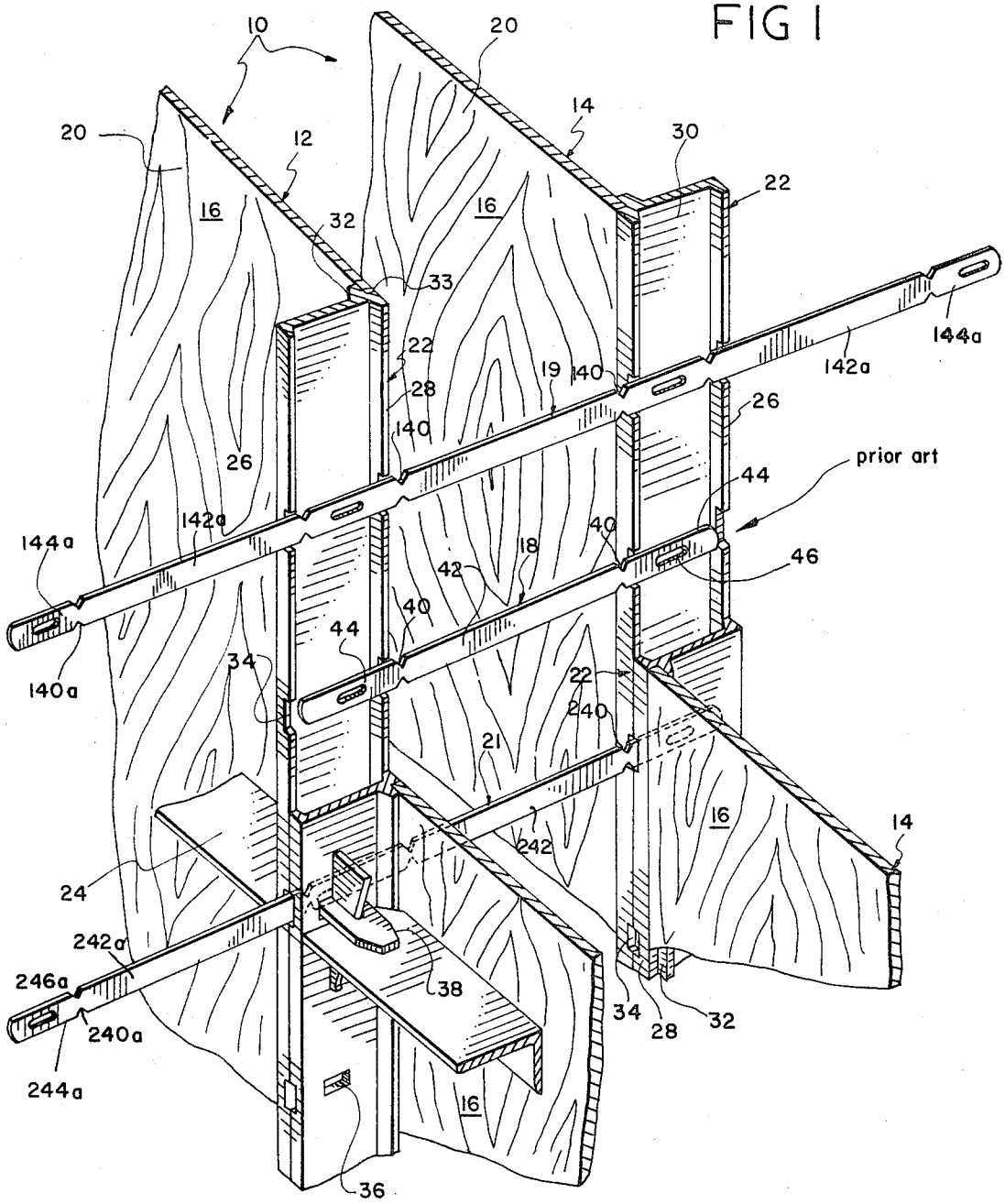
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MULTI-UNIT TIE ROD FOR A CONCRETE WALL FORM

