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F. MAURER

3,394,522

CONNECTING APPARATUS FOR PREFABRICATED STRUCTURAL ELEMENTS

Filed Feb. 15, 1967

2 Sheets-Sheet 1

FIG. 1

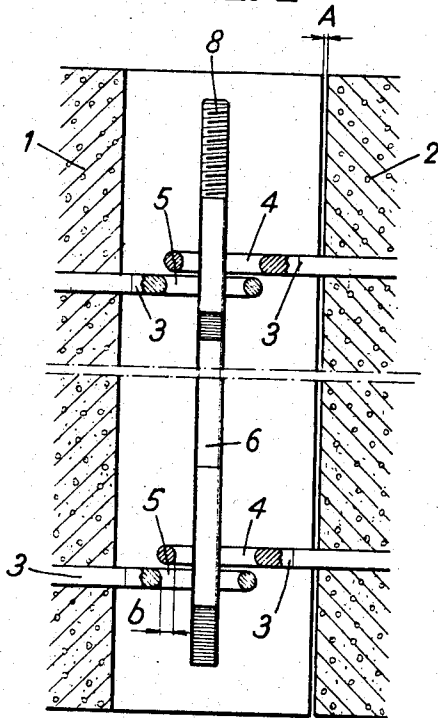


FIG. 3

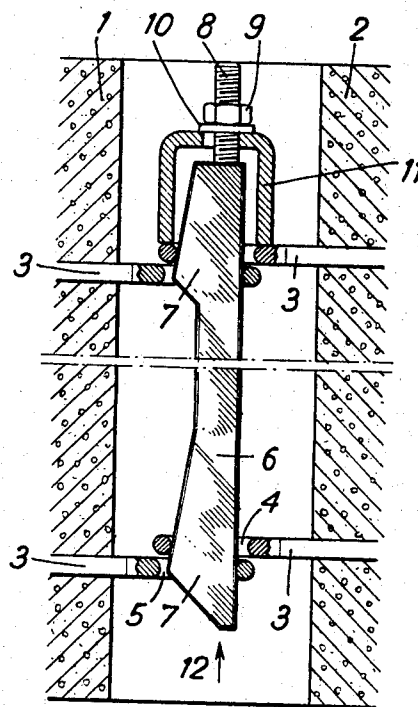


FIG. 2

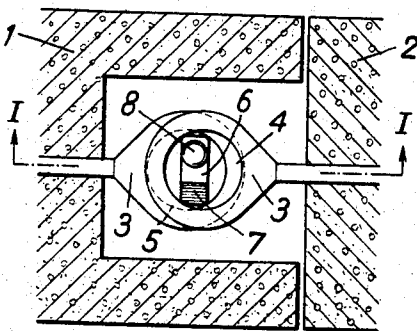
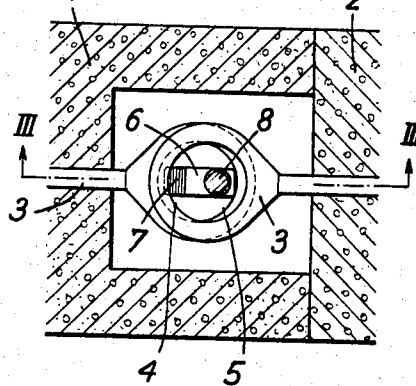


FIG. 4



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FIG. 5

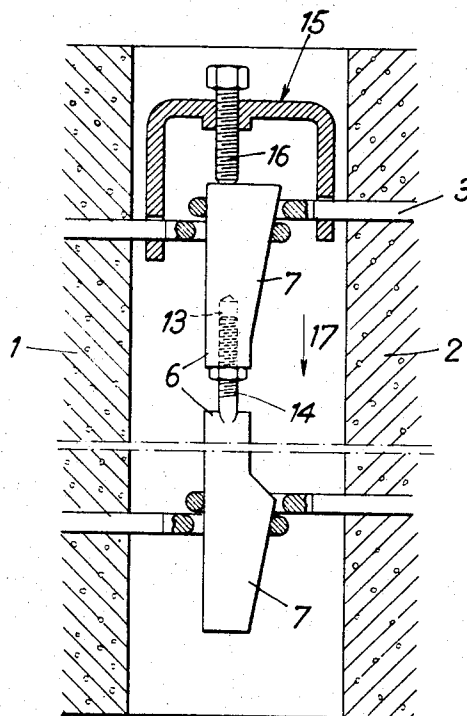
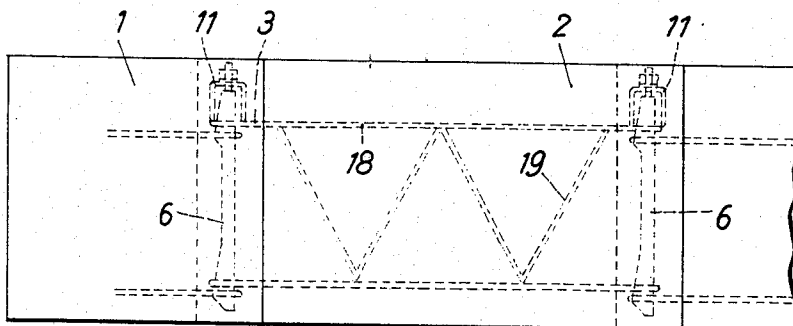


