Aug. 18, 1953 A. F. ANDERSON 2,649,336

BRUSHMAKING MACHINE

Filed Oct. 25, 1950 2 Sheets-Sheet 1

FIG. 1

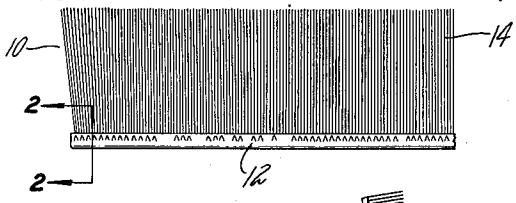


FIG. 2

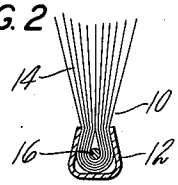


FIG. 3

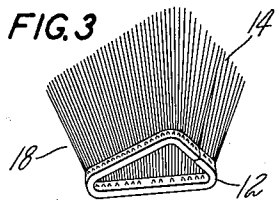


FIG. 4

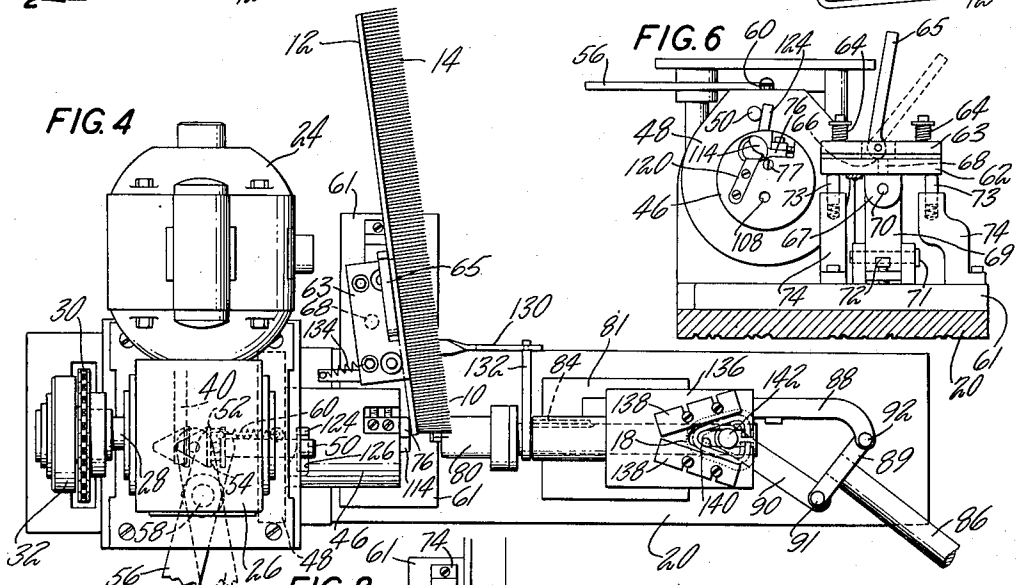


FIG. 6

FIG. 8

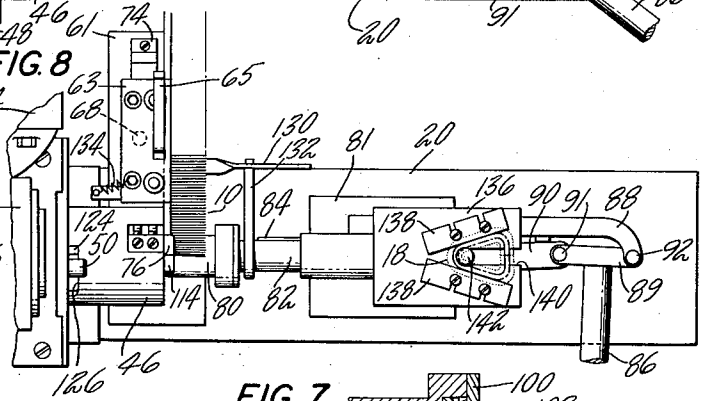


FIG. 5

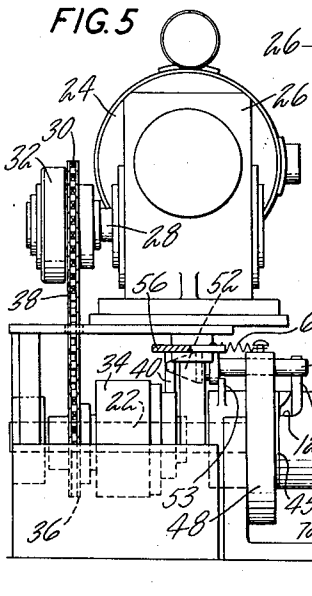
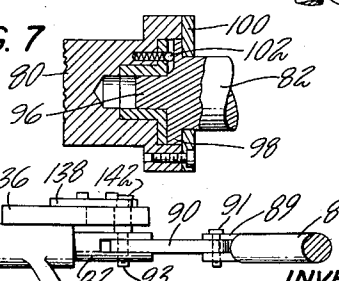