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FIG 1

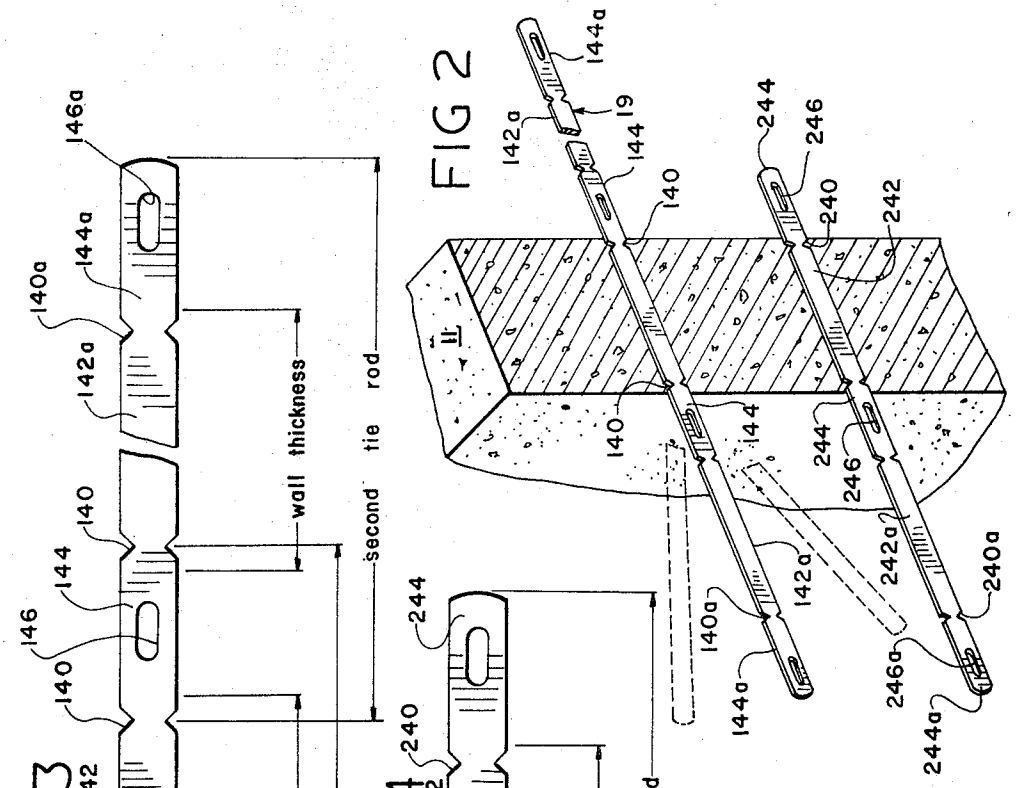


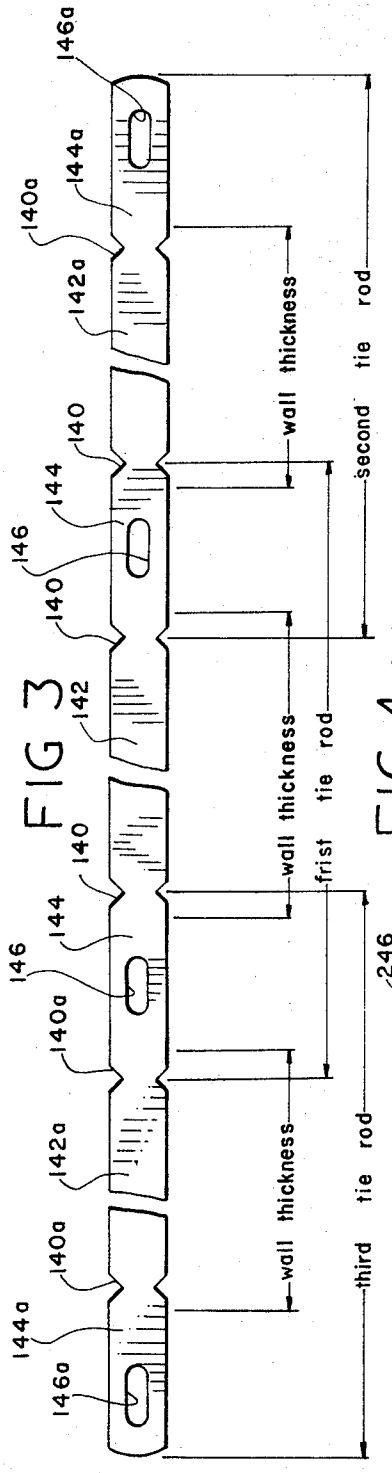
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ATT'Y

