Dec. 17, 1963 U. FINSTERWALDER 3,114,302

ELEVATED ROADWAYS

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Fig. 1

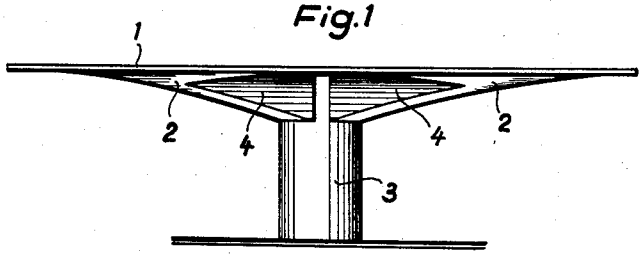
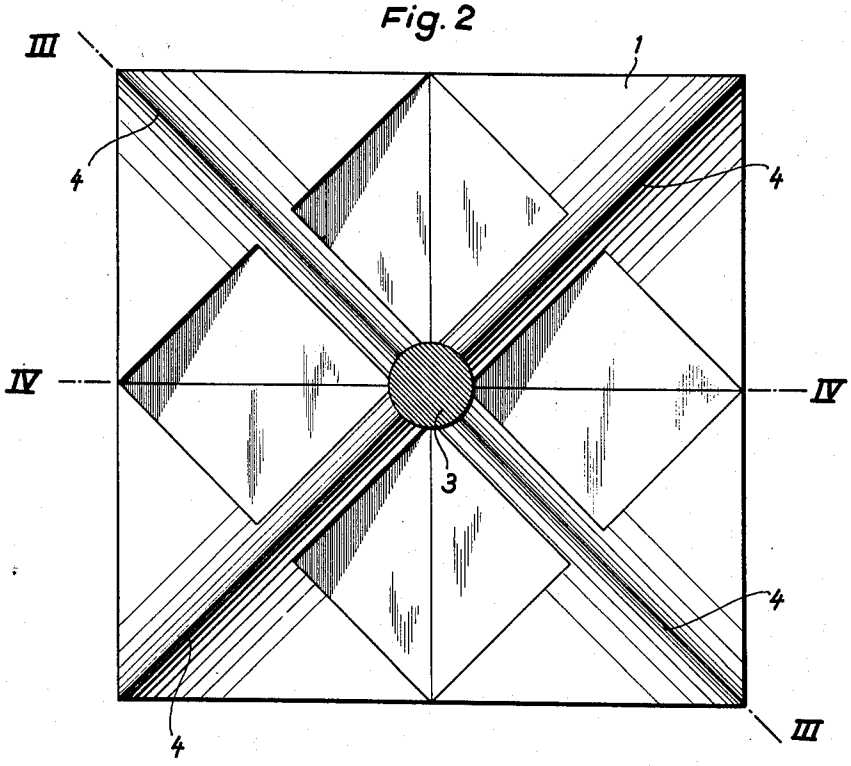


Fig. 2



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Fig. 3

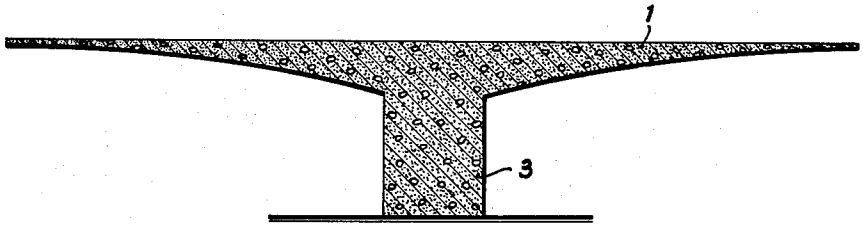


Fig. 4

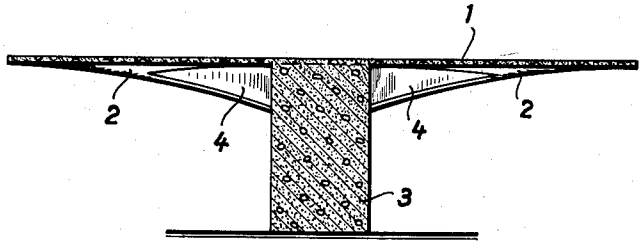
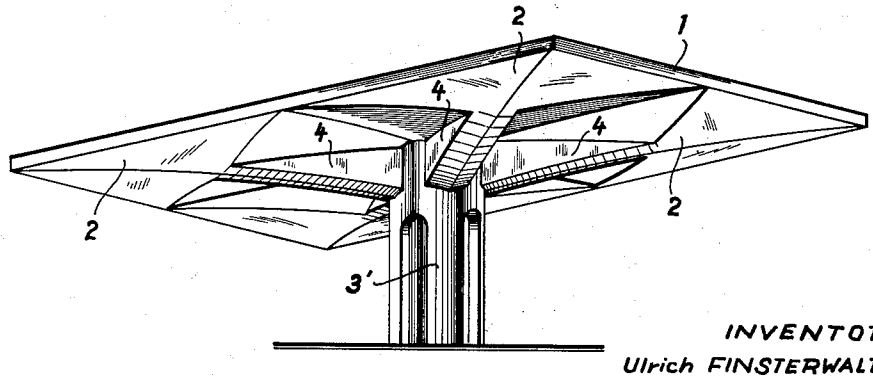


