July 22, 1958 J. L. McDONALD 2,844,024

COMBINATION PREFORMED AND CAST-IN-SITU REINFORCED FLOORING STRUCTURE

Filed Oct. 21, 1954 2 Sheets-Sheet 1

Fig. 1.

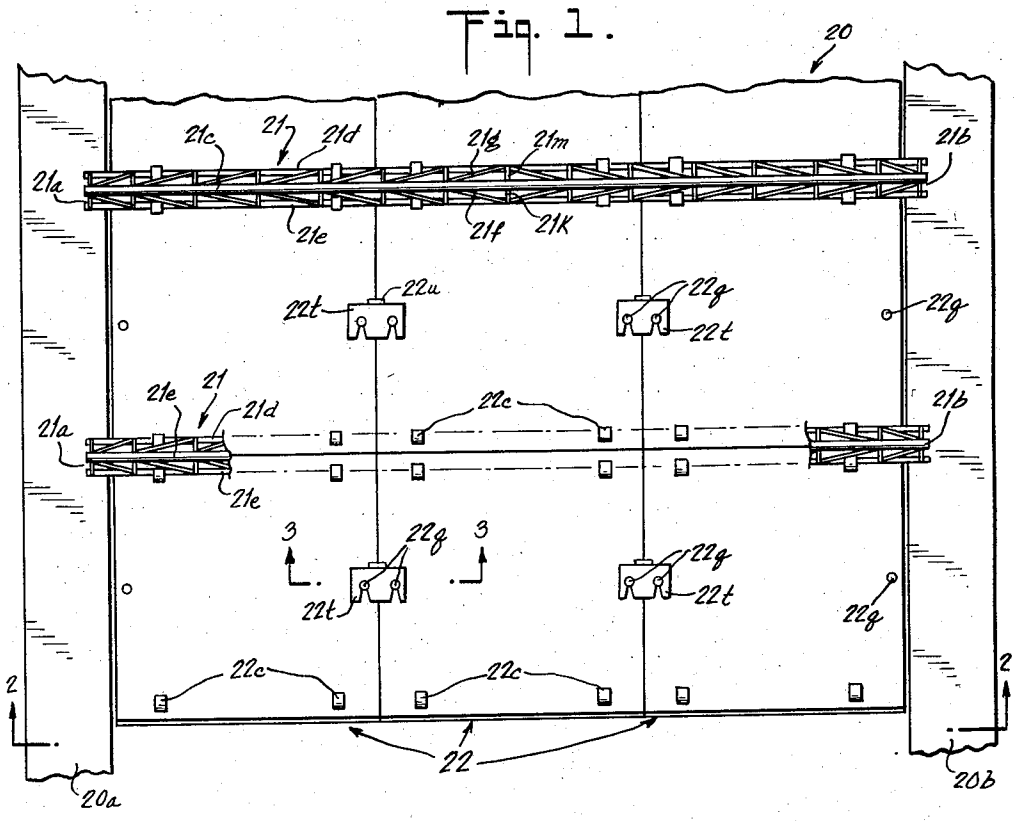


Fig. 2.

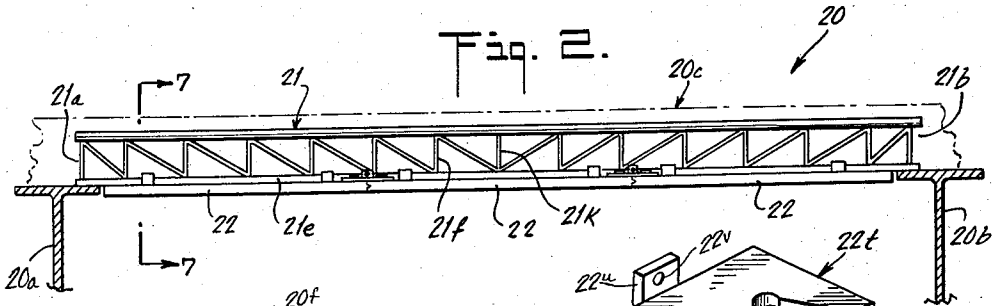
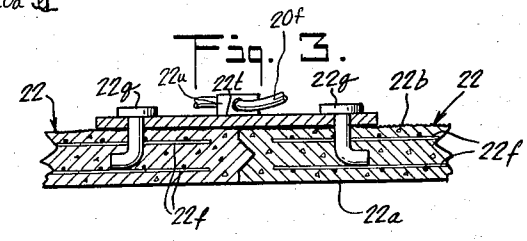


Fig. 3.



