July 18, 1939. J. E. MILLER ET AL 2,166,847

WIRE CLAMP

Filed Sept. 27, 1937 2 Sheets-Sheet 1

Fig. 1.

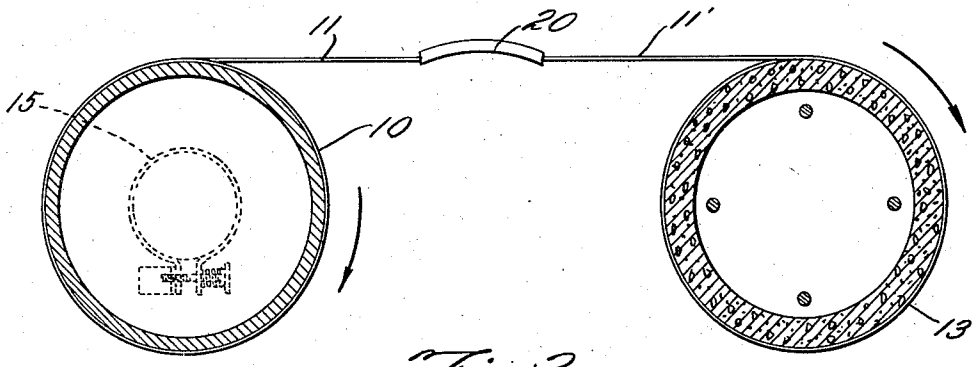


Fig. 2.

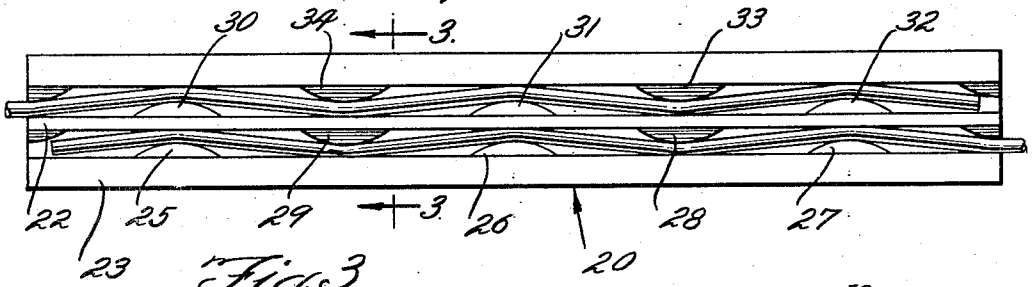
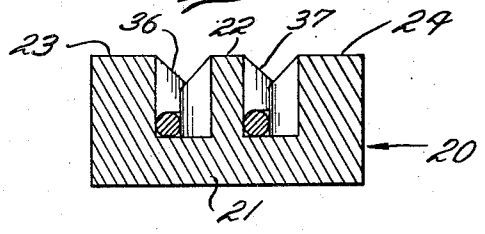


Fig. 3.



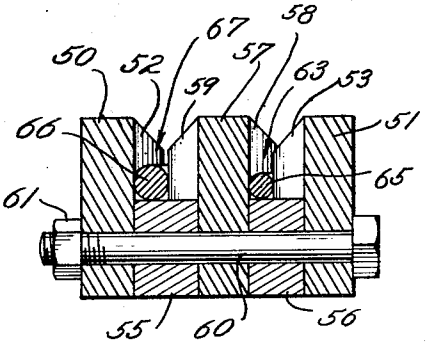


Fig. 5.