Fig. 5



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Fig. 6

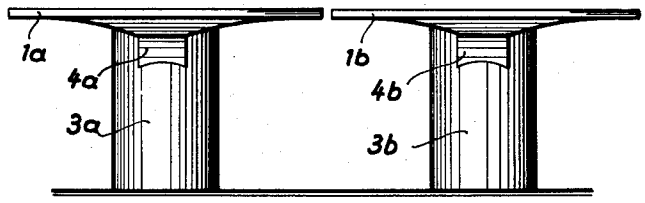
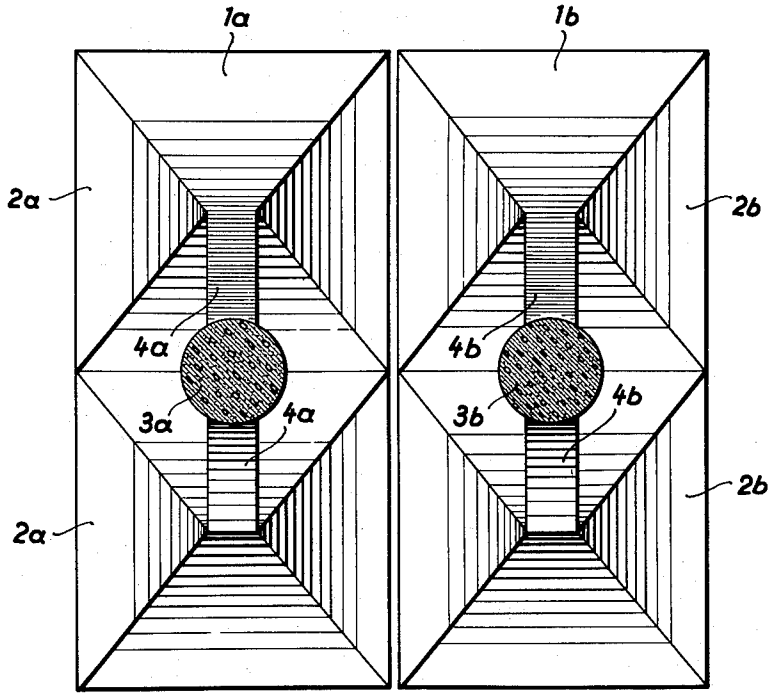


Fig. 7



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3,114,302

ELEVATED ROADWAYS

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5 Claims. (Cl. 94—1)

The present invention relates to elevated roads of concrete constructed in the manner of bridges.

The traffic increase in modern times, particularly in large towns, makes it necessary to construct roads for fast traffic, said roads being preferably constructed as bridges. Owing to the density of the traffic, especially wide bridges are required, since it is necessary for a four-lane roadway to allow 25 meters and for a six-lane roadway to allow 31 meters width.

In attempting to solve this problem, constructions of reinforced concrete have recently been developed, particularly in U.S.A., which generally consist of slabs or sections mounted on columns, cross girders and main girders. The normal span amounts to 15 meters and the space between the columns in the transverse direction amounts to 4 meters, with the result that it is necessary to arrange 7 columns and more adjacent to one another in any one cross section of the bridge roadway. Cross girders are laid across these columns and the roadway is tensioned as a plate girder by way of the cross girders. Under the roadway there is thus a plurality of supports, a feature which is highly unsatisfactory from the aesthetic point of view and is also a serious obstacle to the satisfactory utilisation of the space under the bridge.

The primary object of the present invention is to provide a bridge-like elevated road of concrete wherein these disadvantages are avoided.

The roadway according to the present invention consists of adjacent series of unitary concrete slabs or sections which project widely from supporting columns, are rectangular in plan and are initially tensioned in the axial and transverse directions with the tension bars arranged preferably in the upper region of the slabs or sections, each of which is divided into a number, preferably four, of coherent rectangular or substantially rectangular parts, which increase in thickness downwardly from the peripheral edges towards the center of the section in the manner of a mushroom head and, at their center point, rest on rib-like joists or beams which project diagonally outwardly from a supporting column in directions towards the edges of the section.