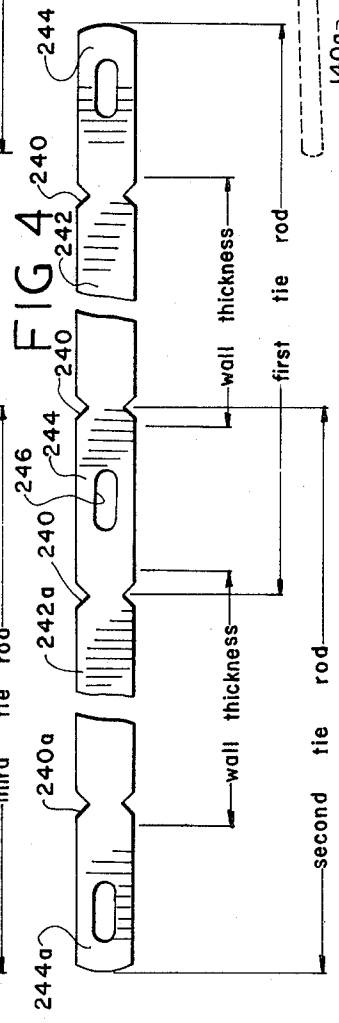
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MULTI-UNIT TIE ROD FOR A CONCRETE WALL FORM

Filed Oct. 24, 1965 2 Sheets-Sheet 2







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MULTI-UNIT TIE ROD FOR A CONCRETE WALL FORM

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3 Claims. (Cl. 249—214)

ABSTRACT OF THE DISCLOSURE

A multi-unit rod designed for use in successive concrete wall form installations and wherein the protruding end portions of the first installation are reclaimable for use in subsequent installations without modification by breaking them away from the poured and hardened concrete of such first installation.

The present invention relates generally to tie rods for use in connection with concrete wall forms and the like and has particular reference to that type of tie rod which is designed for use in maintaining a pair of opposed series of edge-to-edge concrete wall form panels in properly spaced relationship and in holding such series against outward displacement during pouring of the concrete therebetween. Still more specifically, the invention is concerned with flat frangible tie rods of the general type which is shown and described in United States Patent No. 2,948,045, granted on Aug. 9, 1960, and entitled "Tie Rod Assembly for Concrete Wall Forms and Cone Therefor." Such tie rods are adapted to project through the two opposed and spaced apart series of wall form panels and the intervening concrete so that, after hardening of the concrete and removal of the panels, the projecting ends of the tie rods may be bent, twisted or otherwise "worked" in various directions to weaken the metal of the rods at the regions where they enter the concrete and ultimately rupture or sever the projecting ends from the medial embedded portions of the rods.

It is common practice, in connection with such a frangible tie rod, to weaken the metal of the tie rod at regions which lie within the concrete mass so that after breaking away the ends of the rod as outlined above, the retained embedded portion thereof will lie wholly within the confines of the concrete mass and present no protruding ends or otherwise create irregularities in the concrete wall side surfaces and thereby interrupt the continuity or smoothness thereof. To render the tie rod frangible at these inner regions, it is customary to notch the tie rod at opposed spaced regions along the opposite sides of the rod, the portion of the rod between the notched regions and the end extremities of the rod being employed for wall panel anchoring purposes and being slotted so that various types of concrete wall form hardware may be applied thereto to hold the associated concrete wall form panels and such associated extraneous devices, as, for example, waler supporting brackets, anchor devices, and the like, in their erected or assembled condition. After stripping of the panels from the hardened concrete wall, the projecting ends of the tie rod which, as aforesaid, are broken away, represent scrap material.

It has been estimated that approximately 95% of the cost of producing a tie rod resides in the cost of the metal of the rod, the fashioning or stamping of the tie rod from the base metal being a minor cost item. Where a six inch concrete wall span, for example, is considered, the two approximately three inch protruding end regions at the ends of the tie rod represent one-half of the bulk of the tie rod.

