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(54) **Block for repairing a road surface and method for the production of such block**

(57) The present disclosure relates to a block (10) for repairing a road surface wherein the block (10) includes at least one portion (31) of precompressed asphalt. The present disclosure also relates to a method for the production of a block (10) suitable for repairing an asphalt road surface. The method comprises the steps of prearranging a mould (22) having a shape corresponding to the portion (31) of precompressed asphalt to be obtained; pouring into the mould (22) a mass (M) of asphalt; subjecting the mass (M) to compression, so as to obtain the portion (31) of precompressed asphalt, and removing the portion (31) from the mould (22).

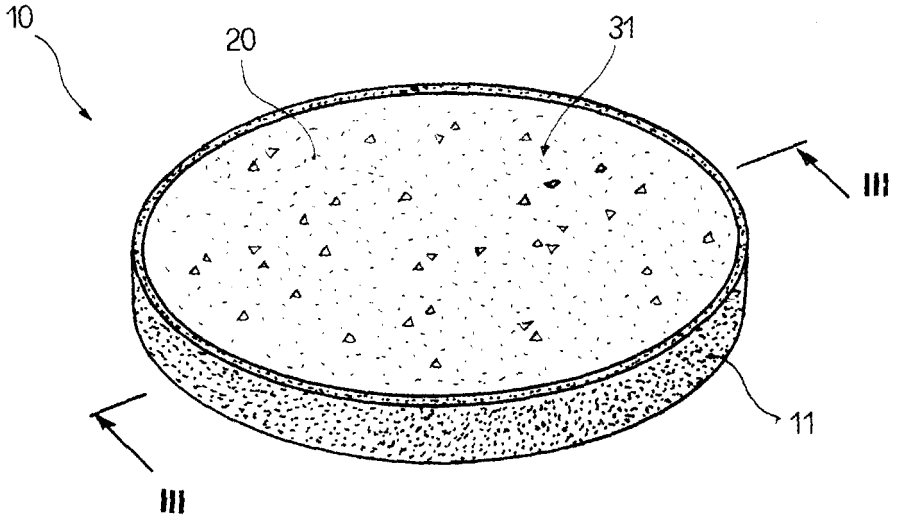


FIG.1

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Description

[0001] The present disclosure relates to a block or insert for repairing a road surface, a method for the production of such block and a method for repairing a road surface, i.e. for obtaining adequate repairing of damaged road surfaces, for instance having holes, cracks or depressions, e.g. caused by adverse weather or other natural phenomena, or, e.g., owing to wear caused by vehicles transiting on said road surface.

[0002] The block according to the present disclosure finds application in the field of maintenance of road, highway, or town and out-of-town areas, and specifically in the field of repairing of damaged and worn road surfaces.

[0003] The need to provide for the repairing of damaged road surfaces within the shortest viable time is known.

[0004] Road surface repairing operations can be performed according to several known modes.

[0005] A first way to proceed envisages a removal of an entire portion of the road surface by suitable milling machines, a pouring of a hot (and therefore less viscous) mass of asphalt in the previously milled region, and a subsequent levelling of the poured asphalt.

[0006] A second method envisages the filling of holes or cracks of the road surface simply by pouring a hot mass of asphalt into the existing holes or cracks, then levelling, after cooling, the asphalt to a level matching that of the adjacent road surface road.

[0007] Both of these repairing methods entail some drawbacks.

[0008] A first drawback lies in a high burdensomeness of the repairing operations, such that road surface betterment proves quite costly, both for machinery used and manpower.

[0009] A second drawback lies in the fact that such repairing interventions do not allow a full integration of the added asphalt mass with the existing road surface and have a very limited duration, so much so that it has been found that, over a short time span, stresses from traffic can cause detachment of the added asphalt mass and therefore the need to make a new repairing.

[0010] The use of a cement block has also been proposed, which is inserted inside a conjugated cavity obtained in the road surface at the damaged zone. Even more particularly, the cement block is glued into the cavity by means of a suitable adhesive that is arranged into the cavity prior to insertion.

[0011] The cement block did not prove suitable for asphalt road repairing, as over time, following vehicle transit, surface discontinuities between the cement block and the surrounding road surface have become more marked, with formation of new cracks between the cement block and the surrounding road surface.

[0012] Therefore, the present disclosure stems from the technical problem of providing a block for repairing road surfaces allowing to overcome at least one of the drawbacks mentioned hereto with reference to the known art, and/or allowing to attain further advantages.

[0013] A block according to the present disclosure is defined in independent claim 1; the abovementioned technical problem is solved also by a method according to claim 7 for the production of a block suitable for repairing a road surface and by a method according to claim 15 for repairing a road surface.

[0014] Secondary features of the subject-matter of the present disclosure are defined in the corresponding dependent claims thereof.

[0015] The subject of the present disclosure provides some relevant advantages.

[0016] In particular, a block according to the present disclosure allows to obtain an adequate repairing, resisting over time, of road surfaces damaged, e.g., by adverse weather or other natural phenomena, or owing to wear, etc.

[0017] Even more particularly, since the block includes a portion of asphalt suitably precompressed before the same block is laid on a road surface, it is a block having compressive strength (or ultimate strength), and/or yield stress (i.e., the lower stress by which a material gets to yield, exhibiting a plastic behaviour with elastic failure sets) features comparable to those of a road surface adjacent to the block; in fact, the adjacent road surface underwent over time constant and repeated compression by vehicles and transport transiting on the road surface itself.

