

July 29, 1952

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2,604,986

COILED STRIP OF ELECTRICAL TERMINALS

Filed Sept. 13, 1947

2 SHEETS—SHEET 1

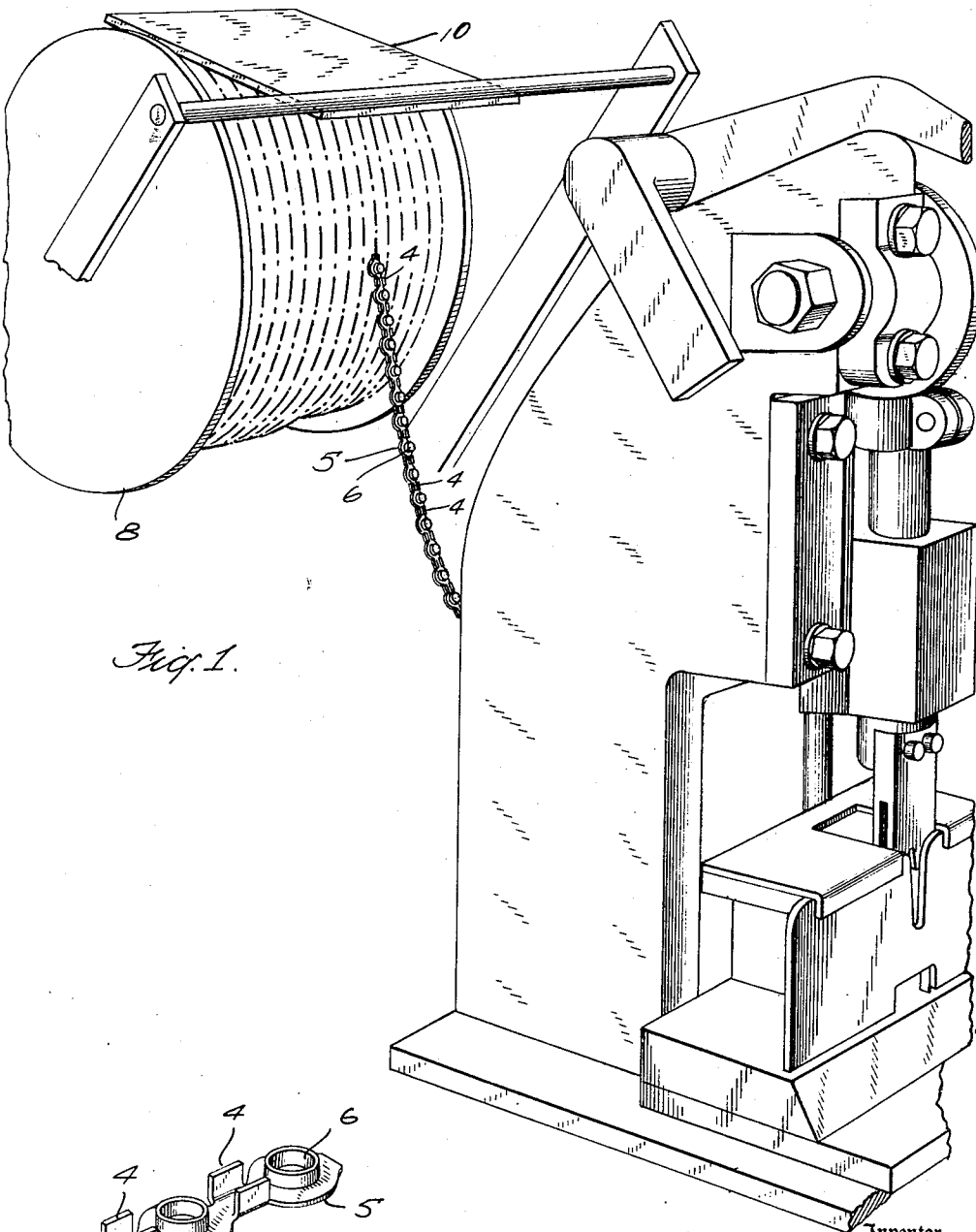


Fig. 1.

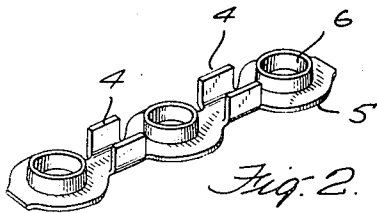


Fig. 2.

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2 SHEETS—SHEET 2

Fig. 3.

