

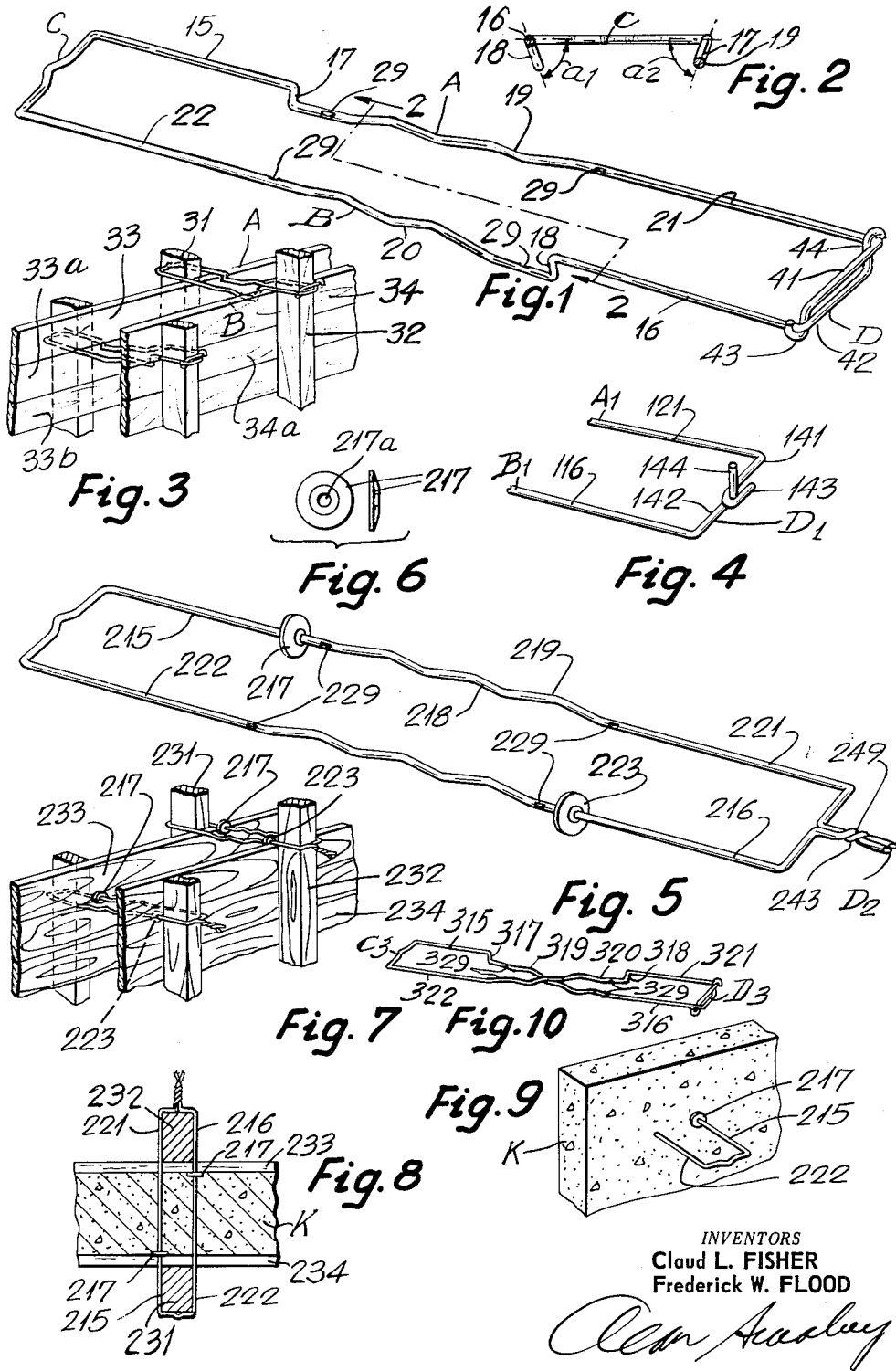
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FORM TIES

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1

2

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FORM TIES

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1 Claim. (Cl. 249—214)

This invention relates to form ties.

A popular type of form tie is made up of a single length of wire shaped to constitute a substantially rectangular frame having elongated sides and transverse ends at one of which the free ends of the wire are connected. Spacing means is provided at the sides and spaced from the ends so as to engage respective sides of formwork and to space them apart accurately.

In a number of form ties of this general type, there are end parts which surround the uprights of the formwork and which are separated from intermediate substantially parallel parts either by a jog or by some other means constituting a spacer. One of the disadvantages of these form ties is that the intermediate part which remains in the concrete is perpendicular to the face of the concrete. It is an aim of the present invention to provide a form tie in which the intermediate part of the form tie left in the concrete is at an angle to the perpendicular so that it can less easily be withdrawn by a pull perpendicular to the face of the concrete.

Another disadvantage of existing form ties is the difficulty of connecting the ends and it is therefore a further aim of the present invention to provide simplified end connecting means.

