Dec. 10, 1968 HANS-DIETER KLAISS 3,415,484

BRACING AND SPACING DEVICE FOR CONCRETE WALL FORMS

Filed Aug. 27, 1965 2 Sheets-Sheet 1

FIG. 1

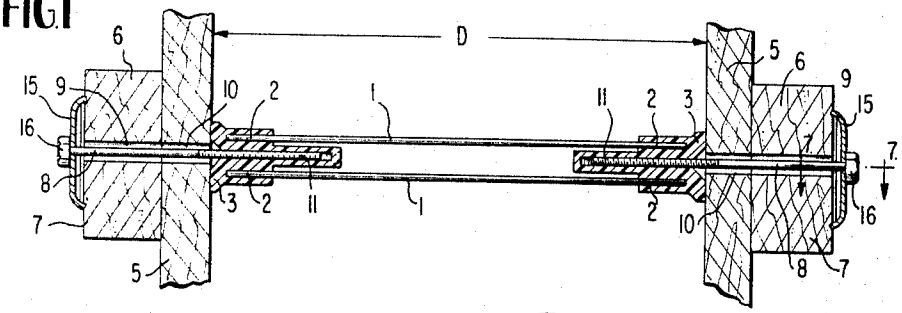


FIG. 2

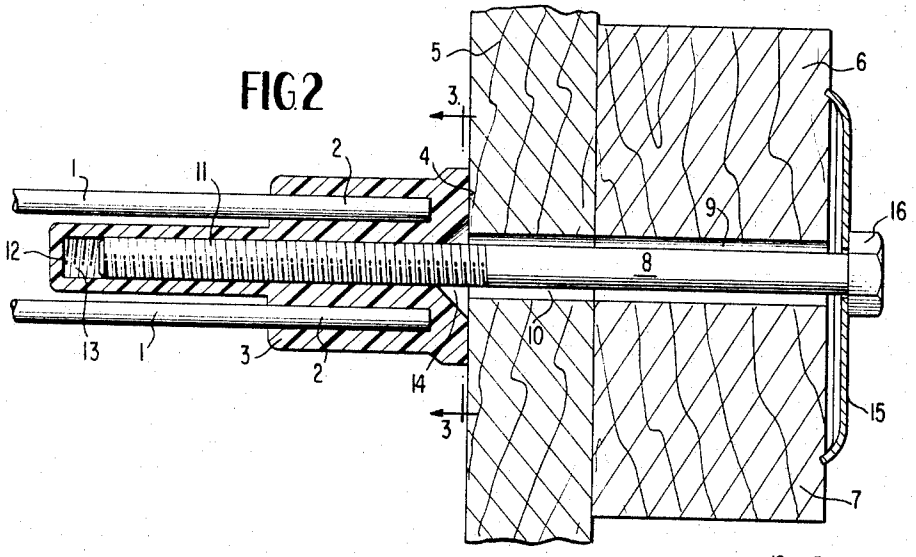


FIG. 3

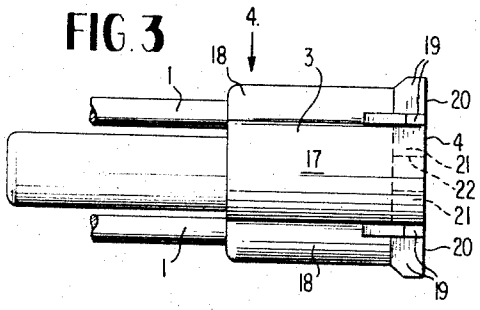


FIG. 4

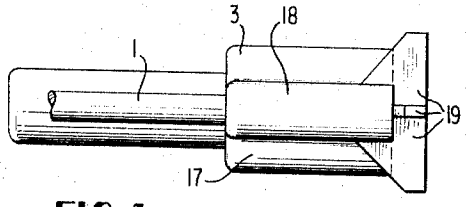


FIG. 5

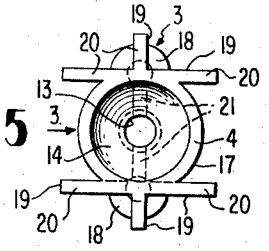


FIG. 6

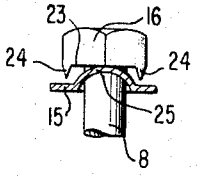
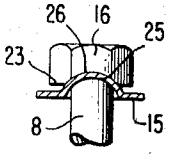


