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3,372,626

ROAD LAYER AND ITS MANUFACTURE

Filed Aug. 5, 1965

3 Sheets-Sheet 1

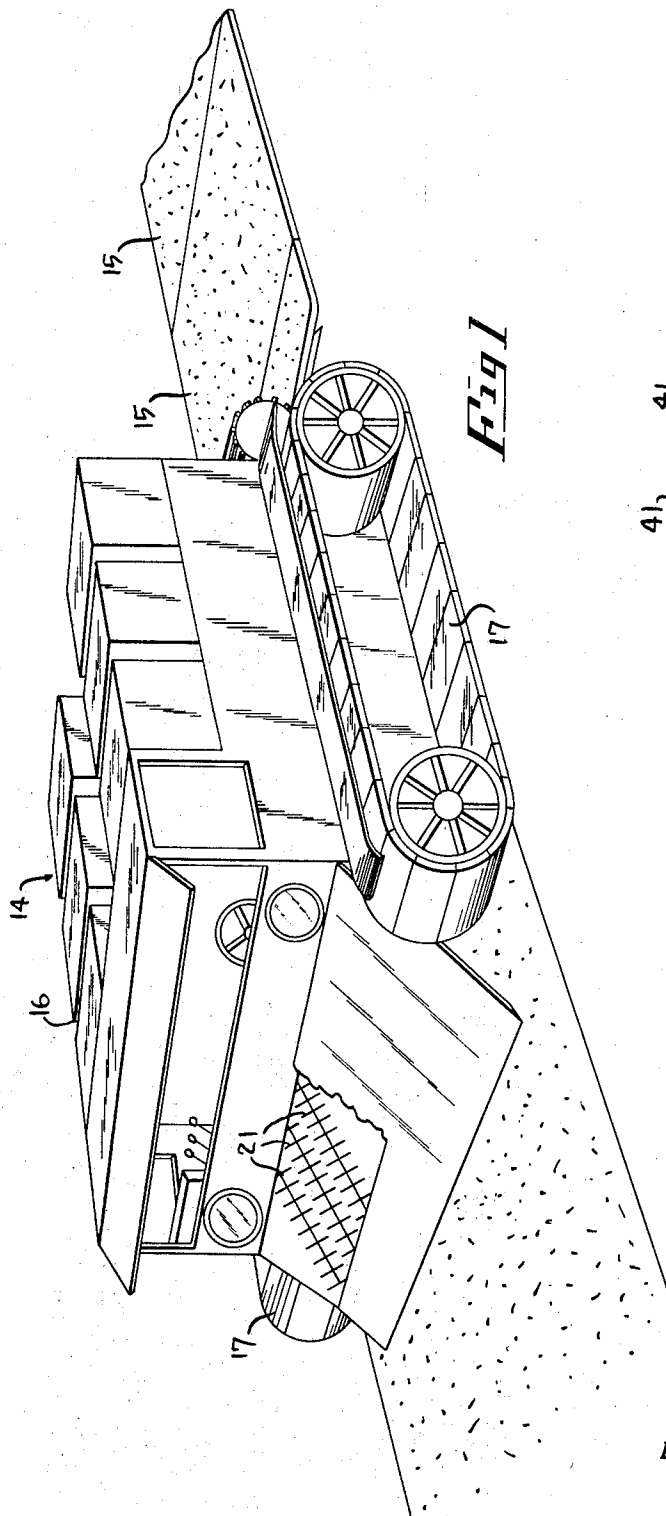


