

March 2, 1971

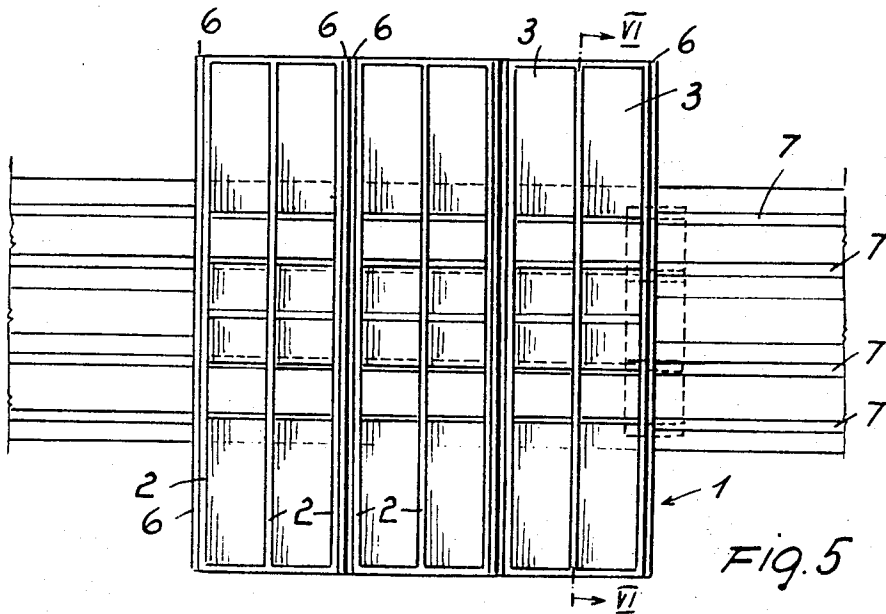
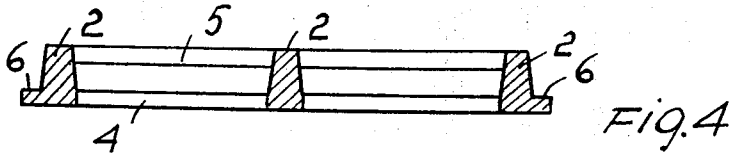
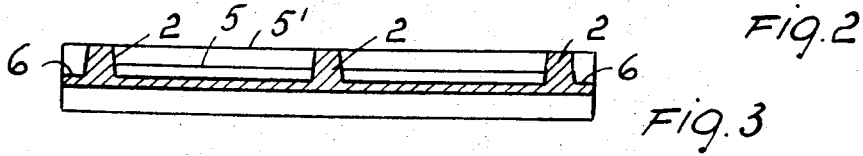
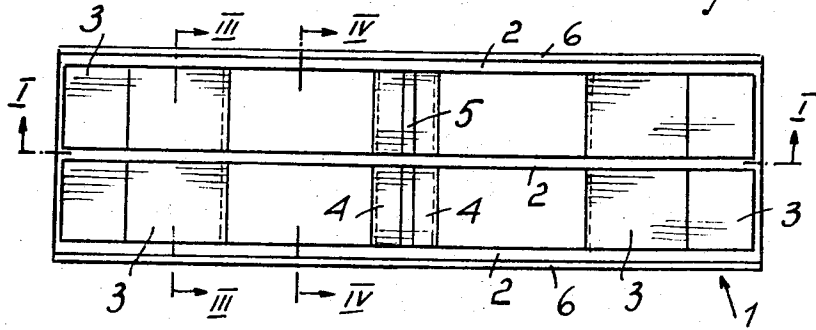
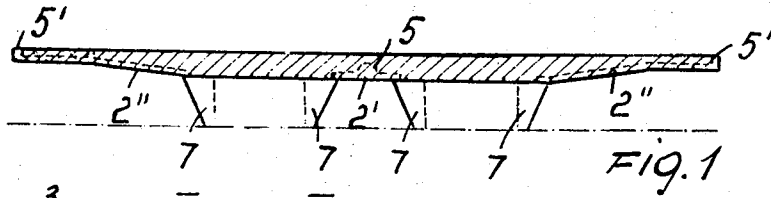
R. COMOLLI