FIG. 6



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CONNECTING APPARATUS FOR PREFABRICATED STRUCTURAL ELEMENTS

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4 Claims. (Cl. 52—583)

ABSTRACT OF THE DISCLOSURE

An apparatus for connecting the abutting edges of a pair of prefabricated structural elements, which includes connecting members anchored at intervals along the edge of each structural element and arranged in opposed pairs projecting into a recess between the elements. The pairs of opposed connecting members are closely spaced along the abutting edges, and the overlapping free ends of each pair of opposed connecting members have openings there-through. The openings in the pairs are aligned to form a passage the width of which increases as the structural members are drawn together, while the height of the passage remains substantially constant. The maximum width of the passage, when the structural members are abutting, is substantially less than the height of the passage. The apparatus also includes a bar having spaced wedge-like projections of similar width, inclined in the same sense, all of which extend from one edge of the bar and are spaced at the same intervals as the pairs of connecting members. The maximum width of the bar, measured at such wedge-like projections, is greater than the maximum width of the passages but less than the height of the passages. The thickness of the bar is substantially less than the maximum width of the passages, so that the bar can be inserted through all of the passages to bring the narrow end of each wedge-like projection adjacent to one of such passages and can then be rotated 90°. The apparatus also includes force-exerting means at one end of the bar, positioned within the limits of the recess, for moving the bar longitudinally of the abutting edges of the structural elements to drive the wedge-like projections along the passages so as to draw the structural members together.

The invention relates to a connecting apparatus for prefabricated structural elements.

In accordance with the methods heretofore known, prefabricated structural elements are solidly connected together at the place of installation by means of mortar or similar bonding materials. Also known are other arrangements in which the connection of the structural elements is effected by means of connecting members which are anchored in the structural elements and which are provided on the projecting end with an opening, the connection being made by means of an eccentric rod inserted through these openings. This type of connection can be assembled quickly and conveniently. However, it has the disadvantage that when it has been loosened as the result of the occurrence of fatigue of material or by vibration, it is no longer possible to tighten the connection.

Summary of the invention

The object of this invention is to provide a connecting apparatus for structural elements wherein the joining of the structural elements can be accomplished without hammering and in a short time, and it is possible to tighten a connection which has become loose.

The connecting apparatus according to the present invention is characterized in that the tightening apparatus

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comprises a bar on which flat wedge-like projections, all extending in the same direction, are arranged along the bar with the same spacing as the pairs of connecting members which are anchored in the opposed structural elements, and means arranged at one end of the bar for moving the bar in the direction of the taper of the projections, and in that the greatest dimension of the cross-section of the bar with its projections is less than the diameter of the openings in the connecting members.

Brief description of the drawings

The subject of the invention is explained in more detail below, by way of example, by means of the annexed schematic drawings. The drawings show:

In FIG. 1 a longitudinal section on the line I—I of FIG. 2 through two structural elements which are not fully joined together, with the connecting members and a tightening apparatus,

In FIG. 2 a section through the structural elements, with the connecting members,

In FIG. 3 a longitudinal section on the line III—III of FIG. 4 through two structural elements which have been joined together, with the connecting members and a tightening apparatus,

In FIG. 4 a section through the structural elements and the connecting members,

In FIG. 5 a section through the structural elements with connecting members which are held together by a modified tightening apparatus, and

In FIG. 6 an elevation of structural elements into which have been cast connecting members which extend through the structural elements.

Description of the preferred embodiments

FIGS. 1 and 2 are fragmentary sectional views of two structural elements 1 and 2 which are to be joined together, and which are spaced from one another by a distance A. Connecting members 3 are anchored fast in the structural elements 1 and 2. The connecting members 3 are provided with openings 4 at their free ends. The axes of the openings in all of the connecting members 3 which are attached to one of the structural elements are as nearly as possible in alignment with one another. The openings of the connecting members 3 of the structural element 1 and the openings of the connecting members 3 of the structural element 2 partly overlap, so that a through passage 5, in the form of two sectors joined together, is provided. In this passage 5 there is a bar 6, on which are provided wedge-shaped projections (FIG. 3) at the same levels as the pairs of closely-spaced opposed connecting members 3 of the structural elements. The bar penetrates all the openings of the connecting members, and has its ends extending beyond the outermost connecting members.

The spacing of the walls 4 of the openings, which is the same as the spacing of the axis of the openings of all the connecting members secured to the structural element 1 from the axis of the openings of all of the connecting members secured to the structural element 2, is indicated at b and is greater than the distance A.

