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REINFORCED CONCRETE STRUCTURE FORMING PERMANENT FOUNDATION FOR ROADWAYS

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REINFORCED CONCRETE STRUCTURE FORMING PERMANENT FOUNDATION FOR ROADWAYS

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By

Loosy, Loosy, Attorney
To all whom it may concern:

Be it known that I, JEROME W. WELCH, a citizen of the United States, residing at Sergeant Bluff, in the county of Woodbury and State of Iowa, have invented certain new and useful Improvements in Reinforced Concrete Structures Forming Permanent Foundations for Roadways, of which the following is a specification.

My invention relates to concrete structures with metal reinforcements of specific shapes providing substantially permanent foundations for rural and urban roadways. The main object of the present invention is the provision of a concrete and iron foundation that has such firm connection with the road bed that sliding or displacement of the roadway is practically eliminated.

A further object of my invention is to provide a plurality of channels in the concrete slab forming separate tracks, which are so firmly bound together by reinforcing rods, imbedded in the concrete, so as to make it practically impossible for the channels to become deformed or separated by ordinary external forces, such deformation only being possible by explosive agencies or dynamic forces of nature.

A still further object of my invention is to furnish these permanent channels in a corresponding number, so that the tracks that are intended to run side by side on the roadway and to construct the roadway with, for instance, two outer tracks for light automobile traffic in each direction and a central track for heavy loads. In this manner the different tracks will be constructed in a manner most suitable to the traffic for which they are intended.

Still another object of my invention is to furnish a permanent and durable guide rail or ramp along each side of a single track roadway and in addition interior ramps between the several channels of a multiple track roadway. These ramps are constructed in such a manner that they prevent serious and dangerous skidding of passing vehicles while at the same time they will not seriously hinder the vehicles from passing from one roadway to another.

A further object of my invention is to produce a foundation for a series of tracks constructed in such a manner, that the surface of each track will always be level in its own width but not necessarily on a level with any other of the parallel tracks in the same roadway. Accordingly each vehicle will travel on its own track on a level axle.

A still further object of my invention is to construct the undersurface of a concrete slab in such a manner that, when it is once hardened and set, it will firmly grip the sand or gravel bed upon which it rests, thereby preventing the slab from moving off from the sub-structure of the roadway and that only very unusual forces will be able to move or destroy the roadway. For this purpose the under side of the slab is provided with a wavy surface or undulations to firmly engage with the corresponding undulations in the formed gravel bed upon which it rests. Consequently some portions of the concrete slab are sunk deeper than others into the bed and particularly those under each ramp.

A further object of the invention is to provide an outlet for water accumulating on the tracks, particularly in low places where rain is apt to collect.

A further object of the invention is to provide rounded tops for the external ramps or guide rails changing into inwardly sloping surfaces, which join them to the perpendicularly side walls of the external ramps; while the internal ramps or guide rails have parabolic and circular tops joining the perpendicularly side walls of the ramps. The object of furnishing the parabolic shaped tops is to give a properly inflated wheel tire a greater tractional grip on the ascending surface of the guide rails, than it would have if the ascending surface was at an angle of about 45° merging into a perpendicular surface.

Lastly, the object of the invention is to construct and position the reinforcing iron rods, so that settling and cracking of a foundation slab will be practically prevented near the outside of the slab and the external ramps in this manner preventing the warping of these parts. The parts of the track exposed to the heaviest wear and strain are reinforced by closely positioned longitudinal rods, while the middle of each track only is provided with two of these reinforcing rods; the ramps also having reinforcing rods near their tops, all of these rods being cross connected by means of transverse reinforcing rods anchored to the rods in the ramps.
With these and other objects in view my invention will be more fully described and illustrated in the accompanying drawings, and specifically pointed out in the claims, which are attached hereto and form a part of the specification.

In the drawings:

Figure 1 represents a fragmentary top plan view of a roadway forming the subject-matter of the present invention and provided with three separate channels for tracks;

Fig. 2 is a transverse section along the line 2-2 of Figure 1;

Fig. 3 is a top plan view of the roadway showing the reinforcing skeleton before the concrete has been poured over it;

Fig. 4 is a partial transverse section similar to Fig. 2 showing the anchorage for the short transverse rods;

Fig. 5 is a side elevation and partial longitudinal section of the roadway, and

Fig. 6 is a perspective view of the details of the reinforcing rods and their anchorage.

