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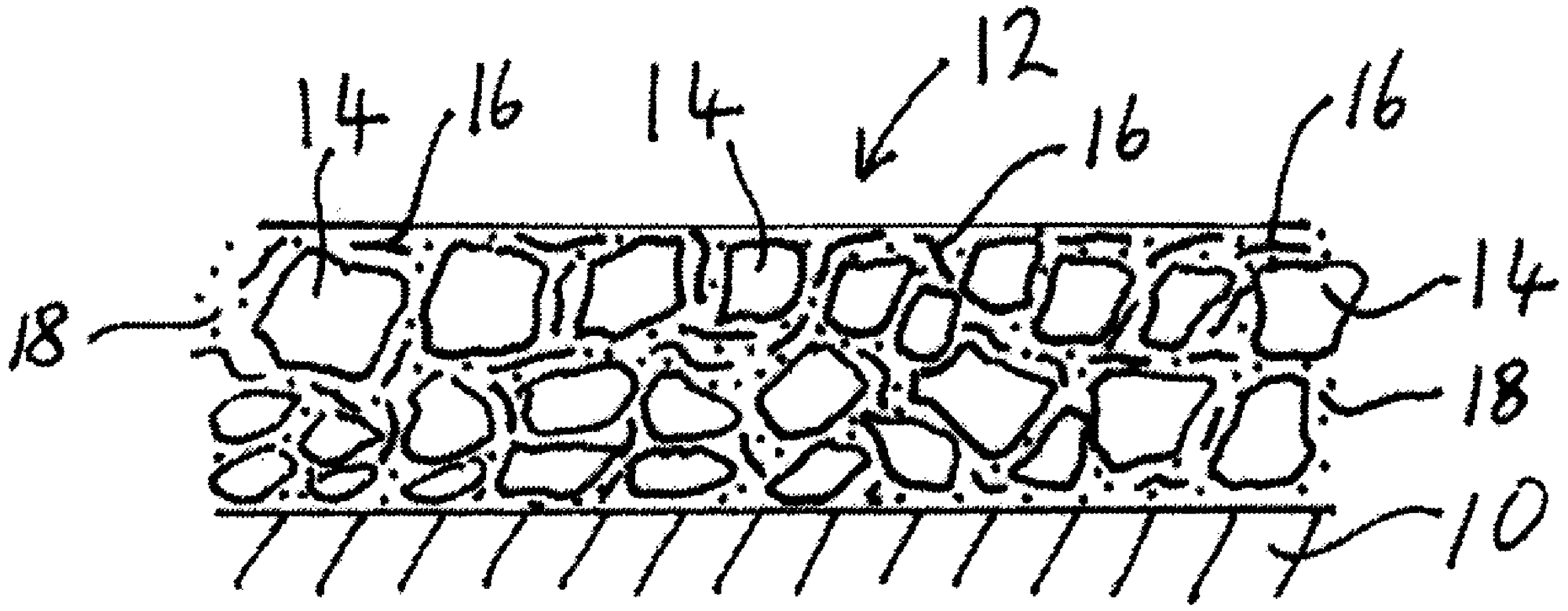
(54) Titre : COMPOSITION D'ASPHALTE REFLECHISSANTE
(54) Title: REFLECTIVE ASPHALT COMPOSITION



(57) Abrégé/Abstract:
An asphalt composition comprises aggregate, binder coating the aggregate and reflective particles embedded in the binder. In various embodiments, the binder may comprise one or more of clear bitumen, bio-bitumen or a polymer modified bitumen for cold application. The binder may comprise a glare control additive. The reflective particles may be aluminum strips.

ABSTRACT OF THE DISCLOSURE

An asphalt composition comprises aggregate, binder coating the aggregate and reflective particles embedded in the binder. In various embodiments, the binder may comprise one or more of clear bitumen, bio-bitumen or a polymer modified bitumen for cold application. The binder may comprise a glare control additive. The reflective particles may be aluminum strips.