FIG. 7



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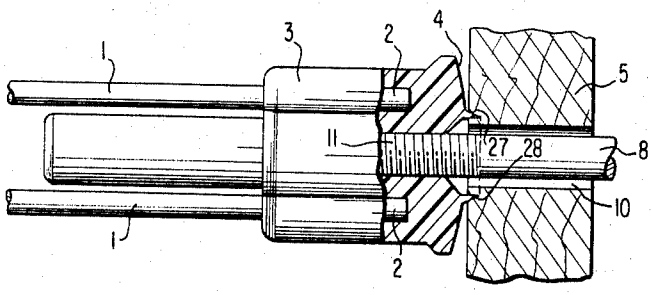


FIG.8

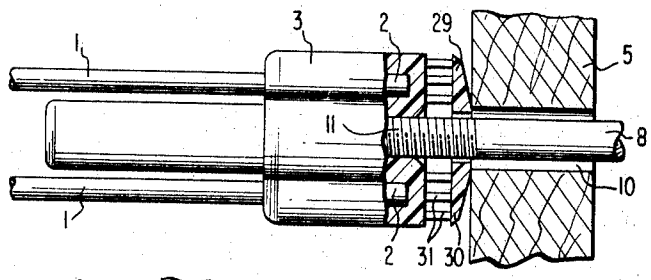


FIG.9

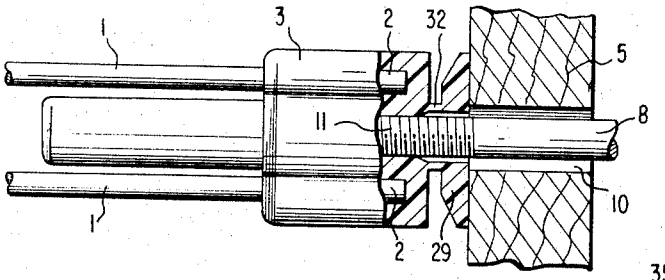


FIG.10

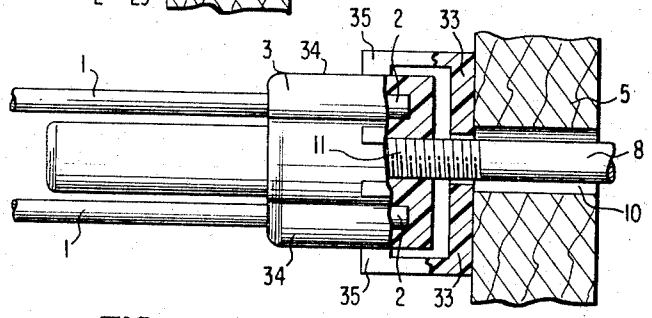


FIG.11

FIG.12

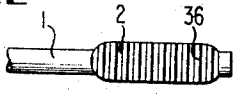


FIG.14



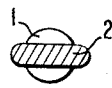


FIG.15

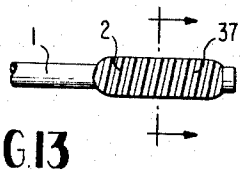


FIG.13

FIG.16



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BRACING AND SPACING DEVICE FOR CONCRETE WALL FORMS

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14 Claims. (Cl. 249—216)

ABSTRACT OF THE DISCLOSURE

A bracing and spacing device for concrete wall forms to be inserted between oppositely positioned forms at spaced intervals to brace and accurately space the forms. A pair of head members are secured to the inner face of each of the opposite forms, respectively, by means of bolts inserted through the form from the outer side and screwed into outwardly opening blind end centrally located bores in the head members. Two parallel rod braces extend between the head members on diametrically opposite sides of the respective bolts. The head members are constructed of plastic molded about the rods, which are deformed at their ends for tight securement.

Background of the invention

In spite of the general simplicity of construction of concrete forms there are several considerations which have provided difficulties in the past in connection with such constructions. One of these considerations is the proper spacing and bracing of parallel forms over their entire surface so as to achieve a concrete end product, such as a wall or the like, having truly parallel surfaces. In attempting to solve this problem, it has been proposed that the concrete forms be constructed with the use of securing devices positioned at prescribed intervals throughout the form, which devices serve as braces for the form walls against the forces created by the wet concrete and also serve to accurately position the form walls so as to insure a parallel disposition thereof.