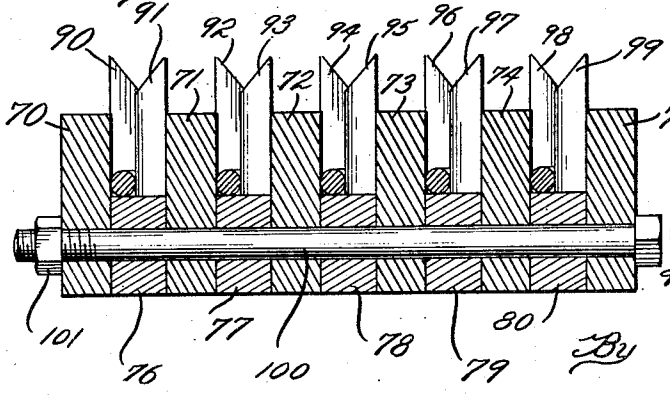


Fig. 4.

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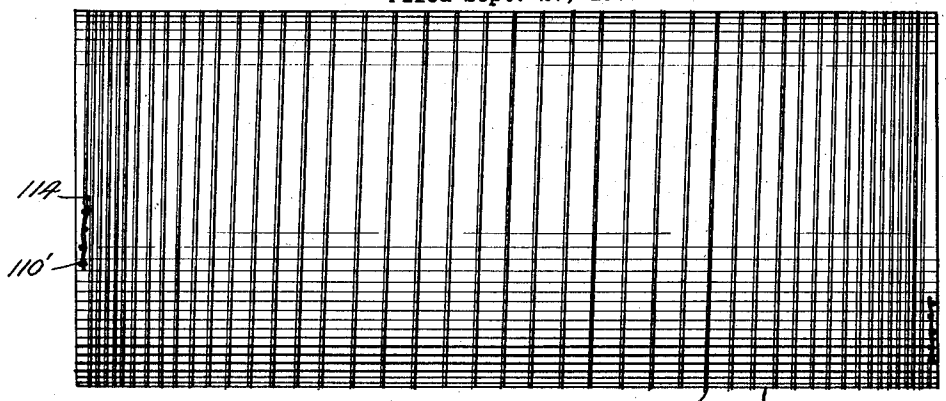


Fig. 6.

Fig. 7

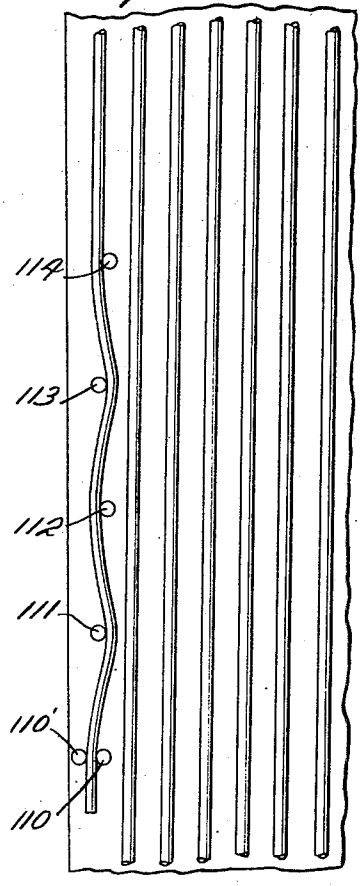


Fig. 9.

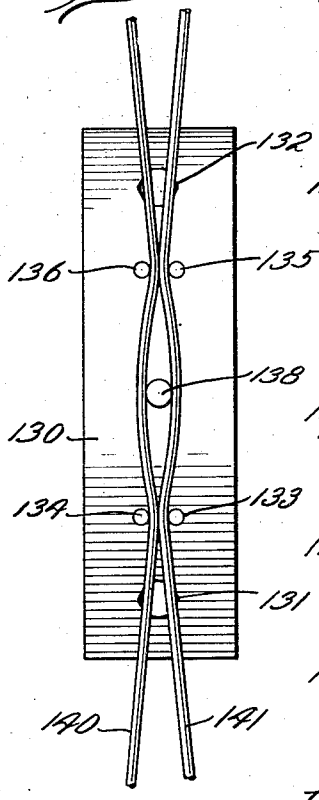
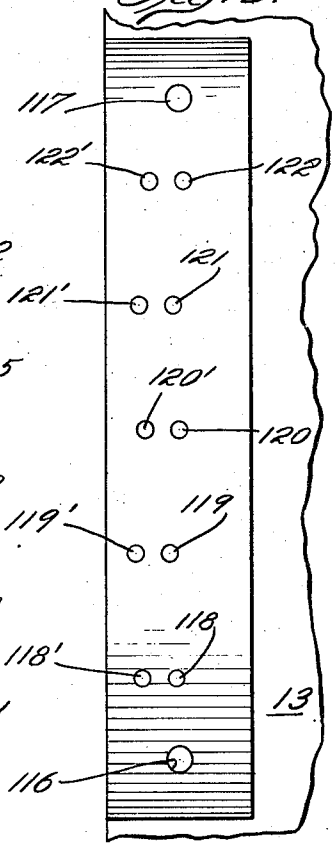