3,566,557

PREFABRICATED TRELLIS FOR THE EXECUTION WITHOUT
TEMPORARY SUPORTS OF FLOORING FOR
CIVIL AND INDUSTRIAL STRUCTURES

Filed July 22, 1968

2 Sheets-Sheet 1



INVENTOR.
Rino Comolli
BY *Albert Josef*
AGENTS

March 2, 1971

R. COMOLLI

3,566,557

PREFABRICATED TRELLIS FOR THE EXECUTION WITHOUT
TEMPORARY SUPORTS OF FLOORING FOR
CIVIL AND INDUSTRIAL STRUCTURES

Filed July 22, 1968

2 Sheets-Sheet 2

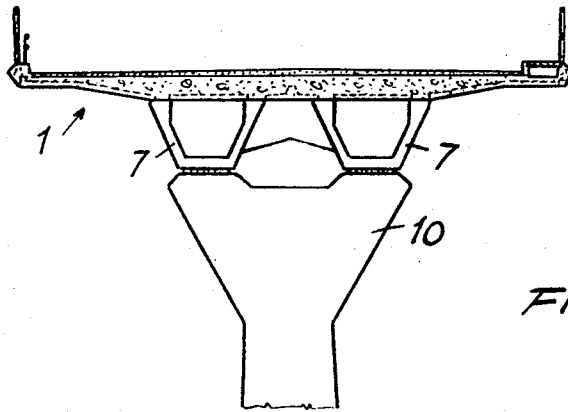


Fig. 6

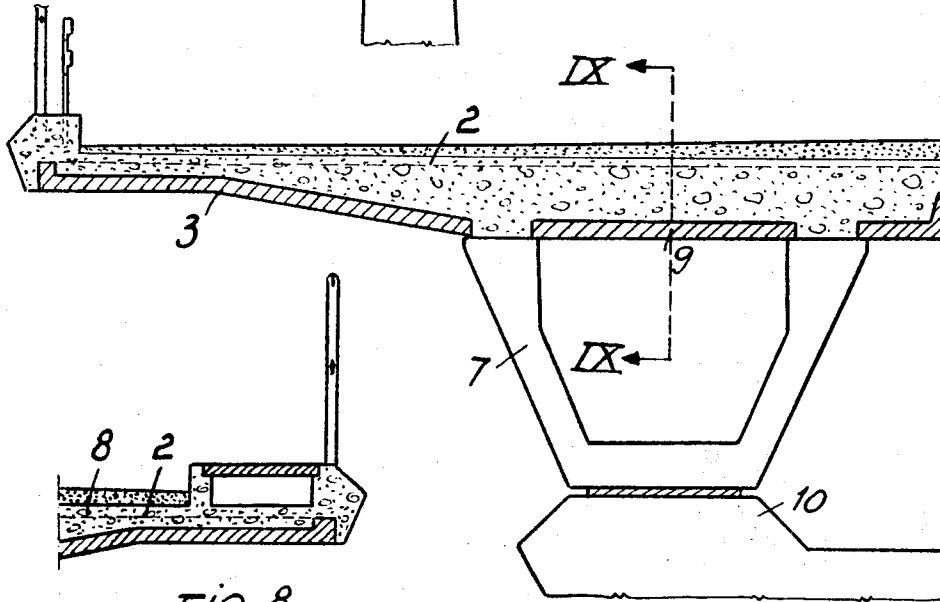


Fig. 7

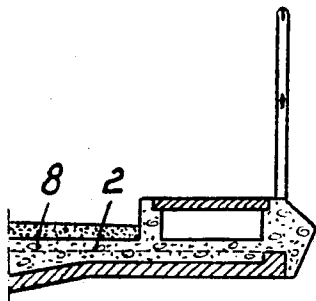


Fig. 8

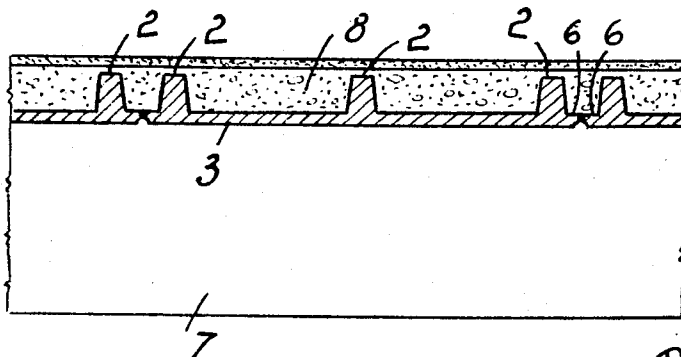


Fig. 9

INVENTOR.

Rino Comalli

BY

Albert Joris

AGENTS

1

2

3,566,557

PREFABRICATED TRELLIS FOR THE EXECUTION WITHOUT TEMPORARY SUPPORTS OF FLOORING FOR CIVIL AND INDUSTRIAL STRUCTURES

Rino Comoli, Via Canova 31/A, Milan, Italy

Filed July 22, 1968, Ser. No. 746,473

Claims priority, application Italy, July 28, 1967,

18,933/67

Int. Cl. E04b 1/34, 1/20

U.S. Cl. 52—73

2 Claims

ABSTRACT OF THE DISCLOSURE

Bridge structure with an assembly of prefabricated supporting structural units made of reinforced or prestressed concrete allowing the execution without temporary supports of bridge floors where the flooring is supported between the lateral boundaries thereof at an intermediate portion thereof on two spaced beam structures and having laterally overhanging portions projecting outwardly at both sides from said beams, said floors comprising a plurality of said structural units arranged side by side transverse to the longitudinal extension of the bridge and covered by a cast-in-situ concrete layer.

BACKGROUND OF THE INVENTION

This invention relates to a bridge structure including prefabricated frames or structural units allowing the execution without temporary supports of flooring for bridges and in particular of overhanging decks of bridges, in normal or prestressed reinforced concrete.

According to known technology, in the construction of bridges the system of prefabricating the various elements which comprise the structure is in common use, such as girders, slabs, cross beams, curbs, footways and other parts, and their erection on site is effected by various methods, schematically classifiable according to two fundamental processes as follows:

