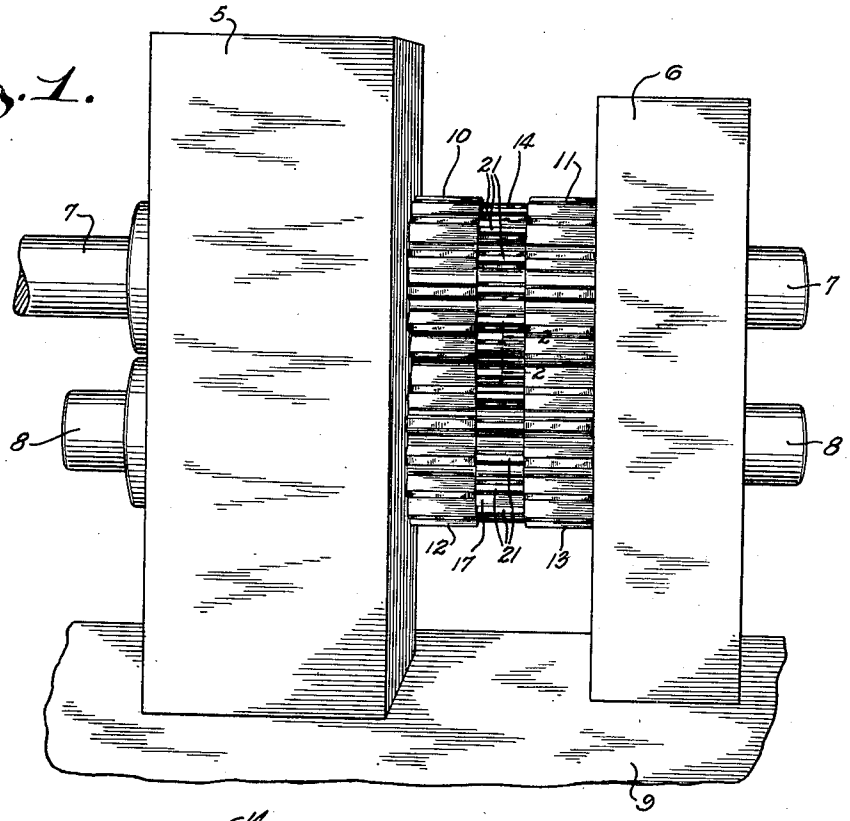
June 30, 1953 D. E. CROOKER 2,643,688

DEVICE FOR CORRUGATING WIRE

Filed July 20, 1949

Fig. 1.



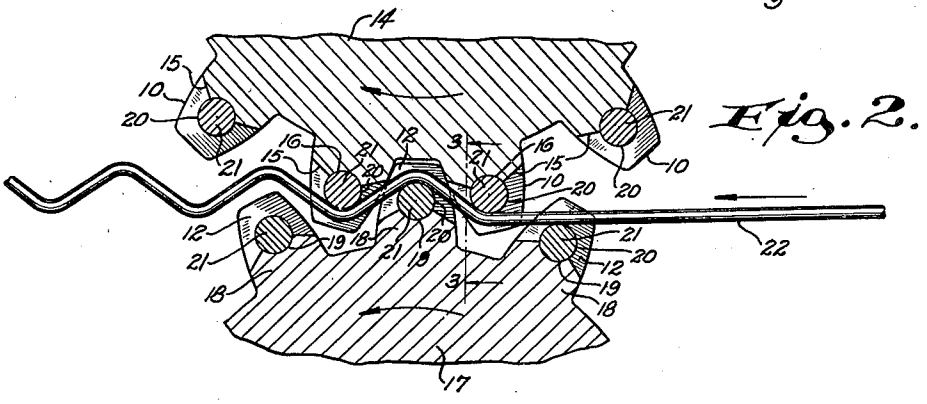


Fig. 2.

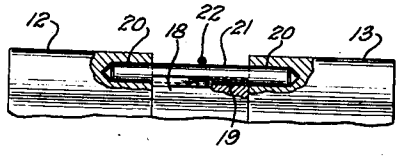


Fig. 3.

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Patented June 30, 1953

2,643,688

UNITED STATES PATENT OFFICE

2,643,688

DEVICE FOR CORRUGATING WIRE

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Application July 20, 1949, Serial No. 105,691

10 Claims. (Cl. 140—105)

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This invention relates to improvements in devices for corrugating wire.