[0018] In other words, according to an aspect of the present disclosure, it is provided that road repairing be carried out through the use of a block including at least one portion of precompressed asphalt, which has a very compact physical consistency comparable to that of an aged road surface, that therefore has been subjected to vehicular load for a long time. This repairing allows to repair the road with a block or insert of a material having mechanical resistance features as similar as possible to the physical features of the surrounding surface.

[0019] It follows that an advantage of the block according to the present disclosure lies in the fact that it offers, once laid on the road surface, behaviour similar to that of the asphalt adjacent thereto, which, by having been subjected to vehicular compression for a longer time, exhibits greater wear.

[0020] Thus, a repairing of the road surface is obtained in which, as soon as a repairing is carried out, in spite of it the road surface exhibits a condition of homogeneous compression and homogeneous behaviour of the asphalt over time after vehicle transit.

[0021] Another advantage of the use of a block including a portion of precompressed asphalt lies in an uncommon simplicity of application, as it basically requires the making of suitable cavities at damaged areas of a road surface and the positioning, in the cavities, of a block according to the present disclosure.

[0022] Cavities should be made with shape and size conjugated to the blocks they house, so as to attain as much as possible a surface continuity.

[0023] According to an aspect of the present disclosure, it has been found advantageous that the block, after having been subjected to compression, have a yield stress comprised between 5 and 130 N/mm^2, preferably between 10 and 70 N/mm^2, even more preferably between 30 and 50 N/mm^2.

[0024] The block preferably has the shape of a disc, of a height comprised between 5 and 15 cm and a diameter comprised between 70 and 100 cm. Such disc therefore has an area comprised between about 3.800 cm^2 and about 7.900 cm^2. The disc-like shape entails the advantage that it allows to insert the block into a matching circular cavity, which can easily be made by coring or progressive milling.

[0025] A block according to the present disclosure is made, e.g., in the following way.

[0026] A mould or formwork is prearranged, having a cavity conjugated to the portion of precompressed asphalt of the block to be obtained. Then, a suitable dosed amount of asphalt is poured into the mould; such amount of asphalt is in a soft or fluid form, e.g., as it has been heated in advance; in other words, said amount of asphalt has a viscosity sufficiently low to be poured into the mould.

[0027] Then, the asphalt is subjected to a compression.

[0028] In one embodiment, the compressive effort (i.e., the compression force per surface unit) is calculated by assuming a weight force interval comprised between 2000 and 20000 kgf (kilogram force) (i.e., an average weight force interval of vehicles commonly transiting on a road surface) on an area corresponding to the section of the portion of precompressed asphalt to be obtained. The weight force to be exerted is selected in said interval according to intended use and road type.

[0029] In one embodiment, to foster block adhesion in the cavity, the block is provided with a coating of bonding agent for the fixing to the adjacent road surface.

[0030] Preferably it is a thermoplastic bonding agent, which is in a dry non-tack form during a storing stage, and is heated to activate tackifying properties (bonding agent capacity) only at the time when the block is implanted in the matching cavity. Even more particularly, the bonding agent is bitumen which is compatible with a conventional asphalt road surface.

[0031] Furthermore, in a preferred embodiment, the block comprises a coating of bonding agent arranged at a side wall of the portion of precompressed asphalt and at a face of the portion of precompressed asphalt intended to be facing the bottom of the road surface where the block is arranged.

[0032] Thus, in the face opposite to the cavity, which is visible after the laying, the block does not have bonding agent in sight, apart from at a side edge, where the block adheres to the surrounding road surface.

[0033] Preferably, in one embodiment, the portion of precompressed asphalt is made of draining asphalt, adapted to drain rainwater, and the coating of bonding agent, at said face intended to face the bottom of the road surface cavity, has discontinuities or openings; in other words, said face has coating-free zones, in which the asphalt is exposed in sight. When the block is fixed in the cavity in the road surface, such coating-free zones allow in-depth drainage of rainwater coming from the portion of precompressed asphalt.

[0034] Further advantages, features and the operation steps of the subject of the present disclosure will be made evident in the following detailed description of a preferred embodiment thereof, given by way of example and not for limitative purposes.

[0035] However, it is evident how each embodiment of the subject of the present disclosure may entail one or more of the advantages listed above; anyhow, it is not required for each embodiment to concomitantly entail all of the advantages listed.

[0036] Reference will be made to the figures of the annexed drawings, wherein:

- Fig. 1 illustrates a schematic top perspective view of a block according to the present disclosure;
- Fig. 2 illustrates a schematic bottom perspective view of a block according to the present disclosure;
- Fig. 3 illustrates a view in vertical section along line III-III of the block of Fig. 1;
- Fig. 4 illustrates a perspective view of a mould for making a block according to the present disclosure;
- Fig. 5A schematically shows a first step of a process for making a block according to the present disclosure;
- Fig. 5B schematically shows a second step of a process for making a block according to the present disclosure;
- Fig. 5C schematically shows a third step of a process for making a block according to the present disclosure;
- Fig. 5D schematically shows a fourth step of a process for making a block according to the present disclosure;
- Fig. 6A schematically shows a fifth step of a process for making a block according to the present disclosure;
- Fig. 6B schematically shows a sixth step of a process for making a block according to the present disclosure;
- Fig. 7 shows a schematic view of a miller or borer for making a cavity on a road surface;
- Fig. 8 schematically shows an operating step in which a first set of cavities is made, obtained on a road surface;
- Fig. 9 schematically shows an operating step in which a second set of cavities is made, obtained on a road surface and partially overlapped with the cavities of the first set of Fig. 8;
- Fig. 10 schematically shows a repairing of a road surface obtained by a plurality of blocks according to the present disclosure.