(a) Assembly by means of prestressing (longitudinal and/or transverse) of the various components.

(b) Assembly by means of "sealing" casting effected with concrete, at recesses (linear, or also discontinuous, of variable forms and dimensions) obtained by particular shaping of the prefabricated elements in zones in which they are flanking or superimposed one to the other.

These systems of assembly, in addition to requiring in certain cases the adoption of temporary supports, carry the disadvantage of giving rise to so-called "weak" zones in the structural complex. In particular the flooring slabs of bridges, even where these are prefabricated in portions of variable length according to the capacity of the erection equipment and of width corresponding to that of the complete flooring, are normally joined to the girders below by means of the process of "sealing" castings as indicated above.

However in the case of projecting slabs which are notably overhanging with respect to the edge girders, which is an essential characteristic for example of the majority of super-elevated urban viaducts, it is not possible to apply the process of assembly by "sealing" castings or other systems because the transverse deflection of the slab is such as to compromise the efficiency of its bond with the girders.

It is therefore necessary to renounce the use of prefabricated decks or slabs, resorting instead to the traditional solution of casting the slab in situ in moulding forms supported by temporary supports, with many disadvantages, of which the principal ones are the elevated cost and slowness of execution of the said traditional system.

SUMMARY OF THE INVENTION

An object of the present invention is to eliminate the disadvantages of the known technology indicated above, both generally in the field of prestressed or normal reinforced concrete structures for civil and industrial constructions, and in particular in the construction of bridges with overhanging decks allowing the realisation of the said decks on supporting beams of any type, without the use of the traditional temporary forms, while at the same time maintaining all the advantages derived from casting the slab in situ.