In the manufacture of non-skid rubber traction members, it has been found desirable to employ helical coils made of corrugated, relatively hard steel wire. Much difficulty has heretofore been experienced in the use of corrugated coils made by conventional methods. This difficulty has been due to the fact that prior methods of corrugating not only bent the wire, but also stretched the wire to such an extent that its strength was greatly reduced and to such an extent as to render the wire relatively brittle.

For use in tires a relatively thick wire, having corrugations which form acute angles is desirable. This combination is impractical and expensive to produce by conventional methods, and when corrugated wire of this type, stretched in a conventional corrugating process, is formed into helical coils, fracture frequently occurs, either during the coiling operation, or soon after the coil is subjected to the wear and flexure of ordinary use.

It is, therefore, a general object of the present invention to provide a device for corrugating wire which does not result in stretching or weakening the wire.

Another object of the invention is to provide a device of the class described which is capable of corrugating relatively large diameter wire into a conformation wherein adjacent extents thereof are in acute angular relationship and wherein the corrugations are relatively close together.

A further object of the invention is to provide a device of the class described wherein the wire is corrugated by the use of roll members which are freely rotatable.

A further object of the invention is to provide a device of the class described wherein the corrugating roll members automatically intermesh at properly timed intervals and in a predetermined spacial relationship.

A further object of the invention is to provide a device of the class described having a pair of spaced, identical gears fixedly mounted on each of two parallel shafts, the gears of one shaft meshing with the gears of the other shaft and the gears of each shaft rotatably supporting a plurality of corrugating rolls, said rolls having their opposite ends journaled in recesses formed in the facing inner end surfaces of corresponding teeth.

A further object of the invention is to provide a device of the class described wherein the intermediate portions of the corrugating rolls are rotatably supported against deformation.

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A further object of the invention is to provide a device of the class described which is strong and durable, simple in construction, efficient in operation, and which is otherwise well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved device for corrugating wire, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the drawing accompanying and forming a part of this specification, wherein is shown one complete embodiment of the preferred form of the invention and wherein the same reference characters indicate the same parts in all of the views:

Fig. 1 is a front perspective view of the improved wire corrugating device;

Fig. 2 is an enlarged fragmentary vertical sectional view taken approximately along the line 2—2 of Fig. 1 and showing a wire being corrugated by the device; and

Fig. 3 is a side elevational view on a smaller scale taken approximately along the line 3—3 of Fig. 2 with the upper gear removed, parts being broken away and shown in section.

Referring more particularly to Fig. 1 of the drawing, the numerals 5 and 6 indicate a pair of spaced bearing blocks which rotatably support a pair of spaced parallel shafts 7 and 8. The blocks 5 and 6 are suitably supported on a base 9.

Fixedly mounted on the shaft 7 are a pair of substantially identical spaced gears 10 and 11, the teeth of which are in alinement as shown. Similarly mounted on the shaft 8 are a pair of spaced gears 12 and 13 which are substantially identical with gears 10 and 11 and which mesh with said gears respectively. The shaft 7 may be connected to any suitable source of rotative power.

Fixed to the shaft 7 between the gears 10 and 11 is an intermediate gear 14 formed with teeth 15 having a pitch identical with and positioned in alinement with the teeth of the gears 10 and 11. The teeth 15 are relatively short and are each formed wtih a transversely extending arcuate recess 16 at their outer ends as shown in Fig. 2. A gear 17 which is substantially identical with the gear 14 is fixed to the shaft 8 between the gears 12 and 13. The teeth 18 of the gear 17 are alined with the teeth of the gears 12 and 13 and are formed with transversely extending arcuate recesses 19 at their outer ends.

The inner end faces of the teeth of the gears 10, 11, 12 and 13 are each formed with a cylin-

drical recess 20, the margin of which registers with the surface of one of the arcuate recesses 16 or 19 in the adjacent intermediate gear. A preferably cylindrical roller 21 is journaled at its ends for free rotation in an opposing pair of recesses 20, as shown in Fig. 3. An intermediate portion of the roller 21 is positioned in the arcuate groove (16 or 19), the surface of which is in registration with the recesses 20 in which said roller is journaled. Each roller 21, while resting in its groove in contact with the surface thereof, is free to rotate therein.

For each tooth in the gear 10, there is a corresponding and alined tooth in the gears 14 and 11, as well as a roller member 21. Similarly, for each tooth in the gear 12 there is a corresponding and alined tooth in the gears 17 and 13, as well as a roller member 21.