In connection with this type of bracing and spacing devices, one construction is known in the art which consists of a single, rod-shaped brace for bracing and determining the distance between the forms and wherein the planking boards rest against both ends of annular intermediate members secured to the free ends of this support. There is also provided in this known construction in both ends of this single brace, bores with an internal thread into which the clamping bolts, which extend through the plankings or forms, engage to secure the brace to the forms and to provide a support therefor. This axially symmetrical configuration of the device is unfavorable, however, by reason of the fact that the entire support assembly due to its axially symmetrical configuration will very easily turn with the clamping bolts when the clamping bolts are withdrawn even after the concrete has set. As a result, an interspace having an annular cross section will be formed between the support and the hardened concrete; into which interspace water can easily seep and possibly penetrate also through the concrete. Even if the conical openings remaining after the removal of the intermediate members are closed off by means of plugs or the like, the problem of water seepage remains as serious consideration.

In another known construction of such a device, two rod-shaped braces extending parallel to each other are provided at both ends thereof with axially symmetrical head pieces adapted to be secured to the plankings of the concrete form for spacing and bracing thereof. In this instance, helical wires are disposed between the adjacent

ends of the pair of braces, which wires connect the two supports with one another and constitutes simultaneously an internal thread for the shafts of the clamping bolts, which extend through the planks to secure the form to the support member. While these two braces together with the helically provided wires connecting the former with one another constitute an asymmetrical structural part, which is therefore torsion-resistant, the danger exists with this construction that, after the removal of the axially symmetrical head pieces, water will seep through the remaining openings, which must again be closed off by plugs or the like, into the cavity surrounded by the helical wires, and, in case the hardening concrete present between the two cavities is not completely set, water will penetrate through it. Additionally, there exists the danger that the two braces will corrode or rust through so that after a time the water can possibly penetrate through the concrete also along these supports.

Summary of the invention

The present invention is directed to such a bracing or spacing device which is suitable for securing the plankings or forms used in the construction of concrete walls, and consists basically of at least two rod-like braces of selectively predetermined length supported in parallel relation to one another by a pair of head pieces secured to opposite ends thereof. The head pieces accurately spaced by the rod-like braces are then removably secured to oppositely disposed planks or forms by means of clamping bolts extending through the plankings or forms from the outside thereby simultaneously bracing and accurately spacing these forms.

The present invention has the object of providing a bracing and spacing device in which the penetration and also the permeation of water through the concrete is with certainty prevented in every case.

It is a further object of the present invention to provide a bracing and spacing device which is simple and economical in manufacture so as to permit a retaining of the entire device in the hardened concrete without great expense.

It is another object of the instant invention to provide a bracing and spacing device which may be easily adapted to any length and easily and firmly secured to the opposing walls of the concrete form.

It is still a further object of the instant invention to provide a bracing and spacing device which is so constructed as to be visible in the surface of the concrete to as little an extent as possible.

It is still another object of the instant invention to provide a bracing and spacing device which is constructed so as to make possible a simple removal of any portion visible in the surface of the concrete.

In order to achieve these objects it is proposed, in accordance with the present invention, that the head pieces be provided of non-symmetrical configuration in that in each head piece the bore for receiving the clamping bolt shafts is provided as a blind-end bore formed concentrically in the head piece and the recesses for receiving the ends of the rod-shaped braces are provided in projections disposed eccentrically on the head piece. By virtue of this particular configuration, not only the two-rod shaped braces but also the two head pieces connecting the braces with one another are positioned in the hardened concrete in a torsion-resistant manner so that they too will be seated tightly, sealingly in the concrete and cannot become loose even when the clamping bolts are withdrawn. Since, additionally, the bores serving for receiving the clamping bolt shafts are constituted as blind-end bores, in a head piece made of waterproof synthetic or plastic material, no water can seep through these bores into the concrete and no corrosion of the head piece form-

ing a passage for water can occur. As a result thereof, there is also no need to specifically close off the remaining openings of the blind-end bores with plugs or the like, which has, in turn, a favorable effect particularly with regard to construction cost and cost of materials. Finally, this tension and compression resistant device may also be adapted to a limited extent to the respectively prevailing conditions inasmuch as the total length of the device may be shortened by twisting or also by racking or bending the braces toward each other.