REFLECTIVE ASPHALT COMPOSITION

TECHNICAL FIELD

[0001] Construction of paved surfaces.

BACKGROUND

[0002] A conventional manner of making a road or other paved surface is to combine a hot bitumen as a binder with aggregate to create asphalt, transport the asphalt to a paving site and lay the asphalt at the paving site while the asphalt is still hot. Recent advancements in the paving of surfaces with asphalt have included use of polymer modified asphalts that contain an adhesive agent to allow the asphalt to be applied at a much lower temperature. These polymer modified cold asphalts permit a greater distance between the asphalt mixing plant and the paving site, which is desirable in many remote locations. Other advances include the mixing of pigments such as titanium dioxide into bitumen to change the colour of the asphalt, development of bitumen made from organic matter (bio-bitumen) and creation of clear bitumen. Conventional bitumen is black, but the blackening pigments may be removed during the production process to produce clear bitumen.

[0003] In the paving of surfaces, particularly in northern latitudes, it can be advantageous to prevent heat conduction to the ground under the paved surface. For this reason, coatings have been developed that reflect incident solar radiation. These coatings have been found to be useful in preventing undesirable sub-surface heat conduction, but the coatings tend to adhere poorly and become ineffective.

SUMMARY

[0004] There is thus provided an asphalt composition that provides reflective characteristics using embedded reflective particles. In one embodiment, the asphalt composition comprises aggregate, binder coating the aggregate and reflective particles embedded within and coated by the binder. In various embodiments, the binder may comprise one or more of clear bitumen, bio-bitumen or a polymer modified bitumen for cold application. The binder may comprise a glare control additive. The reflective particles may be aluminum strips. These and

other aspects of the composition are set out in the claims, which are incorporated here by reference.

BRIEF DESCRIPTION OF THE FIGURE

[0005] The figure shows a section of an asphalt composition.

[0006] Embodiments will now be described with reference to the figure, in which like reference characters denote like elements, by way of example, and in which the figure shows a dispersion of aggregate and reflective particles in binder on a base.

DETAILED DESCRIPTION

[0007] An embodiment of an asphalt composition comprises aggregate, binder coating the aggregate; and reflective particles embedded within and coated by the binder.

[0008] The aggregate comprises any suitable aggregate used in the asphalt paving industry, and will typically include small stones or rock fragments made predominantly of quartz and silicates.

[0009] The binder may comprise bitumen, such as one or more of clear bitumen, bio-bitumen and a polymer modified bitumen for cold application. Clear bitumen may be obtained from any of a number of sources such as Ventraco Chemie B. V. of Holland or Suncor Energy of Calgary, Canada. Clear bitumen may be synthetic or produced from a naturally occurring feedstock, such as oil sands. Clear bitumen in the thickness of a typical asphalt binder is essentially transparent. The bitumen binder may also comprise any of various forms of bio-bitumen, made from non-petroleum low molecular weight materials such as lignin, cellulose, molasses, sugar, natural tree resins, gums, vegetable oils, wastes from vegetable oil production, potato, wheat and rice starches and distillation bottoms derived in the process of cleaning used motor oils. An example of bio-bitumen is Bitumen GEO320 available from Ecopave of Australia. The bitumen may be a polymer modified bitumen for cold application, in which any of various forms of synthetic, natural or biologically derived bitumen may have an adhesive polymer added to permit application at cold temperatures, for example below 90C.

[0010] The binder may also include a glare control additive such as titanium dioxide or other pigments. Iron oxides may be used to produce red, orange or yellow colour, titanium

dioxide for white, chromium dioxide for green and cobalt oxide for blue. The glare control additive is added in an amount sufficient to provide a desirable balance between reducing glare and permitting reflection from the reflective particles. While an essentially opaque binder may have some applications, such as where reflective particles exposed on the surface provide sufficient reflectivity for the intended application, the binder in some embodiments is partially transparent or translucent and allows at least a portion, for example 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or more, of radiation incident on the asphalt composition in the visible and infrared spectrum to penetrate the thickness of the binder and reflect off reflective particles embedded in the asphalt.

