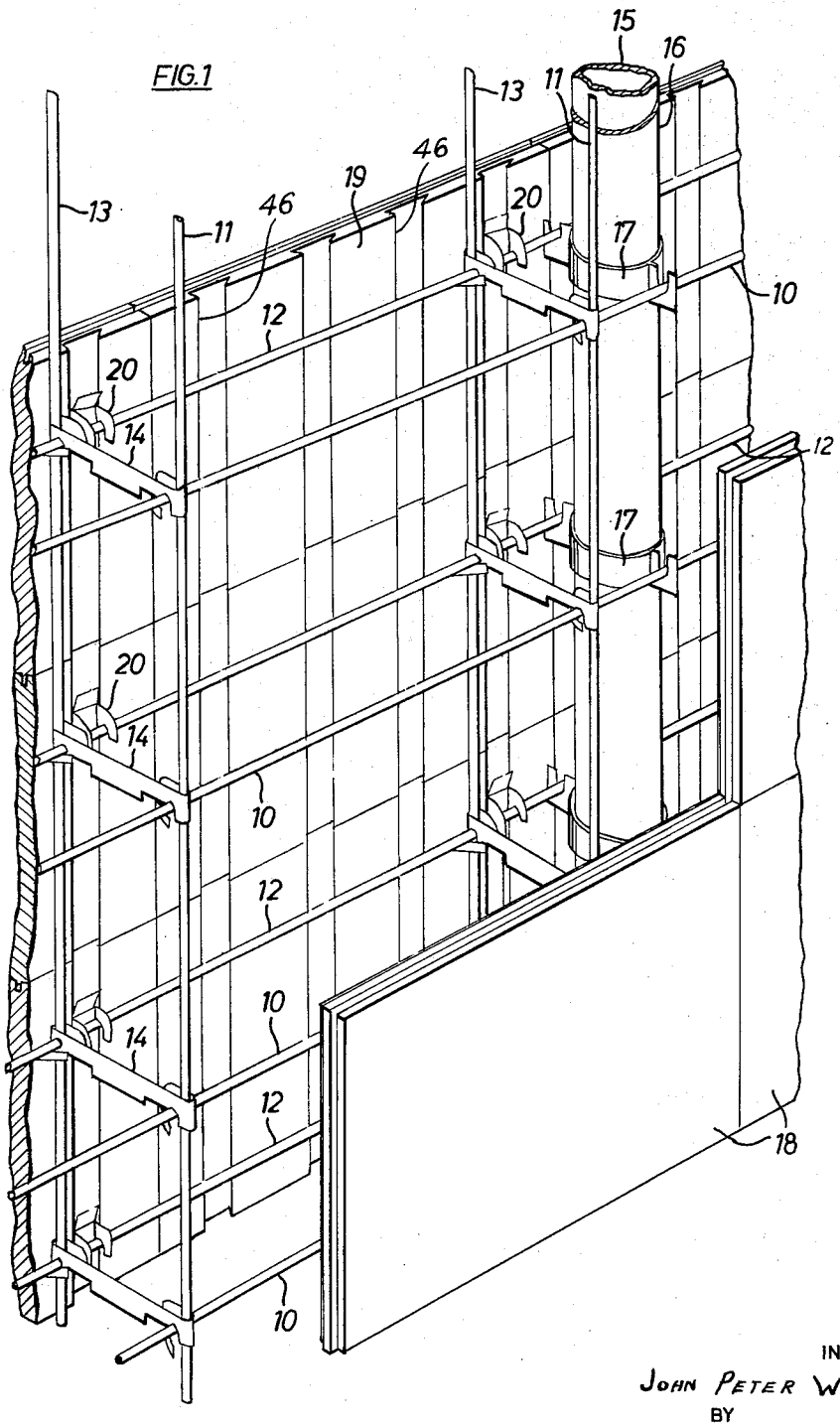
March 8, 1966 J. P. WOOD 3,238,684

REINFORCEMENT AND SHUTTERING ASSEMBLY FOR CONCRETE

Filed Jan. 17, 1963 3 Sheets-Sheet 1

FIG.1



INVENTOR:
JOHN PETER WOOD
BY
Browne, Schuyler & Burridge
ATTORNEYS

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Filed Jan. 17, 1963 3 Sheets-Sheet 2

