Sept. 14, 1943. H. CAVE 2,329,434

MACHINE FOR WINDING STRIPS OF MATERIAL

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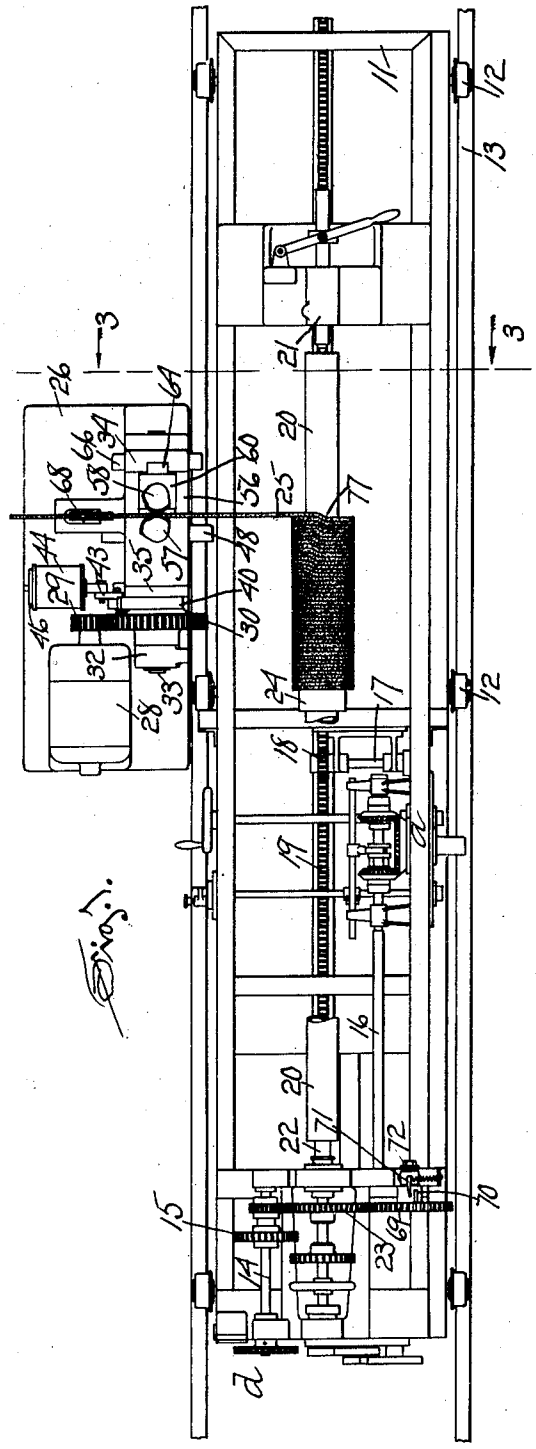


Fig. 1.

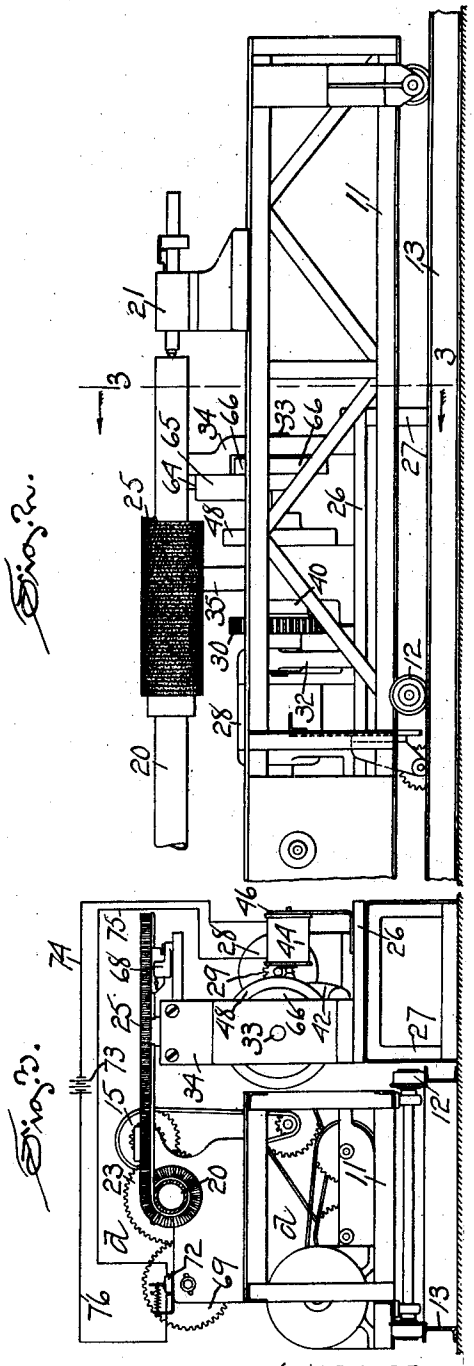


Fig. 2.