FIG. 7



INVENTOR
ALFRED F. ANDERSON
BY S. Jay Teller
ATTORNEY

Aug. 18, 1953 A. F. ANDERSON 2,649,336

BRUSHMAKING MACHINE

Filed Oct. 25, 1950 2 Sheets-Sheet 2

FIG. 9

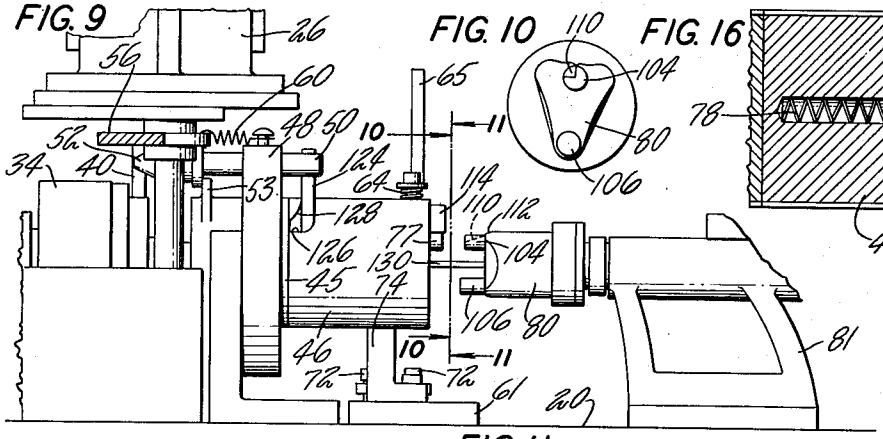


FIG. 10

FIG. 16

FIG. 12

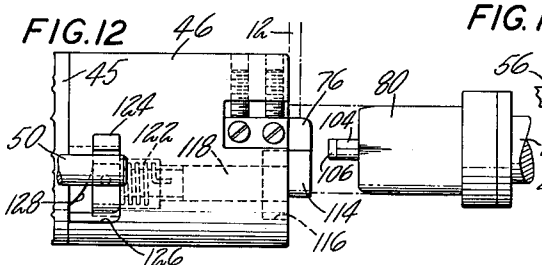


FIG. 11

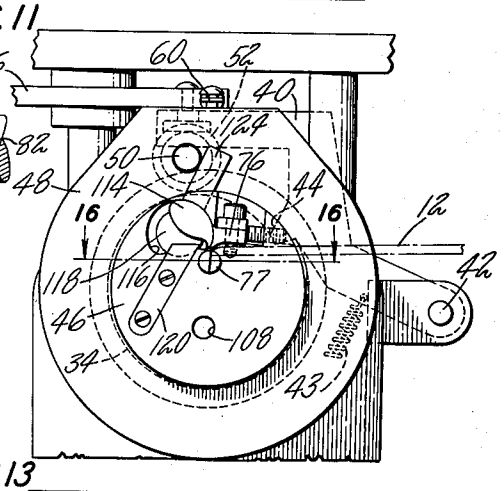


FIG. 14

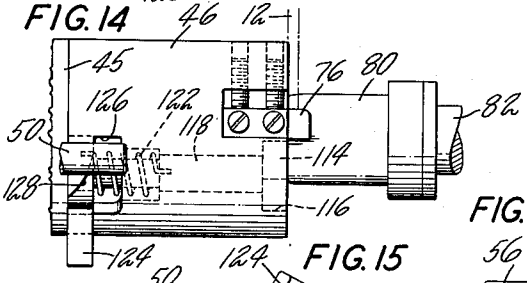


FIG. 13

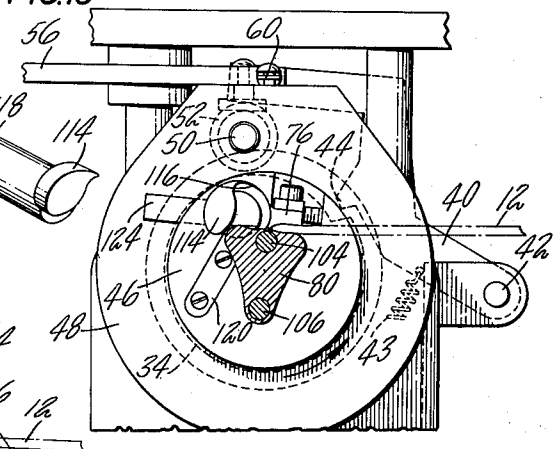


FIG. 15

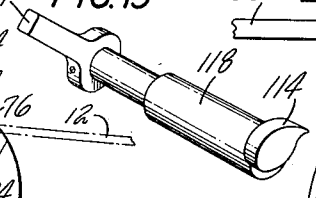


FIG. 17

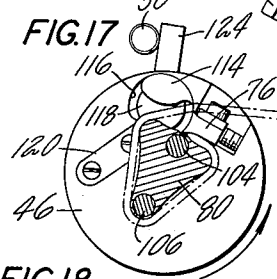


FIG. 18

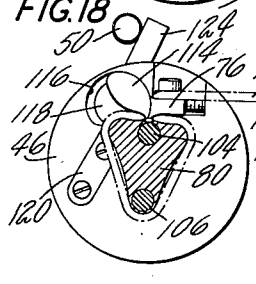
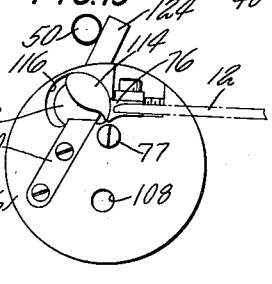


FIG. 19



INVENTOR
ALFRED F. ANDERSON
BY S. Jay Teller
ATTORNEY

Patented Aug. 18, 1953

2,649,336

UNITED STATES PATENT OFFICE

2,649,336

BRUSHMAKING MACHINE

Alfred F. Anderson, East Hartford, Conn., assignor to The Fuller Brush Company, Hartford, Conn., a corporation of Connecticut

Application October 25, 1950, Serial No. 192,091

23 Claims. (Cl. 300—2)

1

The general object of the invention is to provide a semi-automatic machine for making brushes from brush strips each of which comprises a channel member carrying transversely projecting brush fibers.

A more specific object of the invention is to provide an improved machine for the purpose stated which serves to engage a brush strip and to wind it upon an arbor to a predetermined limited extent to form a brush, the brush then being supported on the arbor and being removable therefrom by endwise movement.

Another more specific object of the invention is to provide a machine for the purpose stated which serves not only to engage and wind a brush strip as described but also serves to automatically cut the channel member of the strip upon the completion of winding so as to sever the wound brush from the unwound portion of the strip.

Further specific objects of the invention are to provide various features of structure and arrangement whereby the before-stated objects are advantageously attained.

Other objects of the invention will be apparent from the drawings and from the following description and claims.

In the drawings I have shown in detail a preferred embodiment of the invention, but it will be understood that various changes may be made from the construction shown, and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a side view of a brush strip adapted to be wound and cut by a machine embodying the invention in order to form a brush.

Fig. 2 is an enlarged transverse sectional view taken along the line 2—2 of Fig. 1.

Fig. 3 is a perspective view of a brush which is formed by the machine from the brush strip shown in Figs. 1 and 2.

Fig. 4 is a plan view of a brush forming machine embodying the invention, the parts of the machine being in the positions which they occupy at the end of each brush making operation.

Fig. 5 is a front view of the machine shown in Fig. 4.

Fig. 6 is a vertical sectional view taken along the line 6—6 of Fig. 5, the main drive mechanism and the brush strip being omitted.

2

Fig. 7 is an enlarged fragmentary sectional view taken along the line 7—7 of Fig. 5.

Fig. 8 is a plan view similar to the right portion of Fig. 4 but showing some of the parts in different positions.

Fig. 9 is an enlarged fragmentary view similar to Fig. 5 but showing some of the parts in different positions.