[0037] Referring to the annexed figures, an asphalt block according to the present disclosure is denoted by reference number 10. In the example, in particular the block 10 is disc-shaped, and comprises a central portion 31 having a first face 20 and a second face 21 opposite to the first face 20, and a side wall, or mantel 30. The second face 21 is intended to be facing the bottom of a cavity 40, 50 obtained in a road surface, as will be described hereinafter.

[0038] The block 10 has a height H comprised between 5 cm and 15 cm, in the example of 6 cm, and has a diameter D comprised between 70 cm and 100 cm, in the example of 70 cm.

[0039] According to an aspect of the present disclosure, the central portion 31 is of precompressed asphalt, i.e., it is a portion that has been subjected to a compression operation prior to the laying.

[0040] Compression in the example is carried out along an axis X-X in the direction of the height H of the block 10 (Fig. 3).

[0041] In particular, referring to Figs. 4 to 6B, the block 10 is made in the following way.

[0042] On a bearing plane P a mould 22 is prearranged, which in the example is made of metal and ring-shaped, high approximately about 8-10 cm, in the example 8 cm, and of a diameter comprised between 65 cm and 105 cm, in the example about 68 cm. In particular, the mould 22 comprises a cylindrical side wall or shell extended along a central longitudinal axis 200, including two half-shells 122, 222 separable thereamong and joined along a longitudinal direction by hinge 24a, and connected from an opposite side to the hinge 24a by clips 24b or hooks (Fig. 4, Fig. 5D).

[0043] The mould 22 has a shape conjugated to the portion 31 of the block 10.

[0044] Therefore, the mould 22 lacks a bottom wall; to make the block 10, the mould 22 is placed resting on the bearing plane P. The hinge 24a allows closing the mould 22 before starting the process and reopening the mould 22 after use, to draw out the portion 31 of block 10. In one embodiment, on a bottom of the mould 22 a reinforcing member 23 is prearranged (Fig. 4), e.g. a honeycomb grate, having circular shape and a diameter coherent or compatible with that of the block 10 or disc to be obtained and the mould 22. In the example, the honeycomb cells have hexagonal shape.

[0045] During the production stage of each block 10, a soft asphalt mass M (i.e., with a viscosity sufficiently low to be poured) is poured into the mould 22 in a dosed amount (corresponding to the portion 31 to be obtained), such as to fill the entire mould 22 and incorporate the reinforcing member 23, if present.

[0046] The asphalt is subjected to compression by a press 25 having a pressing surface corresponding to the circular shape and size of the portion 31 of the block 10, and adapted to get into the mould 22, with a small clearance, along said longitudinal direction 200.

[0047] In the example, schematically illustrated in the drawings, the press 25 exerts a compression force only on one side of the asphalt mass M (i.e., of the block 10); such compression force is comprised between 2 and 20 tonne-force, depending on the intended application of the block, on an area corresponding to the section of the portion 31 of the block 10 to be obtained, i.e. to the face 20 of the portion 31.

[0048] Basically, the portion 31 is precompressed before the block is laid. Compression is performed with a force substantially comparable to the force at which an equivalent portion of road surface is subjected owing to vehicular traffic.

[0049] As to the asphalt employed, it is a traditional-type asphalt, i.e. an artificial bituminous conglomerate obtained by mixing suitable amounts of coarse inerts (gravel), fines (sand and filler) and bitumen; such asphalt is selected on the basis of the features of the surrounding asphalt, i.e. of the road surface where each block 10 is laid.

[0050] Therefore, if the asphalt of the road surface to be repaired is of draining type, also the portion 31 is made of draining asphalt.

[0051] The portion 31 may anyhow be made by utilizing any one among the asphalts currently in use.

[0052] In one embodiment of the subject of the present disclosure, the portion 31, after compression, is covered with a coating 11, preferably of bitumen acting as bonding agent.

[0053] In the example, the block 10 includes a first layer 11a of bitumen arranged at one of said faces, in particular the second face 21 intended to face the bottom of the cavity 40, 50 made in the road surface, and a second layer 11 b of bitumen laid at the side surface 30 of the portion 31, laid at the side surface 30 of the portion 31.

[0054] In practice, the block 10 includes a portion 31 or core of precompressed asphalt and a coating 11, or layer, of bonding agent, in the example of bitumen, arranged at at least one face 21 and/or at a side wall 30.

[0055] In the example the coating 11 has a thickness comprised between 0.5 and 2 cm.

[0056] The coating 11 is arranged on the portion 31 by casting of bonding agent, of bitumen in the example. For example, casting occurs from the top, on portions 31 laid on a mesh belt N (Fig. 6A, Fig. 6B) with the face 21 facing upward, so that the coating 11, by casting, covers the entire portion 31 apart from the face 20; in other words, the coating 11 coats the bottom face 21 and the side wall 30 of the block 10.

[0057] In an alternative mode, the coating 11 is arranged on the portion 31 by spreading or brushing.

[0058] In a variant embodiment, referring to Figs. 6A and 6B, before performing the casting, on the face 21 of the portion 31, i.e. on the face intended to be coated with the coating 11, masks or covers 26 are arranged, intended to leave zones 27 of the face 21 without coating 11 (as may be seen in Fig. 2); basically, said masks 26 are removed after the casting of the bonding agent and cause openings 27 to remain in the coating 11. In the example

the masks 26 have circular shape and are four; however, it is evident that different shapes and/or a different number of masks 26 may be envisaged according to needs.