The present invention provides a means for reclaiming

these protruding end portions of the tie rods by causing them to constitute, in effect, end portions of additional tie rods subsequently to be used in a separate concrete wall form installation or installations. Thus, according to the invention, multiple tie rods in the form of single lengths of tie rod stock are provided, each such tie rod consisting of alternately arranged sections which, in use, constitute the protruding portions, and sections which, in use, constitute the embedded sections. In use, any three consecutive sections, inclusive of only one medial embedded section, may be employed in the manner of a conventional tie rod and then, after the panels and associated hardware have been stripped from the finished concrete wall, the sectional length of protruding tie rod stock on either or both sides of the wall may be twisted from its anchorage in the concrete wall in the usual manner and the thus salvaged portions will embody one or more complete and operative tie rods ready for a subsequent installation, depending upon the number of tie rods embodied in the original length of tie rod stock.

For practical reasons, especially to avoid undue lengths of tie rod protrusion on a given concrete wall form installation, three, or at the most four, tie rods will be embodied in a single length of metallic tie rod stock. Two tie rods, appropriately named a "bi-rod," when contained in a single length of stock provide a structure which is entirely feasible and may save approximately four inches of metal. Three tie rods, thus contained and termed a "tri-rod," may save approximately seven inches of stock.

Tie rods constructed according to the principles of the present invention involve no special manufacturing operations or equipment over and above conventional tie rod manufacturing equipment, the forming process being merely a matter of handling the flat stock in longer lengths than conventional lengths. Furthermore, in actual use, the tie rods are applied in the manner of conventional tie rods and, in the installation thereof, practically all of the items of concrete hardware which are capable of being used in connection with conventional tie rods are useable with the multi-unit tie rods of the present invention.

The provision of a multi-unit tie rod of the character briefly outlined above and possessing the stated advantages constitutes the principal object of the present invention. Other objects and advantages of the invention will readily suggest themselves as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, two illustrative embodiments of the invention are shown.

In these drawings:

FIG. 1 is a fragmentary perspective view, partly in section, of a concrete wall form installatoin showing two embodiments of the multi-unit tie rod operatively applied thereto;

FIG. 2 is a fragmentary perspective view, partly in section, of a concrete wall form installation showing two produced by the concrete wall form of FIG. 1, with one of the multi-unit tie rods in position within the hardened concrete preparatory to fracture and removal of the protruding end portions thereof;

FIG. 3 is a side view of a three-unit tie rod, such view illustrating, by legending, the tie rod's manner of use; and

FIG. 4 is a side view, similar to FIG. 3, but showing a two-unit tie rod.

Referring now to the drawings in detail and in particular to FIG. 1, a fragmentary portion of a composite concrete wall form of more or less conventional construction is illustrated therein and designated in its entirety by the reference numeral **10**. The wall form is made up of two opposed and spaced apart series **12** and **14** of rectangular panels **16** with the panels of each series being arranged in edge-to-edge relationship. The panels **16** of

the two series are maintained in spaced parallel relationship by means of tie rods, one such rod **18** being in the form of a three-unit construction, another such rod **19** being in the form of a two-unit construction, and a third tie rod **21** being of conventional one-unit construction. The erected concrete wall form **10** is designed for the production of a concrete wall **11** such as is fragmentarily shown in FIG. 2.

The individual panels **16** selected for illustration herein are conventional in their design and no claim is made herein to any novelty associated with the same, the novelty of the present invention residing rather in the construction and design of the tie rods **18** and **19**. The illustrated panels are of the prefabricated type, which is to say, that they consist of rectangular plywood facings **20** having steel marginal rectangular reinforcing frames applied to the outer faces of the panels and consisting of vertical and horizontal frame bars, only the vertical bars **22** being illustrated herein. At appropriate levels in the form structure, suitable intermediate horizontal frame struts or bars **24** of angle shape may extend across the panels between the opposed vertical frame bars **22**.

Specifically, the vertical frame bars **22** are in the form of structural steel members which are generally of shallow U-shape cross section, including spaced marginal parallel ribs **26** and **28** and a connecting base or web portion **30**. On the side of the web portion **30** opposite the ribs **26** and **28**, a shallow longitudinally extending rib **32** defines an angular groove or recess **33** for reception therein of the adjacent vertical edge region of the plywood panel facing **20**. The end horizontal frame bars and the intermediate frame bars **24** are welded to the inside faces of the vertical frame bars **22**. At vertically spaced regions along the vertical frame bars **22**, the ribs **26** and **28** are notched as at **34** to accommodate the tie rods **18** and **19**, while the web portions **30** are formed with rectangular openings **36** in horizontal register with the notches **34** for reception therethrough of conventional connecting bolt and wedge assemblies **38** by means of which adjacent panels are clamped together.