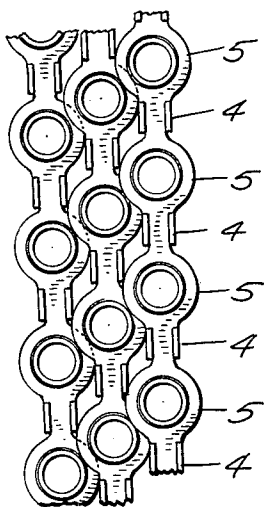


Fig. 5.

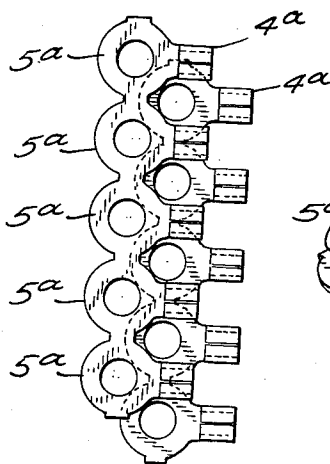


Fig. 6.

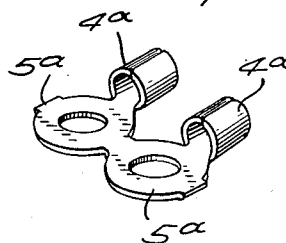


Fig. 4.

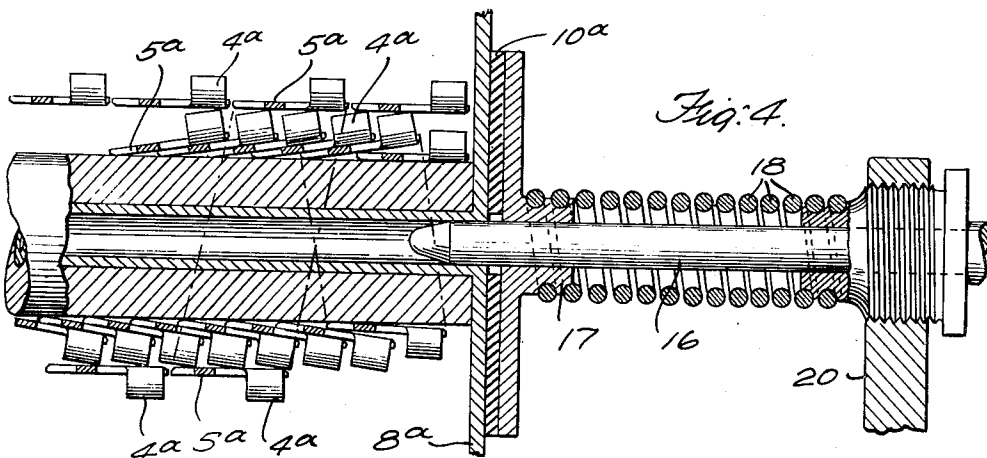
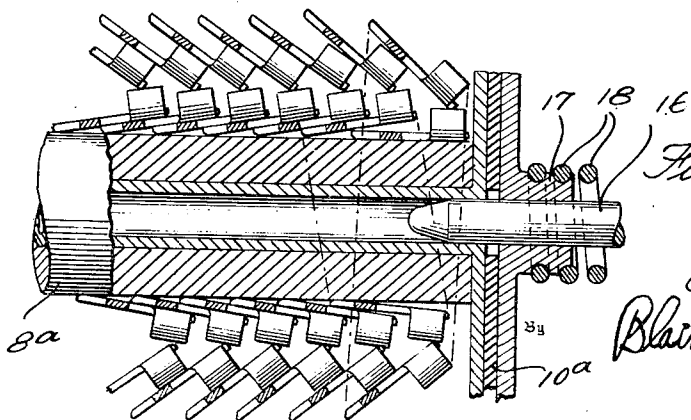


Fig. 7.



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COILED STRIP OF ELECTRICAL TERMINALS

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8 Claims. (Cl. 206—59)

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This invention relates to blanks for forming, on wires or other electrical conductors, terminal connectors of the type having a ferrule portion (by which is meant a portion, whether closed or open in the strip, which is adapted to embrace and grip the conductor). More particularly the invention relates to coiled strips of such connectors in which the partially formed individual connectors are integrally joined in the strip and wound in coils for feeding successive connectors into position for severing and applying them onto conductors.

One machine for severing and applying terminals from a strip such as that with which this invention is concerned is shown, for example, in the U. S. patent of Vernon E. Carlson, No. 2,396,913. In order that an ample supply of connectors may be available for substantially continuous operation of such a connector applying machine, a strip should be provided of such length that, for convenient handling, it needs to be coiled; but prior to my invention it had been found as a practical matter and generally recognized that such terminal strip could not be wound in laterally displaced coils, because the laterally projecting portions of the terminals in one coil would catch under the laterally adjacent coil and lock the strip against further feeding. Consequently such coiled strips have had to be confined to the width of a single strip, usually by use of a narrow reel. This, of course, has limited very materially the number of connectors that can be supplied at one time to a connector applying machine, and has to that extent involved skilled labor for changing reels and rethreading machines. Usually, also, there is a wastage of terminal strip at the ends of each reel.