Fig. 10 is a fragmentary view looking toward the right along the line 10—10 of Fig. 9.

Fig. 11 is a fragmentary view looking toward the left along the line 11—11 of Fig. 9, this view showing the parts in loading positions.

Fig. 12 is an enlarged plan view of the rotatable driving and cut-off mechanism, the parts of the said mechanism being in the same positions as shown in Fig. 11.

Fig. 13 is a view similar to Fig. 11 but showing the various parts in the positions which they occupy when winding starts.

Fig. 14 is a view similar to Fig. 12 but showing the parts in the same positions as in Fig. 13.

Fig. 15 is a perspective view of certain parts of the cut-off mechanism.

Fig. 16 is a fragmentary sectional view taken along the line 16—16 of Fig. 11.

Fig. 17 is a view similar to Fig. 13 but showing the parts in the positions which they occupy near the end of winding and with the cutter about to act.

Fig. 18 is a view similar to Fig. 17 but showing the parts in the positions which they occupy when winding and cutting are completed.

Fig. 19 is a view similar to Fig. 18 but showing the parts of the machine in the same positions as in Fig. 11, the brush strip being in a position intermediate that shown in Fig. 18 and that shown in Fig. 11.

Referring to the drawings, more particularly Figs. 1 to 3 thereof, 10 represents as an entirety a brush strip which is adapted to be used in a machine embodying the invention for the making of a brush. The strip comprises a longitudinal metallic channel member 12 which is preferably symmetrical with its side walls converging. Fibers 14 arranged in a layer are looped or folded within the channel, but fibers extending around a longitudinal retaining wire 16. The term "fibers" is herein used in a generic sense and is intended to include vegetable fibers or animal bristles or synthetic fibers or any other filaments adapted for the intended purpose. During manufacture of the brush strip the side walls of the channel member are initially parallel or approximately parallel and the wire 16 and the fibers 14

are pressed into the channel member, the fibers being folded by reason of their engagement with the channel member side walls. Thereafter the side walls of the channel member are bent toward each other to the inclined positions shown, the side walls thus gripping the fibers so that the fibers and the retaining wire are held in place.

By means of the machine embodying the invention a length of the strip 10 is bent or wound so to form a brush 18 having a shape such as that shown in Fig. 3, and the wound brush 18 is cut off from the remainder of the strip 10. The invention is not limited to the formation of a brush having the particular triangular shape shown and by changing the shapes and proportions of certain parts of the machine brushes of other shapes can be made.

Referring to Figs. 4 to 19 of the drawings, 20 is a main bed or base which carries the other parts of the machine. Rotatably mounted in suitable bearings on the base 20 is a longitudinal horizontal shaft 22. Mounted above the shaft 22 on suitable supports carried by the base 20 is an electric motor 24 connected with a speed reducing mechanism 26 having a projecting longitudinal drive shaft 28. A sprocket wheel 30 is connected with the shaft 28, this sprocket wheel being preferably connected by means of an overload slip clutch 32 which will yield when necessary to prevent damage to parts of the machine.

Means is provided for rotating the shaft 22 to a predetermined limited extent, and as shown the said means rotates the shaft through a single revolution. For this purpose a single revolution clutch 34 is mounted on the shaft 22, the clutch having its driving element connected with the said shaft and having its driven element connected with a sprocket wheel 36 in register with the sprocket wheel 30. An andless chain 38 extends around the two said sprocket wheels, and the chain serves to continuously rotate the driven element of the said clutch 34. The operation of the clutch 34 is controlled by a lever 40 shown in Figs. 11 and 13, this lever being pivoted at 42 and being biased in the downward direction by a spring 43. The lever 40 has a tooth 44 which, when in the lower position shown in Fig. 11, enters a notch in the driving element of the clutch 34 to prevent rotation of the said element and of the shaft 22. When the lever 40 is moved to the upper position shown in Fig. 13 the driving element of the clutch and the shaft are rotated in the counterclockwise direction as viewed in Figs. 11 and 13.

Figs. 4, 5, 6, 9, 10, 11 and 12 show the several parts of the machine in the positions which they occupy immediately prior to the winding operation and for convenience the parts will be referred to as being in the loading position. In this position the lever 40 and the tooth 44 prevent rotation of the shaft 22 and of the parts carried thereby.

