

March 16, 1965

F. GREBNER ETAL

3,173,193

METHOD OF MANUFACTURING A LATTICE GIRDER

Filed Nov. 5, 1963

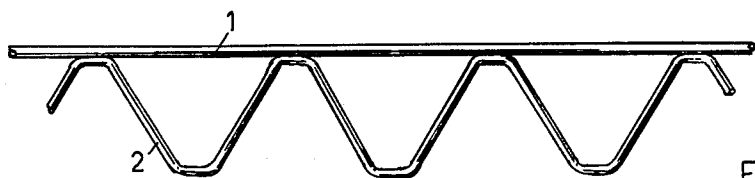


FIG. 1.

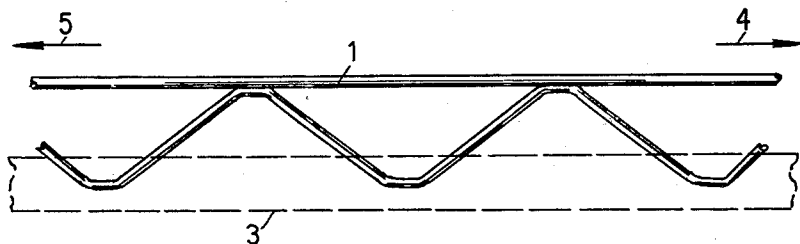


FIG. 2.

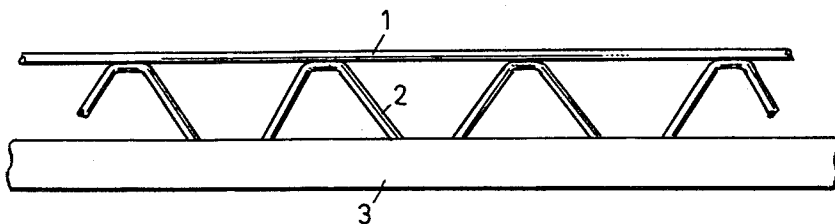


FIG. 3.

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METHOD OF MANUFACTURING A LATTICE GIRDER

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Filed Nov. 5, 1963, Ser. No. 321,605

Claims priority, application Germany, Nov. 9, 1962,

R 33,856

5 Claims. (Cl. 29—155)

The present invention relates to the manufacture of lattice girders comprising an upper chord, a lower chord and diagonal struts interconnecting the chords. More particularly, it relates to girders wherein the upper chord is a steel rod and the lower chord is a concrete slab, such as are used as reinforcements in the construction of concrete ceilings or floors.

In girders of this type, it has heretofore been impossible to take advantage of prestressed concrete because the girders must be of a predetermined dimension and it is important that the concrete chords and the steel chords are planar so that the ceiling and floor may be properly finished. If the girder chords did not extend in a flat plane, this would not be possible. However, it has been found most difficult to produce prestressed concrete girders of considerable length with flat faces. It has been impossible to produce the lower girder chords of prestressed concrete because a large portion of the girder, i.e. most of the diagonal struts and the upper chord, are outside of the concrete slab so that they do not participate in the dimensional changes of the concrete slab during the prestressing and consequent shrinkage. These outside portions of the girder will, therefore, be deformed during the produced of the prestressed concrete chord and the resultant girder is of no use in the construction of ceilings and floors.

The above and other disadvantages are avoided and a useful lattice girder for concrete floors and ceilings is produced according to the invention by first affixing one end of the diagonal girder struts to the upper chord and then embedding the other end of the struts in a layer of concrete. The concrete layer is prestressed and hardened in the conventional manner to produce a prestressed concrete slab which constitutes the lower girder chord, the concrete shrinking in the conventional manner when the stress is removed therefrom. However, before the concrete has been permitted to shrink, the upper chord is temporarily stretched the same length as the hardened concrete shrinks. Under the stress of the concrete shrinkage, the temporary stretch of the upper chord will be removed so that the upper chord will return to its original length and will not be warped as the prestressed concrete slab is formed. Thus, the upper chord will remain in a flat plane in the finished girder.