Fig. 1

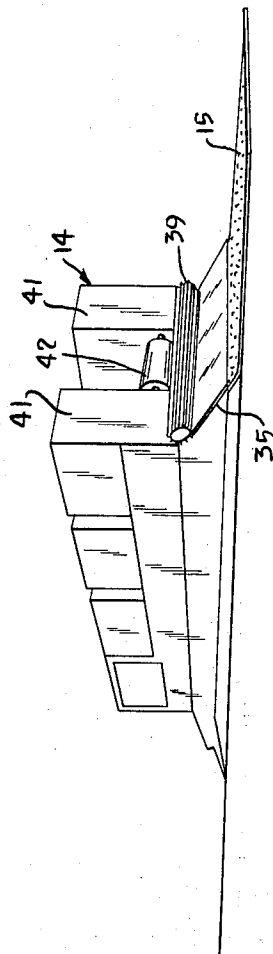


Fig. 2

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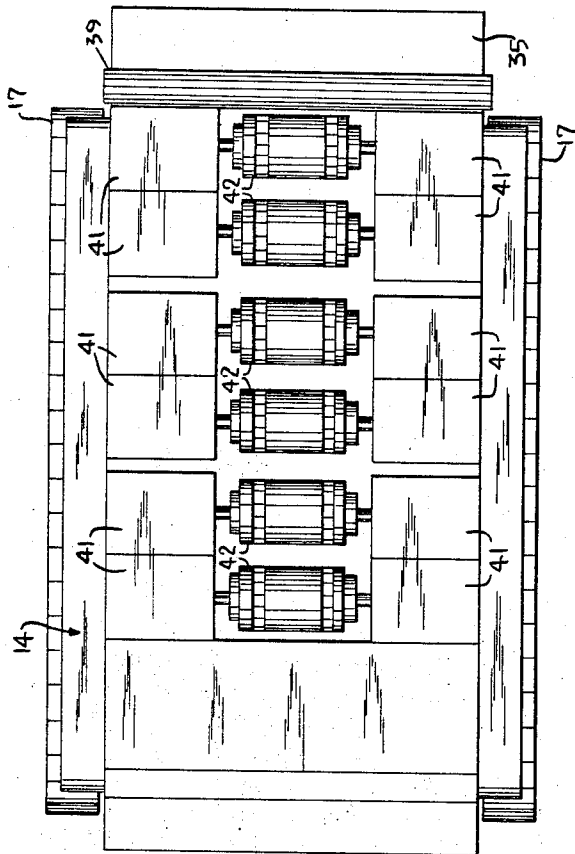


