

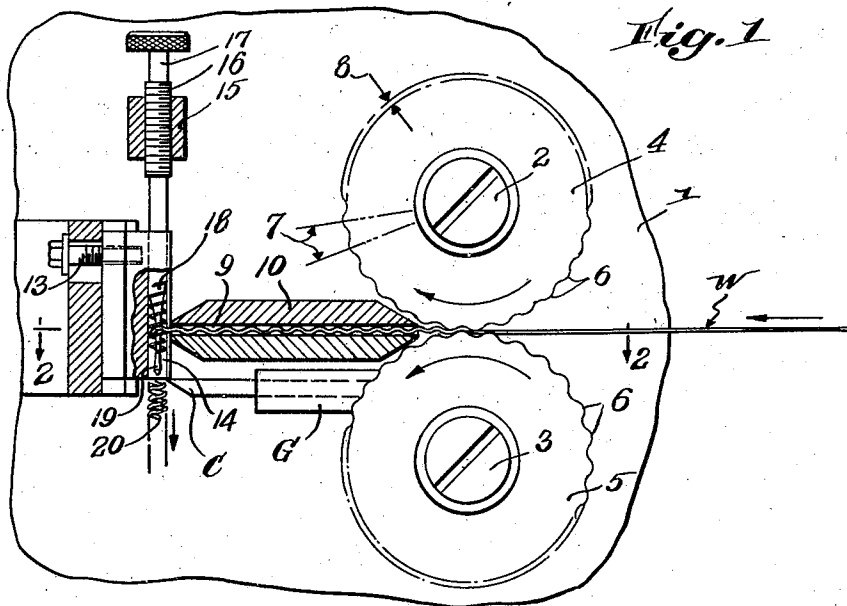
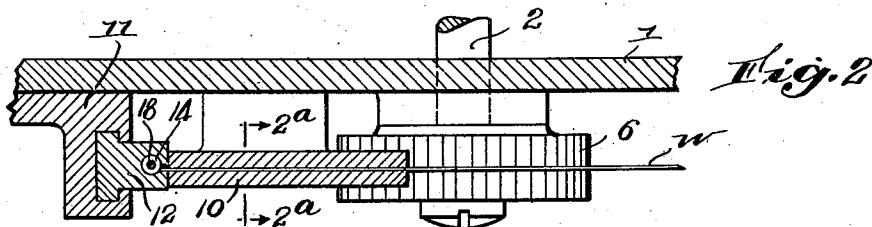
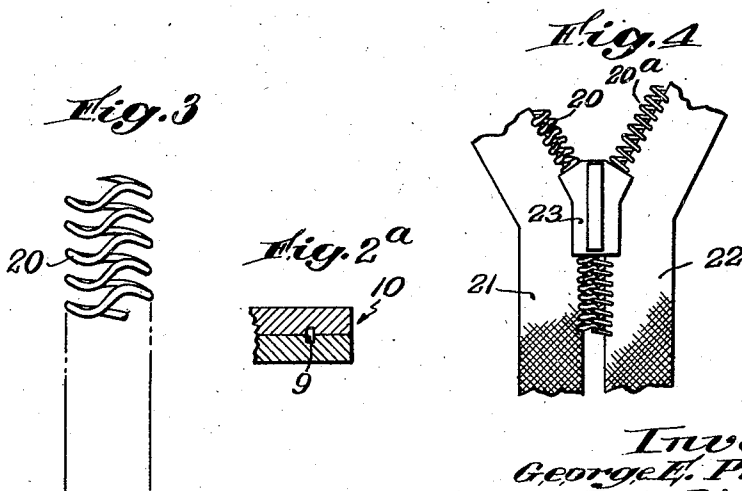
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G. E. PRENTICE

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METHOD OF MAKING FASTENERS

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METHOD OF MAKING FASTENERS

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This invention pertains to slide fasteners and relates more particularly to a method of making such fasteners. In Patent No. 1,796,395, granted to G. E. Prentice, March 17, 1931, there is disclosed a type of fastener in which the fastener elements of each of the opposed series are constituted by the successive turns of an open coiled helix of wire. As disclosed in this patent, the fastener elements of both series are alike, being turns of simple cylindrical coils, but in Patent No. 1,724,311, granted to G. E. Prentice on August 13, 1929, an improved construction is disclosed wherein the turns of the coil forming at least one of the series of fastener elements are so deformed or bent from true helical curvature as to constitute hook-like parts operative to engage the turns of the opposite coil with a positive grip. Heretofore in making the deformed coil it has been thought necessary first to form a simple cylindrical coil from plain wire by usual wire coiling operations and then to deform the turns of the coil by a swedging operation. Thus, two separate operations, involving two handlings of the material, were requisite, and unless the swedging operation were carefully performed, the resultant fastener elements might not be uniformly spaced or properly aligned so that a defective fastener would result.