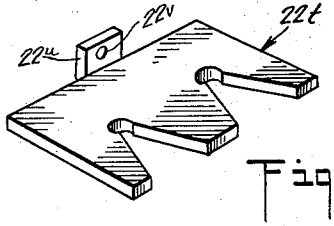


Fig. 4.

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Fig. 7.

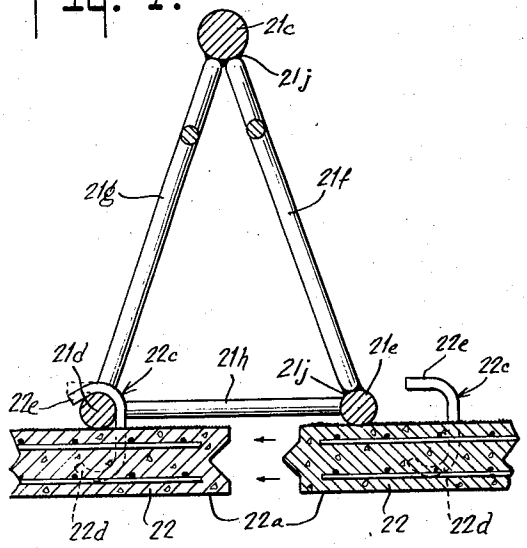


Fig. 6.

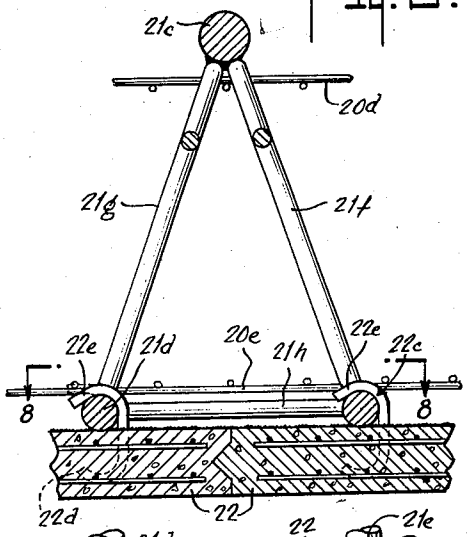


Fig. 5.

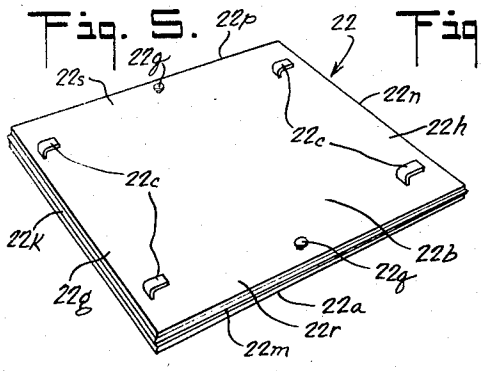


Fig. 8.

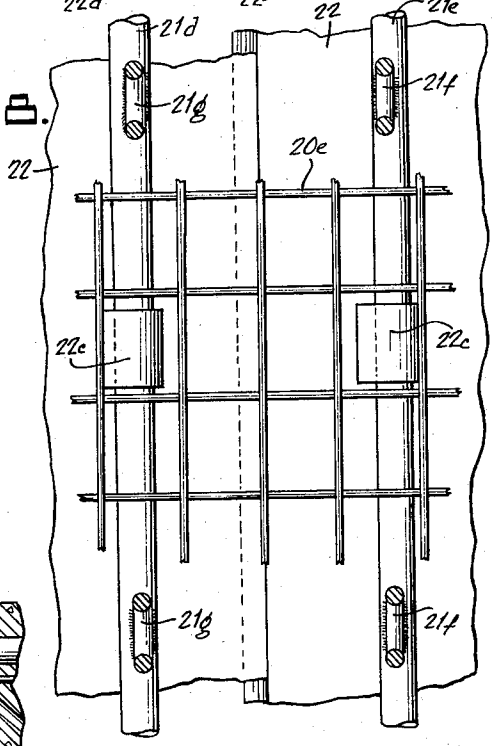
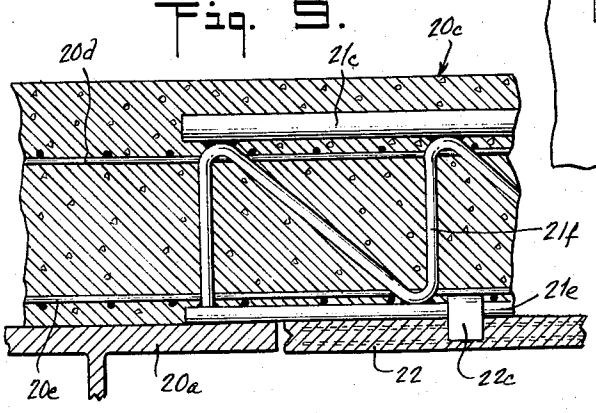


Fig. 9.