More specifically, a preferred form tie in accordance with the invention comprises a single length of metal wire in the form of a substantially rectangular frame having spaced-apart sides and transverse ends, in which the free ends meet and are joined in a connection at one of the transverse ends. Each side has at each end a straight part adapted to embrace an upright and to overlap the edge of a board of the formwork. The straight parts are parallel to each other and in the same plane. Each side has a downward and inward jog at the inner end of one of the straight parts separating its straight part from an intermediate part extending from said jog at an upward and outward angle to meet the straight part at the other end of the side at an angle both in the cross-ways direction of the form as well as in the upward and downward direction. The jogs in the respective sides are toward opposite ends of the form so as to engage boards at opposite sides of the formwork.

This construction has the advantage that only one side of the frame is distorted by a jog and the intermediate parts at both sides of the frame are embedded in the concrete at an angle to the horizontal plane as well as at an angle to the vertical plane. This eccentric placing of the intermediate parts makes it less likely that the intermediate part will be pulled out inadvertently by force exerted perpendicular to the concrete.

A preferred end connection in accordance with the invention is made up as follows. Each end piece extends inwardly right across the end of the frame and is provided with a hook which engages the opposite side of the frame. Preferably, each end piece extends at a slight

angle to the plane of the frame. In this case one end piece will extend slightly upwardly and will have a downwardly extending hook and the other end piece will extend downwardly and will have an upwardly extending hook. The end pieces and the hooks are so disposed that the end pieces cross at the ends and also one of the sides is arranged so that it is normally biased resiliently out of the plane of the frame and has to be forcibly brought into the plane of the frame so that the ends can be hooked together, and once hooked the resilience of the biased side will retain the hooks in place.

In another preferred form, the connecting end is made up of the two free ends of the frame being brought in from each of the sides part-way across the end. One of the free ends is turned up to provide a connecting post. The other end is provided with a hook which engages this post.

In another preferred form tie according to the invention, the sides are substantially straight and the form spacing means are washers one on each side of the frame and spaced from opposite ends of the respective sides. Preferably the type of washer is employed that is of a conical shape when it is applied to the wire and when it is flattened out its inner rim bites into the wire and firmly anchors it in place.

Having thus generally described the invention it will be explained in more detail by reference to the accompanying drawings showing preferred embodiments and in which

FIGURE 1 is a perspective view of one type of form tie according to the invention.

FIGURE 2 is a cross-section along the line 2—2 of FIGURE 1.

FIGURE 3 is a perspective view of concrete formwork showing the form tie of FIGURE 1 in position.

FIGURE 4 is a perspective view showing another type of connecting end for a form tie along the lines of that shown in previous figures.

FIGURE 5 is a perspective view showing an alternative type of form tie in accordance with the invention.

FIGURE 6 is a side elevation showing a washer of the type employed in the form tie of FIGURE 5.

FIGURE 7 is a perspective view of formwork showing the form tie of FIGURE 5 in place.

FIGURE 8 is a horizontal cross-section along the line 8—8 of FIGURE 7 showing the relationship of the form tie to the forms and concrete.

FIGURE 9 is a perspective view of a finished concrete wall showing the form tie embedded in it as when the forms are removed and prior to breaking off of the end of the tie.

FIGURE 10 is a perspective view on a reduced scale of an alternative construction of form tie similar to that shown in FIGURES 1 to 3 but in which the intermediate parts cross.

Referring more particularly to FIGURE 1, the form tie is made up of a single length of heavy steel wire bent into a frame having opposite sides indicated generally by A and B and ends indicated generally by C and D. The side A is made up of an initial straight part 15 which extends at right angles from the end C, a short downwardly and inwardly extending part or jog 17, an intermediate part 19 provided with anchoring undulations and which extends upward and outward at an angle to the part 15 to meet a straight part 21 at the other end of

the side A. The side B is similarly made up of a straight part 16 corresponding to the part 15, an inwardly and downwardly bent part or jog 18 corresponding to part 17, an intermediate part 20 provided with anchoring undulations and extending upwardly and outwardly to meet a straight end part 22. The part 19 merges into the part 21 at an outward and upward angle and the part 20 merges into the part 22 at an outward and upward angle. The angles between the jogs 18 and 19 and the end C are shown as a_1 and a_2 respectively. A suitable angle is about 68° but this can vary up to about 120° or can be as little as about 60° . It is understood that the angle must be sufficient for the jogs 17 and 18 to protrude far enough down to engage the inside of the panels 33 and 34.

It is also within the scope of the invention for the lower end of the jog to extend slightly towards the end D so as to provide a sharper engagement with the inside of the form 33 or 34 as the case may be.

The parts 15 and 22 and 16 and 21 are disposed substantially horizontally and are long enough to extend the width of the uprights 31 and 32 of the formwork and to extend across the top boards 33 and 34, as shown in FIGURE 3. The parts 19 and 20 are of sufficient length to extend between the boards 33 and 34. The parts 15 and 22 lie on the top edge of the form board 33 while the parts 21 and 16 lie on the top edge of the form board 34. The parts 17 and 18 abut the inside surface of the forms 33 and 34 respectively so that the forms are spaced-apart accurately the distance along the axis of the frame between the jogs 17 and 18. Another tie is shown which lies between the boards 33 and 33a and 34a.