If the aforementioned head pieces or members are made from synthetic material, these head pieces may be formed around the deformed ends of the braces which will not only considerably simplify the manufacture of the device, but will additionally protect or shield braces made from metal against any water which could possibly enter the apertures in the head members provided for such braces from the outside, and thus eliminate a priori any corrosion thereof. In addition, the manufacture of the head members from synthetic materials will make it possible to retain the entire device in the hardened concrete without great expense.

In order to insure a good support of the deformed ends of the braces in the synthetic material, it is advantageous to provide these ends with a reduced portion having an out-of-round, rectangular, triangular, or rhombic cross section. For purposes of being enlarged with respect to the synthetic material surrounding them, the ends of the braces may be provided with rib portions, indentations or the like extending transversely and diagonally to the longitudinal axis of the brace, and, in that case, the transverse rib portions may be disposed on one side and the diagonally-extending rib portions may be arranged on the other side. In case the diagonally-extending rib portions are inclined and provided in such a manner that they constitute in each case the continuation of the transverse rib portions disposed at the other side, this will practically have the effect of a continuous rib portion following approximately the line of a screw thread.

In order to facilitate the insertion of the clamping bolts into the head members, each of the blind-end bores provided in the head members is provided with an opening which widens outwardly in the form of a cone in which case the end face of the head member surrounding the aperture of the blind-end bore may be constituted as an annular surface. On the one hand, this annular surface of the head members assures a sufficiently large bearing surface for the plankings or forms, and on the other hand, it is sufficiently small to be apparent in visible surfaces of the concrete only to a very minor extent. Moreover, this annular surface may be plastered with concrete without specific expenditure and thus readily covered, if such is desired. In addition, if it should prove to be necessary, the openings of the blind-end bores may, of course, additionally be closed off by means of plugs or also with concrete.

Furthermore, rib portions may also be disposed within the area of the eccentric parts of the head member and additionally effect a special anchorage of the head members in the concrete. If, in this case, the end faces of these rib portions terminate flush with the annular end face of the head member, the entire bearing surface for the plankings or forms may be increased thereby.

Likewise, it is of advantage, particularly in the case where the support members extend to visible surfaces of the concrete, to provide the rib portions cross-wise so that they will extend suitably to the area of the internal thread of the blind-end bore and support the concrete introduced between the rib portions, while thus preventing any breaking-out of concrete when the clamping bolts are withdrawn.

Furthermore, specifically in the case where the support members extend to visible surfaces of the concrete, it is also possible to provide, if desired, a collar portion surrounding the aperture of the blind-end bore which will be pressed into the planking or form and thus prevent any outflow of concrete through the hole in the form which accommodates the clamping bolt for the head members.

In order to absorb the compressive stresses arising when the planking or form is braced by these devices of the invention, and in order to thus prevent the head member from being pressed thereinto, the contacting or bearing part containing the annular surface is preferably provided as an annular disc which is connected with the head member by means of deformable supports or the like arranged at the periphery therof which will be deformed by the compressive stresses applied by the clamping bolt to the head member thereby preventing the latter from being pressed into the form. For the same purpose, it is also possible that the bearing or contacting part which is provided as an annular disc may be supported on the head member by means of a projecting collar portion surrounding the aperture of the blind-end bore, which collar is also deformable to prevent the head member from being pressed into the form. Finally, the disc-shaped contacting part may, in this case, additionally also be subdivided into at least two annular sectors which are connected, by means of brackets or supports extending preferably outside of the head member.

Furthermore, during the assembly of the device and when screwing in the second clamping bolt in order to prevent the device as well as the first clamping bolt from rotating at the same time, it is advantageous that the bearing or contacting surfaces of the clamping bolt heads facing the planking or form have either projections or arched-out portions, and that the supporting discs through which extend the clamping bolts have curvatures, rib portions, or the like which project against the clamping bolt heads and which engage, in turn, between the projections or the arched-out portions of the clamping bolt heads, thus effecting the desired sability against rotation.