The prefabricated frame, according to the invention comprises essentially at least two spaced ribs, joined over at least part of their development by cross slabs suitable to serve as self-supporting moulding forms particularly for those projecting parts of a slab overhanging from the edge beams, thereby permitting the casting of the slab substantially in situ without temporary forms.

Therefore much reduced time requirements are obtained even though the casting of the slab is executed practically entirely in situ, and with the total absence of "weak" points corresponding with the most stressed sections.

According to a further feature of the invention, in the execution of flooring the axes of the frame ribs are arranged orthogonally to the axis of the principal supporting beams, so as to appear orthogonal to the longitudinal inflection planes of the principal beams and to ensure the best condition for the union by simple adherence between the trellis and the cast in place concrete, even without the necessity of iron bars or stirrups projecting from the ribs.

The prefabricated trellis of the present invention can have the cross slab limited to the overhanging zones of the edge beams, thus reducing the weight of the trellises themselves to a minimum, with possibly one or more short tracts of cross slab corresponding with the internal zone, fixed to one or more transverse secondary ribs, with the object of giving the trellis an adequate rigidity during the operations of transport and erection on site.

According to a further characteristic of the present invention, the height of the ribs of the prefabricated trellis is less than the height of the finished slab of the deck, thus permitting the insertion during casting in situ operations of all steel reinforcements, both longitudinal and transversal, required by the stress calculations of the said slab.

BRIEF DESCRIPTION OF THE DRAWING

Further advantages and characteristics of the prefabricated trellis, object of the present invention, will appear from the following description referring to the attached drawings which illustrate a preferred but not exclusive embodiment of the invention.

In the drawings:

FIG. 1 illustrates the prefabricated trellis according to the invention, through section 1—1 of FIG. 2;

FIG. 2 is a plan view of the trellis according to FIG. 1;

FIG. 3 is a transverse section through the line III—III of FIG. 2 in enlarged scale;

FIG. 4 is a transverse section through the line IV—IV of FIG. 2 in enlarged scale;

FIG. 5 represents a plan of assembly of the prefabricated trellis supported on beams perpendicular to the longitudinal extension of the trellis in reduced scale;

FIG. 6 is a transverse section of a bridge structure taken according to line VI—VI of FIG. 5;

FIGS. 7 and 8 are details, in section, of FIG. 6 in enlarged scale; and

FIG. 9 is a sectional view according to line IX—IX of FIG. 7.

3

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the said figures, the prefabricated trellis or structural unit is indicated in its entirety by 1; the trellis 1 is formed from three ribs 2, of decreasing transverse section from the central zone 2' towards the external zones 2'' (corresponding to the overhanging parts of the slab to be cast in situ). At the external zones 2'' the trellis comprises the backing or bottom slabs 3, fixed to the ribs. At a part of the central zone 2' the trellis 1 presents backing or bottom slabs 4, of limited dimensions and a transversal rib 5.

Provided on the end of the backing slab 3 is an upwardly projecting edge 5'. A short tract of slab 6, projecting from the two external ribs 2, and running along the entire development of these ribs is provided in order to form the cavity or recess between the adjacent trellises 1 in the erection phase (see FIG. 5) and designed to be filled during casting in situ. The dimensions of this slab 6 are naturally calculated as a function of the dimensions of the cavity which is to be obtained, and is therefore variable according to requirements.

The height of the ribs 2 and 5 and of the edge 5', is calculated such that it is less than the height of the finished slab or concrete layer 8 (FIGS. 7, 9).

As can be seen particularly in FIG. 5, the prefabricated trellises 1 are arranged on the principal supporting beams 7, with the axes of their ribs 2 extending widthways with respect to the lengthways extension of the bridge or orthogonal to the axes of the beams 7. The reinforcement of the trellis of concrete is not shown and may be of any kind.