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COMBINATION PREFORMED AND CAST-IN-SITU REINFORCED FLOORING STRUCTURE

James Leonard McDonald, New York, N. Y.

Application October 21, 1954, Serial No. 463,769

1 Claim. (Cl. 72—66)

This invention relates to improvements in the method and construction of reinforced concrete roadways and building floors or roofs, and more particularly is directed to the use of easily handled truss joists or knockdown parts thereof that can be readily assembled in situ for positioning prefabricated concrete slab units to incorporate same in reinforced concrete roadway or said building constructions entirely eliminating wooden or other forms usually required thereby saving expensive labor and carpentry work, reducing insurance costs on the buiding job, and requiring a minimum of material.

Among the objects of the invention is to generally improve constructions of the character described and the method of installation, which construction shall comprise few and simple parts that are readily assembled from prefabricated or partly fabricated members requiring ready and easy association all incorporated into the structure being built, which shall eliminate the necessity of utilizing forms for molding a desired reinforced concrete structure, which shall save labor and time as compared with the best known present practice in accomplishing like results, which method shall reduce waste of material on the job to a minimum and employ the used material to their utmost utility, and which shall be practical and efficient to a high degree in use in small as well as large scale construction work.

Other objects of the invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly comprises the steps of the manufacturing method and features of construction, combination of elements and arrangement of parts which will be exemplified in the method and construction hereinafter disclosed, the scope of the application of which will be indicated in the claim following.

In the accompanying drawing in which an illustrative embodiment of the invention is shown:

Figs. 1 and 2 are top plan and side elevational views, respectively, of a fragmentary portion of a bridge roadway spanning spaced apart stringers constructed to embody the invention showing improved triangular truss joists each having three parallel aligning bars interconnected by struts, said joists supporting precast concrete slab uniform units interfitted to form a bottom side or downfacing finished wall of the structure before a roadway concrete slab is molded thereon to encase the joists before reinforcing rods or wire have been installed where found desirable, said roadway slab being shown in Fig. 2 by dot and dash lines.

Fig. 3 is an enlarged cross-sectional view taken on line 3—3 in Fig. 1 showing fragmentary portions of adjoining precast slab units interlocked by a plate strap or saddle.

Fig. 4 is an enlarged perspective view of the plate strap or saddle shown in Figs. 1, 2 and 3.

Fig. 5 is a perspective view of one of the precast slab units showing the upfacing side to which is molded the required roadway slab and from which upstands suspension hook members and interlocking studs.

Fig. 6 is an enlarged fragmentary cross-sectional view taken on line 6—6 in Fig. 2 showing the interfitting of the adjoining slab units securing the latter to the joist bars against relative movement and in addition reinforcing rods for the roadway slab portion.

Fig. 7 is an enlarged fragmentary cross-sectional view like Fig. 6 but showing the method of assembling the

slab units into rigid interfitted position shown in Fig. 6.

Fig. 8 is a cross-sectional view taken on line 8—8 in Fig. 6 showing in plan the rigid interfitting of the adjoining slab units, and

Fig. 9 is a fragmentary cross-sectional view of one end of the completed bridge roadway construction embodying the invention which has the upper roadway slab laid to unite and bond with embedded truss joists, reinforcing rods and underlying slab units to a predetermined over-all thickness yet requiring no molding forms.

An example of a construction embodying the invention is shown in Figs. 1, 2 and 9 as bridge roadway 20 spanning spaced apart horizontally disposed stringers 20*a* and 20*b*, said roadway 20 being of predetermined over-all thickness including reinforcing triangular truss joists 21 incorporated in an upper cast roadway slab portion 20*c* laid to unite with and be bonded to underlying precast slab units 22 yet requiring no molding forms in the improved manner hereinafter more fully described.