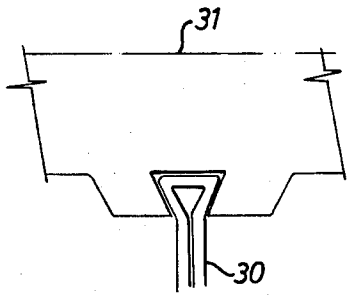

FIG.2

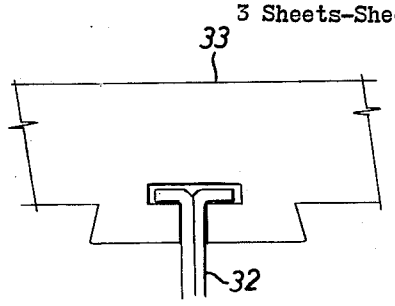

FIG.3

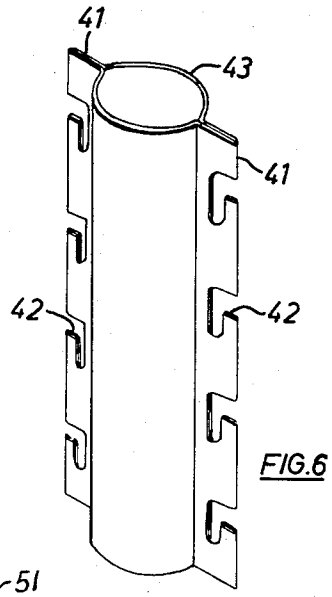

FIG.6

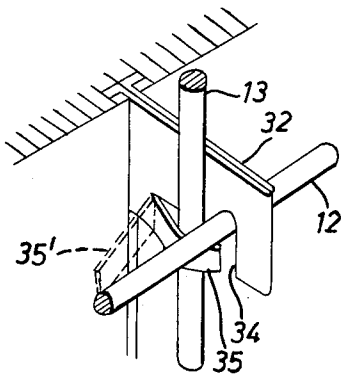

FIG. 4

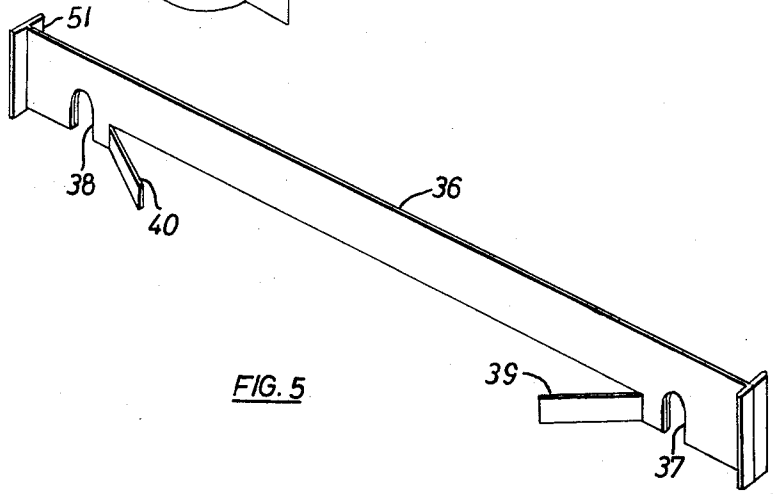

FIG. 5

INVENTOR:
JOHN PETER WOOD
BY
Browne, Schuyler & Burridge
ATTORNEYS

March 8, 1966 J. P. WOOD 3,238,684

REINFORCEMENT AND SHUTTERING ASSEMBLY FOR CONCRETE

Filed Jan. 17, 1963 3 Sheets-Sheet 3

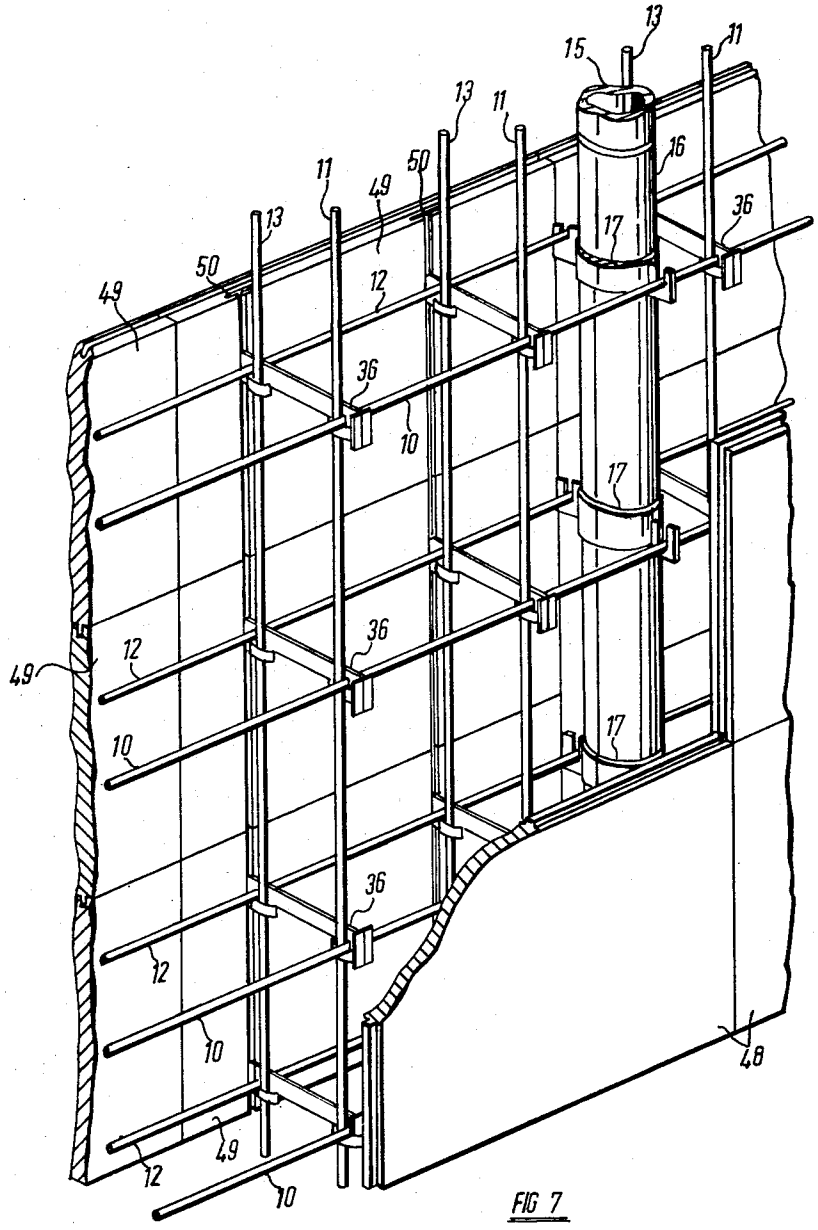

FIG 7

INVENTOR:
JOHN P. WOOD
BY
Brumm, Schuyler & Rummage
ATTORNEYS

United States Patent Office 3,238,684 Patented Mar. 8, 1966

3,238,684

REINFORCEMENT AND SHUTTERING ASSEMBLY FOR CONCRETE

John Peter Wood, 5 Hill View Drive, Upton, Wirral, England

Filed Jan. 17, 1963, Ser. No. 252,238
Claims priority, application Great Britain, Jan. 19, 1962, 2,134/62
8 Claims. (Cl. 52—481)

The present invention relates to the casting of concrete and in particular to a novel method of making reinforced concrete structures and includes such structures when made by the novel method.

According to the present invention a method of building a reinforced concrete structure comprises assembling reinforcement, erecting facing members on both sides of the assembled reinforcement and securing the facing members to the reinforcement by anchoring members, the anchoring members being attached to the reinforcement, and being connected to the facing members by a tongue-and-groove connection by which each tie is slid into an open-ended under-cut groove in or slid onto a lipped or flanged rib on the back face of a facing member, pouring concrete between the facing members to fill the space therebetween and to surround the reinforcement and allowing the concrete to set and harden.