Fig. 8.



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WIRE CLAMP

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Application September 27, 1937, Serial No. 165,863

4 Claims. (Cl. 24—28)

This invention relates to wire clamps for holding the free ends of concrete reinforcing wire. In our application, Serial No. 159,165, filed August 14, 1937, we have disclosed a method of reinforcing concrete pipe by winding wire on said pipe under tension. The wire is originally wound on a primary roll in a substantially untensioned condition and at a pitch determined by the ratio of the diameter of the primary roll and concrete pipe and the desired pitch on the concrete pipe. This wire is thereafter rewound from the primary roll under tension and automatically adjusts itself on the concrete pipe at the desired pitch. As disclosed in the abovementioned application, the wire is tensioned to a value corresponding to over 30,000 lbs. per square inch of cross-section and may go as high as 150,000 lbs. per square inch. In a process of this type, it is clear that a continuous feed of wire is essential. It is impractical to rely upon integral lengths of wire for each pipe section since the wire mills do not, as a rule, supply indefinite continuous lengths of such material. The wire comes in rolls and such rolls may, in practice, be either too long or too short for any one pipe section. Furthermore, if continuous lengths of wire were relied upon, there would be considerable wastage of wire and the speed and utility of the process would be greatly lessened. Furthermore a quick means for clamping the beginning and end of the wire on the pipe is essential.

Because the wire is under a tension which is a substantial porttion of its modulus of elasticity, it is impossible to rely upon any welding junction. In the course of welding, the heating reduces the tensile strength of the wire to a value as low as 45% of the original tensile strength. This reduction is not uniform and, furthermore, the entire tensile strength of the wire would be limited by the weakness of the junction.

An object of this invention is to devise a means for joining concrete reinforcing wire, which will be simple, cheap, which may be quickly applied and which junction may be run off as part of the wire reinforcement. Another object is to devise a simple means for anchoring the wire ends on the concrete pipe. Other and additional objects will appear in connection with the drawings, wherein Figure 1 is a diagrammatic view, showing a pipe being reinforced with wire including a junction. Figure 2 is a top view of the wire junction. Figure 3 is a section on line 3—3 of Figure 2. Figure 4 is a section of the junction, wherein different size wires are used. Figure 5 is a section of a multiple wire junction. Figure 6 shows a concrete pipe with wire end anchoring means. Figure 7 is an enlarged detail of the anchoring means. Figure 8 shows a modified form of anchor. Figure 9 shows another modification.

Referring to Figure 1, the primary roll 10, which may be of steel, concrete or any similar material, has wound thereon, at predetermined pitch, steel reinforcing wire 11. This wire is originally wound on this roll in a normally substantially untensioned condition. Thereafter wire 11 is pulled over to a concrete pipe section 13, which is suitably mounted and rotated clockwise, as shown by the arrow. Any suitable means, such as a brake mechanism 15 on the primary roll 10, may be utilized to retard the rotation of primary roll 10 and impose a tensile strain on the reinforcing wire 11. Because of the predetermined pitch of winding upon primary roll 10, it is clear that wire 11 will be rewound on concrete pipe 13 at a final pitch which depends upon the relative diameters of the two cylinders and the initial pitch upon primary roll 10. This process is more fully disclosed and claimed in our co-pending application referred to above.