[0059] Thus, by utilizing a draining asphalt, when the block 10 is laid in place, the zones 27 allow rainwater penetrating through the portion 31 to cross the entire block 10 and go in depth in the underlying layers of the road.

[0060] The coating 11, which in the example is a bitumen layer, forms a single piece with the portion 31 of precompressed asphalt, and remains in this condition until the time of use. Preferably the coating 11, when the block 10 is an end product, is in a dry, non-tack condition, and therefore it is compatible with storehouse storage.

[0061] In this regard, a storehouse for blocks 10 includes a suitable loader where a plurality of blocks 10 are loaded, e.g. stacked the one on the other, and such loader can be installed aboard a vehicle (not illustrated) e.g. as a sort of skip box, used for road surface repairing.

[0062] Thus, a vehicle provided with the loader/storage reaches the site of the road surface to be repaired and provides a number of blocks 10 according to needs.

[0063] More particularly, before laying the block 10, in the road surface and at the region to be repaired a cavity or recess 40, 50, 50 is made, wherein the cavity or recess is shaped to match the shape and size of the block 10 is made, such as to allow a sort of clearance-free joint of the block 10 into the cavity 40, 50.

[0064] For the making of the cavity 40, 50, the road surface is subjected, e.g., to boring or progressive milling, with the obtainment of a circular cavity 40, 50.

[0065] Even more particularly, before each block 10 is arranged in the respective cavity 40, 50, as anticipated above, the bitumen layer 11 is brought to working temperature, or thermally heated, by means of a suitable electrical resistance heater located aboard the above-mentioned vehicle. The heating temperature for heating the coating 11 is comprised between 100 °C and 300 °C, and the heating time is rather fast, e.g. of the order of 1 - 2 min.

[0066] Upon reaching said temperature, a melting of the sole coating 11 (such as to activate the tackifying properties of the bitumen) is attained and the block 10 is then stuck into the cavity 40, 50 of the road surface, exerting thereon a pressure until the first face 20 of the block 10 forms a surface continuity with the surrounding road surface (Fig. 8).

[0067] Basically, the first layer 11 a covering the bottom face 21 of the portion 31, and the second layer 11 b covering the shell or side wall 30 of the portion 31, acts as bonding agent between the portion 31 and the surrounding road surface, in particular between the portion 31 and the side and bottom walls of the cavity 40, 50.

[0068] Cooling takes place in a few minutes, and there occurs a sort of welding of the block 10 with the road surface.

[0069] In Fig. 7 a borer 12 or milling head is illustrated, used for making circular cavities 40, 50 at damaged road surface zones. Such a borer 12 is installed aboard the repairing vehicle, e.g. fixed on a spindle (not illustrated).

[0070] Preferably, the borer 12 includes a cylindrical-shaped or crown-like blade 14 having, at a zone intended for perforation, a diamond toothing 15 suitable for cutting into the road surface. The blade 14 has a diameter corresponding to the disc-shaped block 10, and is intended to fragment and crumble the road surface where the cavity 40, 50 is made.

[0071] The borer 12 further includes a collar 13, whose position is adjustable with respect to the diamond toothing 15 and which acts as a limiter or abutment member, and allows a perforation in the road surface at a depth corresponding to a height H of the block 10 which is inserted in the cavity 40, 50.

[0072] Even more particularly, the borer 12 is mounted on a cardan joint, schematically denoted by reference number 16, and inserted in the above-mentioned spindle, which allows an orientation adjustment of the borer 12, by adapting to any inclination of the surrounding asphalt.

[0073] The intervention for repairing a road surface occurs according to the following steps:

- From the vehicle for repairing the road surface, vehicle which is preferably camera-equipped, a linear path is singled out along which a set of perforations are to be carried out, at as many zones of damaged road surface, obtaining a first set of cavities 40;
- Perforation and debris and residue suction are performed, following with the camera the correct carrying out of the step;
- In the meantime, each block 10 is heated, so as to slightly melt the bitumen of the coating 11;
- then, by a grip member, such as, e.g., a pincer-shaped body comprising two jaws, the block 10 is taken (the jaws take the block 10 from opposite sides in correspondence of the side wall, so that the block 10 be substantially horizontal or slightly tilted according to road surface inclination);
- the block 10 is housed in the cavity 40, exerting a controlled pressure, optionally with the aid of a strut, until matching the top edges of the block 10 (i.e., the face 20) with the adjacent edges of the road surface (i.e., with the road surface); thus the block 10 is implanted in the road surface.

[0074] Upon waiting for bitumen setting, the repairing is substantially completed.

[0075] Estimated intervention time is approximately of about 10 min.

[0076] The operation is repeated in order to implant other blocks 10 in the other cavities 40. During milling operations, generated debris is sucked up by suitable orifices positioned around and into the miller.

[0077] Several advantages are obtained by utilizing the solution according to the present disclosure, among which a remarkable rapidity of maintenance intervention

steps and the need to employ few operators.

[0078] Another advantage of the block according to the present disclosure lies in the fact that it makes an eventual reasphalting possible; moreover the intervention may be carried out under any weather and temperature condition, and even on mountain roads where asperities make these jobs difficult.

[0079] In addition, each block has a very reasonable cost and operations can be planned so that, through the use of suitable lights positioned on the front and rear of the vehicle used for repairing and integral thereto, road traffic could be organized without aid by other operators.

[0080] The block 10 including a portion 31 of precompressed asphalt reduces the problems related to a diversity of compactness with the surrounding road surface, as it simulates in terms of compactness the surrounding road surface.