Fig 5

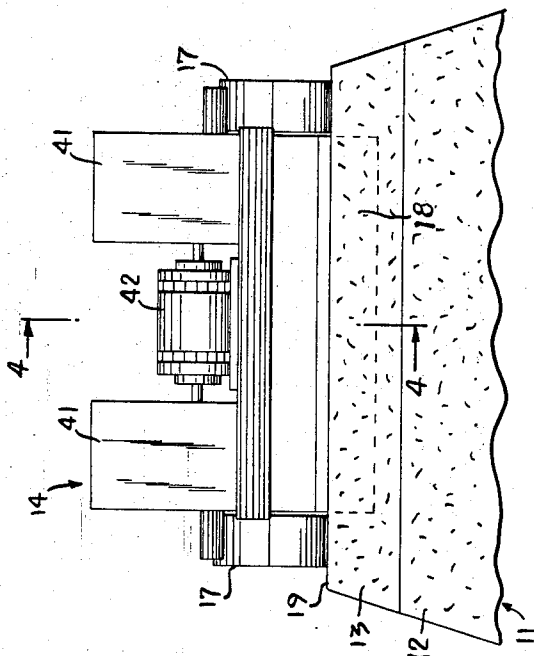


Fig 3

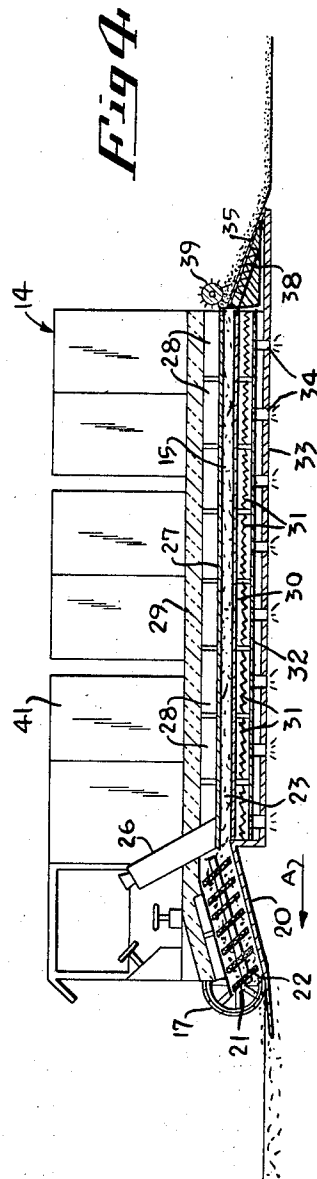


Fig 4

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Fig 6

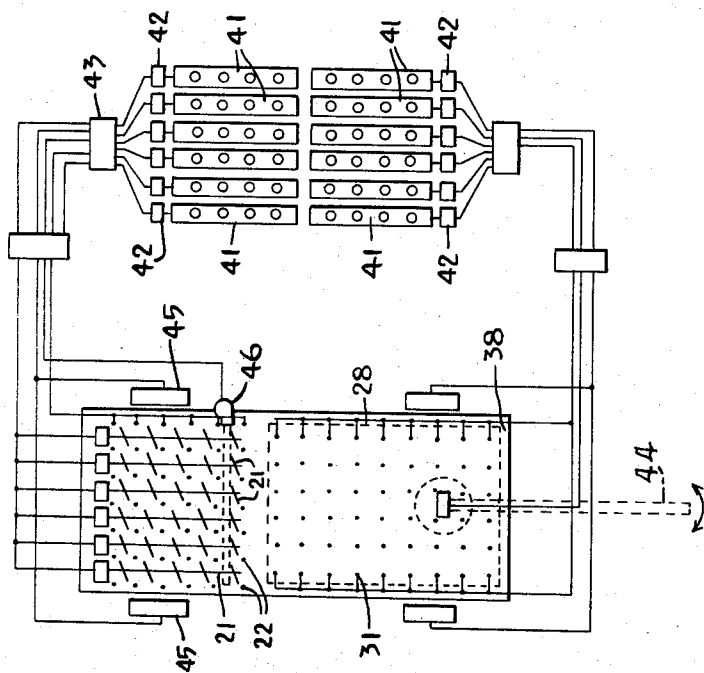
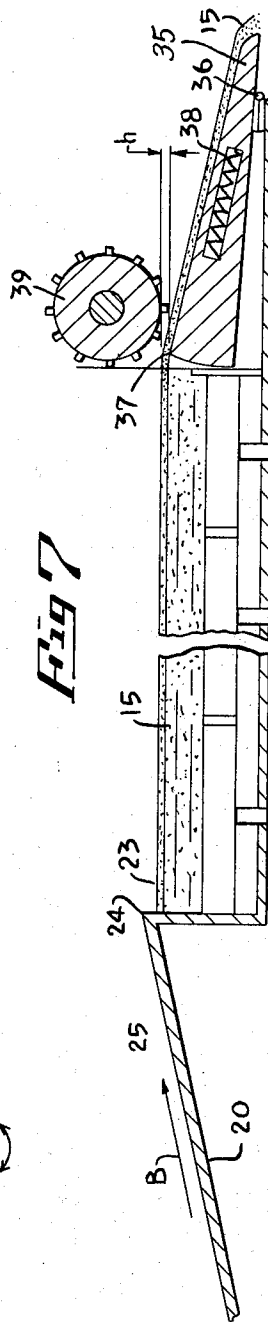


Fig 7



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ROAD LAYER AND ITS MANUFACTURE**Richard Z. Smarzak, New York, N.Y., assignor of one-half to Jack Borgos, New York, N.Y.****Filed Aug. 5, 1965, Ser. No. 477,470****3 Claims. (Cl. 94-40)****ABSTRACT OF THE DISCLOSURE**

A machine for producing a hardening road layer includes a vehicle that scoops up sand placed in front, heats and melts the sand and deposits the molten sand at the rear. The method provides for the scooping, melting of the sand and the deposit of the molten sand as the top road surface.

