June 23, 1964 TAKEO NOJIMA 3,138,078

ROAD SUBSTRUCTURE CONSTRUCTION

Filed Feb. 28, 1961

FIG. 1

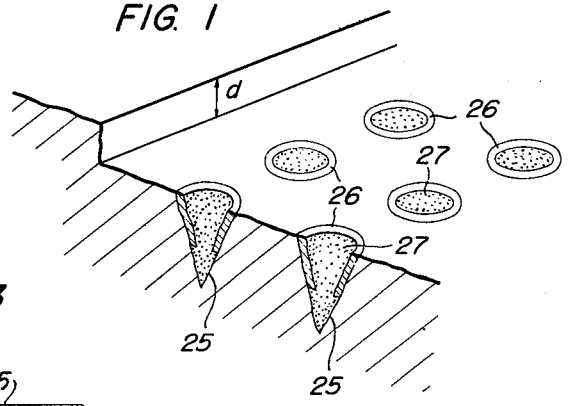


FIG. 3

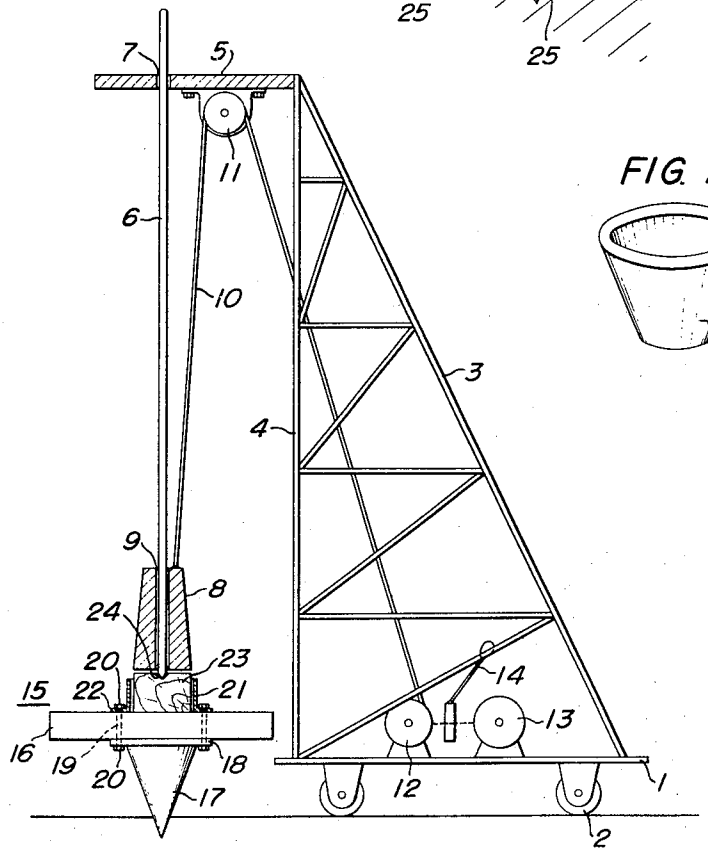


FIG. 2

INVENTOR:
TAKEO NOJIMA

BY
Richardson, David and Vordon

Atty's.

United States Patent Office

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ROAD SUBSTRUCTURE CONSTRUCTION

Takeo Nojima, 542 Kosugi-cho 1-chome, Kawasaki, Kanagawa Prefecture, Japan

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This invention relates to process and apparatus for constructing road substructures, and road substructures constructed thereby.

An object of the present invention is to provide a novel process for constructing road substructures of great strength with least labour and materials.

Another object of the present invention is to provide apparatus for carrying out the process above-mentioned.

A further object of the present invention is to provide road substructures of great strength or load carrying capacity with least materials and lowest costs.

There are other objects and particularities of the present invention, which will be obvious from the following detailed descriptions with reference to the accompanying drawings, in which,

FIG. 1 is a perspective view of a road substructure according to the present invention, partly in vertical cross-section;

FIG. 2 is a perspective view of a metal sleeve employed in the road substructure shown in FIG. 1; and

FIG. 3 is an elevational view of an apparatus, partly in section, for constructing the road substructure shown in FIG. 1.

Referring to FIG. 3, the apparatus for use in constructing the road substructure shown in FIG. 1 comprises a truck 1 having wheels 2, which carries a tower structure or framework 3 mounted thereon. The framework 3 has a substantially vertical side 4, on the top of which a shelf 5 is mounted and extends laterally in a cantilever manner.

