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PRESTRESSED STRUCTURAL UNIT

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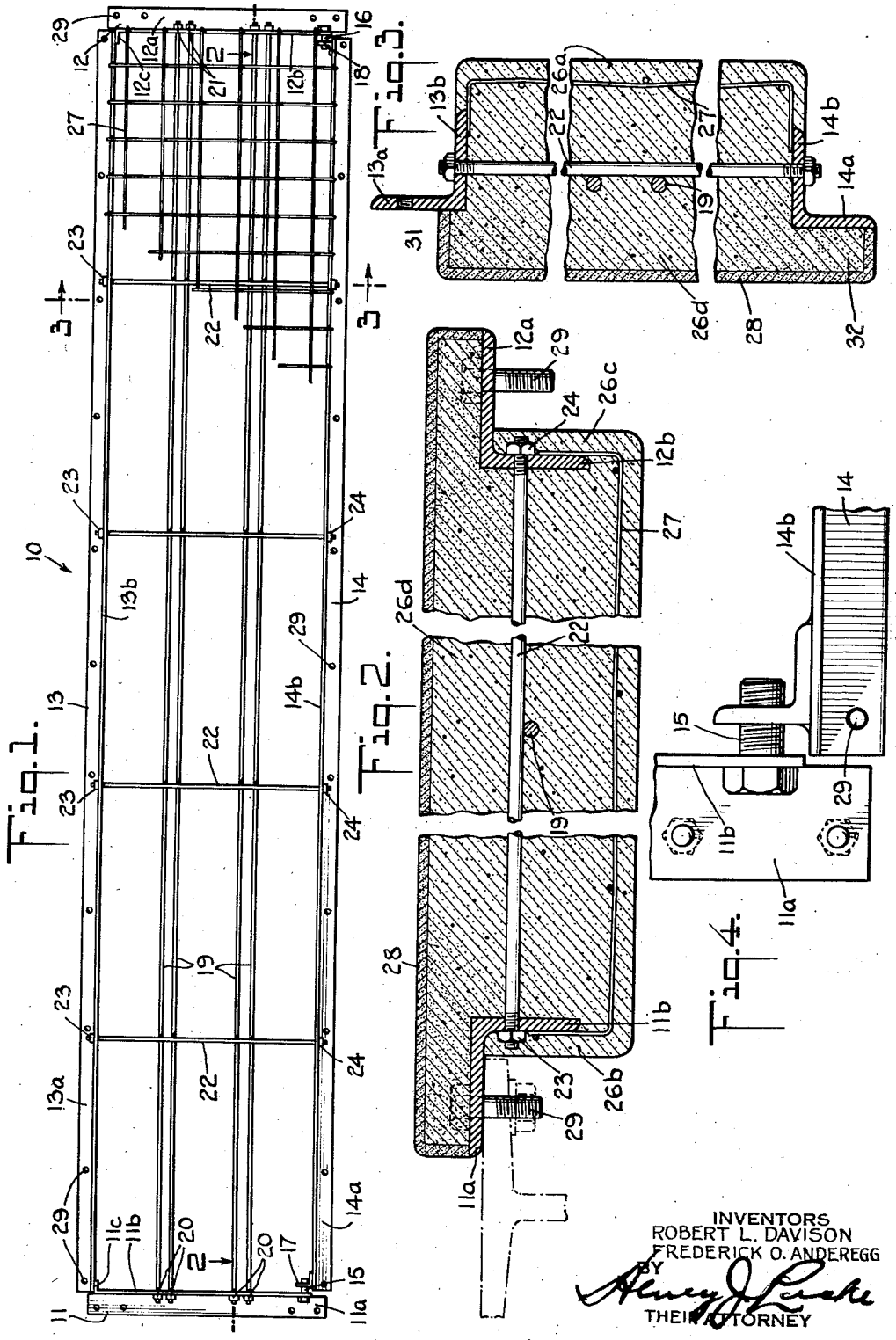

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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PRESTRESSED STRUCTURAL UNIT

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7 Claims. (Cl. 72—68)

This invention relates to prestressed structural units and applies particularly to panel units formed from cementitious composition material enclosed by a reinforcing frame.

Among the principal objects of the invention are to provide:

(1) A structural unit appropriately prestressed under both tension and compression.

(2) A structural unit of considerable strength and yet of light weight.

(3) A structural unit comprising cementitious material prestressed under the compression of a reinforcing framework, which is prestressed under tension.

(4) A structural unit pre-fabricated for simplicity and for positivity of securement to other structure in a building construction.