A general object of the present invention is to provide partially formed electrical connectors in integral strip wound in laterally abutting coils upon a spool and to assure free unwinding therefrom, thus making possible the provision of a much larger supply of connectors upon a reel or spool of reasonable dimensions. In fact, by use of the improved strip of the present invention it has been found possible to wind 40,000 or more connectors upon a single spool of convenient size, from which they can as easily be unwound as were the former connector strips from the single width reel.

Other objects, advantages and important features of the invention, to which reference has not hereinabove specifically been made, will appear hereinafter when the following description and claims are considered in connection with the accompanying drawings, in which:

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Figure 1 is a perspective view of a connector strip embodying the present invention wound upon a spool and feeding into a terminal applying machine;

Figure 2 is an enlarged fragmentary perspective view of a short length of the connector strip shown in Figure 1;

Figure 3 is a fragmentary plan view showing portions of several turns of a coil of side connected terminals;

Figure 4 is a fragmentary view in axial section showing one end of a reel mounted in a holder and with two layers of terminal strip coiled thereon;

Figure 5 is a view similar to Figure 3 but showing a different type of strip;

Figure 6 is an enlarged fragmentary perspective view of a short length of the connector strip; and

Figure 7 is a fragmentary sectional view similar to that of Figure 4, showing in section a portion of two layers of terminal strip coiled at one end of the reel.

The connector strip of the present invention may be formed in various ways, as, for example, by blanking out a strip of connectors from a continuous strip, but leaving them integrally joined, and each comprising laterally extending wings 4 adapted to be rolled up, curled or otherwise crimped to form the wire-engaging portion or ferrule portion of the connector, and the tongue portion 5 having therein the hole 6 for a binding post or other connection. The wings 4, which form the barrel, are turned up toward one another forming a U-shaped trough.

The strip of terminals as described above is wound in a cylindrical helix on a spool 8, i. e., is coiled with axial progression along the surface of the spool and advantageously with the successive turns of the coil overlapping one another, as clearly indicated in Figure 3.

By providing an upstanding part on each connector element of the continuous strip which serves as a stop to limit lateral shifting of overlapping coils to an amount not beyond the edge of the narrowest part of the strip, as shown in Figures 1 and 2, it will be seen that, when the strip is wound upon the spool 8 in laterally abutting coils, as shown in Figure 1, the upturned parts 4 of each turn will abut against the edges on adjacent turns so as to limit lateral movement between them and thus serve to prevent the tongues or other laterally projecting parts of the individual connectors of the strip becoming interlocked under adjacent coils in such man-

ner as to interfere with free unwinding of the strip.

Advantageously, the terminal strip is not formed to the curvature of the coil but is resiliently stressed therein so that as it is released it rises by its own resilient force away from its original position in the coil, at the same time slipping circumferentially relative to adjacent coils, because of its enlarged circumference. This action facilitates release of the terminals if by any chance a laterally projecting part should catch under the next coil. For best results, however, the spool should not be free to allow unlimited release of the coil, but should be held, e. g., by a friction drag weight 10 so that as one connector after another is pulled up to the applying position, the reel is jerked and given a little momentum which slackens the tension on the strip and allows the first coil to expand and rise a little from the spool, but is soon held again by the friction drag. Instead of a separate drag 10, the reel may be mounted so that the rotational friction of its mounting is adjusted to approximately balance and withstand the resilient force of the strip, but still to allow some overshoot by momentum at each feeding operation.

In Figure 4 is shown a fragment of a reel with another type of strip coiled therein. In this case ferrule portions 4a are positioned so as to extend perpendicularly from the side of the strip, and each ferrule of course rises abruptly above the adjacent part of the connector. With the strip wound as shown, the turns in one layer overlap with the upstanding ferrule portions in one turn lying on the tongue portions 5a of the previous turn, while alternate layers have substantially no overlap of successive turns. From such a coil the strip will feed off freely, but advantageously the turns are held tight against the underlying coils until they are pulled off tangentially.

This tight holding can be achieved as mentioned above either by use of a friction drag, as shown in Figure 4, but in this case tight enough to prevent loosening of turns by jerking, as previously described, or by prebending the coils to a little shorter radius of curvature than that of the coils, so that they hug the reel by their own resiliency. If a friction drag 10a is used as shown in Figure 4, it may be slidably mounted on shaft 16 and secured by means of the screw plug 17 to the spring 18, the other end of which is similarly secured to the frame 20, with the result that any jerking is taken up in the spring and very little slack is developed in the coil.