When the bar has been turned 90° on its longitudinal axis, as illustrated in FIGS. 3 and 4, then one is able to draw the bar upward in the direction of the arrow 12, by means of a traction apparatus consisting of a threaded stud 8 on the bar 6, a nut 9, a pressure distributing washer 10 and a supporting body 11. By means of this quarter rotation and drawing upward of the bar, the common axis of the openings of all of the connecting members 3 of the structural element 1 is brought closer to the common axis of the openings of all of the connecting members 3 of the structural element 2, while the two structural elements are brought together by means of the adjusting

members 8 and 9 which are located within the structural element 1. The said adjusting elements also cover the connecting apparatus so that the latter is not visible from the upper side of the structural elements.

The dimensions of the bar 6 and of the wedge-shaped projections 7 are so chosen that the maximum width of the bar, measured at such wedge-like projections, is greater than the maximum width of the passage 5 (FIG. 4) but is less than the height of such passage, so that the bar, when in the position shown in FIG. 2, can be inserted with its projections down through the passage 5 which is defined by two sectors of a circle. The turning of the bar through 90° is performed when the narrow ends of the wedge-shaped projections are just below and adjacent to the passage 5 through the corresponding pairs of connecting members. Then when the bar is drawn upward by means of the traction apparatus, the inner surfaces of the openings 4 that are adjacent to the bar which abut the bar itself on one side and abut the sloping surfaces of the projections on the other side are forced apart by the wedge action, which causes the structural elements 1 and 2 to be drawn together the more firmly as the nut 9 is drawn up more tightly. As shown in FIG. 4, the maximum width of the passage 5, when the structural members are abutting, is substantially less than the height of the passage.

In the event that the connection becomes loosened in the course of time, as the result of fatigue of parts which are permanently subjected to tension or compression, it is possible to draw the nut 9 down further whereby the connection between the structural elements is again tightened.

Preferably the spacing of the wedge-shaped projections 7 is adjustable, as illustrated in FIG. 5, in order to match exactly the spacing of the connecting members. This adjustability can be provided by making the length of the bar between two projections adjustable, for example by providing an upper section of the bar 6 with an internally threaded bore 13, and a lower section of the bar having fixed thereto a threaded stud 14, or by securing the projections adjustably upon the bar.

Instead of the traction apparatus, a pressure apparatus can be applied to the opposite end of the bar, as shown in FIG. 5. The pressure apparatus may consist of a stirrup 15 embracing the connecting members 3 and a hexagonal screw 16. It is only important that the direction of the movement imparted to the bar correspond with the direction of the arrow 17.

When the structural elements are made of material the dimensions of which change substantially under the influence of external conditions such as temperature and moisture, then it is preferable to use connecting elements which permit the distance of the axis of the opening from the structural element to be adjusted.

The adjusting members 8 and 9 may be mounted upon the structural elements by means of any desired mounting, or may be made in any special way. The joint which exists between the two abutting structural elements may be straight, or may take any suitable form, for instance two planes forming an angle with one another. In this way, a suitable alignment may be produced in bringing the two structural elements together.

In accordance with FIG. 6 the connecting members may be interconnected by means of rods 18 extending through the structural elements. Further such interconnected connecting members may be additionally connected together by means of cross members 19 inside the structural elements, so that such connecting apparatus can serve also to reinforce the structural elements.

I claim:

1. Apparatus compressively connecting abutting edges of a pair of prefabricated structural elements, said apparatus comprising a plurality of similar connecting members anchored at intervals along the edge of each structural element, the connecting members of the two structural elements being arranged in opposed pairs and projecting from the elements into a recess between the elements, the pairs of opposed connecting members being closely spaced longitudinally of the abutting edges, the overlapping free ends of each pair of opposed connecting members having openings therethrough, the openings in said pairs being aligned to form a passage the width of which increases as the structural members are drawn together while the height of the passage remains substantially constant, the maximum width of such passage, when the structural members are abutting, being substantially less than the height of the passage; a bar having spaced wedge-like projections of similar width, inclined in the same sense, all of which extend from one edge of the bar and which are spaced at the same intervals as the pairs of connecting members, the maximum width of the bar, measured at such wedge-like projections, being greater than the maximum width of such passages but less than the height of such passages, and the thickness of the bar being substantially less than the maximum width of such passages, so that the bar can be inserted through all of such passages, to bring the narrow end of each wedge-like projection adjacent to one of such passages, and then rotated 90°; and force-exerting means at one end of the bar and positioned within the limits of said recess for moving the bar longitudinally of the abutting edges of the structural elements to drive the wedge-like projections along the passages to thereby draw the structural members together.

2. Apparatus according to claim 1, characterized in that said force-exerting means is a traction means comprising a threaded stud projecting from the end of the bar toward which the wedge-like projections are tapered and a supporting body bearing against at least one connecting member, said stud projecting through said supporting body, and adjustable means threadedly engaging said stud and bearing against said body.

3. Apparatus according to claim 1, characterized in that said force-exerting means is a pressure means comprising a support body having one end linked to one pair of connecting members at the end of the bar away from which the projections are tapered and a member threadedly engaged with the opposite end of said support body, one end of said threaded member bearing against an end of said bar.

4. Apparatus according to claim 1, wherein said bar comprises at least two separable sections, and threaded means adjustably interconnecting said sections between said wedge-like projections.

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