[0081] Even more particularly, as visible in Figs. 8 to 10, for larger repairing, by using blocks 10 according to the present disclosure it is possible to carry out an intervention according to the following modes.

[0082] A first set of main cavities 40 is made (Fig. 8), spaced thereamong of a distance shorter than the diameter of the block 10.

[0083] Respective blocks 10 are implanted in all of the main cavities 40. In Fig. 9, blocks 10 inserted in respective main cavities 40 are illustrated.

[0084] In a second step, a second set of cavities 50, or secondary cavities (Fig. 9) is made, wherein each secondary cavity 50 is interposed, with overlapping or intersecting with respective adjacent main cavities 40, and therefore with the blocks 10 inserted therein.

[0085] Basically, millings of secondary cavities 50 are carried out so as to partially remove part of the blocks 10 already inserted in the main cavities 40.

[0086] Respective blocks10 are implanted in the secondary cavities 50.

[0087] Thus, a sort of band for repairing the road surface is made, consisting of the sequence of the blocks 10 intersecting thereamong.

[0088] In Fig. 9 a repairing band is shown, extending in a direction longitudinal to the carriageway, whereas in Fig. 10 a band for repairing a road surface is illustrated, extended according to a direction transversal to a carriageway.

[0089] In fact, an advantage of the repairing method according to the present disclosure lies in the fact that the repairing can be carried out according to a direction extended longitudinally to the carriageway (as may be seen in Fig. 9) as well as to a direction extended transversally to the carriageway (as may be seen in Fig. 10).

[0090] The subject of the present disclosure has been hereto described with reference to preferred embodiments thereof. It is understood that other embodiments might exist, all falling within the protective scope of the claims hereinafter.

Claims

1. A block (10) for repairing a road surface, said block (10) including at least one portion (31) of precompressed asphalt.

2. The block (10) according to claim 1, wherein said block (10) comprises a coating (11, 11 a, 11 b) of bonding agent that coats at least partially said portion (31).

3. The block (10) according to claim 2, wherein said portion (31) comprises two opposite faces (20, 21) and a side wall (30) comprised between said two faces (20, 21), and wherein said coating (11) includes a first layer (11 a) covering said portion (31) at one of said faces (20, 21) and a second layer (11b) covering said portion (31) at said side wall (30), said coating (11, 11a, 11b) being a bonding agent apt to foster adhesion of the block (10) inside a cavity (40, 50) obtained in a road surface.

4. The block (10) according to claim 3, wherein said portion (31) is of draining asphalt and said first layer (11a) comprises openings (27), at which the precompressed asphalt is without coating.

5. The block (10) according to any one of the claims 2 to 4, wherein said coating (11, 11 a, 11 b) is of bitumen.

6. The block (10) according to any one of the claims 1 to 5, having a disc-like shape.

7. A method for the production of a block (10) suitable for repairing an asphalt road surface, wherein said block (10) includes at least one portion (31) of precompressed asphalt, the method comprising the steps of:

   - prearranging a mould (22) having a shape corresponding to said portion (31) to be obtained;
   - pouring into the mould (22) a mass (M) of asphalt;
   - subjecting said mass (M) to compression, so as to obtain said portion (31) of precompressed asphalt,
   - removing said portion (31) from the mould (22).

8. The method according to claim 7, wherein said mass (M) is subjected to a compressive effort comprised between 2 and 20 tonne-force.

9. The method according to claim 7 or 8, wherein after the step of removing the mould (22), the portion (31) is at least partially coated with a coating (11, 11a, 11b) of bonding agent.

10. The method according to claim 9, wherein said portion (31) comprises two opposite faces (20, 21) and a side wall (30) comprised between said two faces (20, 21), and wherein said coating (11) is arranged at said side wall (30) and at one of said faces (20, 21).

11. The method according to claim 10, wherein before arranging said layer of coating (11) on said one of the faces (20, 21) a plurality of masks (26) are arranged, such as to determine zones (27) without coating.

12. The method according to any one of the claims 9 to 11, wherein said coating (11) of bonding agent is made of bitumen.

13. The method according to any one of the claims 8 to 12, wherein, before pouring said mass (M), into said mould (22) a reinforcing member (23) is arranged.

14. A block (10) obtainable according to the method of any one of the claims 7 to 13.

15. A method for repairing an asphalt road surface by a block (10) according to any one of the claims 1 to 6 or according to claim 14, the method comprising the steps of

- obtaining in the road surface at least one cavity (40, 50) having size and shape conjugated to a shape and size of the block (10);
- implanting the block (10) in said cavity (40, 50).

16. The method according to claim 15, when dependent on claim 5 or on claim 12, wherein said coating (11, 11 a, 11 b) is heated before implanting the block (10) in the respective cavity (40, 50).

17. The method according to claim 15 or 16, including

- a first step during which a first set of main cavities (40) in a spaced-apart relationship thereamong is obtained;
- a second step wherein in the main cavities (40) respective first blocks (10) are implanted (10);
- a third step, during which a second series of secondary cavities (50) is made, wherein each secondary cavity (50) is interposed between two main cavities (40) and partially overlaps with said two main cavities (40); wherein during said third step the blocks (10) are partially removed at the overlap zones between said main cavities (40) and said secondary cavities (50);
- a fourth step, wherein in the secondary cavities (50) respective second blocks (10) are implanted.