[0011] The reflective particles in some embodiments comprise reflective, flat surfaces such as may be obtained from reflective metal strips having one or more flat surfaces. In some embodiments, the reflective particles have multiple reflective surfaces or facets. The reflective particles may have various sizes and in one embodiment have a largest dimension less than 1 cm. An exemplary metal strip is an aluminum strip less than 1 cm long, having a width greater than depth and both the depth and width being of the order of 1 mm. Such strips may be obtained from waste processing of aluminum products such as metal cans. The reflective particles may be uniformly sized in an embodiment, and in other embodiments may have a range of sizes. In an embodiment, such as in the case of metal being used for the reflective particles, the reflective particles do not absorb binder. When the reflective particles do not absorb binder, the resulting asphalt composition may be made more durable. In other embodiments, the reflective particles may comprise metal oxides or metal sulphides and may be crystalline.

[0012] The reflective particles may be added to the asphalt at any suitable stage of production, for example may be mixed with aggregate before binder is added, or added to binder before mixing with aggregate, or added to the mixed binder and aggregate. The glare control additive may be added to the binder in a conventional manner for the addition of pigment to binder either at an asphalt mixing plant or at a work site. For hot applied bitumen, the reflective particles may be added to the aggregate and the glare control additive added to the binder before the binder is mixed with aggregate. During production, the binder should be present in a sufficient amount to coat the reflective particles and aggregate to bind the materials together and ensure that the reflective particles are embedded within and coated by binder.

[0013] For a cold applied asphalt, a hot mix asphalt plant may also be used for production of the surfacing material. The aggregate is first dried by heating then allowed to cool, for example to 80C – 90C. The aggregate is then introduced back into the hot mix plant with no flame, or introduced into another suitable mixing container such as a pugmill, and is then mixed with the reflective particles, the binder and the glare control agent. The aggregate and reflective particles are then mixed with binder and glare control agent.

[0014] The proportion of binder in the resulting asphalt composition may be a conventional amount in relation to the total solids. The amount is selected to coat the aggregate and bind the aggregate together. An embodiment of a ratio of binder to aggregate or binder to total solids, including aggregate and reflective particles, is an amount such that the asphalt composition has a durability suitable for use on a highway that is subject to truck traffic. Examples are 3-5% by weight binder of the total asphalt composition for a cold applied asphalt and 5-8% by weight binder of the total asphalt composition. The amount of reflective particles should be sufficient to provide a desired amount of reflectivity but not so much that the reflective particles compete excessively with the aggregate for the binder. The amount of binder should thus be sufficient to coat both the aggregate and the reflective particles. Hence, the binder may be present in a conventional weight percent of the total solids, where in this case the solids comprise both aggregate and reflective particles. The reflective particles may comprise up to 1%, 5%, 10%, 20% or more of the aggregate by weight. The weight percent of binder to total solids may be for example 1% to 10%.

[0015] An exemplary application is shown in the figure. Base 10 is a conventional prepared sub-surface for paved surfacing. Asphalt composition 12 comprises aggregate 14, reflective aluminum strips 16 and binder 18. The asphalt composition 12 may be a road, parking lot, airstrip, sidewalk or any other paved surface.

[0016] The asphalt composition with embedded reflective particles provides UV protection for reduced breakdown of material (longer lasting road surface), and by increased albedo of the surface mitigates effects of increased greenhouse gases. When installed over permafrost, the asphalt composition provides permafrost thaw mitigation.