Fig. 3.

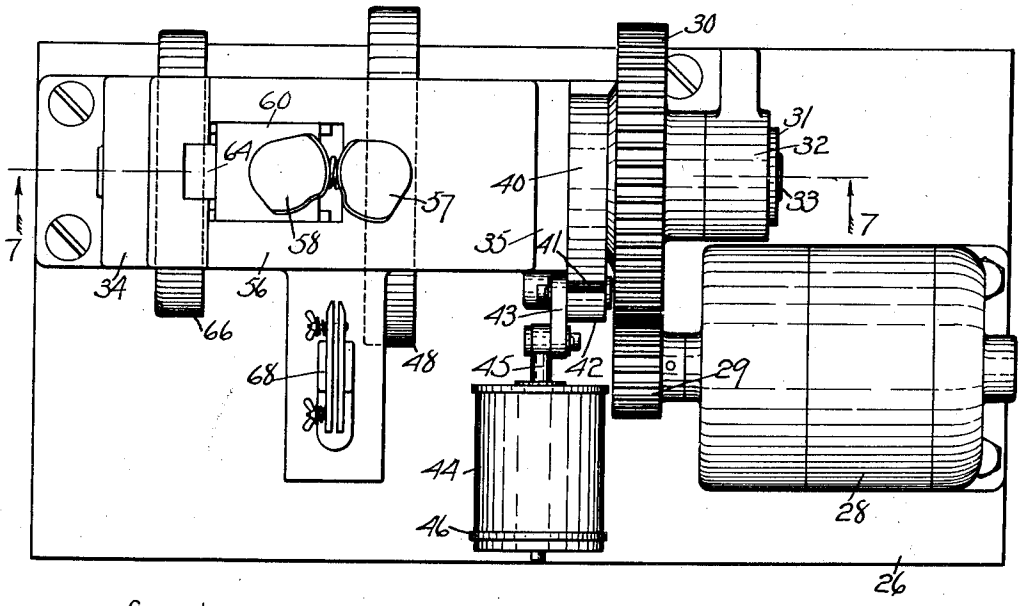
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MACHINE FOR WINDING STRIPS OF MATERIAL

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Fig. 4.