The simplest shape in plan view of the said mushroom-head-like structure, is that of a square. If the bridge road is 25 meters wide, this slab or section covers a ground surface of 25 x 25 m. It projects freely in both directions from a point in the center of the square. The slab of 25 x 25 m. surface area is 25 cm. thick and is divided into four quadrants of 12.5 x 12.5 m. surface area each of which in turn increases in thickness from the outer corner towards the center and is supported by the diagonal rib which projects from the center support for the slab or section as a whole and terminates in the center of the section.

While retaining the multi-partite mushroom head, the roadway slab may however have an oblong outline, a feature which is suitable for example at junctions where the roads cross at an angle other than 90°.

Where it is desired that the traffic along a roadway should move in one direction only, the road sections may be arranged on separate super-structures. In such event each individual slab or section is narrower and similarly of oblong form, but is subdivided into only two coherent

quadrant parts which likewise increase downwardly in thickness from the edges towards the center in the manner of a mushroom head and the centers of which rest on rib-like joists projecting from the supporting column in a direction parallel with the longer side of the oblong section.

Further features and advantageous properties of the present invention will be apparent from the following description of two embodiments of the present invention which are illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a view of a bridge-like elevated roadway constructed in accordance with the present invention,

FIGURE 2 is a corresponding inverted plan view showing the column-like support in section,

FIGURE 3 is a section taken on the line III—III of FIGURE 2,

FIGURE 4 is a section taken on the line IV—IV of FIGURE 2,

FIGURE 5 is a perspective view of a section of the bridge-like elevated road having a modified form of column,

FIGURE 6 is a front elevation of an embodiment of the bridge-like elevated roadway, the individual slabs or sections of which are of oblong shape,

FIGURE 7 is an inverted plan view of FIGURE 6.

In the embodiment of the bridge-like form of concrete elevated roadway shown in FIGURES 1–5, the individual slabs or sections **1** forming the roadway, have a square shape in plan and are provided in the axial and transverse directions with tensioning reinforcements (not shown). Each slab or section is sub-divided into four coherent quadrant parts of equal size, the undersides of which have mushroom-like thickened portions **2** extending from the edges of the parts towards the center of the slab or section, where the parts have maximum thickness. From the column-like strongly constructed center support **3**, rib-like girders, joists or beams **4** project diagonally of the part members in the manner of cantilevers and terminate in the center of the latter, communicating with the mushroom-like thickened portions **2**.

In the construction illustrated in FIGURE 5, the column-like center support is divided into four symmetrical individual supports **3'**, the space between which may be used for any desired purpose, such as garages, business premises, shops and the like.

In the modification shown in FIGURES 6 and 7 two adjacently parallel roadways are arranged on separate superstructures **1***a*, **1***b*. The roadway slab or section of each superstructure is oblong in plan and consists of two integral or coherent quadrant-like parts. Each of the columns **3***a* and **3***b* for these separate sections is provided in the center of the contact line between the coherent parts. Rib-like joists **4***a*, **4***b* projecting from the columns **3***a*, **3***b* extend parallel to the longitudinal sides of the oblong roadway slabs and terminate in the mushroom-like thickened portions **2***a*, **2***b* of the parts.

Should the bridge-like elevated road extend along a curve, the individual sections or slabs have a shape in plan which is only approximately rectangular, that is to say they resemble the shape of a trapezium or a segment of a circle.

In the case of elevated roadways of the bridge type which are located at a low height above the level of the street network, it is necessary to arrange parting lines centrally between two successive supports. In this case it is advisable to choose a construction which absorbs transverse forces but leaves room for relative axial movement. If the supports are comparatively high it is possible to dispense with joints between two successive supports, by virtue of the elasticity of the supports. In such cases joints are desirable only at comparatively

large spaced intervals. Clearly the jutting out ribs may interengage with the supports in various ways.

By means of the present invention roadways may be constructed at substantial heights with a minimum of concrete at the centers of the quadrants and on the support, said constructions making it possible to arrange a square network of steel bars immediately under the top faces of the roadway slabs or sections. This network forms the main reinforcement of the entire supporting framework. It is advisable for this reinforcing network to be initially tensioned.

Owing to the concentration of the said reinforcements in the center areas of the quadrants and on the supporting column, the bending moments arising from the weight of the sections are very greatly reduced relatively to continuous slabs currently used. The effect of this is that the necessary quantity of steel required for the reinforcements is surprisingly small. The shuttering is simple as it deviates only slightly from the plane surface and in its layout only projects to a small extent beyond the ground surface to be covered.

The supporting framework of the roadway is distinguished by the fact that it is easy to survey since the series of column-like supports may be perceived not only in the axial and transverse direction but also in perspective, i.e. in any desired direction of viewing. The comparatively great height of the construction above the support, which is the basis of the economy of the construction, is not apparent optically, since it is limited to the supporting point. The space under the roadway is completely free and can be widely utilised for other purposes.