Brief description of the drawing

Several embodiments of the bracing and spacing device proposed by the present invention, as well as details thereof, are illustrated, by way of example, in the attached drawings, wherein:

FIGURE 1 illustrates the device according to the present invention in its operative position in sectional view;

FIGURE 2 shows the right-hand part of the device illustrated in FIGURE 1 in a longitudinal cross-sectional view;

FIGURE 3 is a lateral view of the head member;

FIGURE 4 is a top plan view of the head member;

FIGURE 5 is a front elevational view of the head member;

FIGURES 6 and 7 show specific designs of the heads of the clamping bolts as well as of the coordinated supporting discs;

FIGURES 8 through 11 show specific designs of the head members; and

FIGURES 12 to 16 show in cross section deformations of the brace ends in accordance with the invention.

Description of the drawing

The clamping and expanding device illustrated in sectional view in FIGURE 1 comprises two rod-shaped metal braces **1** extending parallel with respect to each other. The suitably deformed or at least roughened ends **2** of these braces **1** are inserted in pairs into head members **3** made from synthetic material, which members **3** connect the braces **1** with another. The head members are provided with annular bearing surfaces **4** which contact the planking or form boards **5** thereby bracing and accurately spacing these forms at a distance D from each other.

In order to be able to press these planking boards **5**, for example by means of spacing members, which may take the form of square timbers designated with reference numerals **6** and **7**, against the end faces **4** of the

head members 3, thus securing them in position, clamping bolts 8 are provided which extend through interspaces 9, provided between the square timbers 6 and 7, and through bores 10 in the planking boards 5 and are screwed with the threaded shaft or shank 11 thereof into the internal thread 12 of a concentric blind-end bore 13 disposed in the corresponding head member 3. For the purpose of facilitating this insertion or introduction of the clamping bolts 8 into the blind-end bore 13, the opening 14 of this blind-end bore 13 widens conically in the manner illustrated in FIGURES 3 and 5. Finally, a supporting disc, identified with reference numeral 15, is positioned against the spacing members 6 and 7 and engages with the head 16 of the bolt 8 thereby enlarging the bearing surface of the head 16 of the clamping bolts 18 on the spacing members.

As is further apparent from FIGS. 3 to 5, the annular portion 17 of the head member 3 is provided concentrically with the blind-end bore 13 whereas the two projections 18 of the head member 3, serving for receiving the brace ends 2, will assume an eccentric position and are slightly set back with respect to portion 17. Due to this particular design and configuration of the head members 3, the latter constitute a structural element which is out-of-round. As a result, after the concrete has been poured between the planking boards 5 and has hardened, this head member is securely seated in the concrete and can no longer become twisted even when the clamping bolts 8 are withdrawn. Both a reinforcement of the head member 3 and a guarantee against the torsional displacement thereof may additionally be attained by the provision of rib portions, designated by reference numeral 19, which are disposed in each case within the area of the projections 18. The end faces 20 of these rib portions 19 projecting beyond the eccentric projection 18 terminate flush with the annular end face 4 of the annular portion 17 surrounding the blind-end bore 13 and thus constitute an enlarged bearing surface for the planking boards 5.

In the illustrated embodiment of the head members 3, which is particularly suitable for visible surfaces of the concrete, the concentric structural part 17 also projects forwardly only to the extent of the eccentric projections 18 in the manner as seen in dashed lines in FIGURES 3 and 4. In this case, the rib portions 19 projecting over both structural elements 17 and 18 are provided crosswise and constitute cross-shaped bearing surfaces, as has been illustrated in FIGURE 5. The inner rib portions 21 will then protrude into the plane of the internal thread 12 and a thread identical to the internal thread 12 is then cut into the rigdes 22 thereof facing the threaded shaft 11. Due to this construction, the concrete introduced into the form will settle between the individual rib portions 19, and the rib portions 21 will support the set or hardened concrete and prevent the concrete in this area from breaking out when the clamping bolts 8 are removed from the head members.