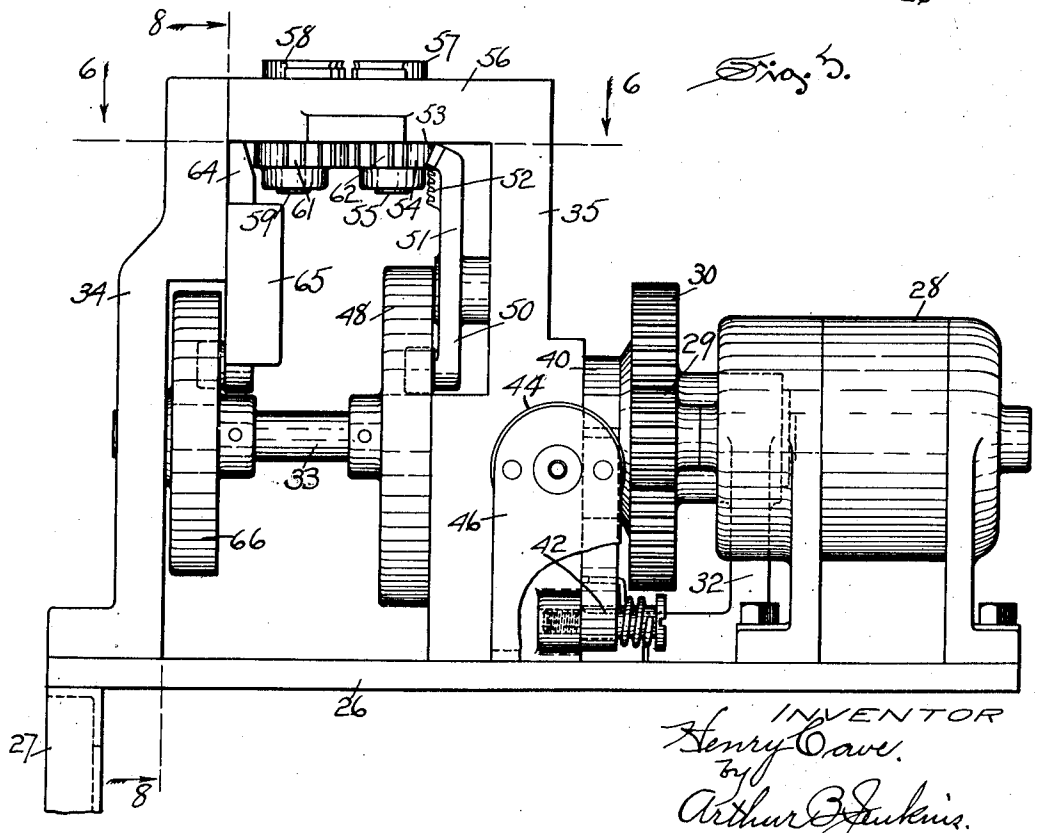


Fig. 5.

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MACHINE FOR WINDING STRIPS OF MATERIAL

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Fig. 6.

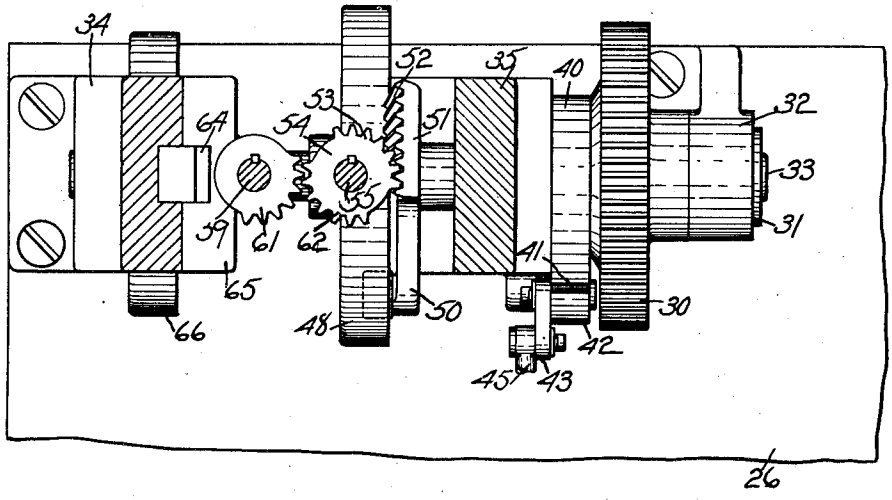
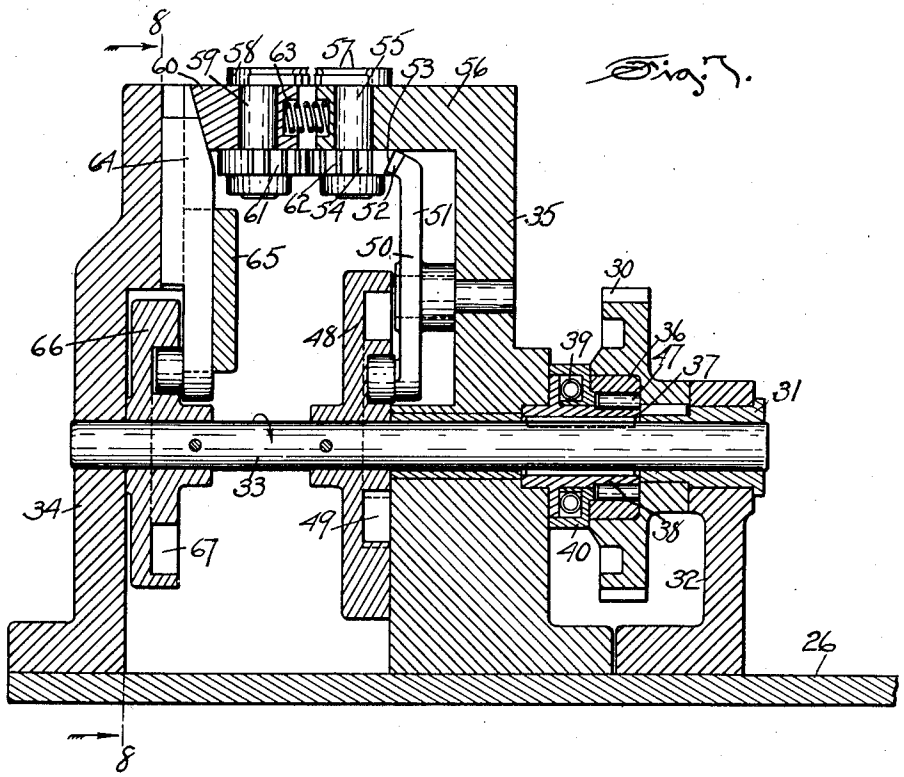


