both figures.

Fig. 1 is a vertical cross-section of a glass fabric road in which the siliceous reinforcing and bonding agent is a closely woven glass cloth. Fig. 2 is a perspective cross-section of a glass fabric road in which the siliceous reinforcing and bonding agent consists of narrow tape-like strips (woven from glass fibers), the latter being interwoven at right angles to furnish a netting or screen and being fastened at the various points of intersection.

Referring now to the details of the drawing, 1 is the earthen or dirt roadbed upon which is placed 2, a layer of gravel or other fairly coarse stone. Upon the latter is spread a coating of asphalt, 3, on which in turn is laid the siliceous bonding and reinforcing agent, 4. As previously mentioned, the siliceous agent 4 is shown as a glass cloth in Fig. 1 and as interwoven ribbons (made of glass fibers) in Fig. 2. The bonding and reinforcing agent, 4, is covered with a coating of asphalt, 5, to which finely crushed stone, 6, is applied as a finish. The interwoven ribbons, or tape-like strips, of the siliceous agent are fastened at the intersections by wire staples, 7.

Although the roads described above are admirably suited for my purpose, it is to be understood that I do not wish to limit my invention to the exact number of layers or strata just mentioned. For example, in some instances I may find it preferable to place the siliceous bonding agent directly on the coarse stone or gravel and then apply a coating of asphalt. In other cases it may be desirable to have several alternating layers of siliceous bonding agent and asphaltic material.

One procedure whereby I may incorporate the vitreous, siliceous reinforcing agent is as follows: Upon the dirt bed of the road is placed a layer of gravel, to serve as a supporting medium for the asphalt. A sufficient quantity of the latter, heated until it flows readily and easily, is then spread over the gravel to act as a bonding agent. While this asphaltic material is still liquid and hot, the vitreous, siliceous reinforcing agent is spread upon it. A second layer of molten asphalt is then applied. In this manner there are obtained two coats of asphalt bonded together and reinforced by the siliceous material. If desired, finely crushed stone may be applied as a finish to the top coat.

As an alternative procedure, the vitreous reinforcement may be spread directly upon the stone base, in which case only one layer of molten asphalt need be applied. In other instances gravel or crushed rock may be incorporated with the molten asphalt and the bonding agent then

incorporated between successive coatings of this mixture. On the other hand it may be desirable to use asphalt emulsions. In such cases, stone and emulsion can be mixed and the mixture (one or more layers) spread over the bonding agent. The following examples will serve to illustrate my invention.

Example 1.—Natural asphalt was fluxed with a heavy mineral oil until the mixture flowed readily at about 200° C. A base was made using a portion of this fluid asphalt and small rock and, while the asphalt was still warm, glass cloth was laid on it. Then on top of the glass was poured a layer of hot fluxed asphalt and the latter covered with small crushed rock. Three more successive thin layers, each consisting of road tar and crushed rock, were laid upon the top asphalt coat.

Example 2.—Strips of fiber glass tape ($\frac{1}{2}$ " wide by 0.007" thick) were interwoven (at 90° angles) to give a glass screen, the square open portions of which were about 3" x 3". At each intersection the strands were tied together by means of a small wire staple.

An asphalt road containing this glass screen as a bonding agent was made by laying the latter on a bed of asphalt ($\frac{1}{2}$ " to $\frac{3}{4}$ " deep) while still soft and warm. After the asphalt, with the bonding agent adhering to it, had partially cooled another layer (about $\frac{1}{2}$ " deep) of molten asphalt was poured over the glass screen. Crushed stone, to the depth of about $\frac{3}{4}$ inch, was then spread on the top coat of asphalt.

Example 3.—A screen of glass tape (1" wide by 0.02" thick) was prepared as described in Example 2. In this instance, however, the openings in the screen were about 2 inches square. A glass bonded road, using this screen, was made as described in Example 2.

Example 4.—Another screen of glass tape ($\frac{3}{4}$ " wide by 0.02" thick) was prepared as described in Example 2. The openings in the screen this time were only about 1" square. A glass bonded road, using this screen, was made as described in Example 2.

From the foregoing it will be seen that my invention comprises incorporation of a vitreous, siliceous bonding and reinforcing agent with the asphaltic or bituminous layer of coating during construction of an asphaltic road. Such an agent may be employed in the form of glass cloth or as narrow strips of tape or ribbon. In the latter instance it is preferable that the narrow strips, before incorporation with the asphaltic or bituminous material, be interwoven at right angles to a glass screen or netting. In the latter instance the strips, if desired, may be fastened together at the various points of intersection.

My invention also involves reduction in the formation of cracks in the asphaltic portion of the road due to the exertion of upward pressure, or heaving, brought by freezing of water in ground, on which the road is laid, or which may have seeped into the asphaltic layer or the crushed rock which serves as the base for the road. Another phase of my invention comprises lessening of disintegration of the asphaltic road surface by incorporating a vitreous, siliceous bonding agent to which the asphaltic or bituminous material firmly adheres and thereby may prevent the sloughing off or breaking away of lumps or small portions of the roadway.

What I claim is:

1. An asphalt road containing as the flexible, bonding agent a vitreous, siliceous composition

consisting of glass fibers present in the form of fabric.

2. An asphalt road in which a flexible, vitreous, siliceous bonding agent is present as cloth woven from glass fibers and is covered with an adhering layer of asphaltic material.

3. An asphalt road in which the flexible, vitreous, siliceous bonding agent is present as ribbons woven from glass fibers, said ribbons in turn being interwoven to form a glass screen and covered with an adhering layer of asphaltic material.

4. An asphaltic road in which a flexible, vitreous, siliceous bonding agent is present as cloth woven from glass fibers and placed between two adhering layers of asphaltic material.

5. An asphaltic road in which a flexible, vitreous, siliceous bonding agent is present as ribbons woven from glass fibers, said ribbons in turn being interwoven to form a glass screen and placed between two adhering layers of asphaltic material.

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