The manipulation or operation of the device according to the present invention is extremely simple: When one of the planking or form walls has been erected, the clamping bolts 8 coordinated to this wall are inserted through the bores 10 provided in the planking boards 5 and screwed into the head member 3 facing the same thereby securing the head member 3 firmly to the wall. Thereafter, the other planking or form wall is erected and the head member is secured to this wall by means of its clamping bolt 8. The braces 1 are then inserted in the apertures provided in the head members 3. By means of a simple tightening of the clamping bolts 8 on both sides of the form the planking or form may be rigidly clamped, which assures that the inside distance, in other words, the inside width D between the planking boards 5 is constant over the entire form. After the removal of the clamping bolts 8 as well as of the planking boards 5, after the concrete has set, the entire device remains in the hardened concrete, and the braces 1 and head members 3 are completely covered by the concrete except for the end faces 4 and 20 and the orifices 14 thereof.

In order to prevent the device and the first clamping bolts 8 from rotating when the second clamping bolt 8 is screwed in or tightened, projections or teeth designated by reference numeral 24 are disposed, in a manner shown in FIGURE 6, at the bearing surfaces 23 of the clamping bolt heads 16 facing the supporting discs 15 and thus project against the supporting discs 15 during securing of the bolt and come to rest against one or more projecting flange or stop members 25 on the supporting discs 15, thereby preventing any further rotation of the clamping bolt 8. Instead of the projections 24 it is also possible to provide the bearing surfaces 23 of the clamping bolt heads 16 facing the supporting discs 15 with a recess or recesses 26 corresponding in shape to the stop member 25 of the supporting discs 15 into which the reinforcement 25 meshes in the manner illustrated in FIGURE 7, thus securing the clamping bolt head 16 against a displacement or further rotation thereof.

In order to conceal the head member 3 in the concrete as much as possible, it is advisable to tighten the clamping bolts 8 only lightly, or to loosen the same again to some degree after tightening thereof. Since the planking boards 5 will be pressed outwardly to some extent due to the weight of the concrete, any outflow of the concrete through the bores 10 provided in the planking boards 5 must be prevented in order to obtain a smooth concrete surface. For this purpose, the provision and design of the head member 3, according to FIGURE 8, proposes that at the annular bearing surface 4 thereof a projecting collar 27 be disposed which surrounds the orifice 14 of the blind-end bore 13 and engages by means of the pointed end rim 28 thereof with the planking board 5 to which it is secured, thereby guaranteeing a faultless closure. If the bearing surface 4 of the head member 3 is additionally curved away from the planar surface of the planking board 5 in a arcuate manner, the concrete may penetrate also between the planking board 5 and the bearing surface 4 of the head member 3 so that the essential end face of the head member 3 is also covered with concrete and thus will no longer be visible.

FIGURES 9 through 11 illustrate advantageous structural designs of the head member 3 in order to prevent a penetration thereof into the planking board 5, which would result in an undesirable projecting of the head member from the finished concrete surface. For this purpose, the head member 3, illustrated in FIGURE 9, comprises a separate fitting or bearing part provided as an annular disc 29 which is connected to the head member 3 by means of a plurality of deformable brackets 31 disposed along the outer periphery 30 thereof. If, in this embodiment of the head member 3, the respectively coordinated clamping bolt 8 is tightened to too great an extent, the resultant pressure will be absorbed by virtue of the deformation of the bracket 31 and any penetration of the annular disc 29 into the planking board 5 is thereby prevented.

In the embodiment shown in FIGURE 10, the annular disc 29 is supported by means of a collar 32 which surrounds the orifice 14 of the blind-end bore 13, and is subjected to the deformation and absorbs excessive forces applied by the clamping bolts in a manner similar to brackets 31 in FIGURE 9. This collar 32, which may also be provided with recesses to make it more easily deformable, if desired, has additionally such a weakening effect that the annular disc 29 may be broken out of the concrete after the same has set. If the thus resulting recess is filled with fresh mortar, the head member 3 remaining in the concrete will be completely invisible.

With respect to the embodiment of FIGURE 11, two half discs 33, for example, of semi-circular configuration enclose the clamping bolt 8 and are connected with the jacket 34 of the head member 3 by way of brackets 35. At the time the clamping bolts 8 are tightened, the pres-

sure will be applied from the planks 5 to the half discs 33 so as to bend the brackets 35 until they break off, which in turn, will result in the removal of the half disc 33. Accordingly, the head members 3 will be invisible in the face of the concrete in this case also.