Fig. 7.



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Fig. 9.

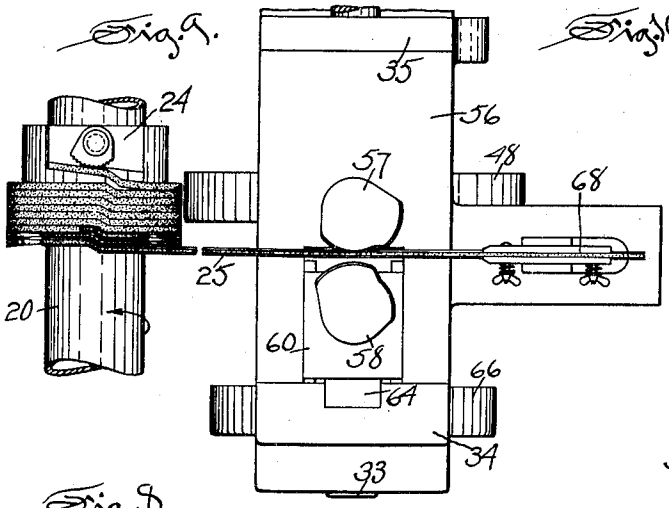


Fig. 10.

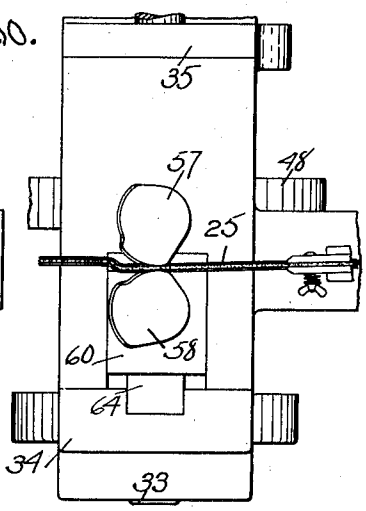
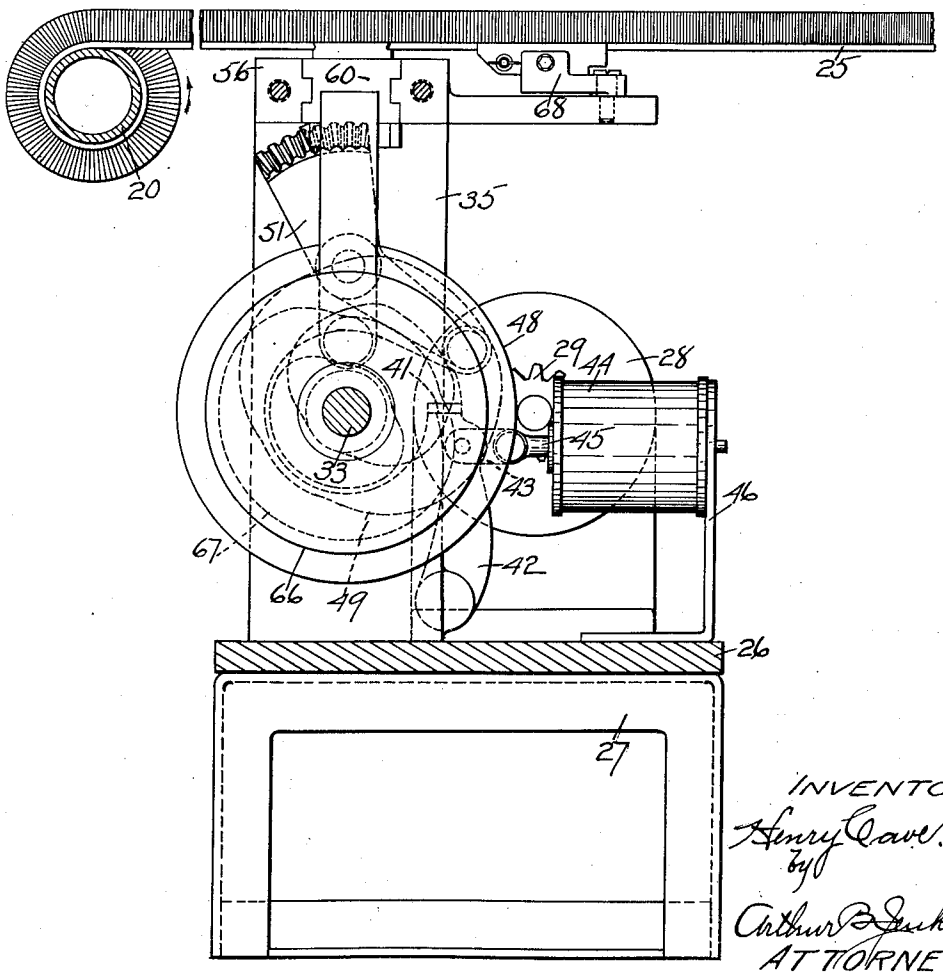