To utilize the above reinforcing process more efficiently, a wire clamp or junction 20 is shown as joining the ends of reinforcing wire 11 and 11'. As more clearly shown in Figures 2 and 3, the wire clamp comprises a bottom base 21, having a central upstanding wall section 22, flanked by end wall sections 23 and 24. As clearly shown in Figure 2, between adjacent wall sections are disposed a plurality of protuberances 25 to 34 inclusive. These protuberances preferably have a segmental cross-section and alternate on opposite sides in each of the channels 36 and 37 to produce a tortuous path. The width of each of the channels 36 and 37 between the outer surface of each segmental protuberance and the opposing wall is preferably just a shade less than the diameter of the reinforcing wire. As shown in Figure 3, the protuberances extend upwardly from the bottom of the channels a substantial distance, here shown as roughly about two-thirds of the way and then taper to the side wall from which the protuberances project. As shown in Figure 2, protuberances 25 to 27 inclusive, extending from wall 23, are spaced from each other along the length of the clamp, while the opposing protuberances 28 and 29 from the opposing wall 22 extend midway between the first protuberance. It is preferable to have a symmetrical and uniform arrangement of the protuberances. The distance between adjacent protuberances will depend, in a large measure, upon the pull to which the wire is subjected.

Obviously, the closer the protuberances are to each other, the sharper the curvature of the wire and the more surface is pressed against the wire to create a frictional drag.

In order to dispose the wire in the clamp as shown in Figure 3 with the wire at the bottom of each channel, it is only necessary to dispose the wire in the flared top of each channel 36 and 37. The wire may be disposed straight therein and then hammered down by any suitable means. In fact, a preliminary hammering down of the wire into the channels is sufficient since the tension imposed upon the wire tends to work the wire deeper into the channels.

It is perfectly possible to clamp the wires so tightly in a device of this character that under sufficient tensile strain the wire will part at a point outside of the wire clamp.

The entire junction or clamp may preferably be curved as shown in Figure 1, so that when winding upon pipe section 13, a matched bearing surface will be created with the entire bottom of the clamp resting over the concrete. The matching of the surface of the clamp to the primary roll, if made of steel, is not so important since the steel surface of the primary roll can easily withstand the mismatching of the opposing surfaces. However, it is, of course, perfectly possible to provide bearing blocks, the bottom surface of which will match the primary roll, if desired.

In Figure 4 we have shown a modified form of clamp, wherein the entire construction is formed out of component sections and bolted together. A pair of elongated steel blocks 50 and 51 have segmental protuberances 52 and 53 projecting from one side thereof. As with Figure 2, these protuberances are duplicated at predetermined intervals. These protuberances 52 and 53 extend only part way down, here shown as approximately half way down the side of the blocks, and thenceforth, members 50 and 51 are smooth as indicated in the cross-section. Bearing on the inside smooth portions of blocks 50 and 51 are spacer blocks 55 and 56 of suitable thickness. Between blocks 55 and 56 is an intermediate block 57, having segmental protuberances 58 and 59 from opposite sides thereof and staggered with respect to the opposing protuberances 50 and 51. As with blocks 50 and 51, central block 57 has its lower portion smooth so that the opposing smooth faces all match. Suitably registering apertures are provided at spaced intervals along the length of the clamp and bolts 60 are passed through and the entire assembly maintained intact by nuts 61. As shown in Figure 4, a channel 63, between opposing blocks 51 and 57, is adapted to accommodate a wire 65, which is somewhat smaller than wire 66 in channel 67 between blocks 50 and 57. Obviously, the wires joined by the clamp need not be the same size.