FIGURES 12–16 illustrate the possibility of achieving, by a deformation of the ends 2 of the braces 1, a highly secure anchoring of the braces in the plastic head members 3 and therewith also a good transmission of the tractive forces between these members. As is apparent from FIGURES 14–16, the bracket ends 2 may be deformed, as by being squeezed off or pressed in such a manner that the cross section thereof may obtain an either triangular, rectangular or also rhombic configuration.

Additionally, and according to FIGURES 12 and 13, rib portions designated by reference numerals 36 and 37 may be formed into the brace ends 2. The rib portions 36 are formed at the upper side extend transversely to the longitudinal axis of the bracket ends 2, whereas the rib portions 37 formed at the underside are, instead, inclined with respect to the axis of the brackets. The inclination of these rib portions 37 may, in that case, be so chosen that these rib portions 37 will be provided immediately adjacent the transverse rib portions 36 so that practically a continuous rib 36–37 will be formed following approximately a screw line.

Thus, while I have shown and described several embodiments in accordance with the present invention, it is obvious that the same is not limited thereto, but is susceptible to numerous changes and modifications as known to a person skilled in the art, and I therefore do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A bracing and spacing device for concrete wall forms of the type which is inserted between oppositely positioned forms at spaced intervals so as to brace and accurately space said forms comprising

a pair of noncorrosive head members each capable of being secured to the inner face of a form by means of a fastening member inserted through said form from the outer face thereof, and

at least two elongated brace members having their respective ends secured to said pair of head members so as to extend substantially parallel to one another.

said head members being axially non-symmetrical so as to be incapable of rotation when imbedded in substantially solid concrete,

said head members being provided with bore means in the form of a blind-end bore for lockingly receiving said fastening member.

2. A bracing and spacing device for concrete wall forms according to claim 1, projections including blind-end recesses opening oppositely to said blind-end bore disposed eccentrically on said head members for receiving and securing the ends of said brace members in said head members, said blind-end bore being disposed concentrically in said head members.

3. A bracing and spacing device for concrete wall forms according to claim 2, said head member being made of synthetic material.

4. A bracing and spacing device for concrete wall forms according to claim 2, the ends of each of said brace members being deformed so as to securely engage with said head members.

5. A bracing and spacing device for concrete wall forms according to claim 4, the ends of said brace members being squeezed off so as to have a cross section of regular geometric non-circular configuration.

6. A bracing and spacing device for concrete wall forms according to claim 5, the outer ends of said brace members being provided with rib portions extending transversely to the longitudinal axis of said members.

7. A bracing and spacing device for concrete wall forms according to claim 2, said blind-end bore being widened concially outwardly at the opening thereof, the end face of each said head member surrounding the opening of said blind-end bore being provided as an annular surface.

8. A bracing and spacing device for concrete wall forms according to claim 2, support ribs positioned on said head members in the area of said projections for increasing the area of the end face thereof.

9. A bracing and spacing device for concrete wall forms according to claim 7, said annular surface of said head members being arcuate in cross section so as to slope away from the center.

10. A bracing and spacing device for concrete wall forms according to claim 9, a projecting collar provided in said annular surface forming the opening for said blind-end bore.

11. A bracing and spacing device for concrete wall forms according to claim 7, said annular surface forming part of an annular disc, said annular disc being connected to the remainder of said head member by means of deformable support means, collapsible in response to axial pressure on said annular disc.

12. A bracing and spacing device for concrete wall forms according to claim 11, said annular surface of said head members being arcuate in cross section so as to slope away from the center.

13. A bracing and spacing device for concrete wall forms according to claim 11, said deformable support means being provided as a collar integral with said annular disc and forming an enlarged portion of said blind-end bore.

14. A bracing and spacing device for concrete wall forms according to claim 2, said fastening members being in the form of threaded clamping bolts having a head portion, supporting disc means engaging with the head portion of said clamping bolt for increasing the bearing surface thereof, and stop means on said head portion and said supporting disc means for preventing relative rotation thereof, said stop means being in the form of at least one projection on the periphery of said head portion and an arched portion on said supporting disc means in line with the periphery of said portion, and a recess in said head portion having a shape corresponding to said arched portion.

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