Fig. 8.



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Patented Sept. 14, 1943

2,329,434

UNITED STATES PATENT OFFICE

2,329,434

MACHINE FOR WINDING STRIPS OF MATERIAL

Henry Cave, Hartford, Conn., assignor to The Fuller Brush Company, Hartford, Conn., a corporation of Connecticut

Application April 25, 1941, Serial No. 390,260

20 Claims. (Cl. 300—2)

My invention relates to the class of machines employed for winding strips of material, commonly on a mandrel, and an object of my invention, among others, is to provide in a machine of this type means for squaring the end of the coil at the termination of the winding operation so that the end part of the coil will lie in a plane substantially at right angles to the axis of the coil.

One form of a machine embodying my invention, and in the construction and use of which the objects herein set out, as well as others, may may attained is illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view of my improved winding machine.

Figure 2 is a view in front elevation of a portion of one end of the machine.

Figure 3 is a view in cross section on a plane denoted by the broken line 3—3 of Fig. 1.

Figure 4 is a top plan view on enlarged scale of the mechanism for offsetting a portion of the strip.

Figure 5 is a view in front elevation of this mechanism.

Figure 6 is a view in section on a plane denoted by the broken line 6—6 of Fig. 5.

Figure 7 is a view in section on a plane denoted by the broken line 7—7 of Fig. 4.

Figure 8 is a view in section on a plane denoted by the broken line 8—8 of Fig. 5.

Figure 9 is a partial top plan view similar to that of Fig. 4 but showing the forming dies in their open positions and a strip of material associated therewith.

Figure 10 is a view similar to Fig. 9 but showing the forming dies closed just after the formation of the offset or bend in the strip.

Figures 1, 2 and 3 are in the nature of diagrammatic views to illustrate the association of the invention mechanism with respect to a machine and parts are therefore omitted in some of the figures as not necessary for an understanding of the invention.

In the manufacture of some types of brushes a grooved metal strip with brush material, as bristles, projecting therefrom is wound and coiled upon a mandrel, the coil thus assuming a spiral formation. The end of the coil is therefore inclined on a plane at an angle to the axis of the coil. This is objectionable, as much better results may be obtained from a coil wherein its end is located in a plane at right angles to the axis of the coil, that is, the coil is squared with the axis.

In the machine illustrated and described herein I have provided means for winding or coiling a brush strip in such manner that the end of the coil will be squared with the axis thereof, such machine shown in the drawings herein comprising a base frame 11 constituting a carriage supported on wheels 12 to roll along rails 13. A driving mechanism denoted generally by the letter *d* is supported on the frame at one end thereof and includes a driving shaft 14 that may be driven from any suitable source of power applied as to a sprocket wheel 15 in a manner that will be readily understood.