The principal object of the present invention is to provide an improved method of making such fasteners, in particular a deformed helical coil for use in such fasteners, such that the operation is simplified, cheapened and more rapidly performed than has previously been possible, while at the same time insuring uniform results. In accordance with this novel method, a length of plain wire is first crimped transversely to form a series of undulations all in the same plane and of uniform length and depth, and thereafter this crimped wire is coiled to form an open helical coil. In thus crimping the wire, it is desirable to make the depth of each undulation substantially equal to the pitch of the desired coil, and also to make the length of the undulation to be an aliquot part of the circumference of the completed coil.

A convenient way of performing the above operation is to pass the wire between a pair of transversely toothed or corrugated rolls which preferably also constitute feed rolls for advancing the wire, then causing the wire with its undulations formed by the action of the teeth of the rolls to move along a path in which it is confined so that it can not bend transversely, and then delivering the crimped wire directly to

a coiling device, for example a tapered and threaded mandrel disposed within a hollow cylindrical die, the pitch of the mandrel being that of the desired coil and the internal diameter of the die being the external diameter of the desired coil. The teeth of the rolls are of such shape, depth and circumferential length as to form undulations of the desired depth and length, and by the use of this arrangement it is possible to deliver the plain wire continuously and without interruption and to have the completed coil discharged from the die ready to be cut to desired length for use.

In the accompanying drawing wherein the steps of the improved method are illustrated diagrammatically, and by reference to mechanism for carrying them into effect:

Fig. 1 is a side elevation partly in vertical section illustrating a simple apparatus useful in performing the improved method;

Fig. 2 is a horizontal section substantially on the line 2—2 of Fig. 1;

Fig. 2^a is a fragmentary section on the line 2^a—2^a of Fig. 2;

Fig. 3 is a fragmentary side elevation to larger scale illustrating the appearance of the completed coil resulting from the practice of the improved method; and

Fig. 4 is a fragmentary front elevation showing a slide fastener comprising a deformed coil such as results from the practice of the present method.

Referring to the drawing, the numeral 1 designates the frame of a machine useful in the performance of the improved method. This frame provides bearings for shafts 2 and 3, one or both of which is driven by suitable drive means not shown. On these shafts are mounted rolls 4 and 5, respectively, these rolls having toothed or corrugated edges, the teeth preferably being of undular or approximately sinusoidal form. The teeth of the two rolls mesh with each other after the manner of gear teeth but with a clearance substantially equalling the diameter of the wire to be coiled.

The circumferential length of each of the teeth 6, as indicated at 7, preferably is an aliquot part of the circumference of the coil to be formed, in the present instance being one-quarter of the circumference of the completed coil. Furthermore, the depth of each of the teeth 6, as indicated at 8 in Fig. 1, is preferably substantially equal to the pitch of the coil which is to be formed.

The rolls 2 and 3 are turned in the direction

of the arrows shown in Fig. 1 and thus advance the wire W to the left as viewed in said figure. The action of the rolls is to crimp the wire which passes between them so as to form undulations in the wire, all disposed in substantially the same plane, this being the plane of the paper as seen in the drawing. Immediately after leaving the rolls, the crimped wire enters a guide passage 9 in a housing 10 which extends from adjacent to the delivery point of the rolls to the coiling die. The guideway 9 is of a horizontal width substantially equal to the diameter of the wire and of a vertical depth equal to the depth of the undulations or crimps formed in the wire, that is to say, as here shown, equal to the pitch of the coil to be formed. The housing 10 is substantially rigid and so confines the crimped wire as it moves from the rolls toward the die that it cannot bend or deflect out of the proper path.

The frame of the machine supports a bracket 11 having a vertical guideway for the reception of a vertically slidable die member 12. This die member may be adjusted vertically and when properly positioned is retained in position by means of a set screw 13 or equivalent means. The die member 12 is provided with an elongate vertical bore 14 of a diameter substantially equal to that of the coil which is to be formed. The axis of the bore 14 is slightly offset from the guide passage 9 in the housing 10, although its axis is vertical and thus parallel to and very closely adjacent to the plane of the corrugations in the wire as the latter advances through the passage 9.