Secured to the shaft 22 for rotation therewith is a disc 45 to which is secured an arbor driving member 46 which is preferably cylindrical. This member has an exposed end portion at the right. Adjacent the member 46 is a stationary vertical plate 48 within which the disc 45 is located at the right. A pin 50 extends through a bearing aperture in the plate 48, this pin being longitudinally movable. At its left end the pin 50 carries a conical member 52 having an annular groove 54 therein. Movement of the pin 50 toward the right is limited by a stop 53 which

engages the member 52. A manually operable lever 56 is provided which is movable about a vertical axis at 58, and this lever carries a shoe which is entered in the annular groove 54 of the member 52. A spring 60 biases the lever 56 to the position shown by full lines in Fig. 4. When the lever 56 is in the last said position the pin 50 projects from the plate 48 to the extent permitted by the stop 53 and the conical member 52 is in its position toward the right and out of engagement with the lever 40. The lever 40 is in the position shown in Fig. 11, the shaft 22 and the driving member 46 being held against rotation. When the lever 56 is moved to the position shown by dotted lines in Fig. 4, the pin 50 is retracted and the conical member 52 is moved toward the left to engage the lever 40 and move it to the position shown in Fig. 13. This initiates rotation of the shaft 22 and of the driving member 46. As soon as rotation has started the lever 56 is released and the parts are restored to their former positions by the spring 60. Rotation continues for one complete revolution, being then stopped by the entry of the tooth 44 into the notch in the driving element of the clutch 34 as shown in Fig. 11.

A suitable guide means for the brush strip 10 is mounted on a plate 61 secured to the base 20, this guide means being in proper position for guiding the strip toward the winding mechanism which will be fully described. As best shown in Figs. 4 and 6 there are two superposed horizontal plates 62 and 63 which are grooved adjacent their right edges for receiving and fitting the channel member 12 of the strip. The upper plate 63 is normally pressed downwardly against the channel member by springs 64, 64, so that the plates frictionally engage the channel member to resist movement thereof. A manually operable lever 65 is provided having a cam 66 at its lower end. When the lever is in the position shown by full lines in Fig. 6 the upper plate 63 is slightly raised in opposition to the springs 64, 64 so that the strip 10 is freely movable. When the lever is in the position shown by dotted lines the springs are permitted to act to cause frictional engagement of the plates with the channel member of the strip as previously described.

The lower plate 62 is connected with a bracket 67 for pivotal movement about a vertical axis at 68. The said bracket 67 is connected with a substantially vertical strut 69 for movement about a horizontal longitudinal axis at 70. The lower end of the strut 69 is connected with the plate 61 for pivotal movement about the axis of a transverse pivot pin 71. By means of screws 72, 72 engaging the plate 61 the strut 69 may be adjusted about the axis at 71 and may be locked in adjusted position. The screws 72, 72 serve for the adjustment of the plates 62 and 63 in the longitudinal direction so as to locate the strip in proper feeding position. Spring pressed pins 73, 73 project upwardly from brackets 74, 74 secured to the plate 61. These pins abut against the bottom of the plate 62, and they thus tend to bias the plates 62 and 63 toward their normal horizontal positions.

An abutment 76 is secured in fixed position on the driving member 46, this abutment projecting toward the right from the exposed end portion of the said member. Adjacent the said abutment 76 and below the inner end thereof is a stop pin 77 which initially projects toward the right from the face of the member. The pin 77 is flattened to provide a rearwardly exposed stop face near the

center of the pin. As shown in Fig. 16 the pin 77 is longitudinally movable in an aperture in the driving member, being biased outwardly or toward the right by a spring 78. The pin 77 has a longitudinal slot therein into which a set screw 79 projects. The set screw prevents relative rotation of the pin and also limits outward movement thereof.

As the first step preparatory to the winding of a brush the operator separates the guide plates 62 and 63 by means of the lever 65 and inserts the channel member 12 of a brush strip 10 between the plates. It will be understood that the brush strip 10 is initially relatively long, its length being sufficient for the making of several brushes. The brush strip is moved so that its channel member is below the abutment 76 and so that the front end of the channel member is in engagement with the flat face of the stop pin 77. Then the lever 65 is moved to permit the springs 64, 64 to apply pressure against the channel member.