Carriage controlling mechanism denoted generally by the letter *a* is supported on the carriage near its lengthwise center and at the front thereof, this mechanism being driven through a suitable connection including a shaft 16 from the main driving source hereinbefore referred to, this mechanism *a* including a shaft 17 to which a carriage driving cog wheel 18 is secured, said wheel meshing with a rack 19 and operating to move the carriage back and forth by means of a reversing arrangement of any desired form included in the mechanism *a* in a manner that will be readily understood and for which reason a further and more detailed description is omitted herein.

All of the mechanism thus far described is of old and well known construction and therefore requires no detailed showing or description herein, as such mechanism comprises no part of the present invention which is confined to mechanism for winding the strip of material upon an arbor in a manner now to be described, and while the arbor is shown herein as driven by an old and well known form of mechanism, it may be driven by mechanisms of various sorts and the invention illustrated and described herein may be applied for use in connection with any mandrel driven by these various sorts of mechanisms. The mechanism for rotating the mandrel and the mechanism for governing the operation of the carriage may be manually operated in any suitable way and a detailed showing and description of this arrangement is therefore omitted herein.

A winding arbor 20 is supported at one end by a tail stock 21 and at its opposite end on a live spindle 22 driven as by means of a gear 23 operatively connected with the driving shaft 14 as shown in Fig. 1. This mandrel driving and supporting mechanism is of old and well known construction and a further and more detailed description is therefore omitted herein as not

necessary to a full understanding of the invention.

The mandrel supports a clamp device 24 that is employed for securing the end of a brush strip 25 to the mandrel as shown in Fig. 9 of the drawings. The mechanism of old and well known construction and that is daily operated at the present time and in connection with which my improved apparatus has been employed having been described in general terms only, I will now proceed to describe my invention as applied to the present machine.

A table 26 mounted on a frame 27 (see Fig. 8) supports a motor 28 the spindle of which has a pinion 29 secured thereto in mesh with a gear 30 keyed to a sleeve 31 mounted in a bearing at the upper end of a support 32 secured to the table 26. A driving shaft 33 is mounted in standards 34—35 secured to and rising from the table 26, the shaft in fact being mounted in a sleeve in the standard 35, as shown in Fig. 7. A roller clutch is housed within the hub of the gear 30, one member 36 of this clutch being secured to the gear and the other member 37 being formed on the end of a sleeve 38 keyed to the shaft 33 and supported at its end opposite the clutch in the standard 35.

Retracting springs 39 are housed within a case 40 comprising a part of a cage and having fingers between which the rollers 47 of the roller clutch are located in a manner common to one-revolution clutches any of which would serve the purpose herein, the one particularly shown being set forth and described in United States patent to Anton Van Veen, No. 1,719,093, dated July 2, 1929, and to which reference is made for an understanding of the invention more in detail if desired.

The case 40 within which the springs are housed comprises a stop member having a stop nose 41 formed thereon in a manner common to one-revolution clutches of which this clutch is a type.

To control operation of the clutch to connect the gear 30 with the shaft 33 for intermittent rotation of the latter a stop lever 42 is pivotally mounted at the lower end of the standard 35, its upper end being located for positioning in the path of movement of the nose 41 on the stop member. This stop lever is connected by a link 43 with the armature 45 of a solenoid 44 supported by a bracket 46 rising from the base 26, as shown in Figs. 4 and 8 of the drawings, the solenoid being intermittently energized in a manner to be hereinafter described.

A die actuating cam 48 is secured to the shaft 33 and has a cam groove 49 to receive a roller on the end of a die actuating lever 50 pivotally mounted on the standard 35, as shown in Figs. 7 and 8. The end of the lever opposite the roller is in the form of a segment 51 having rack teeth 52 meshing with a set of gear teeth 53 on a die actuating gear 54. This gear is secured to one end of a spindle 55 rotatably mounted in a lip 56 formed on the upper end of the standard 35, as shown in Figs. 5 and 7 of the drawings. A forming die 57 is secured to the upper end of the spindle 55 and is located in cooperative relation to a companion forming die 58 secured to a spindle 59 rotatably mounted in a spindle supporting slide 60 operating in slideways in the lip 56, as shown in Figs. 4, 7 and 8. The spindle 59 has a segment of a gear 61 adapted to be moved into and out of engagement with and from a gear segment 62 on the gear 54, a spring 63 operating to separate the gear segments and a wedge 64 mounted in a slideway in a block 65 secured to the inner face of the upper end of the standard 34 acting to move the wedge to engage the gears one with the other, as shown in Fig. 7. The lower end of the wedge 65 constitutes a slide which carries a roller operating in a groove 67 in a die closing cam 66 secured to the shaft 33, as shown in Fig. 7.