Directly above the die member 12 the frame of the machine is provided with a bracket 15 having a vertical internally screw-threaded bore aligned with the die passage 14 and which receives a threaded portion 16 of a mandrel-supporting stem 17 having a head at its upper end by means of which it may be turned for vertical adjustment. The lower part of this stem 17 is shaped to provide a downwardly tapering mandrel 18 having an external screw thread of a pitch equalling the desired pitch of the coil to be formed. The mandrel 18 tapers downwardly and preferably terminates in a point 19 adjacent to the lower end of the die cavity or passage 14.

In the operation of the device the wire W is advanced between the rolls 4 and 5, the latter preferably acting as feed rolls for the wire and at the same time forming transverse crimps or undulations therein. The crimped wire advances through the passage 9 in which it is closely confined, and its advancing end enters through a suitable opening in the wall of the die passage or cavity 14 and is forcibly advanced against the forming mandrel 18. Due to the slight offset of the axis of this mandrel with respect to the delivery end of the passage 9, the advancing end of the wire strikes the circumferential surface of the mandrel more or less tangentially and, being confined between the central core of the mandrel, the wall of the die passage 14 and the faces of adjacent turns of the screw thread on the mandrel, the advancing wire is compelled to take a helical course, gradually passing down axially along the mandrel 18 and eventually escaping from the lower end of the die passage 14 in the form of a completed coil 20. This coil has the characteristics of the coil disclosed in the Prentice Patent No. 1,724,311 above referred to, the undulations formed in the wire as it advances being preserved and embodied in the helical coil. By reason of the definite relation

between the lengths and depths of the undulations formed in the wire and the diameter and pitch of the coil, the undulations in successive turns of the completed coil lie directly one above the other longitudinally and all in the same phase and thus in the completed coil are accurately spaced and arranged for proper engagement with the turns of the opposite coil of the fastener. Preferably, cutting means is provided which automatically cuts the formed coil to predetermined length as it issues from the die. Thus, as shown in Fig. 1, a reciprocating cutter C, sliding in a guide G is disposed to move in a horizontal path just below the lower end of the die. This cutter may be actuated by any suitable means, for example a cam, not shown, moving in timed relation to the rolls 4 and 5.

In Fig. 4 a fastener of the general type to which the invention relates is diagrammatically illustrated, such fastener comprising the tapes or stringers 21 and 22 and the slider 23. To the tape 21 is secured a deformed coil 20 such as results from the practice of the method above described, while the opposite stringer 22 is provided with a coil 20^a which may be a plain helical coil if desired.

While one desirable form of apparatus useful in performing the method has herein been described, it is to be understood that the invention is not necessarily limited to the use of such apparatus but that the improved method may be carried out by other means, including hand-actuated implements if desired.

I claim:

1. That method of making fasteners of the kind in which one series at least of fastener elements consists of consecutive convolutions of an open coiled spring which comprises as steps transversely crimping a length of wire to form a series of uniformly spaced undulations therein, the undulations being disposed in the same plane, each undulation being of a depth which equals the pitch of the desired coil and of a length which is an aliquot part of the circumference of the desired coil, and, so confining it as to prevent change in the plane, length or depth of its undulations, advancing the crimped wire longitudinally into tangential contact with a concavely curved rigid cylindrical surface whose axis is substantially parallel to the plane of said undulations, and deflecting the advancing wire axially of said surface thereby to cause it to follow a helical path and assume the form of the desired coil.

2. That method of making fasteners of the kind in which one series at least of fastener elements consists of consecutive convolutions of an open coiled spring which comprises as steps advancing a length of wire between crimping rolls having transverse teeth operative to form undulations of uniform length and depth in the wire, so advancing the crimped wire, while confining it in such a way as to maintain unchanged the depth and length of its undulations as to cause its advancing end to contact a stationary, concave cylindrically curved surface and to follow a helical path longitudinally of said surface, the radius of said surface being such that the circumference of the resultant wire helix is substantially four times the length of each undulation.

3. That method of making wire coils of substantially any desired length for use in fasteners of the kind in which one series at least of fastener elements consists of consecutive convolutions of an open coiled spring which comprises

as steps continuously advancing a length of wire between and solely by the feeding action of crimping rolls having transverse teeth operative to form undulations of uniform length and depth in the wire, confining the advancing crimped wire so as to prevent transverse deflection while introducing the advancing end of the crimped wire

into an annular elongate rigid-walled chamber and causing said end to follow a helical path of definite pitch in moving toward the exit end of said chamber thereby to form an open coiled helix.

GEORGE E. PRENTICE.