It is best, however, to have the coil pre-formed to hug the reel, as described, and to adjust the pressure on the shoe 10a or the stiffness of spring 18 so that substantial slack is introduced into the first turn at each feeding step.

In the layers wherein the ferrule portions overlap the tongue portions of the previous turns, respectively, there is no chance of fouling the turns, because each is held in place by the next; but in the alternate layers wherein the ferrule of one turn lies at the edge of the tongue in the adjacent turn, the tendency is for the tongue to slip under the ferrule and thus to interlock successive turns and prevent feeding. In the reel embodying my invention, however, this is prevented by the closely spaced upstanding edges of the ferrules in the underlying layer against which the edges of the tongues soon catch if they should escape under the ferrule portions of the next turn in the same layer. The tighter the layers are held together, the more effective is such catch-

ing. Since the pitch of the coils tends to cant the individual terminals with their tongues tilted toward the center of the reel, the tendency to slip under the next turn in the same layer is strong, but for the same reason the tongue is assured of catching on the edges of the ferrule portions in the underlying layer, if wound as described and shown. This I accentuate and take advantage of by making the pitch of the coil in said alternate layers a little greater than the nesting width of the strip, i. e., the minimum pitch which could be used without overlapping any parts of the terminals. Insofar as the terminals are made so that those in one turn can nest with those in the next, such nesting overlap may be allowable, but advantageously only a part of it is actually utilized so that there is still substantial room for the connector strip to shift laterally. If such shifting occurs, the last turn leading off from the reel will catch on the edges of the underlying ferrules before it can slip under the next turn of the same layer.

In Figure 7 I have shown an alternative in which the pitch on the return winding is substantially the same as that on the first layer. In this case the terminals in the second layer are sharply tilted with respect to those in the first, and consequently any shifting will quickly result in the ferrules abutting against one another. Moreover, since the ferrules in this case will be directed downwardly toward the underlying layer and the tongues upwardly, there is little possibility of catching. In this case, however, tilting will result in a bending of each connector with respect to the next, because of the fact that the tongue ends lie at a greater radius than the ferrule ends. When the strip is pulled off of the reel, there will consequently be a tendency for the strip to assume a lateral curl, and unless the strip is under considerable tension or is fed through a straightening device, this may result in its fouling at the point of feeding into the machine.

What is claimed as new is:

1. A series of identical partially formed terminal connectors joined in a long strip and wound in successive overlapping helices on a spool, said terminals each comprising a barrel-forming portion opposite sides of which are bent up from the plane of said strip.

2. A strip of partially formed terminal connectors according to claim 1 in which the connectors have tongues formed with upstanding rings and the barrel-forming portions are U-shaped constituting a partially formed barrel.

3. A coiled strip as defined in claim 1 wherein said strip is formed of resilient material and in which the turns of the coil have a natural set resiliently urging said turns into a radius of curvature greater than their radius of curvature in the coil, whereby as said turns are released from said coil they expand and loosen by their own resiliency as they approach a feeding position.

4. A coiled strip of connectors as claimed in claim 1 wherein said connectors have laterally-extending edge portions and wherein the successive overlapping helices have opposite pitch, said turns respectively engaging lateral edge portions of adjacent turns to hold them against lateral movement relative to each other and thereby to keep them free for tangential release from the coil.

5. A coiled strip of connectors as claimed in claim 4 wherein said strip is formed of resilient

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material in which the turns of the coil have a natural set resiliently urging each of said turns into a radius of curvature greater than its radius of curvature when free of external restraining forces.

6. A coiled strip of electrical terminals having laterally projecting portions which tend to catch on one another and interlock successive turns of the coil, said strip being formed of resilient material and having a natural set resiliently urging said turns into radii of curvature respectively less than their radii of curvature in the coil, successive turns lying side-by-side in a plurality of concentric cylindrical helices and successive overlapping helices having opposite pitch, and upstanding portions on said strip, said turns respectively engaging lateral edges of adjacent turns to hold them against lateral movement relative to each other and thereby to keep them free for tangential release from the coil.

7. A coiled strip of electrical connectors having laterally projecting flat tongue portions at one side of said strip and upstanding ferrule portions at the other side thereof, said ferrule portions in successive turns of alternate layers of the coil overlapping and successive turns of the intermediate layers of the coil being spaced from one another.

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8. A coiled strip of electrical connectors as defined in claim 7 wherein the pitch of the coil in the overlapped layer approximates but is greater than the length of said upstanding ferrule portions and the pitch of the coil in the intermediate layers is greater than the over-all width of the strip.

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