In operation, the shaft 7 can be operated in either direction to permit the feed of wire to be supplied from one side or the other of the device. As the shaft 7 and the gears thereon rotate, the gears 12 and 13 are simultaneously rotated because they are in mesh with the first mentioned gears. Rotation of the gears 10, 11, 12 and 13 causes the rollers 21 carried thereby to intermesh, as shown in Fig. 2, without coming in contact with each other. When a piece of straight wire 22 is fed into the device, the wire is bent into a corrugated conformation as shown. The rollers 21 are supported against deformation during said operation by the teeth of the gears 14 and 17.

As the bending of the wire 22 takes place due to the intermeshing of the rollers 21, there is no stretching of said wire. This is due to the fact that the rollers 21 are free to rotate. For example, when the roller 21 in the center tooth of the gear 17 (see Fig. 2) moves upwardly between the rollers 21 of the teeth of the gear 14 on each side thereof the wire 22 is bent into an inverted V-shape as shown. Since this V-shaped extent is longer than a straight extent having a length equal to the distance between two adjacent rollers 21 of the same gear, a certain amount of wire must be added to form said V-shaped extent. Since the rollers 21 are free to rotate and do not grasp the wires in a clamping manner to prevent an additional length of wire from being pulled in, but rather aid in the pulling in of the necessary wire, the wire 22 is readily bent into the desired conformation by said rollers without any stretching, and the corrugations, which are close together, are made without excessive elongation of the wire.

As shown in Fig. 2, the relationship between the pitch of the gear teeth to the diameter of the gears is preferably such that the wire 22 does not come into pressure contact with more than three of the rollers 21 at any one time. This prevents the wire 22 from being unduly restrained and allows said wire to be readily drawn in by the rotatable rollers 21 with no substantially gripping contact.

It is obvious that by varying the size and pitch of the gears or by varying the diameter of the radial position of the rollers 21, a wide variety of corrugated shapes can be selectively produced. The corrugation shown is only illustrative and can be made with greater or lesser angularity as desired. Similarly, the improved device is adaptable for use with wires of any diameter.

Various other changes and modifications may be made without departing from the spirit of the invention, and all such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In a device for corrugating wire or the like, a pair of spaced parallel rotatable shafts; a first gear fixedly mounted on the first of said shafts, a second gear fixedly mounted on said first shaft adjacent said first gear, said second gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the first gear, the end surfaces of the teeth of said first gear adjacent said second gear being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journaled in one of said bearing recesses and having an intermediate peripheral wall portion thereof in contact with the teeth of said second gear, said rollers extending parallel with said shafts; a third gear fixedly mounted on the second of said shafts and meshing with said first gear; a fourth gear fixedly mounted on said second shaft adjacent said third gear, said fourth gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the third gear, the end surfaces of the teeth of said third gear adjacent said fourth gear being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journaled in said bearing recesses and having an intermediate peripheral wall portion thereof in contact with the teeth of said fourth gear; journal means on said first shaft for supporting the other ends of the rollers which are journaled in the bearing recesses of the first gear; and journal means fixed to said second shaft for supporting the other ends of the rollers which are journaled in the bearing recesses of the third gear, the rollers associated with the first and second gears being movable into and out of spaced intermeshing relationship with the rollers associated with the third and fourth gears as said shafts are rotated.

2. In a device for corrugating wire or the like, a pair of spaced parallel rotatable shafts; a first gear fixedly mounted on the first of said shafts, a second gear fixedly mounted on said first shaft adjacent said first gear, said second gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the first gear, the teeth of said second gear each being formed with a longitudinal groove in its top surfaces and the end surfaces of the teeth of said first gear adjacent said second gear being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journaled in one of the bearing recesses of said first gear and having an intermediate peripheral wall portion thereof positioned in the groove of one of the teeth of said second gear, a third gear fixedly mounted on the second of said shafts and meshing with said first gear; a fourth gear fixedly mounted on said second shaft adjacent said third gear, said fourth gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the third gear, the teeth of said fourth gear each being formed with a longitudinal groove in its top surface, and the end surfaces of the teeth of said third gear adjacent said fourth gear being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journaled in the bearing recesses of said third gear and having intermediate side wall portions thereof positioned in the groove of one of the teeth of

said fourth gear; journal means on said first shaft for supporting the other ends of the rollers which are journaled in the bearing recesses of the first gear; and journal means fixed to said second shaft for supporting the other ends of the rollers which are journaled in the bearing recesses of the third gear, the rollers associated with the first and second gears being movable into and out of spaced intermeshing relationship with the rollers associated with the third and fourth gears as said shafts are rotated.