My reinforced roadway consists of a concrete body or slab 10, see Figs. 2 and 4, where a series of three channels or tracks are provided. The under side of the slab 10 has a wavy surface in transverse direction for the purpose of gripping the road bed firmly and to prevent any sliding or displacement of the slab. This wavy surface comprises regularly repeated grooves 11 which preferably are situated along the axis of each channel or track, as seen in Figure 2. The channels are formed by external ramps 12 running along the outer edges of the slab 10 and internal guide rails or ramps 13. The two outer channels 14 in this figure are placed at a lower level than the central channel 15 and the outer ones are in this case intended for lighter traffic, such as automobiles and light vehicles, while the central channel 15 is intended for heavily loaded waggons and trucks. It will be noted that the minimum thickness occurring along the axis of the central channel 15 is considerably greater than that of the side channels 14 and that the deeper section of the roadway occurs under each of the ramp or guide rails 12 and 13.

The internal ramps 13 have their sides 16 and 17 rising perpendicularly from the level of the respective tracks and from the side 16 to the crest of the ramp 13 the ramp is rounded a quarter of a circle, while the side 17 merges into the circular curve 18 by means of a parabolic curve 19. About three inches below the top of each ramp 13 is imbedded a longitudinal reinforcing rod 20 and its position in sideways direction is about one quarter of the thickness of the ramp from the perpendicular side 16 thereof and the merging line of the two curves 18 and 19 is preferably situated in the vertical plane above the reinforcing rod 26.

The external ramps 12 also rise perpendicularly from the level of the outer channels 14, as at 21, but from an approximately medial line 22 between the top and the bottom of the ramp, the side is outwardly inclined about 45° as at 23, and finally forms a semi-circular top 24, the outer side 25 of the ramp running at a slight angle downwardly tangentially from the semi-circular top 24.

A reinforcing rod 26 running longitudinally in the ramp is also provided in this case and positioned about the same distance down as already described with regard to the reinforcing rod 20.

The ramps are spaced apart approximately six feet, so that, for instance, if a single track is provided the total width would be about seven and a half feet; while for a two track roadway the distance across the outer ramps would be approximately fourteen and one-half feet, and for a three track road about twenty-one feet. The suitable height of the ramp is fifteen inches, in which case the sloping side 23, which is preferably at a 45° angle, would be about three inches and the greatest thickness of each ramp is preferably about nine inches.

The width of the tracks may, of course, vary, but ought not to be less than six feet. The surface of channel 15 is about two inches higher than that of the side channels 14. In this manner the central channel becomes not only stronger but its higher level facilitates the draining from the central channel to the side channels.

The reinforcement of the concrete slab comprises the following parts and is done in the following manner; transversely reinforcing rods 27 are placed near the bottom of the slab 10, so that about one inch of concrete is laid at the base of the slab 10. These transverse reinforcing rods run the entire width of the roadway whether the latter comprises one or more channels. The rods 27 have their ends bent upwards to form elbows 28 and continue upwardly, as at 33, and around the reinforcing rods 26 in the exterior ramps 19 from where the rods are bent downwardly, as at 29, running nearly parallel with the upward running parts 30 terminating with a hook 31, which is adapted to engage between the longitudinal rod 32. These transverse reinforcing rods 27 are spaced approximately eight feet apart and between them are preferably positioned shorter transverse rods 33, which extend under only one of the tracks, so that for a three track roadway there will be three of these reinforcing rods 33 across the entire roadway. These shorter rods 33 are also provided with elbows 28 and loops 35 terminating with hooks 31 adapted.
versedly level channel, the crest lines of said contour running parallel with the longitudinal axis of the slab, and a ramp formed along each edge of said slab.

2. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, providing a transversely level channel, the crest lines of said contour running parallel with the longitudinal axis of the slab, and a ramp formed along each edge of said slab, the inner face of each ramp rising perpendicularly from said slab to a substantially medial line and slanting outwardly from said line.

3. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, composed of alternating level and inclined plain surfaces, the crest lines of said contour running parallel with the longitudinal axis of the slab, a ramp formed along each edge of said slab, longitudinal reinforcing rods in said slab and said ramps, and transverse reinforcing rods having anchoring connection with the reinforcing rods of said ramps.

4. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, composed of alternating level and inclined plain surfaces, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming a channel between them.

5. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels.

6. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps.

7. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps.

8. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps.

9. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps.

10. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps, the crest on each inner ramp being formed by merging circular and parabolic curves between its medial side lines.

11. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps on said slab forming channels between them, the surface level of one channel differing from that of the next channel, the thickness of said slab being greatest under said ramps and smallest along the axis of the channels, the sides of said ramps rising perpendicularly from the surface level of the channels up to a substantially medial line of the height of the ramps, the crest on each external ramp being rounded and a 45° slope joining the crest with said medial line.

12. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a ramp formed along each edge of said slab, longi-
to engage under the nearest longitudinal reinforcing rod 22. It will be evident that the spacing of all the transverse reinforcing rods will then be about four feet and that the long and short rods alternate, as best seen in Fig. 3.