Considering now the conventional tie rod **18**, this rod is in the form of a length of flat sheet metal (steel) stock of rectangular cross section and of a longitudinal extent somewhat greater than the over-all width of the spaced series **12** and **14** of the wall form panels **16**. At regions spaced inwardly from the opposite ends of the tie rod **18**, the metal of the tie rod is relieved by the provision of respective pairs of opposed break-off notches **40**, thus weakening the metal of the tie rod at these regions. The break-off notches **40**, in effect, divide the tie rod **18** into three sections, namely, a medial section **42** and two end sections **44**. The medial section **42** constitutes a fixed section which is adapted to remain embedded in the hardened concrete of the wall **11** and the end sections **44** constitute free sections which are adapted to be removed by fracturing the tie rod along transverse lines extending across the opposed notches after the panels **16** have been stripped from the concrete wall **11**. Fracture is accomplished by either striking the end sections with a hammer or twisting the protruding end sections **44** and working the same back and forth in all directions until such sections break loose from the embedded medial section **42** of the tie rod at break-off points established by the notches **40**, all in a manner well-known in the art. Each end section **44** is provided with an elongated slot **46** which is designed for cooperation with one of the wedge and bolt assemblies **38** in removably maintaining the adjacent end of the tie rod secured to its associated panels **16**, likewise in a well-known manner.

From the above description, it will be appreciated that the two end sections **44** of the tie rod **18** represent disposable sections which are discarded after they have been broken off from the medial section **42** of the tie rod. Considering the fact that approximately 95% of the cost of a tie rod is represented by the metal of the rod, these disposable end sections **44** constitute an appreciable item of waste. It is an object of the present invention to reduce this waste to a minimum and, accordingly, the tie rods **19** and **21** have been designed in such a manner that, when employed in any given concrete wall form installation, an appreciable amount of tie rod stock metal may be salvaged.

Considering now the tie rod **19**, and referring additionally to FIG. 3, there is disclosed therein a multiple or multiunit tie rod including three sections **142**, **144**, **144** which (considered as a unit) correspond in configuration to the sections **42**, **44**, **44** of the tie rod **18** and are useable in the same manner when the tie rod **19** is installed in a concrete wall form structure. The section **142** constitutes a medial section and the sections **144** constitute end sections having slots **146** therein for the same purpose as the slots **46** of the tie rod **18**. Notches **140** separate the medial section **142** from the end sections **144**.

The tie rod **19** is further provided with two auxiliary medial sections **142***a*, adjoining the end sections **144** and separated therefrom by opposed notches **140***a*. Short auxiliary end sections **144***a* are also provided and are separated from the medial sections **142***a* by similar opposed notches **140***b*. The longitudinal extent of the auxiliary medial sections **142***a* corresponds to the longitudinal extent of the medial section **142** and, similarly, the longitudinal extent of the auxiliary end sections **144***a* corresponds to the longitudinal extent of the end sections **144**. The auxiliary end sections **144***a* are formed with elongated slots **146***a* therein.

In actual use, the tie rod **19** may be installed in a concrete wall form in the manner illustrated in FIG. 1, the medial section **142** being disposed between the opposed and spaced apart series **12** and **14** of panel **16** and the end sections **144** being applied to the adjacent panels **16** by means of associated wedge and bolt assemblies **38**. After the concrete has been poured between the two series of panels and has become hardened, a structure such as is shown in FIG. 2 will result. As indicated in this view, and also as shown by the labelling of FIG. 3, the three sections **142**, **144**, **144** constitute a first tie rod unit which is useable in precisely the same manner as the conventional tie rod **18** and, after stripping of the form from the wall **11**, leaves two projecting end portions on opposite sides of the wall. Each of these projecting end portions includes a complete auxiliary tie rod unit that is capable of use in a succeeding installation, each auxiliary unit comprising a medial section **142***a* and two end sections **144***a*. Each end section **144** of the first tie rod unit is common to the first tie rod unit and to one of the two other auxiliary tie rod units, the latter being labelled as the second and third tie rod in FIG. 3.