The reinforcement may be self-supporting, but it is preferably supported by a framework. The framework may comprise scaffolding poles around which a sleeve, for example, of cardboard is arranged to prevent the concrete coming into direct contact with and adhering to the scaffolding poles. The poles may then be removed after the concrete has set.

The facing members may be tongued and grooved at their edges so as to be accurately located with respect to one another during their erection.

The reinforcement may comprise spaced sets of reinforcing bars and ties, each tie having slots, into which the bars of the two sets are inserted, and tags which are bent to close the slots and thereby secure the reinforcing bars therein. In the case wherein each set of reinforcing bars includes bars extending in one direction and bars extending in another direction transverse thereto, the bars extending in the one direction are received in the slots of the ties and the tags are bent around the bars extending in the other direction to retain the bars extending in both directions.

Each anchoring member may be provided with a slot into which a reinforcing bar of the reinforcement is inserted thereby holding the facing member in fixed spatial relationship to the reinforcement. Preferably each anchoring member is provided with a tag which is bent to close the slot and thereby retain the reinforcing bar therein. Such tag may be bent around a second reinforcing bar extending transverse to the previously mentioned reinforcing bar.

The grooves in the back faces of the facing members may be of dovetail section or of T-shaped section.

According to another aspect of the invention a means for securing spaced sets of reinforcing bars to one another, comprises a tie provided at or adjacent its end with slots adapted to receive the bars of the two sets and tags which can be bent to close the slots and thereby secure reinforcing bars therein. In the case wherein each set includes bars extending in one direction and bars extending in another direction transverse thereto, the bars extending in one direction are received in the slots and the tags may be bent round the bars extending in the other direction to thereby retain these bars also. This tie thereby holds the bars of the sets in assembly with one another and in

fixed spaced relationship. The tie may be formed of sheet metal strip.

According to a further aspect of the present invention, a means for securing facings for a reinforced concrete structure to reinforcing bars, comprises an anchoring member secured to or adapted to be secured to a facing and provided with a slot for receiving a reinforcing bar and with a tag which may be bent to close said slot and thereby retain said reinforcing bar therein. The tag may also retain a second reinforcing bar extending transversely to the first mentioned reinforcing bar. The anchoring member may be encasted in the facings if these are made of cast material or it may be adapted to be retained in a groove for example dovetail or T-shaped groove formed in the facing. The anchoring member may be formed of a strip metal.

The invention is further described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view showing reinforcement and facing partly assembled before the pouring of concrete, in the manufacture of a structure according to the invention,

FIG. 2 is a detailed edge elevation for a facing slab provided with a dovetail groove for securing the facing to the reinforcement,

FIG. 3 is a similar edge elevation illustrating a facing slab with a T-groove for the same purpose,

FIG. 4 is a detailed perspective view illustrating a means according to the invention for securing the facing to the reinforcement,

FIG. 5 is a perspective view of a means for securing the reinforcing bars themselves to one another,

FIG. 6 is a perspective view of a sleeve which may be placed around a scaffolding pole to enable a scaffolding pole to be removed after the concrete has set, and

FIG. 7 is a perspective view similar to FIG. 1 but showing the use of the means of FIG. 5.

Referring now to FIG. 1 of the drawings, a reinforcement for a concrete structure to be constructed by the method of the present invention comprises a first set of horizontal and vertical reinforcing bars **10** and **11** respectively, spaced from a second set of horizontal and vertical reinforcing bars **12** and **13** respectively. The reinforcing bars **10** and **11** are secured to one another and to the bars **12** and **13** by ties **14**. The reinforcement is held in position by scaffolding of which a scaffolding pole **15** is illustrated. A cardboard sleeve **16** surrounds the scaffolding pole and is provided so that the pole **15** can be removed after the concrete has set. Collars **17** arranged about the sleeve **16** secure the reinforcement to the scaffolding pole. Facing **18** at one side of the structure and consisting of slabs arranged in edge to edge relationship is secured to the reinforcement by anchoring members; similar facing **19** at the other side of the structure is secured to the reinforcement by anchoring members shown at **20**. The vertical ends of the structure (not shown) may be shuttered in conventional manner or may also be provided with facing material which forms a part of the finished structure.