It is preferred to utilize the material "Microporite" disclosed in United States Pat. No. 1,932,971, granted to Hüttemann and Czernin, as the composition filler material for the structural unit. Such material is of light weight, has an extremely high porosity, and is frangible under ordinary handling conditions unless enclosed by a reinforcing framework. It has been found that "Microporite," when properly prestressed, is sufficiently strong for a great number of building purposes, and affords structures of unusual lightness and insulating qualities.

Pursuant to the present invention a reinforcing framework is provided, preferably rectangular in shape, and having one side thereof adjustably mounted in the framework proper by suitable tensioning means. Upon incorporating into such framework cementitious composition material, such as "Microporite," the tensioning means may be adjusted to prestress the frame member under tension, thereby placing the composition filler material under compression.

In the drawing,

Fig. 1 represents a plan view of one embodiment of reinforcing framework before the composition filler material is incorporated therein.

Fig. 2 represents a condensed vertical section taken on the line 2—2, Fig. 1, illustrating the structural unit complete with composition filler material, and as extending between vertical uprights in a building construction.

Fig. 3 represents a condensed vertical section taken on the line 3—3, Fig. 1, of the complete unit as illustrated in Fig. 2.

Fig. 4 represents an enlarged detail view of the lower left-hand corner portion of Fig. 1.

Referring to the drawing:

The numeral 10 indicates a peripheral reinforcing framework, rectangular in configuration, and comprised of the two lateral members 11 and 12, and the two longitudinal members 13 and 14. The respective frame members are advantageously angle-irons associated together in such manner that their open-angles are outwardly directed and, further, preferably such that component leg members are each associated in a respective set of leg members—see 11*a*, 12*a*, 13*a*, 14*a* and 11*b*, 12*b*, 13*b*, 14*b*—which lie in parallel planes, the vertices of the angle-irons being directed inwardly of the framework.

The two frame lateral members, 11 and 12, are rigidly secured to respective ends of longitudinal frame members 13, as by means of tongues 11*c* and 12*c*, respectively, such tongues being formed by cutting the respective angle-irons 11 and 12 at their ends along the vertices thereof and by bending the freed end portion of leg members 11*b* and 12*b*, respectively, outwardly. The tongue so formed may be welded to the respective ends of leg 13*b* of longitudinal angle-iron 13.

The longitudinal member, i. e. angle-iron, 14 is adjustably mounted, with respect to the other members of the framework, so that it may be tensioned between the free ends of lateral members 11 and 12, of the framework. In the illustrated embodiment, to accomplish the desired tensioning of longitudinal member 14, such member is made shorter than the gap between free ends of frame lateral members 11 and 12, into which it fits, and is connected at its ends with such free ends of the frame lateral members by suitable tensioning means. As illustrated, see especially Fig. 4, the tensioning means may conveniently take the form of machine screws 15 and 16, extending through unthreaded holes in the free end of leg members 11*b* and 12*b*, respectively, for threaded engagement with studs 17 and 18, respectively, secured to leg member 14*b* of frame longitudinal member 14.

The framework is desirably provided with longitudinal reinforcing rods, as at 19, which extend between frame lateral members 11 and 12, their threaded ends being received by unthreaded holes in leg members 11*b* and 12*b*, respectively, and being secured in place by nuts, as at 20, 21, screwed on the stated threaded ends. The framework is, further, desirably provided with reinforcing rods, as at 22, extending between the angle-iron leg members 13*b* and 14*b* of longitudinal frame members 13 and 14, transverse to the longitudinal reinforcing rods 19, their threaded ends being received by unthreaded holes in the stated leg members, and the rods being

held in place by nuts, as at 23, 24, screwed on the threaded rod ends.

As before stated, it is preferred to employ the light weight, highly porous material "Microporite" as cementitious composition filler for attaining the desired slab formation of the structural unit. In the present embodiment, see especially Figs. 2 and 3, the structural unit has its reinforcing framework 10 filled with composition filler material 26 as illustrated, i. e. such that a portion of the material, see 26a extends backwardly from the frame to provide a slab face thereat, portions of such material, see 26b and 26c, extending over and covering the outer surfaces of leg members 11b and 12b for concealing the projecting ends of rods 22. A reinforcing wire mesh 27 may be incorporated adjacent the slab surfaces, as illustrated.

Part of the cementitious filler material 26 preferably extends forwardly of the planes of leg members 11a, 12a, 13a and 14a to provide a slab face portion 26d substantially coextensive with the outermost boundary of the framework.