On top of the transverse rods are placed the longitudinal ones and these latter rods are preferably arranged with three or more rods 20 and 21 placed close together adjacent to the ramps to form a stronger construction where the track will experience the greatest wear, that is, under the wheels of the vehicles, whereas the longitudinal rods 28 are placed further apart and near the axis of the channels, as best seen in Figs. 2, 3 and 4.

Imbedded in the interior ramps 13 are stirrups 39, which are bent in V-shape and suspended from the reinforcing rods 20 near the top of the ramps, each end of the stirrups terminating with hooks 40-41 which engage under the nearest longitudinal reinforcing rods 32 imbedded in the slab 10. As already described the thickness at point 11 of the slab under the transverse reinforcing rods 27 and 32 is approximately one inch. The material used for both the longitudinal and transverse reinforcing rods is preferably one inch square and above the longitudinal rods is a layer of about two inches thickness of concrete forming a slab, approximately five inches from the thinnest place in the side channels 14 and about two inches more or seven inches minimum thickness in the central channel 15. These proportions may naturally vary accordingly to the requirements for different roadways.

Reverting particularly to Figs. 1 and 5, the roadway is provided with culverts 42 communicating with the roadway by means of tubular drains 43. The construction of the roadway forming the subject-matter of the present invention is preferably made in the following manner: The road bed 34, made of sand or gravel, is first placed as best seen in Figs. 2 and 4, that is to say, with longitudinally running ridges 44, between which flat depressions 45 are formed at regular intervals. In this manner the cross section of the road bed will show a wavy formation. When a sufficient hardness of the road bed has been obtained a layer of concrete is spread over the same, the thickness of which should not be less than one inch above the ridges 44 on the road bed. After this layer of concrete has dried sufficiently the transverse reinforcing rods 27 and 32 are laid across the roadway alternating the long and short rods as described above and at a distance of about four feet. Upon the transverse reinforcing rods the now placed the longitudinal reinforcing rods 32, 37 and 33 grouped as described, so that there will be three or more close together near the sides of the channels to be formed and two or more spaced farther apart near the center of each channel. The outermost longitudinal rods 32 are then made to engage with the hooks 31 of the transverse rods of the longer rods 27, as well as with the outer ends of the shorter rods 28 and the stirrups 29 made to engage in a similar manner with the longitudinal rods 28 in proximity to where the interior ramps are going to be placed. In the upper loops of the transverse rods or the stirrups the longitudinal rods 20 and 26 are now inserted and held temporarily whereupon the concrete is spread over the entire roadway and the interior and exterior ramps formed in the manner already described, provision being made for the positioning of the drains 43 at certain intervals on the channels for communication with the culverts, which must naturally be constructed before the concrete is laid.

From the foregoing description it will be apparent that the foundation slab, in which the several channels have been formed, will have a very firm hold on the sand or gravel road bed and that for this reason side displacement of the channels becomes practically impossible except from violent vibrations caused, for instance, by earthquakes or gas explosions beneath the surface. It will also be evident that cracking of the roadway is practically eliminated in the length or the transverse direction and accordingly no settlement of a slab or any portion thereof can occur. Furthermore, skidding of the vehicle wheels from the outer edges of the slab will be prevented by the peculiar formation of the ramps with their circular and parabolic tops, as well as by the inclined inner side walls of the outer ramps and that in this manner skidding from the outer tracks to the inner ones will be eliminated and similarly no skidding from the center tracks to any of the outer ones in the case of a three track roadway for instance. The fact that the channels are level taken in connection with the form of the ramps obviates any overturning of vehicles while moving at a rapid rate of speed along a roadway of this construction.

Although I have illustrated and described my invention giving complete details of construction, it will, of course, be understood that I do not limit myself to such details, but reserve the right to make changes within the scope of the appended claims without departing from the spirit of my invention.

Having thus described the invention, what is claimed is new:

1. In a concrete roadway foundation construction, a continuous body of slab formation having transversely varying thickness and wavy bottom contour providing a trans-
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12. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour, the crest lines of said contour running parallel with the longitudinal axis of the slab, a plurality of longitudinally running ramps formed on said slab, longitudinal reinforcing rods in said slab and said ramps, and transverse reinforcing rods having anchoring connection with the reinforcing rods of said ramps, said transverse reinforcing rods being placed substantially one inch above the highest points of said bottom contour and said longitudinal reinforcing rods in said slab resting upon said transverse reinforcing rods.

13. In a concrete road foundation construction, a cementitious body of slab formation having transversely varying thickness and wavy bottom contour composed of alternating level and inclined plain surfaces and providing a transversely level channel, the crest lines of said contour running parallel with the longitudinal axis of the slab, a ramp formed along each edge of said slab, longitudinal reinforcing rods in said slab and said ramps, transverse reinforcing rods, and means for suspending all other reinforcing rods from the rods embedded in said ramps.

In testimony whereof I affix my signature.

JEROME W. WELCH.