FIG. 1 is a fragmentary view of a partial assembly of reinforcement and facing slabs. When the assembly is completed concrete is poured between the facings **18** and **19** and allowed to set. The reinforcement is thereby embedded in concrete and the facing **18** and **19** which acts as shuttering is adherent to the concrete and in any case firmly secured to the reinforcement and forms a part of the finished structure. After the concrete has set the scaffolding poles **15** may be removed. The holes left by the scaffolding poles may serve as ducts for services such as electricity and water.

FIG. 2 shows in detail how an anchoring member **30**

made from strip metal may be secured to a facing slab **31** for locating the facing in its correct position relative to the reinforcement. The part of the anchoring member **30** not shown in FIG. 2 may be similar to that of the anchoring member **20** of FIG. 1. (The member **20** of FIG. 1 consists of spaced apart hook like members and is received in a comparatively wide dovetail groove **46** in the facing.)

FIG. 3 is a similar view to that of FIG. 2 and illustrates an anchoring member **32** also of strip metal but which is adapted to fit in a T-groove of a facing slab **33**.

FIG. 4 is a perspective view of the anchoring member **32**. As can be seen, the member **32** is provided with a lateral slot **34** receiving a horizontal reinforcing rod **12** and a tag **35** which may be bent from a position shown at **35'** so as to close the slot **34** and retain the rod **12** therein and also to retain the rod **13** which runs transversely to the rod **12**.

FIGS. 5 and 7 show a tie **36** which is provided with transverse slots **37** and **38** towards its ends for receiving the horizontal rods **10** and **12** respectively and with tags **39** and **40** which may be bent to close the slots **37** and **38** to retain the vertical rods **11** and **13**. In FIGS. 5 and 7 the tie **36** is T-shaped at its ends **51** so as to serve also as an anchoring member for securing the facing **48**, **49** to the reinforcement structure comprising the horizontal rods **10** and **12**, the vertical rods **11** and **13** and support means **15**, **16**, **17** similar to that illustrated in FIG. 1. The T-shaped ends **51** of the ties **36** are received in T-slots **50** running vertically across the inside surfaces of the facing tiles **48**, **49** from the top edge to the bottom edge thereof.

FIG. 6 shows an alternative form of sleeve **43** which may conveniently be manufactured of cardboard, preferably impregnated to make it substantially waterproof. The sleeve **43** is provided with fins **41** containing lateral slots **42** for receiving reinforcing bars. The sleeve **43** is of a size such that scaffolding poles can be readily withdrawn therefrom after the concrete has set.

It will be appreciated that many modifications may be made within the scope of the invention. For example the facing need not be flat. The tiles may be made as cavity tiles primarily to exclude rainwater when used as exterior wall facing and also to prevent staining of the tile face by slurry water which seeps through the cracks between the tiles.

The tiles forming the facing are tongued and grooved int one another in order to locate the tiles in respect of one another.

Tiles for the facing of external walls, whilst being impervious to water or virtually so in themselves, may be shaped at their edges to form dry (i.e. without mortar) anti-capillary joints between the tiles, designed to exclude rainwater from the core of the structure.

Tiles for the facing of internal walls need not be waterproof and therefore do not need to be made of a water resistant material.

Although the drawings illustrate grooves cast into the tiles for attachment to the anchoring members it is possible to cast in metal members providing suitable grooves. The grooves, instead of being formed in the back faces of the tiles, may be formed in the anchoring members. In this case the tiles have suitable ribs or protuberances adapted to be slidably engaged in the grooves of the anchoring members. Cast in metal members of suitable section, such as K section may provide such ribs or protuberances on the tiles. The tiles may be formed with a metal frame and cast in fine concrete in the frame at the building site before assembly of the structure. This minimises transport difficulties for the tiles.