In Figure 5, a multiple clamp is shown wherein blocks 70 to 75 inclusive are provided, separated by spacer blocks 76 to 80 inclusive. Blocks 70 to 75 inclusive are each provided with opposing protuberances 90 to 99 inclusive, the intermediate blocks 71 to 74 inclusive, having such segmental protuberances on opposites thereof. It is understood of course, that these segmental protuberances are staggered with respect to each other as shown in Figure 2 and suitably spaced to provide tortuous channels. As shown, each of these segmental protuberances projects above the blocks proper. The segmental protuberances taper at the top to form wide lead-in channels. The entire assembly is maintained intact by bolts, one of which is shown at 100 with a nut 101. As here shown in Figure 5, five wires may be accommodated so that two wires from one direction and three wires from the other direction may thus be joined. Any number of sections may be provided. In fact, a multiple section clamp is particularly useful at the end of the concrete pipe section where it is customary to space the reinforcing wires close to each other. Wire scraps may thus be used up by joining the ends with clamps to form a multiple wire reinforcement.

Referring to Figure 6, the concrete pipe 13 has wound thereover the reinforcing wire 11 over its entire extent. Preferably, this wire is spaced in a predetermined fashion over the main body of the pipe to give the desired reinforcement. At each end of the pipe, however, the spacing of the wire is closer as indicated. In order to anchor the wire to the pipe, there is preferably embedded in the concrete a series of pins 110 to 114 inclusive. These pins are preferably disposed in the concrete during the making of the pipe. The pins, as clearly shown in Figure 7, are spaced from each other and so disposed that the wire end must be bent in a wave-like form to thread the pins. Obviously, the spacing and disposition of the pins may be determined by experiment and depend upon the tension and size, as well as stiffness of the wire. In order to prevent the free end of the wire from working loose, an auxiliary pin 110' may be provided close enough to pin 110 so that the wire is tightly wedged in.

In Figure 8, a modification is shown, wherein a metal plate 115 is anchored in the concrete pipe by means of pins 116 and 117 at opposite ends of the plate. Between the retaining pins a plurality of apertures 118 to 122 inclusive are disposed in the plate and in these apertures are pins, around which the wire may be threaded. These pins may be removable so that the curvature of the wire may be adjusted to fit the requirements of the occasion. Plate 115 may have wedging pins 118' to 122' inclusive, each one cooperating with the corresponding pin to hold the wire in place. In practice only one wedging pin is necessary, this being at the end of the wire.

In Figure 9, a further modification is shown, consisting of a plate 130 adapted to be anchored by bolts 131 and 132 in the concrete pipe. A pair of pins 133 and 134 are disposed near one end of the plate, these pins being close together and transverse of the plate and a similar pair 135 and 136 is disposed near the other end of the plate. A large pin 138 may be disposed in the center and wires 140 and 141 may be threaded, as shown in the drawings, to provide an anchorage for several wires.

What is claimed is:

1. A wire clamp for joining the ends of reinforcing wire for concrete pipe and the like, comprising a metal block, having upstanding spaced walls defining at least two parallel channels, each of said channels being wider than the thickness of the wire to be joined, and a plurality of curvilinear protuberances extending from opposite sides of each channel, said protuberances being staggered with respect to each other to form a tortuous channel, whose width at the protuberances is just enough to tightly grip the wire disposed therein.

2. The clamp of claim 1, wherein said protuberances taper toward said wall at the top of the channel to permit the wires to be introduced therein.

3. The clamp of claim 1, wherein said clamp consists of a plurality of metal blocks, comprising wall members and spacer members, and bolts for maintaining said members tightly against each other to maintain said channels.

4. In a concrete pipe having helically wound wire reinforcement, a clamp for maintaining a wire end comprising a base block having a smooth face, and a plurality of spaced solid members extending upwardly from the base block on opposite sides of a tortuous path, said members being staggered with respect to each other, each member having a front face which is rounded perpendicular to the height of the member and forming part of the channel boundary for the wire, the curvature on the face being substantially sharper than the curvature of the wire due to the spacing of the members, each member also having the face cut away to form a taper toward the rear of the member.

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