3. A device for corrugating wire or the like comprising a pair of spaced parallel rotatable shafts; a first pair of spaced substantially identical gears fixedly mounted on the first of said shafts with the teeth thereof in alinement, and having the facing inner end surfaces of said teeth formed with bearing recesses; a first intermediate gear fixedly mounted on said first shaft between said first pair of gears, said intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the first pair of gears; a plurality of freely rotatable rollers having their ends journaled in opposing bearing recesses and having intermediate peripheral wall portions thereof in contact with the teeth of said first intermediate gear; a second pair of spaced substantially identical gears fixedly mounted on the second of said shafts, said gears meshing with the first pair of gears and having the facing inner end surfaces of the teeth thereof formed with bearing recesses; a second intermediate gear fixedly mounted on said second shaft between said second pair of gears, said second intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the second pair of gears; and a plurality of freely rotatable rollers having their ends journaled in opposing bearing recesses and having intermediate peripheral wall portions thereof in contact with the teeth of said second intermediate gear, the rollers carried by the first set of gears being movable into and out of spaced intermeshing relationship with the rollers carried by the second set of gears as said shafts are rotated.

4. A device for corrugating wire or the like comprising a pair of spaced parallel rotatable shafts; a first pair of spaced substantially identical gears fixedly mounted on the first of said shafts with the teeth thereof in alinement and having the facing inner end surfaces of said teeth formed with bearing recesses; a first intermediate gear fixedly mounted on said first shaft between said first pair of gears, said intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the first pair of gears, the teeth of said intermediate gear each being formed with a longitudinal groove in its top surface; a plurality of freely rotatable rollers having their ends journaled in opposing bearing recesses and each having intermediate peripheral wall portions thereof slidably positioned in the groove of one of the teeth of said first intermediate gear; a second pair of spaced substantially identical gears fixedly mounted on the second of said shafts, said gears meshing with the first pair of gears and having the facing inner end surfaces of the teeth thereof formed with bearing recesses; a second intermediate gear fixedly mounted on said second shaft between said second pair of gears, said second intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the second pair of gears, the teeth of said intermediate gear each being formed with a longitudinal groove in its top surface; and a plurality of freely rotatable rollers having their ends journaled in opposing bearing recesses and each having intermediate peripheral wall portions thereof slidably positioned in the groove of one of the teeth of said second intermediate gear, the rollers carried by the first set of gears being movable into and out of spaced intermeshing relationship with the rollers carried by the second set of gears upon rotation of said gears as said shafts are rotated.

5. A device for corrugating wire or the like comprising a pair of spaced parallel rotatable shafts; a first pair of spaced substantially identical gears fixedly mounted on the first of said shafts with the teeth thereof in alinement and having the facing inner end surfaces of said teeth formed with bearing recesses; a first intermediate gear fixedly mounted on said first shaft between said first pair of gears, said intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the first pair of gears, the teeth of said intermediate gear each being formed with a semi-cylindrical longitudinal groove in its top surface; a plurality of freely rotatable cylindrical rollers having their ends journaled in opposing bearing recesses and each having intermediate peripheral wall portions thereof positioned in the groove of one of the teeth of said first intermediate gear; a second pair of spaced substantially identical gears fixedly mounted on the second of said shafts, said gears meshing with the first pair of gears and having the facing inner end surfaces of the teeth thereof formed with bearing recesses; a second intermediate gear fixedly mounted on said second shaft between said second pair of gears, said second intermediate gear having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the second pair of gears, the teeth of said intermediate gear each being formed with a semicylindrical longitudinal groove in its top surface; and a plurality of freely rotatable cylindrical rollers having their ends journaled in opposing bearing recesses and each having intermediate peripheral wall portions thereof positioned in the groove of one of the teeth of said second intermediate gear, the rollers carried by the first set of gears being movable into and out of spaced intermeshing relationship with the rollers carried by the second set of gears upon rotation of said gears as said shafts are rotated.

6. In a device for corrugating wire or the like, a pair of spaced parallel rotatable shafts, a first gear fixedly mounted on the first of said shafts, roller backing means fixed to said first shaft adjacent said first gear, the end surfaces of the teeth of said first gear which are adjacent said roller backing means being formed with bearing recesses, a plurality of freely rotatable rollers each having one end journalled in one of said bearing recesses, said rollers extending parallel with said shafts, a second gear fixedly mounted on the second of said shafts and meshing with said first gear, roller backing means fixed to said second shaft adjacent said second gear, said second gear being formed with bearing recesses, a plurality of freely rotatable rollers each having one end journalled in the last-mentioned bearing recesses,

the roller backing means of each shaft having outwardly open seats located between the rollers and the shaft and rotatably supporting the rollers intermediate their length.

7. In a device for corrugating wire or the like, a pair of spaced parallel rotatable shafts, a first gear fixedly mounted on the first of said shafts, roller backing means fixed to said first shaft adjacent said first gear, the end surfaces of the teeth of said first gear which are adjacent said roller backing means being formed with bearing recesses, a plurality of freely rotatable rollers each having one end journalled in one of said bearing recesses, said rollers extending parallel with said shafts, a second gear fixedly mounted on the second of said shafts and meshing with said first gear, roller backing means fixed to said second shaft adjacent said second gear, said second gear being formed with bearing recesses, a plurality of freely rotatable rollers each having one end journalled in the last-mentioned bearing recesses, the roller backing means of each shaft having outwardly open seats located between the rollers and the shaft and rotatably supporting the rollers intermediate their length, means on the first shaft for rotatably supporting the ends of the rollers opposite the ends which are journalled in the first gear, and means on the second shaft for rotatably supporting the ends of the rollers opposite the ends which are journalled in the second gear.

8. A device for corrugating wire or the like comprising a pair of spaced parallel rotatable shafts, a rotatable member fixed to each of said shafts, a plurality of equally spaced freely rotatable rollers mounted on the periphery of each of said rotatable members with the axes thereof parallel with the axes of said shafts, the rollers of one of said rotatable members being movable into and out of spaced intermeshed relationship relative to the rollers of the other rotatable member during rotation of said members, each rotatable member having spaced open seats located between the rollers and the shaft and rotatably supporting inner portions of the rollers intermediate the length of the rollers, outer portions of the rollers being exposed intermediate the length of the rollers, each of the rotatable members having peripheral roller receiving spaces located between rollers and which are of such depth as to provide substantial clearance between the bottoms of said spaces and the rollers of the other rotatable member when said last-mentioned rollers enter said spaces, and transmission means connecting said shafts to cause simultaneous movement of said rotatable members in timed relationship.

9. In a device for corrugating wire or the like, a pair of spaced parallel rotatable shafts; a gear fixedly mounted on the first of said shafts, a circular gear-like member fixedly mounted on said first shaft adjacent said gear and having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the gear, the end surfaces of the teeth of said gear which are adjacent said gear-like member being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journalled in one of said bearing recesses and having an intermediate peripheral wall portion in contact with the teeth of said gear-like member, said rollers extending parallel to said shafts; a gear fixedly mounted on the second of said shafts and meshing with the gear on the first shaft; a circular gear-like member mounted on said second shaft adjacent said second mentioned gear and having teeth which are shorter than but which have substantially the same pitch as and which are in alinement with those of the second mentioned gear, the end surfaces of the teeth of said second mentioned gear-like member being formed with bearing recesses; a plurality of freely rotatable rollers each having one end journalled in said bearing recesses and having an intermediate peripheral wall portion in contact with the teeth of said second mentioned gear-like member; the rollers associated with said gears being movable into and out of spaced intermeshing relationship as said shafts are rotated.

10. A device for corrugating wire or the like comprising a pair of spaced rotatable shafts; a first pair of spaced substantially identical gears fixedly mounted on the first of said shafts with the teeth thereof in alinement and having the facing end surfaces of said teeth formed with bearing recesses; a plurality of freely rotatable rollers having their ends journalled in said bearing recesses; means rotatable with said first shaft and located between said first pair of gears having spaced open seats engaged by intermediate portions of the rollers to rotatably support the same; a second pair of spaced substantially identical gears fixedly mounted on the second of said shafts meshing with said first pair of gears and having the facing end surfaces of the teeth formed with bearing recesses; a plurality of freely rotatable rollers having their ends journalled in said last-mentioned bearing recesses; means rotatable with said second shaft and located between said second pair of gears having spaced open seats engaged by intermediate portions of said last-mentioned rollers and rotatably supporting the same; the rollers carried by the first set of gears being movable into and out of intermeshing relationship with the rollers carried by the second set of gears as said shafts are rotated.

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