A guide rod 6 passes free through a suitable guide hole 7 formed through the shelf 5 and extends substantially vertically. A striking weight 8 is provided and has a central through opening 9, through which the rod 6 passes freely and guides the striking weight for its vertical movement along the rod. The weight 8 is secured to the lower end of a cable 10 which extends vertically upwards and passes around an idler pulley 11 rotatably mounted between a pair of brackets fixed to the underside of the shelf 5. The cable then extends downwards and its lower end is fixed to a winding drum 12 to be wound up thereby.

The drum 12 is driven by an electric motor 13 which is associated with a suitable and known control device, not shown. The drum 12 is coupled to the motor 13 through a suitable and known clutch device having an operating handle 14. When the clutch is engaged, the cable 10 is wound up by the drum 12 to haul up the striking weight 8, and when the clutch is disengaged, the drum 12 becomes free to rotate and the weight 8 drops.

The apparatus also comprises a striking disc assembly 15 which includes a thick iron disc 16 of a substantial area, and an inverted conical iron block 17 fixed centrally to the disc 16 at its underside. The conical block 17 is provided with an annular flange 18 and a number of through bolts 19 and nuts 20 are utilized to rigidly secure the block 17 to the disc 16.

On the upper surface of the disc 16 is centrally fixed

an iron cylinder 21 having an annular flange 22 by which the cylinder is rigidly fixed to the disc 16 by means of the bolts 19 and nuts 20. A wooden block 23 conforming with the bore of cylinder 21 fits within the latter. The wooden block 23 is provided with a central recess 24 in its upper side, and the lower end of rod 6 engages the wooden block in the recess 24.

In order to construct a road substructure, the truck 1 is moved to and placed on the ground where the road substructure is to be constructed. The ground surface is lowered preliminarily to an appropriate depth d by removing soil therefrom, as indicated in FIG. 1. The depth d substantially corresponds to the thickness of the pavement or surface layer, not shown, of the road.

The striking disc assembly 15 of the apparatus embodying the invention is then placed on the ground with the tip end of the conical block 17 inserted into the ground to a certain extent. The guide rod 6 is set in position with the weight 8 guided thereby as shown in FIG. 3. The motor 13 is energized to rotate, and the clutch handle 14 is operated to couple the drum 12 to the motor 13. Then the drum 12 is rotated to haul up the weight 8.

When the weight 8 has come to the upper limit of height, the operator actuates the clutch handle 14 to disengage the clutch. Then, the cable 10 and weight 8 is released, and the dropping weight 8 falls and strikes the disc assembly 15 through the wooden block 23 which serves to prevent rebounding of the weight 8 due to direct metal-to-metal collision.

The above-mentioned striking operation is repeated until the conical block 17 has been driven wholly into the ground and the ground therearound has been packed tight. Then the disc assembly 15 is raised leaving an inverted conical hole 25 formed in the ground.

After a conical hole 25 is thus formed in the ground, an iron sleeve of a frusto-conical shape 26 as shown in FIG. 2 is inserted into the hole. The iron sleeve 26 has such a configuration that it fits into the inverted conical hole 25 in the ground. However, the sleeve 26 is open at both ends and the upper end face is substantially flat with the ground surface. As a result, the lower end of the sleeve is suitably above the bottom end of the conical hole 25.

The above-outlined operation is repeated for successive positions on the ground with predetermined spacings therebetween, and iron sleeves 26 are inserted into conical holes 25, respectively, as shown in FIG. 1. Into each of the conical holes 25 lined with iron sleeves 26, respectively, is poured wet concrete material 27 to fill up the hole. Since the iron sleeves are open at lower ends, wet concrete material reaches to the bottom end of the holes 25 and directly contacts the soil, facilitating drainage of water out of the wet concrete material.

Alternatively, a frusto-conical metal sleeve similar to that shown in FIG. 2 may be applied to the inverted conical block 17 of the blow disc assembly before it is driven into the ground. In this case, the iron sleeve should be of such size that it fits around the conical block 17, with the tip end portion of the latter projecting beyond the lower end of the sleeve. The sleeve is driven into the ground along with the block 17, and left in the ground after the blow disc assembly has been removed from the ground.

According to the present invention, the ground is reinforced by rows and arrays of holes **25** lined with iron sleeves **26** and filled with concrete bodies **27** as shown in FIG. 1. In addition, the soil between adjacent holes **25** lined with sleeves **26** is packed tight by force transmitted from the dropping weight **8** through the disc **16**, thus resulting in a very strong road substructure with minimum use of labor and materials.

I claim:

1. A road substructure comprising rows and arrays of inverted conical holes formed in the ground with predetermined spacings therebetween, metal sleeves of frusto-conical shapes open at both ends and forming linings of said holes, respectively, and concrete bodies filling up said conical holes lined with said metal sleeves, respectively.

2. The road substructure according to claim 1, said metal sleeves and concrete bodies having top faces coplanar with the ground surface.

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