A rotatable arbor 80 is provided upon which the brush strip 10 is to be wound. This arbor is supported independently of the driving member 46 and is rotatable coaxially therewith. The arbor 80 has an exposed end portion at the left and it is longitudinally movable into and out of an engaged position with respect to the driving member 46. As to size and shape the arbor conforms to the required size and shape of the brush 18 which is to be wound. The arbor may be noncylindrical in cross section and it is shown as being generally triangular, but the invention is not limited to this particular shape.

Mounted on the base 20 is bracket 81 which carries a spindle 82 in alignment with the shaft 22 and the driving member 46. The spindle 82 is longitudinally movable and is nonrotatable, the spindle serving to support the said rotatable arbor 80. Rotation of the spindle may be prevented by a key 84 entering a longitudinal groove in the spindle. The spindle 82 is movable longitudinally by means of a manually operable lever 86. As shown, an arm 88 is rigidly secured to the bracket 81, this arm extending toward the right. Toggle links 89 and 90 are pivotally connected with each other at 91, the link 89 being pivotally connected with the arm 88 at 92 and the link 90 being pivotally connected with the spindle 82 at 93. The said lever 86 is rigidly connected with one of the links, as for instance the link 89. Fig. 4 shows the spindle in retracted position. When the lever 86 is moved in the clockwise direction to the position shown in Fig. 8 the links 89 and 90 move the spindle 82 toward the left. Fig. 8 shows the center pivotal connection 91 of the toggle moved beyond the center line to effect locking.

The arbor 80 has a central bearing recess which receives and fits an extension 96 on the spindle 82, as shown in Fig. 7. The spindle 82 has a circular flange 98 which fits within a circular recess in the arbor 80. An end plate 100 is secured to the end face of the arbor, this plate engaging the said flange 98. Thus the arbor is supported for rotation with respect to the spindle. In order that the arbor may be initially maintained in a predetermined rotative position for loading, it is provided with a spring pressed ball detent 102 which enters a suitably located depression in the flange 98.

The arbor 80 is provided at its exposed left end portion with two pins 104 and 106. With the driving member 46 and the arbor in their proper rotative positions for loading the pin 104 is in alignment with the stop pin 77 and the pin 106 is in alignment with a hole 108 in the exposed portion of the said member 46. When the arbor 80 is moved to its engaged position the pin 104 presses the stop pin 77 inwardly and it enters and fits the hole in which the said stop pin is located. The pin 106 enters and fits the hole 108. The pin 104 has a notch 110 therein which has an inclined bottom face as shown by dotted lines in Fig. 9. The front face of the notch 110 is in alignment with the flat face of the stop pin 77. The inner or left end portion of the arbor is slightly beveled as shown at 112.

After the strip 10 has been placed with the leading end portion of its channel member 12 below the abutment 76 and in engagement with the stop pin 77 as previously described, the lever 86 is moved in the clockwise direction to move the arbor 80 toward the left from the position shown in Figs. 4, 5, 9 and 12 to its engaged position shown in Figs. 8 and 14. The pin 104 forces the stop pin 77 into the cylindrical member and the pins 104 and 106 respectively enter and fit the stop pin hole and the hole 108. Thus the arbor is connected with the driving member for rotation in unison therewith. As the pin 104 is moved the inclined bottom face of the notch 110 forces the end portion of the strip channel member upwardly, if necessary, so that the beveled portion 112 of the arbor can pass under the channel member. The leading end portion of the channel member is pinched between the abutment 76 and the arbor 80, being thus firmly gripped for the subsequent winding operation. The said abutment 76 constitutes means for connecting the leading portion of the channel member with the arbor.

For cutting the channel member 12 of the strip 10 after winding, a cutter 114 is provided which is bodily movable with the arbor 80 during rotation thereof. The cutter 114 is movable relatively to the arbor to cut the channel member and it is shown as being movable transversely for this purpose. When the cutter is movable transversely for cutting it is preferably also movable longitudinally relatively to the arbor into and out of register with the channel member which is to be cut. During winding the cutter 114 is out of register with the channel member so as not to interfere with winding. After rotation of the arbor to a predetermined limited extent, the cutter is automatically moved longitudinally into register with the channel member and it is then automatically moved transversely to cut the channel member. After cutting, the cutter is relatively moved reversely to the position wherein it is out of register with the channel member.