The invention relates to road building, and relates more particularly to the production of a hardening road layer, as well as the road layer thereby produced.

The crust of the earth is composed of quartz and other minerals, quartz being the dominant material. The highest percentage of quartz is found in sand and gravel.

In highway construction today, sand and gravel are in use, but only in their natural state.

In highway construction, the ground is first prepared by rough grading, which includes the earthwork comprising cutting and filling; this is followed by the preparation of the road crown. In road construction today, the road crown is in most instances composed of concrete slabs at a considerable cost.

The instant invention proposes to proceed with the rough grading as heretofore, but to provide the road crown with a top surface which involves but a fraction of the cost of the laying of concrete.

It is accordingly among the principal objects of the invention to provide a road structure, the top layer of which is easy to manufacture and to deposit, and yet involves a great saving of costs.

It is another object of the invention to provide a machine for manufacturing and depositing the top road layer.

It is a further object of the invention to provide a method for the manufacture and deposit of the top layer of the road structure.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, one embodiment of the same being illustrated in the accompanying drawings and described in the specification.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a machine in accordance with one aspect of the invention.

FIG. 2 is a rear perspective view thereof, with the endless tracks omitted for clarity.

FIG. 3 is a rear elevational view of the machine.

FIG. 4 is a sectional view taken on the line 4-4 of FIG. 3.

FIG. 5 is a plan view of the machine.

FIG. 6 is a schematic view of the electric conduits and the parts in connection therewith, and

FIG. 7 is a large-scale sectional view showing a detail of FIG. 4.

In carrying the invention into effect in one of the embodiments which has been selected for illustration in the accompanying drawings and for description in this specification, and referring now particularly to FIGS. 1, 3 and 4, there is shown a road structure 11 which

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has been roughgraded and may include fill 12 from the preceding earthwork. As previously mentioned, the roughgrading will substantially be similar to that practiced heretofore.

Onto the fill there has been placed a stratum 13 of sand. The stratum 13 has a height of from 12" to 22", preferably about 18".

The sand is preferably non-ferrous sand composed of silicones and/or aluminates, in fine grain size, about the size of beach sand. The sand has a melting or fusing point of from about 450° C. to 860° C., depending upon its exact composition. When subjected to temperatures above the fusing temperature, the sand particles will be fused into molten sand, a flowable viscous mass similar to glass or volcanic lava.

The compression strength of this type of molten sand, as well as its flexibility, surpasses that of concrete. Compared to concrete, molten sand pavement is considerably more economic to produce. The sand has been identified as preferably being non-ferrous, because sand without metallic composition is easier to fuse as it has a lower temperature of fusing.

While in the ensuing description, the instant invention is explained as applied to the field of highway construction, it is adaptable to many other uses, as will be obvious as this description proceeds.

A machine generally indicated at 14 is provided that scoops up sand from the layer of sand 13, preferably to the depth of about 12"; so that if the layer of sand 13 originally was 18" deep, there will remain a layer of sand 6" deep. The machine 14, as stated, will scoop up the sand to the depth of about 12", will heat the sand to fuse it, and will deposit the resulting flowable viscous molten sand mass onto the aforesaid 6" layer of sand.

The machine 14 is built into a vehicle that moves in one direction A (FIG. 4) and continuously scoops up sand and moves it to the rear, in a direction opposite to the direction A, and then discharges the flowable viscous mass.