Said stringers 20*a* and 20*b* on which said roadway 20 is carried may be of any suitable construction, such as, parallelly extending steel I-beams on which opposite ends 21*a* and 21*b* of truss joists 21, respectively, are supported. Each truss joist 21 may be formed as shown in Figs. 1, 2, 6, 7, 8 and 9 of three horizontally extending spaced apart bars 21*c*, 21*d* and 21*e* rigidly interconnected by suitably shaped struts 21*f* and 21*g* and cross tie braces 21*h*. As here shown, each of said struts 21*f* and 21*g* and cross braces 21*h* may be formed of reinforcing rod stock bent and welded as at joints 21*j*, into a sawtooth configuration, each of said struts being formed extending between a triangular formation provided by the disposition of said three bars 21*c*, 21*d* and 21*e* which, with said tie braces 21*h*, provide a rigid relatively light weight framework. Struts 21*f* and 21*g* may have a half length portion of each sawtooth configuration thereof oppositely disposed as a symmetrical load carrying arrangement, said halves extending in relatively opposite directions from interposed stretcher braces 21*k* and 21*m*. Thus, if desired, said halves of struts 21*f* and 21*g*, cross tie braces 21*h* and stretcher braces 21*k* and 21*m* as well as bars 21*c*, 21*d* and 21*e* may be furnished on the job prefabricated to size and shape or knocked down in easily handled sections or parts and assembled as required by simply welding, as is clear from Figs. 1, 2, 6, 7, 8 and 9.

Underlying precast slab units 22 may each be rectangularly shaped and made of concrete suitably reinforced as at 22*f* by wire mesh or expanded sheet metal, said units 22 having a smooth, even or otherwise finished under or downfacing surface 22*a* and a rough bonding top or upfacing surface 22*b*. For each unit 22 there is provided spaced apart connector links 22*c*, as here shown, each being formed with one anchored end portion 22*d* embedded in said slab unit 22, opposite end hook portions 22*e* of each link 22*c* being positioned to upstand from said upfacing surface 22*b* along opposite border edges 22*g* and 22*h* of said unit 22.

As is clear from Figs. 2, 3 and 5, edge sides 22*k*, 22*m*, 22*n* and 22*p* of each slab unit 22 may be formed with mating tongue or ridge and groove abutting surfaces, respectively, to provide alignment of said under surfaces 22*a* of each unit 22 with that adjoining and to assure inconspicious tight joints therebetween.

There may also be provided to upstand from said upfacing surface 22*b*, spaced apart headed studs 22*q* arranged along opposite border edges 22*r* and 22*s* of each unit 22 and a plate strap or saddle 22*t* may be fitted to engage and interlock each pair of studs 22*q* for interlocking adjoining slab units 22 to retain same against alignment displacement, as shown in Figs. 1 to 4.

In the improved construction here shown, and as is

clear from Figs. 1 to 6, truss joists **21** may be spaced apart a distance equal to the length of each unit **22**, as for example, when the latter is prefabricated to form a square slab three feet by three feet, the distance between truss joist bars **21***c* is a corresponding distance of three feet, with contacting border edges **22***g* and **22***h* positioned under cross tie braces **21***h* midway between truss joist bars **21***d* and **21***e*. When so assembled, link end hook portions **22***e* of adjoining units **22** will be positioned to engage said bars **21***d* and **21***e*, as shown in Figs. 6 and 8.

From the above description and the drawing, the utility of the invention will now be apparent.

After erecting bridge I-beam stringers **20***a* and **20***b* spaced apart for carrying roadway **20**, the truss joists **21** are assembled and made of sufficient length to span the aligned distance between said stringers **20***a* and **20***b* for resting thereon in spaced apart parallel relation, as is clear from Figs. 1 and 2.

Slab units **22** may then be mounted on horizontally extending bars **21***d* and **21***e* by engaging link end hook portions **22***e* of said units **22** in rows with the groove and tongue edge sides thereof fitted together to provide a completely finished under portion for the yet unfinished bridge roadway **20**. To retain said units **22** rigidly in assembly, partially bent end **22***e* of said link **22***c* may be fully bent from the dotted line to the full line positions shown in Figs. 6 and 7. If desired, relative movement between adjoining units **22** may be prevented by applying plate straps or saddles **22***t* to interlock with pairs of studs **22***q*, as is clear from Figs. 1 to 4.

Suitable reinforcing rods **20***d* and **20***e* for constructing the roadway slab portion **20***c* may be installed and secured horizontally extending and parallelly aligned adjacent joist upper bar **21***c* and also adjacent lower pair of joist bars **21***d* and **21***e*, respectively, as shown in Figs. 6 and 9.

Thereafter, upper roadway concrete slab **20***c* is laid by pouring the same to unite and bond with slab units **22** and to embed truss joists **21** and reinforcing rods **20***d* and **20***e* to a predetermined over-all thickness yet requiring none of the usual molding forms, the prefabricated slab units **22** serving the function of such molding forms, as is clear from Figs. 1, 2, 6, 7, 8 and 9.