In the operation of the machine the brush strip 25 passes through a tensioning device 68 of any suitable construction on to the winding arbor 20 where its end is secured by the clamp 24. As the strip 25 passes between the forming dies 57—58 they operate to form an offset or bend in the strip at such intervals as to extend the strip substantially around the arbor. The arbor is under continuous rotation and hence the dies operate only momentarily to dent or bend the strip. To this end the one-revolution clutch operates the bending mechanism to rotate the dies into bending engagement and then to separate them in a manner that will be readily understood from the foregoing description, the peripheral speed of the dies during the bending operation being substantially that of the speed of the strip as it passes between them.

In order to cause the successive bends in the wire to properly nest, as shown in Figs. 1 and 9, it is necessary to gradually progressively vary the time of operation of the forming dies upon the strip to a slight degree. The beginning of each successive cycle of operation of the forming dies is therefore slightly varied to progressively gradually vary the beginning of operation of the one-revolution clutch that is, the time of operation of the solenoid 44. This is effected by a timing gear 69 in mesh with the gear 23 of the driving mechanism *d*, the gear 23 being secured to the live spindle 22 secured to the winding arbor 20, said gear and winding arbor therefore rotating in unison and at the same speed. The timing gear 69 in mesh with the gear 23 has a different number of teeth so that it rotates at a faster or slower speed depending upon the setting of the mechanism. The gear 69 has a contact 70 operating in connection with a contact 71 on a timing device 72 to make and break an electric circuit comprising a battery 73 and a wire 74 connecting one pole of the battery with the solenoid 44. Another wire 75 connects the solenoid and the timing device 72, while a third wire 76 connects the timing device with the other pole of the battery.

In the set up as shown the bends 77 in the wire are advanced to a slight degree in each rotation of the arbor 20 and the operation of the forming dies 57—58 is therefore advanced in point of time at each operation. Consequently the gear 69 rotates slightly faster and to this end has a less number of teeth than the gear 23 with the effect that the bends 77 are deposited in a spiral path on the arbor 20, as shown in Fig. 1.

In accordance with the provisions of the patent statutes I have described the principles of operation of my invention, together with the device which I now consider to represent the best embodiment thereof; but I desire to have it understood that the device shown is only illustrative and that the invention may be carried out by other means and applied to uses other than those above set out.

I claim:

1. In a machine of the character described, a winding arbor with means for rotating it, bend-

ing means located in the path of a strip of material moving on to said arbor, means for operating said bending means to create successively offset bends always in one direction in said strip, and means for effecting relative movement of the bending means and arbor laterally of the strip to form the strip into coils upon said arbor.

2. In a machine of the character described, a winding arbor with means for rotating it, bending means located in the path of a strip of material moving on to said arbor, means for operating said bending means to create successively offset bends always in one direction in said strip, and means for imparting lengthwise movement to the arbor laterally of the strip to deposit the latter in coils upon the arbor.

3. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies rotatably mounted to receive a strip of material passing between them to said arbor, means for rotating said bending dies to successively create offset bends always in one direction in said strip, and means for passing the strip laterally lengthwise along the arbor to deposit it in coils thereon.

4. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for intermittently closing and opening said dies to successively create offset bends always in one direction and at predetermined intervals along said strip, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

5. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for intermittently closing and opening said dies to successively create offset bends always in one direction and at predetermined intervals along said strip, means for slightly varying the intervals between the bending operations of said dies, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

6. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing and opening said dies to successively create offset bends at predetermined intervals along said strip, means for advancing the time of each successive operation of the bending dies to relatively position the bends to nest successively one within the other, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

7. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing said dies to successively effect offset bend in said strip, an operative connection between said die closing means and said arbor rotating means for varying the time of operation of said die closing means to relatively position the successive bends to nest one within another, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

8. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing said dies to successively effect offset bends in said strip, an operative connection between said die closing means and said arbor rotating means for slightly advancing the time of closing movement of said bending dies to relatively position the successive bends to nest one within another, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

9. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing said dies to effect an offset bend in said strip, an operative connection between said die closing means and said arbor rotating means including a one-revolution clutch to control the operation of said die closing means, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

10. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing said dies to effect an offset bend in said strip, a one-revolution clutch operatively connected with said die closing means to control its operation, an operative connection between said clutch and said winding arbor for controlling operation of said clutch, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

11. In a machine of the character described, a winding arbor, means for rotating said arbor, bending means located in the path of a strip of material passing to said arbor, means for operating said bending means to create off-set bends in said strip, said operating means including a driving shaft therefor, means for rotating said shaft, controlling means for governing the operation of said shaft, means connected with said arbor rotating means for controlling operations of said governing means, and means for passing said strip of material lengthwise of the arbor to form coils thereon.

12. In a machine of the character described, a winding arbor, means for rotating said arbor, bending means including rotatably mounted dies located in the path of a strip of material passing to said arbor, means for rotating said dies to create offset bends in said strip, said means including a driving shaft operatively connected with said dies to effect their operation, controlling means for governing the operation of said shaft, means connected with said arbor rotating means for controlling operations of said governing means, and means for passing said strip of material lengthwise of the arbor to form coils thereon.

13. In a machine of the character described, a winding arbor with means for rotating it, bending means located in the path of a strip of material passing to said arbor, said bending means including a pair of rotatably and separably mounted dies to effect offset bends in said strip, said operating means including a driving shaft therefor, means for rotating said shaft, a connection between said shaft and dies for rotating them, a connection between said shaft and dies for closing them together, an operative connection between said shaft and said arbor rotating means for controlling intermittent rotation of said shaft, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

14. In a machine of the character described, a

winding arbor, means for rotating said arbor, bending means located in the path of a strip of material passing to said arbor, means for operating said bending means to create offset bends in said strip, said operating means including a driving shaft therefor, means for rotating said shaft, controlling means for governing the operation of said shaft, said controlling means including a one-revolution clutch on said shaft, a solenoid for governing the operation of said clutch, means connected with said arbor rotating means for timing the operation of said solenoid, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

15. In a machine of the character described, a winding arbor with means for rotating it, bending means located in the path of a strip of material passing to said arbor said means including a pair of rotatably and separably mounted dies to effect offset bends in said strip, a driving shaft for rotating said dies, a connection between said shaft and dies for rotating them, a connection between said shaft and dies for closing them together, a one-revolution clutch mounted on said shaft for controlling its operation, a solenoid for governing the operation of said clutch, means connected with said arbor rotating means for timing the operation of said solenoid, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

16. In a machine of the character described, a winding arbor with means for rotating it, a pair of bending dies mounted to receive a strip of material passing between them to said arbor, means for closing said dies to effect an offset bend in said strip, an operative connection between said die closing means and said arbor rotating means including a one-revolution clutch to control the operation of said die closing means, electrically actuated means operatively connected with said arbor rotating means for controlling operation of said clutch, and means for passing said strip laterally lengthwise along the arbor to deposit it in coils thereon.

17. In a machine of the character described, a winding arbor with means for rotating it, bending means located in the path of a strand of material moving on to said arbor, means for operating said bending means to create offset bends in said strand, and means for passing the strand laterally lengthwise along the arbor to form it into coils thereon thereby nesting said bends one within another to square said coils with the axis thereof.

18. In a machine of the character described, a winding arbor with means for rotating it, bending means located in the path of a strand of material moving on to said arbor, means for operating said bending means to create offset bends in said strand, and means for effecting relative movement of the bending means and the arbor laterally of the strand to form said strand into coils upon said arbor and thereby nest said bends one within another to square said coils with the axis thereof.

19. In a machine of the character described, bending means engageable with a strip of brush material having bristles or the like projecting therefrom, means to present a straight length of said strip to said bending means, and means for operating the bending means to create offset bends lengthwise along said straight strip.

20. In a machine of the character described, bending means engageable with a strip of brush material having bristles or the like projecting therefrom, means to present a straight length of said strip to said bending means, and means for operating the bending means to create evenly spaced offset bends lengthwise along said straight strip.

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