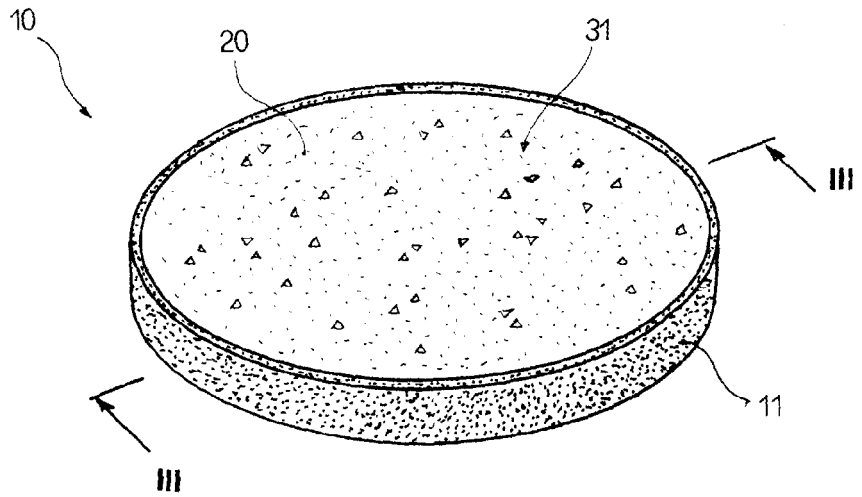


FIG.1

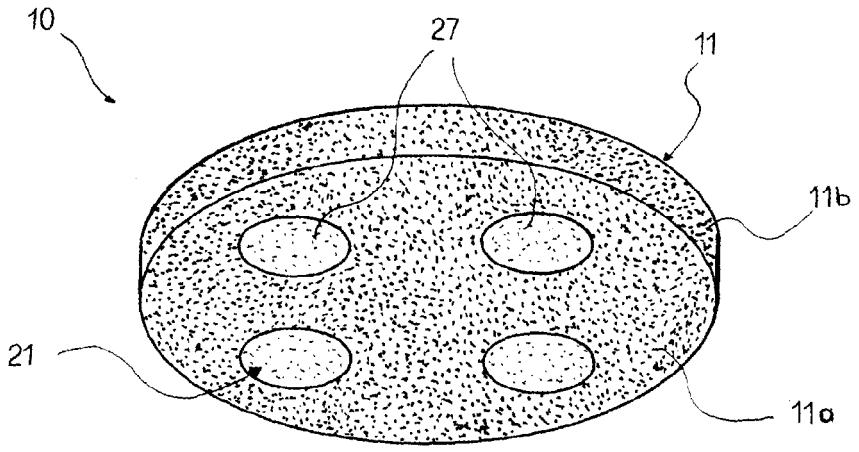


FIG.2

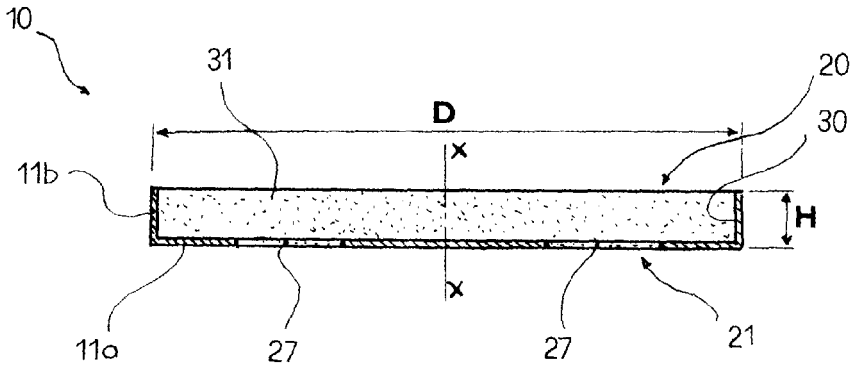


FIG.3

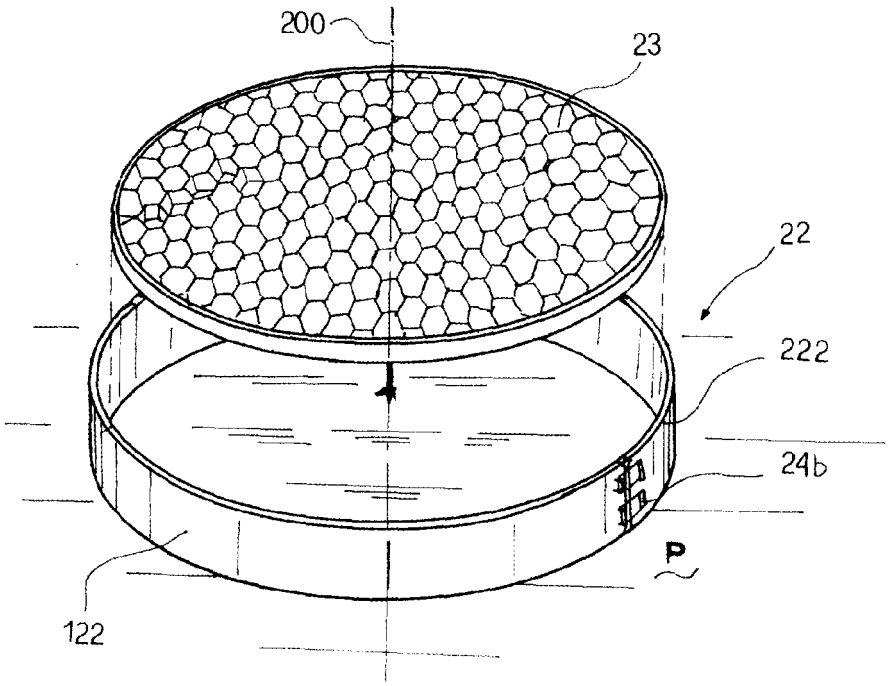


FIG.4

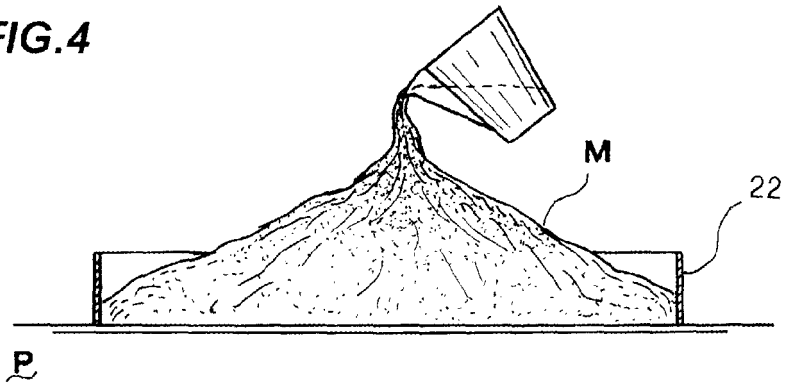