The stretching of the upper chord, which is usually a steel rod or bar, is preferably effected simultaneously with the tensioning of the usual tendons of the prestressed concrete in a conventional concrete tensioning device. This stretching may be effected by tensioning the upper chord or by heating it, preferably electrically.

The pretension method of making prestressed concrete slabs is well known and will, therefore, not be further described herein. Generally, it requires that a multiplicity of tendons be drawn to a high tension and held under stress between two anchor points on a stressing bed. Concrete is then cast around the tendons and is permitted to harden and mature sufficiently to develop an anchorage by bond, at which time the tension at the end of the line of tendons is released, transferring a force into the concrete. During hardening, the concrete shrinks.

In the following description of one embodiment of the invention, the above and other objects, advantages and

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features will be more fully understood, when considered in conjunction with the accompanying drawing wherein

FIG. 1 is a partial side view of a reinforcing member for a lattice girder with a lower chord consisting of prestressed concrete;

FIG. 2 shows the reinforcing member of FIG. 1 stretched in a longitudinal direction and with concrete cast about its lower ends; and

FIG. 3 shows the finished lattice girder.

Referring now to the drawing, wherein like reference numerals indicate like parts in all figures, the reinforcing member of the illustrated lattice girder is shown to consist of an upper chord constituted by a circumferentially circular steel rod 1 and of diagonal struts having one end affixed to the upper chord. The illustrated struts are formed of a sinuously bent structural steel rod 2 whose alternate apices are welded to rod 1.

Similar types of reinforcing members for lattice girders include girders to whose upper chord two or more mutually inclined series of struts are welded so as to form a three-dimensional reinforcement, and the present invention obviously is not limited to the specifically illustrated reinforcement structure. As shown in FIG. 2, either before the lower ends of the struts are embedded in a concrete layer 3 (shown in broken lines in FIG. 2) or at the time the tendons in the cast concrete layer are tensioned in the conventional manner, the upper chord is stretched in the direction of arrows 4 and 5, the struts having first been affixed to the upper chord. For instance, the ends of the rod 2 may be anchored to the same tensioning device at both sides of the stressing bed, to which the tendons in the concrete are anchored so that the upper chord and the tendons in the concrete are anchored so that the upper chord and the tendons are stretched simultaneously. Alternatively, the upper chord may be heated, for instance electrically, to obtain the required stretch, which is exaggerated in FIG. 2 to make the principles of the invention more obvious.

According to this invention, the upper chord is temporarily stretched the same length as the hardened concrete layer shrinks when the tension is removed therefrom. When this temporary stretch is released from the upper chord, it returns to its original length, as shown in FIG. 3. In its finished condition, i.e. after the lattice girder has been removed from the stressing bed, it will consist of a flat lower chord consisting of prestressed concrete and of a reinforcing member with a straight upper chord, thus being ready for use in the construction of concrete ceilings and floors.

While the invention has been described in connection with certain preferred embodiments thereof, it will be clearly understood that many variations and modifications may occur to the skilled in the art, particularly after benefiting from the present teaching, without departing from the spirit and scope of this invention as defined in the appended claims.

We claim:

1. A method of manufacturing a lattice girder comprising an upper chord, a lower chord and diagonal struts interconnecting the chords, including the steps of first affixing one end of the struts to the upper chord, temporarily stretching the upper chord with the affixed struts a predetermined amount, embedding the other end of the struts in a layer of concrete while the upper chord with the affixed struts is stretched, permitting the concrete layer to harden to produce a concrete slab constituting the lower chord, whereby said concrete layer shrinks, said predetermined amount being selected substantially to equal the shrinkage of said concrete layer, and discontinuing the temporary stretch of the upper chord while the hardening concrete layer shrinks.

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2. The method of claim 1, wherein the upper chord is stretched by tensioning the same.

3. The method of claim 1, wherein the upper chord is stretched by heating the same.

4. The method of claim 1, which further comprises embedding tendons in said layer of concrete and tensioning said tendons prior to said hardening, the tension in said tendons being released to permit said shrinking of the concrete layer.

5. The method of claim 4, wherein said upper chord is being stretched simultaneously with said tendons.

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