In the foregoing it has been stated that the sand has been spread onto the fill 12. This is in line with a preferred embodiment, and has the advantage that the sand needed for fusing is on hand; and in this description, this preferred embodiment is being explained. This is done, however, for purposes of illustration, and not for purposes of restriction. It is, of course, possible, instead of spreading the sand beforehand onto the fill 12, to transport it to a point near the machine 14, keeping the machine 14 supplied with sand as needed.

The flowable viscous mass 15 (FIG. 2) that is discharged from the rear end of the machine 14 will be laid down as the top layer of the road in slabs of a predetermined width and length. In accordance with a preferred embodiment, each slab will be about 60 feet long, and successive slabs will be connected by expansion joints. The width of each slab will depend on the width of the machine, varying between 12 and 48 feet or more.

The machine 14 comprises a vehicle body 16 and propelling means, such as endless tracks 17. Conventional means are provided, not shown in detail, for moving the endless tracks 17. Furthermore, lifting means are provided (not shown) for raising and lowering the machine 14 relative to the endless tracks 17. The purpose of the lifting means is the following: when the machine 14 is propelled in the direction A, it will scoop out sand as indicated at 18 (FIG. 3); after the machine has scooped sand of a length corresponding to the entire length of the machine, out of the layer 13 of sand, the machine 14 will be lowered, all at once, by the aforesaid lifting means.

The endless tracks 17, however, will continue to ride on the top 19 of the crown.

The machine 14 may, for example, be about 12 feet wide, about 36 feet long, and about 11 feet high.

As the vehicle 16 is propelled in the direction A, sand will be scooped upon from the layer of sand 13. For this purpose, the machine 14 is provided with an individual intake platform 20 on which there are mounted a series of intake conveyors 21. The conveyors 21 transport the sand in the direction B (FIG. 7) upwardly along the slanting platform 20 in a preheating chamber or area 25. Preheaters 22 are provided, and are operable for preheating the scooped up sand as it is being conveyed in the direction B. The preheating means may be electric coils or electric arc heaters, or other heating means discussed later on in detail, and operate at a maximum of about 1200° C. The preheating removes the moisture from the sand, and heats it sufficiently to prepare it for subsequent fusing.

From the preheating chamber the preheated sand will drop into a heating or melting chamber 23. Near the edge 24 that separates the heating chamber from the preheating area 25, there is provided a scope 26 which permits the operator of the vehicle to view the melt in the heating chamber 23. In the heating chamber 23, the mass will be heated to become a flowable viscous mass 15.

The heating chamber 23 is surrounded by a highly heat-resistant material such as zirconium or others, that forms a layer 27 which, in turn, is surmounted by heaters 28. Above the heaters 28, there is a thermal insulation layer 29.

The heating chamber 23, on the other hand, has a heat-resistant layer 30, for instance of zirconium which, in turn, surmounts heaters 31.

The heaters 28 and 31, like the preheaters 22, may be electrically energized heating coils or electric arc heaters, fed from an electric source to be described later on. Alternatively, however, they may be heaters fed from an oil furnace, a gas furnace, or the like; or may be heaters of the type energized by other more sophisticated sources of energy, for instance atomic energy. In the ensuing description, however, the heaters 22, 28 and 31 will be described as electric heaters, for instance electric arc heaters, fed from an electric source driven by diesel engines, turbines, or the like. Actually, electricity may be delivered to the moving vehicle alternatively by means of overhead wiring, or by bus bars, or by other conventional or more sophisticated means for transmitting electric current.

Below the heaters 31, there is disposed a thermal insulating layer 32, which surmounts a base plate 33. Below passages 34 are formed in the insulating layer 32 and the base plate 33. Means are provided (not shown in detail), to blow through the passages 34 heated air onto the ground, namely in the preferred embodiment the top of the 6" layer of remaining sand, before the viscous flowable molten sand mass is deposited thereonto.

All the aforesaid items, namely the heaters and insulations, are disposed along the entire length of the heating chamber 23.