FIG.5A

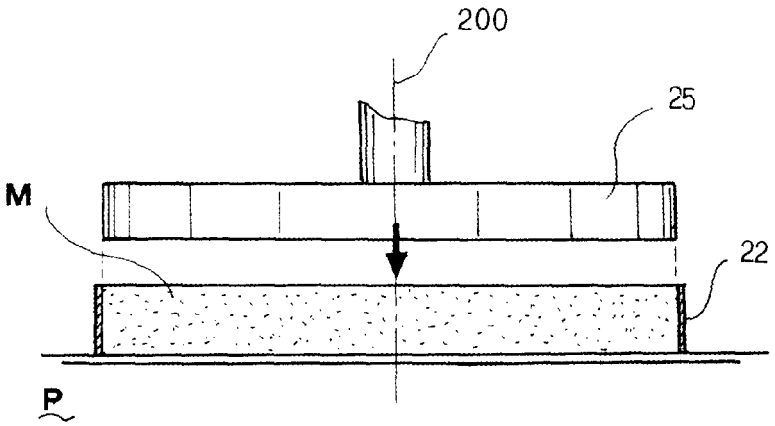


FIG.5B

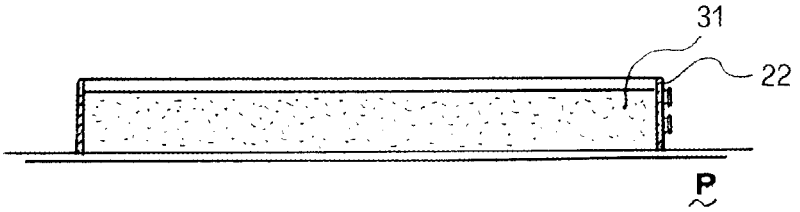


FIG.5C

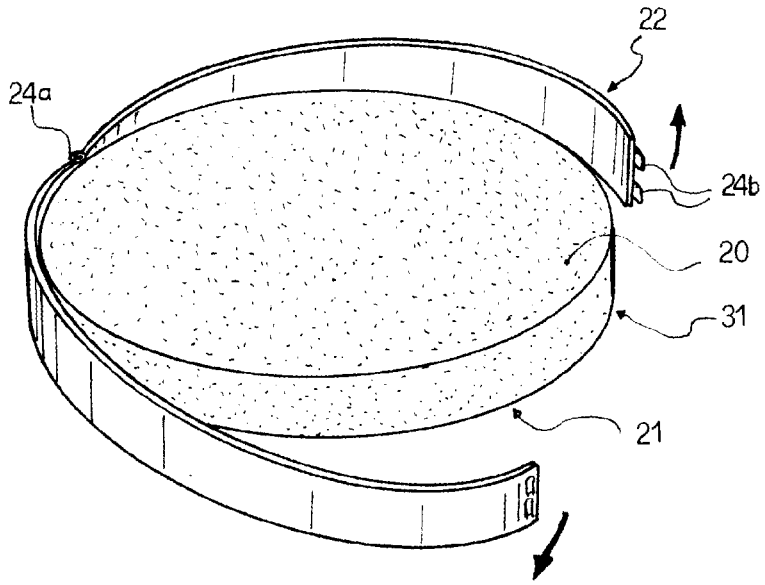


FIG.5D

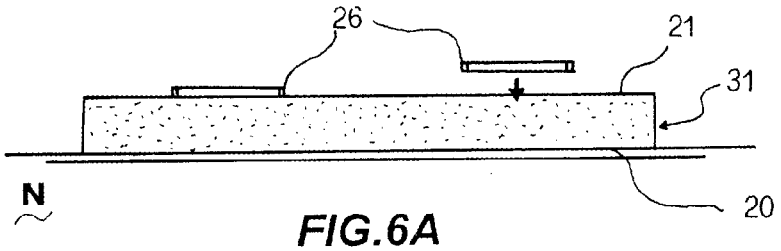


FIG.6A