Since in the above described operations, roadway slab **20***c*, truss joists **21**, reinforcing rods **20***d* and **20***e* and units **22** become united and bonded together into a single one-piece roadway reinforced structure **20**, the latter is recognized and considered in calculating the maximum stresses and strains for said structure **20** making use of all the materials aforementioned either prefabricated or formed and assembled on the job.

The improved method is thus seen to utilize prefabricated reinforced concrete slab units **20** described above bonded to roadway slab portion **20***c* which incorporates truss joists **21** and may comprise the steps of first erecting the truss joists **21** and supporting same on beam stringers **20***a* and **20***b* in spaced apart horizontally disposed relation to correspond to a dimensional size of said units **22**, and next interlockingly engaging said units **22** in an alignment relation supported under said truss joists **21** with the unit bonding surfaces **22***b* upfacing toward said truss joists **21** and with said finished surfaces **22***a* downfacing to provide an exposed exterior side of said structure. Then, if desired, interlockingly engaging pairs of studs **22***q* with saddle plate strap **22***t* and securingly installing reinforcing rods **20***d* and **20***e* adjacent joist upper bars **21***c* and lower pair of joist bars **21***d* and **21***e*, respectively. Next laying batches of concrete to embed the truss joists **21** and said rods **20***d* and **20***e*, covering the unit upfacing bonding surface **22***b* to a predetermined depth to form when hardened a complete unified bridge roadway structure **20** with said unit downfacing surface forming a firmified exterior side for said structure **20**.

It should be noted that in order to more positively bond the plate strap or saddle **22***t* into roadway slab portion **20***c*, said strap **22***t* may be formed with an upstanding ledge **22***u* having a through-opening **22***v* for engaging reinforcing rods **20***f* which are embedded in said slab portion **20***c*, as is clear from Figs. 1, 3 and 4.

It will thus be seen that there is provided an improved roadway and building reinforced concrete construction and method therefor in which the several objects of the invention are achieved and which are well adapted to meet the conditions of practical use.

As various other possible embodiments of the invention might be made of the above invention, and as various changes in the embodiments above set forth might be made, it is to be understood that all matters herein set forth or shown in the accompanying drawings and described in the specification are to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

A reinforced concrete structure of the character described supported on a plurality of spaced apart horizontal stringers, said concrete structure comprising prefabricated concrete slab units of uniform shape and size each having an upfacing bonding surface opposite a downfacing finished surface, a poured concrete slab portion of predetermined thickness incorporated as a unitary structure upon said slab units, reinforcing means for said concrete structure extending through said poured concrete slab portion including a plurality of truss joists each horizontally disposed and including three spaced apart elongated bars, a pair of struts and cross tie braces interconnecting said bars to form a rigid structure of triangular cross-sectional contour, a pair of said elongated bars having opposite ends thereof resting on said stringers spanning the distance therebetween, means for interlockingly suspending each of said units in alignment beneath said truss joists as a horizontally disposed supporting surface for the poured concrete slab portion prior to pouring and as a finished exterior undersurface for said concrete structure, said suspending means including spaced apart links upstanding from said bonding surface of each of said units adjacent opposite rim border portions thereof, one end portion of each link being anchored to the slab beneath said bonding surface and the other end portion of each link being hook-shaped and engaging one of the pair of said elongated bars, each of said concrete slab units having edge sides extending between said upfacing and downfacing surfaces formed with complementary ridge and groove aligning portions for said interlocking therebetween, spaced apart headed studs upstanding from said bonding surface of each of said slab units adjacent other opposite rim border portions, and saddle plate straps interlocking pairs of said studs on adjoining units to rigidify the assembly, each of said saddle plate straps having an upstanding ledge formed with a through-opening engaging a reinforcing rod extending into said poured concrete slab portion for a more positive bonding of said prefabricated slab units to the poured concrete slab portion.

References Cited in the file of this patent

UNITED STATES PATENTS

739,646	Carter	Sept. 22, 1903
809,090	Caine	Jan. 2, 1906
1,065,119	Early	June 17, 1913
1,778,315	Ferguson	Oct. 14, 1930
1,986,171	Wilson	Jan. 1, 1935
2,230,349	Eaton et al.	Feb. 4, 1941
2,271,584	Fellom	Feb. 3, 1942
2,465,074	Edge	Mar. 22, 1949

FOREIGN PATENTS

274,291	Great Britain	July 21, 1927
822,154	Germany	Nov. 22, 1951