To afford joinder of the completed structural unit with other structure in a building construction, as indicated at 28, Fig. 2, holes, as at 29, Fig. 1, may be drilled at appropriately spaced intervals along the frame leg members 11a, 12a, 13a and 14a for the reception of suitable securing elements, such as the machine screws 30. The latter are positioned prior to the filling of the framework with the composition filler material 26, thus being incorporated, upon filling of the framework, as an integral part of the resulting structural unit.

The slab face portion 26d of the structural unit is advantageously covered by a sheet of weather resistant composition material 28, such as "Morbelli" cement sheet disclosed in U. S. Patent No. 2,084,354, issued June 22, 1937, to Giovanni Morbelli, as by bonding to the surface thereof. Such weather resistant sheet adapts slab face portion 26d for exposure to exterior weather conditions when the structural unit is utilized as a primary structural material in building construction.

As illustrated in Fig. 3, the slab face portion 26d preferably stops short of the outer longitudinal edge of leg member 13a of longitudinal frame member 13, see 31, to facilitate overlapping joinder, horizontally, of adjacent units, and, also for this purpose and for the attainment of planar continuity of exterior wall surface, longitudinal frame member 13 is preferably set back with respect to longitudinal frame member 14 such that the tongue formation, see 32, Fig. 3, of one structural unit may be coordinately received by the groove formation, see 31, Fig. 3, of an adjacent similar structural unit.

After filling of the framework 10, as above described, the structural unit may be prestressed by screwing machine screws 15 and 16 in their respective appropriate directions. In such manner, longitudinal frame members 13 and 14 will be stressed under tension while the composition filler material 26 will be stressed under compression, resulting in a strong yet light-weight structural unit prestressed for use as a primary structural element in building construction.

Whereas this invention has been illustrated and described with respect to a specific preferred embodiment thereof, it is to be distinctly understood that many changes may be made without departing from the spirit of the invention as set forth herein and in the claims that here follow.

We claim:

1. A structural unit comprising a substantially rectangular peripheral framework having one of its component frame side members secured in a gap, formed between two mutually opposite frame side members, by means of tensioning devices operative between said two mutually opposite frame side members and said one component frame side member, and composition filler material forming a slab within the framework, said framework being adapted to place and maintain said slab under compression.

2. A structural unit comprising a peripheral framework having a gap therein, a component frame member slightly shorter than the length of the gap and adjustably positioned therein by tensioning means cooperating with the portions of said framework which define the gap, and composition filler material forming a slab within the framework, said framework being adapted to place and maintain said slab under compression.

3. A structural unit as recited in claim 2 wherein the tensioning means are threaded elements, each of which elements is threadedly received by an end portion of said component frame member and the adjacent portion of said framework which defines the gap.

4. A structural panel unit comprising a substantially rectangular peripheral framework formed of angle-irons whose respective vertices are directed inwardly of the framework, the respective leg members of each lying in a plane substantially parallel to the planes in which similar respective leg members of the others lie, and one set of leg members lying in a common plane with the exception of one of the component leg members of the set which is displaced from said common plane by a distance approximately equal to the thickness of the similar leg of the frame member lying opposite thereto, and a panel slab of composition material enclosed by said peripheral framework.

5. A prestressed structural panel unit comprising a substantially rectangular peripheral framework formed of angle-irons whose respective vertices are directed inwardly of the framework, the respective leg members of each lying in a plane substantially parallel to the planes in which similar respective leg members of the others lie, and one set of leg members lying in a common plane with the exception of one of the longitudinal component leg members of the set which is displaced from said common plane by a distance approximately equal to the thickness of the similar leg of the frame member lying opposite thereto, a panel slab of composition material enclosed by said peripheral framework, and adjustable tensioning means securing one of the longitudinal frame members to the respective end frame members whereby said one longitudinal frame member is maintained under tension and said panel slab is maintained under compression.

6. In a structural unit embodying a peripheral framework and a slab of composition material enclosed within the peripheral framework, a component frame element secured in said framework, and adjustable means securing respective end portions of said component frame element to respective free end portions of said framework, said adjustable means being so constructed and arranged that adjustment thereof places the said framework in tension and the said slab of composition material in compression.

7. In a structural unit embodying a substantially rectangular peripheral framework and a slab of composition material enclosed within the peripheral framework, a component frame element secured in said framework, and adjustable means securing respective end portions of said component frame element to respective free end portions of said framework, said adjustable means being so constructed and arranged that adjustment thereof places the said framework in tension and the said slab of composition material in compression.

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