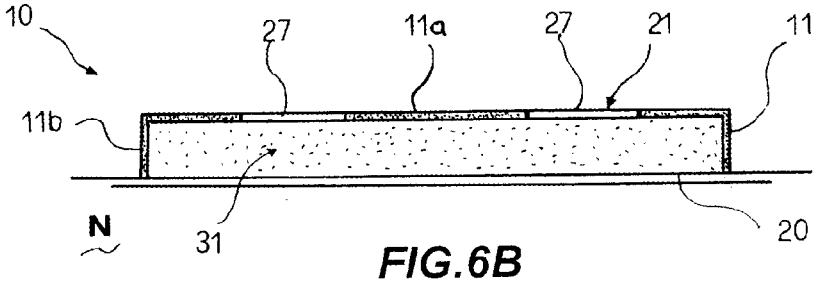


FIG.6B

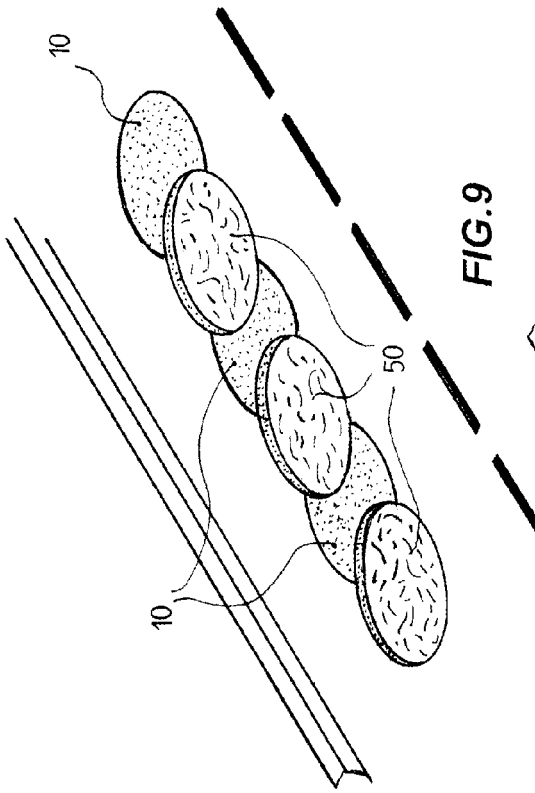


FIG.9

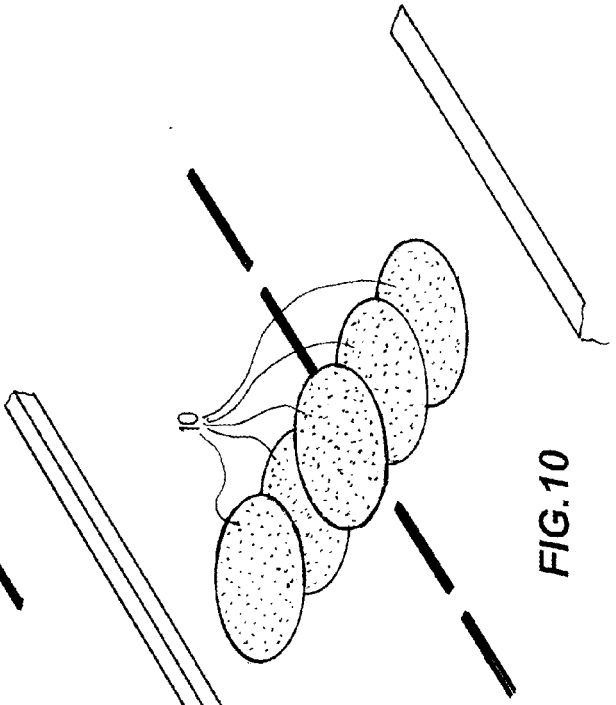


FIG.10

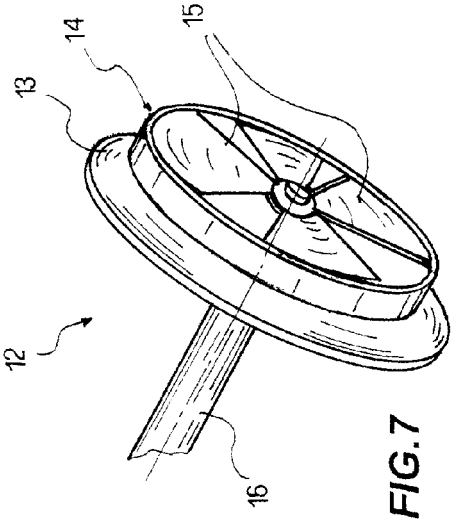


FIG.7

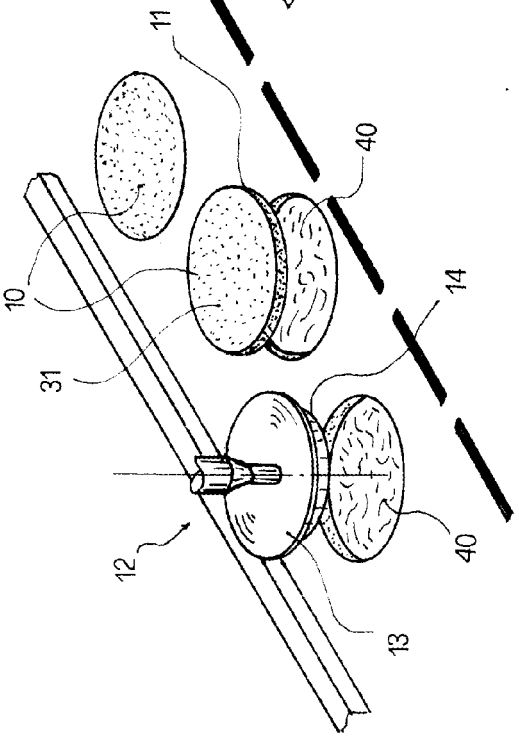


FIG.8