It will be appreciated that numerous variations or modifications of the constructions described and illustrated in the drawings may be adopted without departing from the scope and spirit of the invention. The specification and drawings accordingly should be regarded as an illustrative rather than a restrictive sense.

I claim:

1. An elevated concrete roadway structure comprising structural units aligned with one another and provided with longitudinal and transverse reinforcing means and being each defined by a plurality of adjacent substantially rectangular sections forming a part of a roadway and a column providing support at one edge portion of each of said plurality of adjacent sections substantially at the center of gravity of the structural unit, each said section having a freely supported girder conformation extending cantilever fashion from said column centrally of the bottom portion of the section and decreasing in thickness outwardly of said column, each said section having a bottom portion increasing in thickness inwardly from each of the peripheral borders of the section toward the mid-portion of said section and of said girder conformation in the manner of an inverted pyramid with the sides of said pyramid merging at the vertex of the pyramid with said girder conformation substantially centrally of said section in an area intermediate said column and a free outer edge portion of said section.

2. An elevated concrete roadway structure comprising structural units aligned with one another and provided with longitudinal and transverse reinforcing means and being each defined by a plurality of adjacent substantially rectangular sections forming a part of a roadway and a column providing support at one edge portion of each of said plurality of adjacent sections substantially at the center of gravity of the structural unit, each said section having a freely supported girder conformation extending cantilever fashion from said column centrally and diagonally of the bottom portion of the section and decreasing in thickness outwardly of said column, each said section having a bottom portion increasing in thickness inwardly from each of the peripheral borders of the section toward the mid-portion of said section and of said girder conformation in the manner of an inverted pyramid with the sides of said pyramid merging at the vertex of the pyramid with said girder conformation substantially centrally of said section in an area intermediate said column and a free outer edge portion of said section.

3. An elevated concrete roadway structure comprising structural units aligned with one another and provided with longitudinal and transverse reinforcing means and being each defined by a plurality of adjacent substantially rectangular sections forming a part of a roadway and a column providing support at one edge portion of each of said plurality of adjacent sections substantially at the center of gravity of the structural unit, each said section having a freely supported girder conformation extending cantilever fashion from said column centrally and longitudinally of the bottom portion of the section and decreasing in thickness outwardly of said column, each said section having a bottom portion increasing in thickness inwardly from each of the peripheral borders of the section toward the mid-portion of said section and of said girder conformation in the manner of an inverted pyramid with the sides of said pyramid merging at the vertex of the pyramid with said girder conformation substantially centrally of said section in an area intermediate said column and a free outer edge portion of said section.

4. An elevated concrete roadway structure comprising structural units aligned with one another and provided with longitudinal and transverse reinforcing means and being each defined by a plurality of adjacent substantially rectangular sections forming a part of a roadway and a column providing support at one edge portion of each of said plurality of adjacent sections substantially at the center of gravity of the structural unit, each said section having a freely supported girder conformation extending cantilever fashion from said column centrally and diagonally of the bottom portion of the section and decreasing in thickness outwardly of said column, each said section having a bottom portion increasing in thickness inwardly from each of the peripheral borders of the section toward the mid-portion of said section and of said girder conformation in the manner of an inverted pyramid with the sides of said pyramid merging at the vertex of the pyramid with said girder conformation substantially centrally of said section in an area intermediate said column and a free outer edge portion of said section, said longitudinal reinforcing means of a plurality of adjacent structural units being continuous in the upper part of the roadway to define an uninterrupted roadway.

5. An elevated concrete roadway structure comprising structural units aligned with one another and provided with longitudinal and transverse reinforcing means and being each defined by a plurality of adjacent substantially rectangular sections forming a part of a roadway and a column providing support at one edge portion of each of said plurality of adjacent sections substantially at the center of gravity of the structural unit, each said section having a freely supported girder conformation extending cantilever fashion from said column centrally and longitudinally of the bottom portion of the section and decreasing in thickness outwardly of said column, each said section having a bottom portion increasing in thickness inwardly from each of the peripheral borders of the section toward the mid-portion of said section and of said girder conformation in the manner of an inverted pyramid with the sides of said pyramid merging at the vertex of the pyramid with said girder conformation substantially centrally of said section in an area intermediate said column and a free outer edge portion of said section, said longitudinal reinforcing means of a plurality of adjacent structural units being

continuous in the upper part of the roadway to define an uninterrupted roadway.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,114,302 December 17, 1963

Ulrich Finsterwalder

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 3 and 14, and in the heading to the printed specification, line 5, for "Egon Reif", each occurrence, read -- Egon Ruf --.

Signed and sealed this 16th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents