May 9, 1961 J. LECLABART 2,983,301

DEVICE FOR MAKING FLEXIBLE STRIPS CONSISTING OF A CONTINUOUS METAL WIRE SO WOUND AS TO FORM A PLANE HELICAL SPRING

Filed June 29, 1959 3 Sheets-Sheet 1

Fig. 1

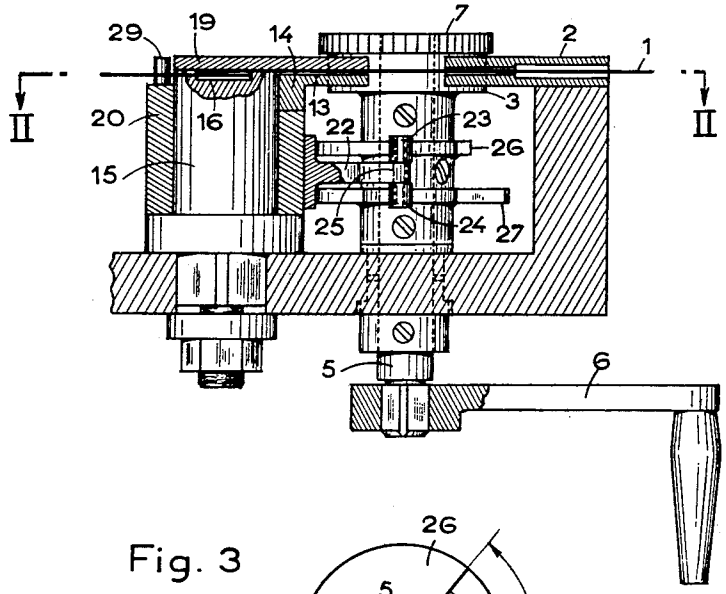



Fig. 3

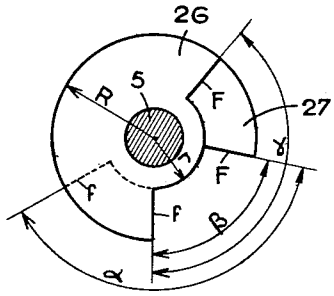
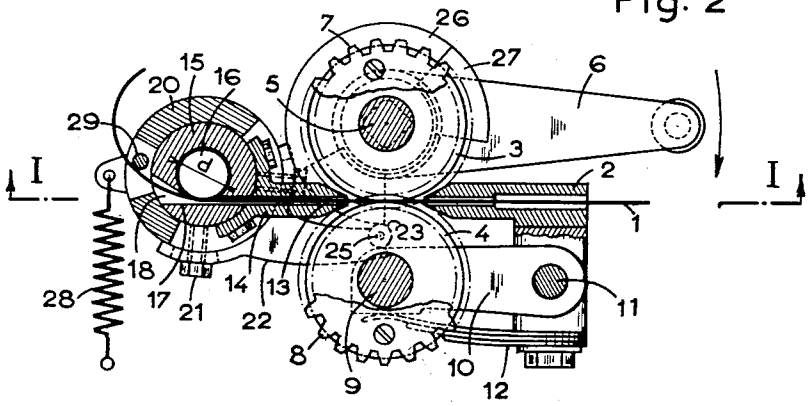



Fig. 2



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Filed June 29, 1959 3 Sheets-Sheet 2

Fig. 4

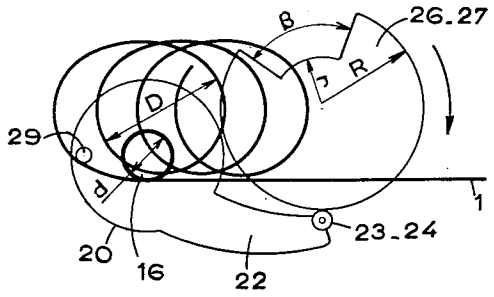



Fig. 5

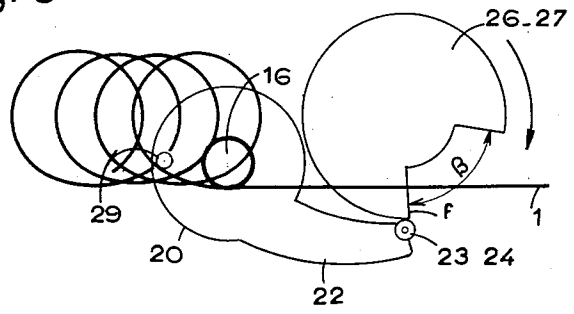
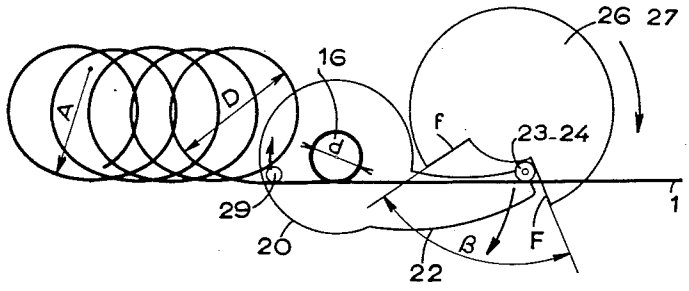



Fig. 6



May 9, 1961 J. LECLABART 2,983,301

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Filed June 29, 1959 3 Sheets-Sheet 3

Fig. 7

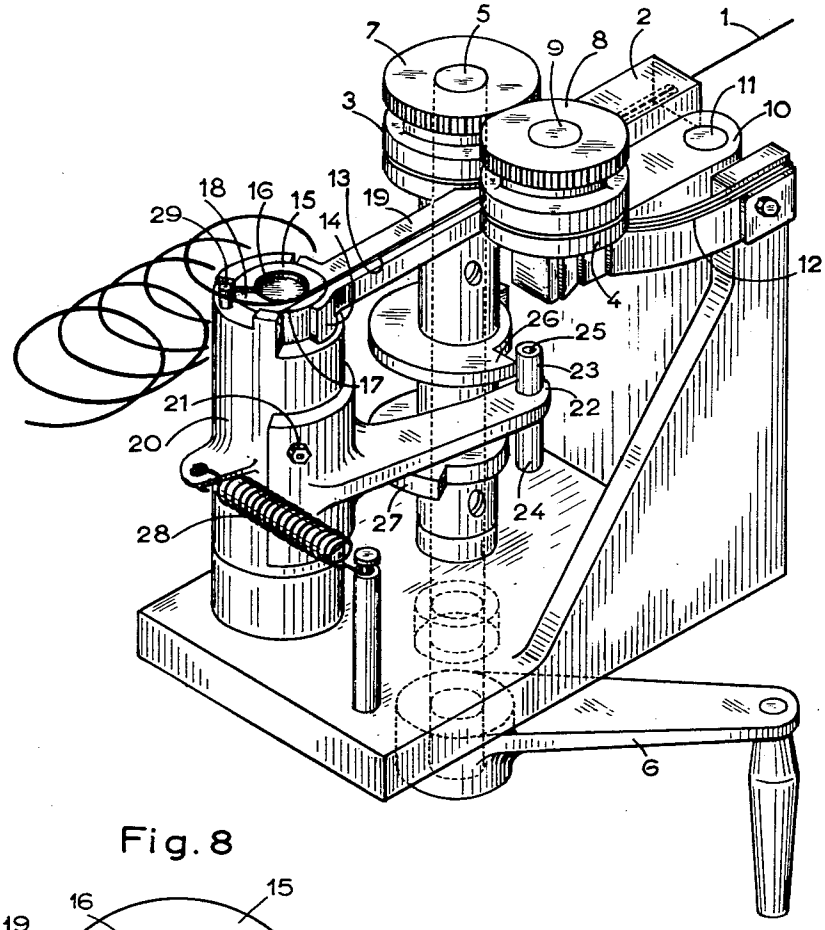
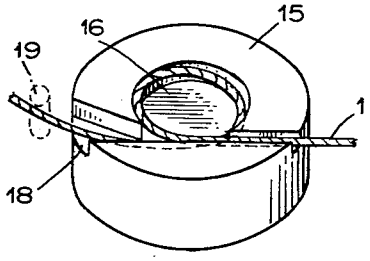



Fig. 8



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2,983,301

# DEVICE FOR MAKING FLEXIBLE STRIPS CONSISTING OF A CONTINUOUS METAL WIRE SO WOUND AS TO FORM A PLANE HELICAL SPRING

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6 Claims. (Cl. 153—65)

The invention relates to a device for making, under cold conditions, flexible strips consisting of a continuous metal wire wound in a succession of large-diameter helical turns, in such a manner as to form a plane helical spring.

According to the present invention, there is provided a device for producing a helix from wire, the device comprising wire feeding means, a cylinder for receiving wire from the feeding means, an outlet from the cylinder for wire initially bent by passage tangentially into the cylinder, around the cylinder and tangentially therefrom, and a guide movable between a first position defining with the outlet a path for partially straightening wire emerging from the cylinder and a second position setting emerging wire to the form required between adjacent turns of the helix.

A method of embodiment of a device according to the invention, and the way in which the device works, are illustrated in very diagrammatic fashion in the appended drawings.

In the drawings:

Figure 1 illustrates an elevation of the device, sectioned along I—I in Figure 2;

Figure 2 is partially cut away plan view, sectioned along II—II in Figure 1;

Figure 3 is a plan view extracted from Figure 2, showing how the control cams are arranged;

Figures 4, 5 and 6 are working diagrams showing the operational cycle of the device;

Figure 7 is an overall perspective view of the device;

Figure 8 is an enlarged view of the spindle and the cup therein as shown in Figs. 1 and 2.

As shown in Figures 1 and 2, the metal wire **1**, introduced through a fixed guide **2**, is inserted between two drums **3** and **4**.

The drum **3** is rotationally fast with a vertical spindle **5** which is rotationally driven by means of a crank **6** fitted to the lower end of the spindle **5**. Rotation of the drum **3** is transmitted to the drum **4** by way of two spur pinions **7** and **8**, which are respectively fast with the two drums, and have pitch diameters equal to the diameters of the drums. The drum **4** is mounted on a vertical shaft **9** carried by a lever **10**, which is articulated about a fixed spindle **11** and acted on by a spring **12** in such a direction as to cause the drum **4** to bear against the drum **3**, thus providing the grip required to drive the wire **1**.

After passing between the two drums **3** and **4**, the wire **1** is guided in a groove **13** in a support **14** attached to a vertical spindle **15**. At the top of this spindle there is a cylindrical cup **16**, of diameter *d*, and of a depth slightly greater than twice the diameter of the wire **1**. As shown in Figures 2 and 8, the cup **16** is tangential to the direction of the wire **1**, which, upon leaving the groove **13**, is guided into a rectilinear groove **17** in the spindle **15**; the wire **1**, after having formed the helical turn forced by the cup **16**, emerges from the latter via a flared aperture **18** in the spindle **15**. A plate **19**, preferably made of transparent material, and detachably fixed to the spindle



**15** and the support **14**, prevents the wire **1** from escaping upwards.

A sleeve **20** is centred on the spindle **15**, and has attached to it, by means of screws **21**, an arm **22** which carries at its free end two co-axial rollers **23** and **24** mounted on a common spindle **25**, above and below the arm **22** respectively.

The rollers **23** and **24** co-operate respectively with two cams **26** and **27** which are locked to the shaft **5**.

Each of the two cams comprises a cylindrical profile of radius R and a cylindrical profile of radius *r*, the two cylindrical profiles of one and the same cam being connected by two straight profiles F and *f* extending substantially along radii of the cylindrical profiles, and including an angle *a* between them. The respective angular settings of the two cams cause there to be an angle $\beta$ between the profile *f* of one of the cams and the profile F of the other cam (Figure 3).

The sleeve **20**, which is acted on by a spring **28** in such a direction as to cause the rollers **23** and **24** to bear against the cams **26** and **27**, carries a vertical finger **29** against which the wire **1** bears after emerging from the aperture **18**.

Operation of the device is diagramatically illustrated in Figures 4 to 6, wherein the only cam profile illustrated, for the sake of greater simplicity, is that produced by definite angular setting of the two cams **26** and **27**.

In the phase illustrated in Figure 4, the angular direction of the sleeve **20**, and consequently of the guide finger **29**, is defined by the rollers **23**, **24** bearing against the profile R of the cams **26**, **27**. A diameter D of the helical turn corresponds to this position of the sleeve **20**, and is that assumed by the wire **1** after it has been initially bent to the diameter *d* in the cup **16**, and then straightened to a definite extent by passing in front of the finger **29**.

Formation of a helical turn of diameter D continues until the instant at which the cam has reached the position illustrated in Figure 5. As soon as the roller clears the end of the profile R, the action of the spring causes the sleeve **20** to rotate about the spindle **15** as far as an angular position defined by the roller bearing against the profile *r* of the cam. In this angular position of the sleeve **20**, which is maintained until the instant at which the profile F of the cam causes the roller to move back up to the profile R (Figure 6), the finger **29** acts on the wire **1** in the direction of additional straightening, which defines an arc of a turn of radius A downstream of the finger **29**.

Finally, after the roller has moved back up to the profile R, the wire **1** will form a new turn of diameter D.

The pitch between two helical turns of diameter D may be altered by adjusting the angular displacement between the two cams **26** and **27**, and the corresponding variation in the angle $\beta$ defines the straightening period corresponding to the arc of radius A; moreover, adjustment of the angular setting of the arm **22** with respect to the finger **29**, which is allowed by the oblong holes in the flanges of the arm **22** through which the screws **21** pass, enables the two angular positions of the finger **29** with respect to the centre of the cup **16** to be simultaneously varied, with a consequent variation in the amplitude of straightening obtained.

The device which has just been described could naturally be modified in detail, or supplemented by any useful accessory, without departing from the scope of the invention.

What I claim is:

1. In a device for producing a helix from wire, wire feeding means, a cylinder receiving wire from said feeding means, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then

circumferentially around said cylinder and then tangentially out of said cylinder, and a guide for the wire movable between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire into successive helicoidal turns having their centers displaced from one turn to the next.

2. In a device for producing a helix from wire, a pair of wire feed rollers, means for mechanically driving said rollers, means for resiliently biasing said rollers toward one another, a cylinder receiving wire from said rollers, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then circumferentially around said cylinder and then tangentially out of said cylinder, and a guide for the wire movable between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire in successive helicoidal turns having their centers displaced from one turn to the next.

3. In a device for producing a helix from wire, wire feeding means, a cylinder for receiving wire from said feeding means, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then circumferentially around said cylinder and then tangentially out of said cylinder, and a finger guide for the wire angularly movable relative to said cylinder between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire in successive helicoidal turns having their centers displaced linearly from one turn to the next.

4. In a device for producing a helix from wire, a pair of wire feeding rollers, means for mechanically driving said rollers, means for resiliently biasing said rollers towards one another, a cylinder for receiving wire from said rollers, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then circumferentially around said cylinder and then tangentially out of said cylinder, and a finger guide angularly movable relative to the axis of said cylinder between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire in successive helicoidal turns having their centers displaced from one turn to the next.

5. In a device for producing a helix from wire, wire feeding means, a cylinder for receiving wire from said feeding means, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then circumferentially around said cylinder and then tangentially out of said cylinder, and a guide movable between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire in successive helicoidal turns having their centers displaced from one turn to the next, said means for moving said guide comprising a cam rotated by said wire feeding means and two circular profiles of different diameters on said cam successively operating said guide for each revolution of said cam, each profile corresponding to one of the two positions of said guide.

6. In a device for producing a helix from wire, wire feeding means, a cylinder for receiving wire from said feeding means, an outlet from said cylinder for wire initially bent by passage tangentially into said cylinder, then circumferentially around said cylinder and then tangentially out of said cylinder, and a guide movable between a first position in line with the axis of said outlet for partially straightening wire emerging from said cylinder and a second position setting emerging wire in successive helicoidal turns having their centers displaced from one turn to the next, said means for moving said guide comprising two cams, a single cam follower and two circular profiles for each of said cams, said two profiles on each of said cams corresponding to the two positions of said guide, said cams being movable angularly relative to one another to vary the profile presented to said follower.

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