Preferably and as shown the cutter 114 is carried by the driving member 46 and it is rotatable relatively to the said member about an eccentric longitudinal axis, this rotation providing the required transverse movement for cutting. The left or inner end face of the abutment 76 is curved and it serves as a cutting abutment for the cutter 114. As previously stated, the cutter 114 is also movable longitudinally into and out of register with the channel member to be cut, and when out of each register it is in a recess 116 in the member 46. The withdrawal of the cutter into the recess 116 prevents the cutter from interfering with the winding operation.

As shown, the cutter 114 is secured in an eccentric position to the inner or right end of a shaft 118 which is mounted in a bearing aperture in

the member 46 for both rotative and longitudinal movement. A bar 120 is located in a groove in the face of the member 46, the outer face of the bar being flush with the exposed end face of the said member. The bar projects into the recess 116, being of such size and being so positioned that it does not interfere with the required movements of the cutter 114. A coil spring 122 surrounds the shaft 118 and serves to bias it for rotation in the counterclockwise direction as viewed in Figs. 11 and 13 and also to bias it for movement toward the left, that is, in the direction to move the cutter 114 into the recess 116. A lever 124 is secured to the shaft 118, this lever projecting from the periphery of the driving member through a slot 126 therein. The length of the lever 124 is such that it can engage the beforementioned pin 50 when the pin is in its projecting position. The slot 126 has a cam face 128 which engages the lever 124 to move the shaft 118 and the cutter 114 toward the right when the lever is moved in the clockwise direction in opposition to the spring 122, that is, when the parts are moved from the positions shown in Figs. 13 and 14 to the positions shown in Figs. 11 and 12. The said movement toward the right is limited by the engagement of the lever 124 with the right wall of the slot 126 or by the engagement of the end of the shaft 118 with the bar 120 or by both.

At the beginning of each operation the parts are in the loading position, as shown in Figs. 11 and 12. The lever 124 is in engagement with the pin 50, the cutter 114 being in the position shown which corresponds to the completion of cutting for the last preceding operation. The operator locates the strip 10 in the manner previously described so that the channel member thereof is beneath the abutment 76 and in engagement with the stop pin 77. Then, by means of the lever 86, the arbor 80 is moved toward the left so that the pins 104 and 106 thereon enter the holes in the member 46, the stop pin 77 being pressed into the member 46 by the pin 104. The ball detent 102 holds the arbor 80 in the proper position for the entry of the said pins into the said holes. The aforesaid movement of the arbor 80 positions it for the winding of the strip thereon, the channel member of the strip being pinched between the said arbor and the abutment 76. The toggle links 89 and 90 are in the positions shown in Fig. 8, thus holding the arbor in the described position. The entry of the pins 104 and 106 in the holes in the member 46 connects the arbor 80 for rotation in unison with the said member. The ball detent 102 yields to permit such rotation.

The operator then moves the lever 56 toward the right from the position shown in full lines in Fig. 4 to the position shown in dotted lines. This movement of the lever 56 moves the lever 42 to release the single revolution clutch in the manner previously described. At the same time the movement of the lever 56 retracts the pin 50, thus permitting the lever 124 to move from the positions shown in Figs. 11 and 12 to the positions shown in Figs. 13 and 14. When the lever 124 is released, the spring 122 moves the said lever, together with the shaft 118 and the cutter 114, in the counterclockwise direction and also moves the said parts longitudinally toward the left so that the cutter is within the recess 116. Thus the cutter is so positioned that it does not interfere with the winding operation. As soon as the lever 124 has moved as above-described, the lever 56 is released and is restored to its original position by the spring 60, the pin 50 being returned to its projecting position.

As the arbor 80 is rotated by the member 46, the strip 10 is wound thereon, the advancing movement of the strip being resisted by the friction applied by the plates 62 and 63 of the guide means. As the result of the resistance the strip as it is wound conforms to the shape of the arbor. The said plates 62 and 63 move about the pivotal axis at 70 during winding so that the strip is always tangent to the periphery of the triangularly shaped arbor.

When the position shown in Fig. 17 is reached, the lever 124 again engages the pin 50. By means of the cam face 128 the cutter 114 is moved longitudinally into position for cutting the channel member 12 of the strip. As movement continues, the cutter 114 is rotated in the clockwise direction from the position shown in Fig. 17 to the position shown in Fig. 18, the cutter cooperating with the abutment 76 to cut off the wound portion of the strip. As the cutter 114 moves, it not only cuts the strip but presses the adjacent end thereof downwardly against the arbor 80. The projecting portion of the bar 120 prevents any possible movement of the end of the channel member 12 into the recess 116 as the said end of the channel member is moved from the position shown in Fig. 17 to that shown in Fig. 18. When the position shown in Fig. 18 is reached, the tooth 44 on the lever 40 stops rotation of the several parts.