Each of the sides is provided with pressed indentations or weakened parts 29 at which the wire of the form tie can be broken so as to separate the protruding ends once the tie is embedded in the concrete and the forms removed.

In the particular form tie shown in FIGURE 1 the end D is made up of a part 41 extending inwardly substantially at right angles to the part 21 and provided at its end with a downwardly extending substantially J-shaped hook 43. Likewise the end of the part 16 is provided with a part 42 extending inwardly substantially at right angles to it and provided at its end with an upwardly extending substantially J-shaped hook 44. When the form tie is brought into position and closed as shown in FIGURES 1 and 3, the hook 43 engages underneath the part 16 and the hook 44 engages over the part 21. This structure works best when one of the sides A or B is bent out of alignment with the plane of the frame so that it has to be forcibly brought back into the plane to hook the ends together. For example if the side A is upwardly biased, its tendency to return to its normal bent position forces the part 41 upward against the hook 44 and the hook 43 upwards against the part 41. The structure permits ready engagement of the hooks 43 and 44 or disengagement as the case may be without the necessity of using any tools.

An alternative form of end D₁ is shown in FIGURE 4. In this case the part 116 is provided with a perpendicularly inwardly extending part 142 having an upwardly extending part 144 intermediate the width of the form tie. The part 121 is provided with a perpendicularly inwardly extending part 141 which has a hook 143 which engages the upwardly extending part 144. This is also a convenient means of hooking the ends of the wire together to complete the frame. It is also desirable that one of the sides A₁ or B₁ be bent or biased in such a way that the hook 143 and part 142 are resiliently urged together.

A still further alternative structure is shown in FIGURE 5. Here the parts 215, 219 and 221 are in alignment with exception of the anchoring undulations 218 provided in the mid-portion 219. Likewise, the parts 222, 220 and 216 are in alignment. A washer 217 is provided to separate the parts 215 and 218 and a washer

223 is provided to separate the parts 216 and 220. The washer 217 is of the dished type provided with a central opening 217a providing an edge which on flattening the washer bites into the wire to anchor the washer firmly in place. The washers serve as spacers for the forms 233 and 234 as shown in FIGURES 7 and 8. In these figures the concrete is indicated as K.

To secure the free ends of the wire in this particular construction, these ends 243 and 244 have been twisted together as shown. This is easily done with a hammer claw.

FIGURE 10 shows a still further type of form tie according to the invention. The same basic reference numerals have been used to identify the parts as in FIGURE 1 with the exception that they are in the 300's. This type of form tie is similar to that of FIGURE 1 with the exception that the intermediate parts 319 and 320 cross over. The intermediate part 319 extends from the part 315 to the part 316 and the intermediate part 320 extends from the part 322 to the part 321. The parts 319 and 320 cross each other toward the middle of the tie. The jogs 317 and 318 fall on the same side of the form tie, although they separate the intermediate parts 319, 320 from an end part in the same manner as in FIGURE 1. This tie has the added advantage that the intermediate parts 319 and 320 are at an increased angle to the perpendicular with respect to the face of the concrete than the type shown in FIGURE 1 and are thus less susceptible to withdrawal by a pull perpendicular to the concrete face.

In its broadest sense, this form tie can have a jog separating the straight part 315 from the intermediate part 319 as well as a jog separating the intermediate part 319 from the straight part 316 as well as jogs separating the straight parts 322 and 321 from the intermediate part 320. It is preferred, however, that there be only two jogs preferably both at the same side of the form tie as shown in FIGURE 10 although they can be on opposite sides. Preferably also the jogs extend downwardly and inwardly in the same way as in the form tie of FIGURE 1, although in the broadest sense of the invention, the jogs may extend in any direction but outwards. Downward jogs would then engage the sheeting of the framework, inward jogs the uprights.

It is understood that the various end-connecting means can be interchanged with the different spacing means without departing from the invention. And, the particular spacing means can be used with other connecting means than those shown just as the connecting means can be used with spacing means other than those shown.

The form tie can be made from any suitable bendable form-retaining material, preferably steel wire of a calibre to suit the purpose as will be well understood by one skilled in the art.

We claim:

A form tie, comprising, a length of springable metal wire in the form of a substantially rectangular frame having spaced-apart sides and transverse ends, the free ends of the length meeting in a coupling structure at one of said ends, said one end being made up of one and other end pieces extending inwardly from one and other sides of the frame right across the frame and each carrying a hook, said one end piece extending downwardly with respect to said frame and said other end piece extending upwardly with respect to said frame, the respective hooks facing in opposite directions whereby each is adapted to hook onto the adjacent side in the opposite sense to the other hook whereby the ends may be coupled, and spacing means on said frame spaced from each end thereof to engage each side of the formwork thereby to space it apart, the wire of the frame being normally biased whereby the respective ends are separated and adapted to be springably brought together for a coupling in which the biasing urges the respective hooks against the sides to which they are hooked, said one end piece having a down-

5

wardly open hook and said other end piece having an upwardly open hook.

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