Referring to FIGS. 6, 7 and 8, it is evident how it is possible to effect the casting in situ of the slab or concrete layer 8, since the backing slabs 3 of the prefabricated trellises 1 constitute self-supporting moulding frames for casting the slab. Between the webs of the troughlike caisson-beams 7 simple prefabricated plates the so-called "caps" are placed which are already in current use. The beams 7 are supported on piers 10. Naturally, if required, it is possible to arrange the prefabricated trellis 1 with tracts of backing slab corresponding also with the said zones between the webs of the beams 7. In addition the trellis 1 can be mounted upside down with respect to the attached diagrams, that is with the ribs 2 turned downwards. In this case the backing slabs 3 constitute a continuous supporting plane for the in situ casting 8 while the parts of the ribs 2 projecting underneath the backing slabs 3 can remain visible in the finished structure and in order to contain the cast concrete of the slab the ribs 2 may project on the opposite side of the backing slab. A relevant advantage of the present invention consists of the fact that the presence in the finished structure of the trellis 1 (the various parts of which can be considered in the static calculations as contributing to the cast structure, or can be considered simply as a "nonrecoverable caisson") does not in the least compromise the static efficiency of the overall structure.

Good union of the backing slabs and ribs of the trellis with the in situ casting can be assured—according to the situation by the simple adherence between the contacting surfaces, or it can be improved by providing stirrups or iron bars variously shaped projecting from the prefabricated parts.

Naturally the number, shape and dimensions of the ribs 2 and the dimensions of the backing slabs 3 of the prefabricated trellises 1 can vary according to each application, according to the width of the spans and the loads and according to the transporting and erection limita-

4

tions. In these cases where the principal beams of the bridge are continuous upon the piers and thus the tensile stresses arise in the top of the slab in the direction of the longitudinal axis of principal beams, holes can be arranged in the ribs of the prefabricated trellises to allow the possible passage of prestressing tendons when dealing with prestressed reinforced concrete structures.

What is claimed is:

1. A bridge structure having a lengthways extension and a widthways extension and including at least two pier structures spaced from one another in the lengthways direction of the bridge structure, at least two beam structures spaced from one another in the widthways direction of the bridge structure and extending in said lengthways direction, said beam structures being supported on said pier structures, and wherein, according to the improvement, the bridge structure includes further a plurality of prefabricated troughlike structural units having generally a rectangular shape and having their length extending in said widthways direction, said structural units being supported on said beam structures and having a substantial part of their length extending cantileverwise at both ends thereof beyond said beam structures, said structural units being arranged in contacting side by side relationship to each other over the lengthways extension of said beam structures, each of said structural units comprising at least three continuous load bearing longitudinal ribs extending according to the length of said structural unit parallel to said widthways direction and spaced from one another in said lengthways direction of the bridge structure, said longitudinal ribs having intermediate portions bearing directly against said beam structures, terminal ribs disposed transverse and connected with said longitudinal ribs at both extremities thereof, bottom slabs extending crosswise to and connected with said longitudinal ribs, said bottom slabs having at least one discontinuity near said intermediate rib portions, defining openings facing said beam structures, said longitudinal ribs and said terminal ribs having their top surfaces at a higher level than said bottom slabs thereby defining side walls of said troughlike shape of said structural unit, a cast-in concrete layer filling and covering said structural units and in direct contact with said beam structures at said openings, said cast-in concrete layer embedding said structural units therein and having a top level higher than the level of said top surfaces of said longitudinal and terminal ribs, and further layers of construction materials thereabove forming the flooring of said bridge.

2. A bridge structure according to claim 1, wherein said top surfaces of said longitudinal and transverse ribs are arranged on the same level and said longitudinal ribs have a cross-sectional height decreasing from said intermediate portions towards both extremities thereof, thereby defining sloped bottom edges of said longitudinal ribs and wherein said bottom slabs connected with said sloped bottom edges have a slope angle corresponding to said sloped edges.

References Cited

FOREIGN PATENTS

164,966	9/1955	Australia	52—335
553,643	5/1943	Great Britain	52—335
1,020,551	2/1966	Great Britain	52—174
477,658	1/1953	Italy	52—73

ALFRED C. PERHAM, Primary Examiner

U.S. Cl. X.R.

52—174, 335