As best shown in FIG. 7, near the rear of the chamber 23, there is arranged a movable lip 35, that is tiltable about a hinge 36 which is mounted on the base plate 33. The lip 35 may be tilted between different positions of inclination. Its upper edge 37 forms a weir that defines the height *h* of the molten sand mass 15 that is discharged from the chamber 23. The lava flow is determined by both the volume of intake and the height of the lip 35. As the molten sand is discharged from the heating chamber 23, it flows along the upper surface of the lip 35, and is deposited thereby onto the ground at the rear of the vehicle 16. Heating means 38 are provided in the lip 35, which again may be any of the heating type means

previously described, and serve to maintain the molten sand heated as it flows over the lip 35.

Design means, such as a channelled drum 39 may be provided near the lip 35, to impart to the surface of the molten sand a texture so that the solidified molten sand pavement will have a regularly textured upper face. Alternatively, means may be provided on the machine 14, for instance a sprinkler 44, for spraying dust or sand onto the upper face of the molten sand mass.

Above the thermal insulation 29, the machine 14 carries Diesel engines 41 and generators 42 or other sources of energy, as previously mentioned (FIGS. 4 and 5). As best shown in FIG. 6, the electric current is fed from one set of generators 42 to transformers 43 and to the conveyors 21, as well as to the preheaters 22 and to the motors 45 for the endless tracks 17, and also to the blower 46 for blowing hot air through the passages 34.

From the other set of generators 42, the electricity is fed to the main heaters 28 and 31, as well as the heaters 38 of the lip 35.

The heaters 28 and 31 will heat the sand to about 2400° C. for melting it into a viscous flowable mass. The conveyors 21 may be screw type conveyors, as shown, or any other suitable conveyors, like bucket type conveyors, or the like.

The operation is as follows:

As the vehicle 16 moves in the direction A, the conveyors 21 will move sand off the layer 13, in the direction B into the preheating area 25 of the machine 14. There the sand will be preheated and dried. The sand will then drop into the heating chamber 23. There the heaters 28 and 31 will convert the sand, by heating it, into the flowable viscous molten sand mass 15.

The molten sand mass 15 will then flow, in a direction opposite to the vehicle propulsion direction A, through the length of the heating chamber 23, and is constantly being heated. Subsequently, the molten sand 15 will flow out of the chamber 23 at the rear of the vehicle 16, over the lip 35, onto the ground.

As the molten sand 15 leaves the heating chamber 23, its top surface may be roughened by a design imparted by the drum 39 or by sprayed sand, dust etc.

Thus, the sand is scooped up at the front end of the machine, converted into molten sand, and then the molten sand is deposited into the scooped groove at the rear end of the machine 14. The machine travels all the time in the direction A, and hot air is blown onto the ground through the passages 34 to heat the ground before the molten sand is deposited.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. A machine for producing a hardening road layer, comprising a self-propelled vehicle including a structure defining an intake chamber operable for taking in sand having a melting point of from about 450° C. to about 860° C. and comprising means for moving the sand there-through in a direction opposite to the direction of normal propulsion of the vehicle, heating means operating at about 1200° C. maximum operable for pre-heating the moving sand, a heating chamber receiving the pre-heated sand and comprising heating means operable for heating the sand to about 2400° C. thereby transforming the sand into a flowable viscous mass, and discharge means operable for discharging said mass from said heating chamber out of said machine.

2. A machine, as claimed in claim 1, said discharge means comprising a movable lip having a top edge that may be lowered and raised and forming near the exit portion of said heating chamber a weir of adjustable height, said lip including heating means and serving, in

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conjunction with the intake scoop, as a guide for the exit flow of said mass, said heating means being operative to retain the mass in the flowable viscous state as it descends along said lip.

3. A machine, as claimed in claim 1, said vehicle moving on a prepared ground, and means operable for pre-heating the prepared ground preparatory to the deposit from said machine thereonto of said mass.

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