The method of the present invention may be used not only for the manufacture of concrete walls as illustrated in FIG. 1 but also for the manufacture of reinforced concrete beams and floors. In the case of floors the structure is cast substantially vertical and then tilted to the horizontal after hardening so that the facing on one side becomes a floor surface and that on the other becomes a ceiling. In the case wherein the method is used in the manufacture of walls it is possible to incorporate windows and doors in the structure before casting.

All the concrete need not be poured at once. It may prove desirable, for example because of the high hydrostatic pressure on the facing due to the concrete, to pour the concrete in stages allowing one batch to set before pouring the next batch.

The framework supporting the reinforcement need not be removable as described above, but may be designed to be expendable in that it may remain in and may contribute to the strength of the structure when the concrete has set.

I claim:

1. For making a reinforced concrete structure, a reinforcement and shuttering assembly comprising;

a plurality of vertical elongate support means spaced apart from one another in a row;

a plurality of pairs of horizontal reinforcement bars extending along said row of support means and supported by said support means to form a reinforcement structure, the bars of each pair lying on opposite sides of said row;

a plurality of rectangular facing tiles resting edge-on-edge at each side of the reinforcement structure to form shuttering;

elongate tie members;

interengageable tongue and undercut groove connection means, one of said connection means extending vertically continuously over inner faces of said tiles from an upper edge thereof and the other of said connection means being provided on both ends of said tie members and being engaged with the said one connection means to vertically slidably connect said tie members to said tiles;

a pair of hook formations on each of said tie members to receive a pair of said horizontal reinforcement bars said hook formations being spaced from said connection means and from one another, said hook formations having downwardly opening slots and being hooked onto said horizontal reinforcement bars from above; and

locking means on said tie members locking said horizontal reinforcement bars in said hook formations.

2. The assembly according to claim **1** wherein each of said tie members comprises strip material, said hook formations comprise slots therein each having a downwardly facing bottom and said locking means comprise bendable tags bent to close said slots with the respective horizontal rods therein.

3. The assembly according to claim **2** wherein the reinforcement structure further comprises pairs of vertical reinforcement bars secured to said pairs of horizontal bars by said bendable tags.

4. The assembly according to claim **1** wherein the edges of the tiles are tongued and grooved.

5. The assembly according to claim **1** wherein said vertical elongate support means have pairs of slots therein with their bottoms facing upwardly and adapted to receive said pairs of reinforcement bars.

6. For making a reinforced concrete structure, a reinforcement and shuttering assembly comprising;

a plurality of vertical elongate support means spaced apart from one another in a row;

a plurality of pairs of horizontal reinforcement bars extending along said row of support means and supported by said support means to form a reinforcement structure, the bars of each pair lying on opposite sides of said row;

a plurality of rectangular facing tiles resting edge-on-edge at each side of the reinforcement structure to form shuttering;

anchor members;

interengageable tongue and undercut groove connection means, one of said connection means extending vertically continuously over inner faces of said tiles from an upper edge thereof and the other of said connection means being provided on said anchor members and being engaged with the said one connection means to vertially slidably connect said anchor members to said tiles;

a hook formation having a downwardly opening slot on each of said anchor members receiving one of said horizontal reinforcement bars, said hook formation being spaced from said connection means and being hooked onto said horizontal reinforcement bar from above;

a plurality of tie means holding the horizontal bars of each pair in fixed relative spatial relationship; and

locking means on each of said tie means locking said pairs of horizontal reinforcement bars to said tie means.

7. The assembly according to claim 6 wherein each of said tie means comprises an extension on one of said anchor members, said extension having a second hook formation therein to receive one of said pairs of horizontal bars.

8. The assembly according to claim 6 which further comprises pairs of vertical reinforcement bars secured to said pairs of horizontal reinforcement bars by said locking means on said tie means.

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FRANK L. ABBOTT, *Primary Examiner.*

HENRY C. SUTHERLAND, *Examiner.*

D. R. COMUZZI, R. A. STENZEL, *Assistant Examiners.*