[0017] In an embodiment for use with a cold applied asphalt, the binder may comprise a total of 3-6% by weight of the asphalt composition. Of the total binder material,

between 0.4 and 1.5% by weight may be asphalt cement used in a pre-mix stage in which the aggregate and asphalt cement are combined in a hot mix stage at around 300F. The aggregate may be a 3/8" washed rock or any other suitable gradation or type of aggregate. In a second stage, the cooling combined aggregate and initial binder is run back through the plant with no flame and mixed with the remaining binder liquid which is a blend of binder and an adhesive polymer adhesive. The adhesive polymer additive may make up 3-10% of the final blended binder. The glare control additive (for example, titanium oxide) and reflective particles (for example reflective, aluminum strips) may each be added in amounts of 1-5% of the weight of the liquid binder or such other amount that is suitable for the desired amount of reflectivity and colour. The reflective aluminum strips may be 1 mm thick, 1-5 mm wide and 1-10 mm for example.

[0018] Immaterial modifications may be made to the embodiments described here without departing from what is covered by the claims. In the claims, the word "comprising" is used in its inclusive sense and does not exclude other elements being present. The indefinite article "a" before a claim feature does not exclude more than one of the feature being present. Each one of the individual features described here may be used in one or more embodiments and is not, by virtue only of being described here, to be construed as essential to all embodiments as defined by the claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An asphalt composition, comprising:

aggregate;

binder coating the aggregate; and

reflective particles embedded within and coated by the binder.

2. The asphalt composition of claim 1 in which the binder comprises clear bitumen.

3. The asphalt composition of claim 1 in which the binder comprises bio-bitumen.

4. The asphalt composition of claim 1 in which the binder comprises a polymer modified bitumen for cold application.

5. The asphalt composition of claim 1, 2, 3 or 4 in which the binder is at least partially transparent and further comprises a glare control additive.

6. The asphalt composition of claim 5 in which the glare control additive comprises titanium dioxide.

7. The asphalt composition of any one of claims 1-6 in which the reflective particles are made of a metal.

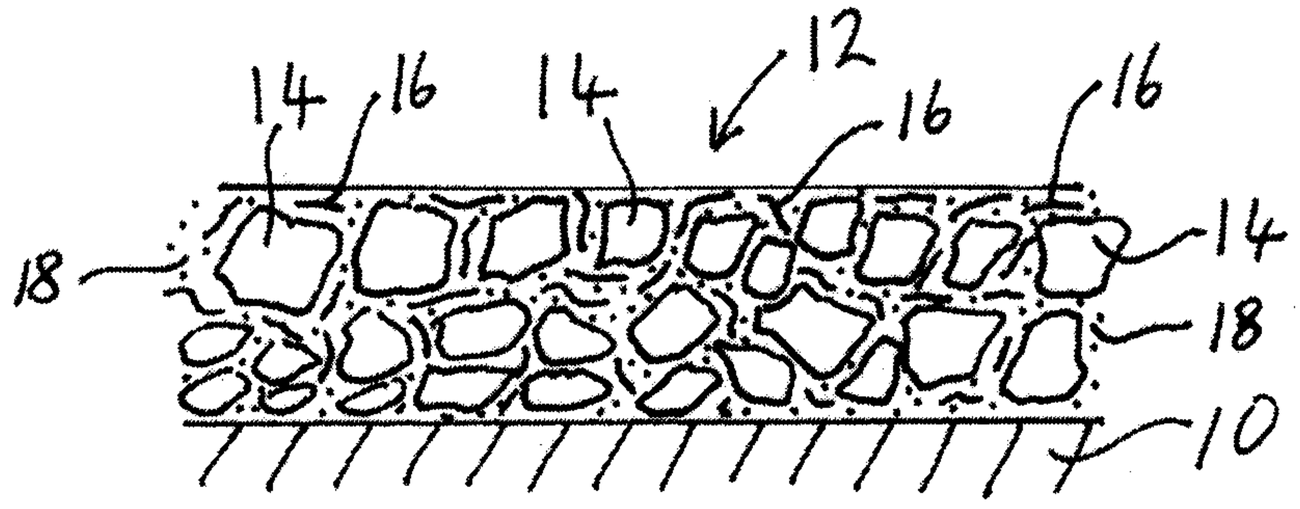
8. The asphalt composition of any one of claims 1-6 in which the reflective particles comprise metal strips.