As shown in FIG. 2, after the concrete of the wall **11** has become hardened, the two protruding end sections which comprise the completely useable second and third tie rods may be released from the wall by hammering or working the same back and forth as shown in dotted lines until a rupture occurs at the region of the opposed notches **140**. The end sections **144** of the first tie rod (which in the case of a conventional tie rod such as the rod **18** ordinarily represents scrap metal that must be discarded) now constitute end sections for the second and third tie rods which, because they are slotted, are capable of attachment to the concrete wall form panels of a succeeding wall form installation in the usual manner by bolt and wedge assemblies **38**.

In FIG. 4, a two-unit tie rod construction, previously designated at **21**, is illustrated in detail. This tie rod includes a medial section **242** that is separated by notches **240** from two short attachment sections **244** having slots **246** therein. The three sections **242**, **244**, **244** constitute a first tie rod (so labelled) in which the medial section **242** is designed for embedment in the concrete wall **11** and the two slotted end sections are designed for attachment to the panels **16** of an associated wall form struc-

ture by means of wedge and bolt assemblies **38**. As shown in FIG. 2, after the concrete wall has become set and the panels **16** stripped therefrom, a disposable end section **244** protrudes from the wall on one side thereof, but on the other side a complete auxiliary or second tie rod including a medial section **242***a* and two end sections **244***a* and **244***a* protrudes from the wall and is adapted to be salvaged therefrom by twisting or otherwise working the same so that cleavage will take place in the region of the adjacent pair of opposed notches **240**.

The above-described methods of tie rod installation are merely exemplary methods and it will be observed that either the tie rod **19** or the tie rod **21** is reversible in use in that it may be turned end-for-end and applied in a concrete wall form installation. The various sections of either tie rod are sequentially symmetrical whether the tie rod is considered from left to right or from right to left. Stated otherwise, what has been labelled in FIG. 3 as the first, second and third tie rods, could readily have been labelled, first, third and second tie rods respectively. In short, after an initial use of any one tie rod section in a first wall form installation, two additional tie rods are available for use in subsequent installations. In a similar manner, after an initial use of any three adjoining sections extending inwardly from either end of the tie rod **21**, a complete and second useable tie rod is available for a subsequent installation.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particularly pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A multi-unit tie rod adapted for successive use in different vertical faced concrete wall form installations, said tie rod consisting of a single length of flat tie rod stock and including a first tie rod unit comprised of a medial section designed for embedment centrally in a first concrete wall, and two end sections divided from the medial section by first and second weakened break-off points, each end section being adapted to protrude from the opposite sides of the first wall and being provided with a slot therein by means of which it may be attached to a wall form, said multi-unit tie rod further including a second tie rod unit comprised of an auxiliary medial section designed for subsequent embedment centrally in a second concrete wall, said medial section of the second tie rod unit adjoining one of the end sections of the first tie rod unit and being separated therefrom by a third weakened break-off point, said second tie rod unit further including an auxiliary end section adjoining said auxiliary medial section and being disposed on the end thereof remote from said one end section of the first tie rod unit and being separated from said auxiliary medial section by a fourth weakened break-off point, said auxiliary end section being adapted to protrude from one side of the second concrete wall and being provided with a slot therein whereby it may be attached to a wall form, said second tie rod unit also including said one end section of the first tie rod unit, said latter one end section being adapted to protrude from the other side of the second concrete wall, all of said weakened break-off points being in the form of metal-weakening notches which lie in transverse planes of separation between adjacent tie rod sections.

2. A multi-unit tie rod as set forth in claim **1** and wherein the medial sections of the first and second tie rod units are identical in length and each has a longitudinal extent slightly less than the width of the concrete wall within which it is adapted to be embedded, whereby the break-off points which separate such medial sections from their respective adjacent end sections will lie inwardly of and in close proximity to the vertical faces of the respective concrete walls within which such medial sections are centrally embedded.

3. A multi-unit tie rod as set forth in claim **2** and including, additionally, a third tie rod unit which is identical in construction to that of the second tie rod unit, the medial section of said third tie rod unit adjoining the other end section of the first tie rod unit and being designed for embedment centrally in a third concrete wall with the end sections thereof protruding from the opposite sides of such third wall, said other end section of the first tie rod unit constituting an end section of the third tie rod unit, whereby said tie rod is of complementary design on opposite sides of a central transverse plane and is thus comprised of seven serially arranged tie rod sections.

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