9. The asphalt composition of any one of claims 1-6 in which the reflective particles comprise aluminum metal strips.

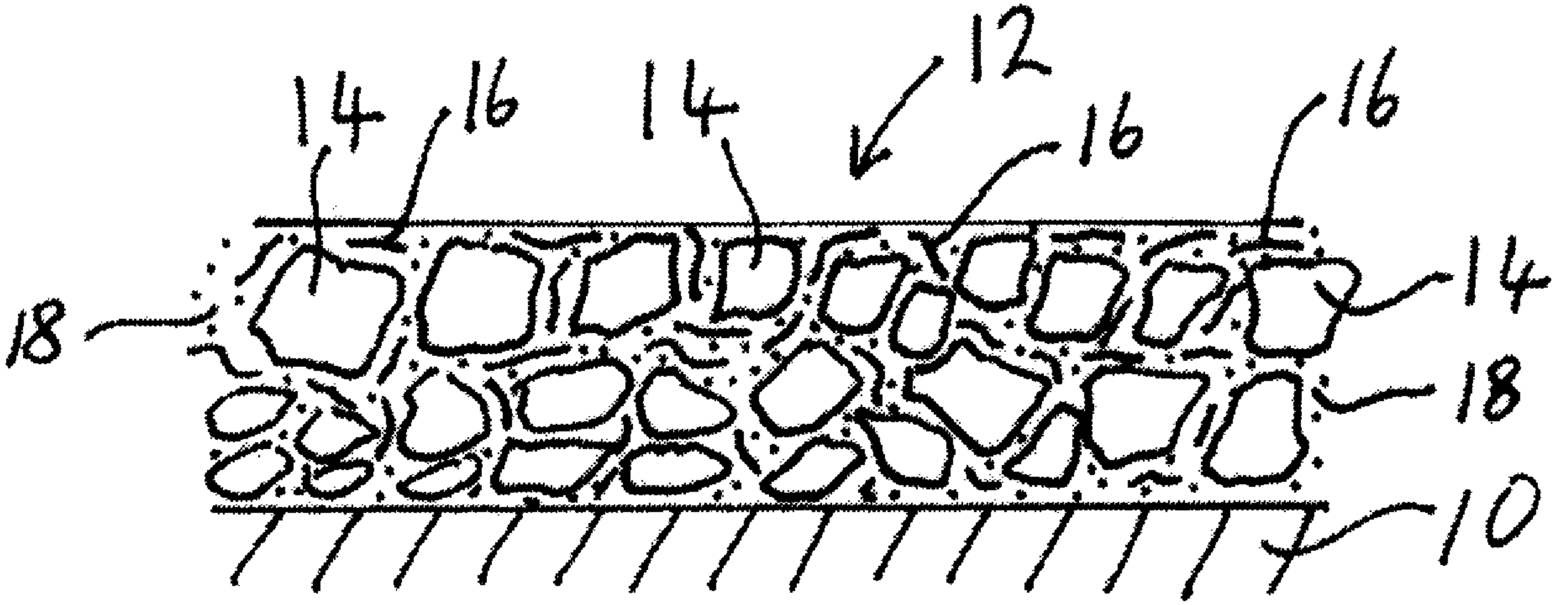
10. The asphalt composition of claims 8 or 9 in which the metal strips have a longest dimension less than 1 cm.

11. The asphalt composition of claim 1 in which the ratio of weight percent binder and aggregate is selected so that the asphalt composition has durability suitable for use on a highway subject to truck traffic.

12. The asphalt composition of claim 1 in which the reflective particles are made of a material that does not absorb the binder.



FIGURE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