Then, by means of the lever 86 the operator withdraws the arbor 80 to the position shown in Figs. 4, 5, 9 and 12, the wound brush being then located on the arbor. The brush is removed from the arbor manually. The ball detent 102 maintains the arbor in the rotative position to which it has been moved and prevents any accidental displacement thereof so that it is ready for the next following operation.

It will be seen that at the completion of winding, as shown in Fig. 18, the channel member 12 of the strip is at the upper side of the abutment 76. For winding the next brush the end of the channel member strip must be transferred to the lower side of the said abutment, that is, to the position shown in Figs. 8, 11 and 12. To assist in the transfer, the plates 62 and 63 are moved slightly in the counterclockwise direction about the vertical pivotal axis at 68. Preferably they are so moved by means operated by the mechanism which moves the spindle 82 and the arbor 80 to their withdrawn positions.

Connected with the lower plate 62 is a link 130 having a longitudinal slot therein. An arm 132 is rigidly secured to the spindle 82, this arm having a reduced end portion which extends into the slot in the link 130. When the spindle 82 and the arbor 80 are withdrawn to the positions shown in Fig. 4, the end portion of the arm 132 engages the right end of the slot in the link 130 and swings the plates 62 and 63 and also the strip 10 in the counterclockwise direction to the angular positions shown in the said Fig. 4.

The above described angular movement of the strip permits the leading end of the channel member thereof to move from the position at the top of the abutment 76 as shown in Fig. 18 to a position at the right end of the abutment 76 as shown in Figs. 4, 5, and 19. Then the operator moves the lever 65 to separate the plate 63 from the plate 62 and manually shifts the chan-

nel member of the strip from the position shown in Figs. 4, 5 and 19 to that shown in Figs. 8, 11 and 12. The leading end of the channel member is engaged with the stop pin 77. When the channel member is shifted as last above stated, the guide plates 62 and 63 are swung in the clockwise direction, such movement being assisted by a spring 134 connected with the upper plate 63. The spindle 82 is free to be moved slightly toward the left by the arm 132. With the channel member in the position shown in Fig. 11, the lever 65 is moved to restore the pressure of the plate 63 against the plate 62 and the machine is ready for the winding of the next following brush in the manner previously described.

As the result of the inherent resiliency of the channel member 12 of the strip and as the result of the action of the cutter 114, the adjacent ends thereof after winding may be somewhat separated at the completion of winding and cutting, and a subsequent pressing operation may be necessary. For this purpose a plate 136 is mounted on the bracket 81, this plate carrying two abutments 138, 138 having an angle between them corresponding to the required angle between the two longer sides of the completed brush. The plate 136 is longitudinally slotted at 140, and an extension 142 of the pivot pin 93 extends through the said slot. After the winding of a brush and after the withdrawal of the arbor 80, the parts are in the positions shown in Fig. 4, the pin extension 142 being near the right end of the slot 140. The wound brush is placed on the plate 136 between the abutments 138, 138 as shown in Fig. 4, the pin extension 142 being within the space bounded by the wound channel member 12.

When the parts are moved from the position shown in Fig. 4 to the position shown in Fig. 8 the arbor is moved toward the left as previously described for the winding of another brush. When the parts are so moved the pin extension 142 moves toward the left in the slot 140. As the pin extension so moves, it engages the narrow end portion of the wound brush to force the brush between the abutments 138, 138. This serves to press the ends of the channel member toward each other into their proper final positions.

When the parts are restored to the positions shown in Fig. 4, the pressed brush is removed and the next following brush is put in place for pressing.

The invention claimed is:

1. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion, means for rotating the said member to a predetermined limited extent, an arbor supported independently of the driving member and rotatable coaxially therewith, the said arbor having an exposed end portion facing the said end portion of the driving member and the said arbor being longitudinally movable into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, means for connecting the leading end portion of the brush strip channel member with the arbor to cause the said strip to be drawn through the said guiding means and to be wound on the said arbor to form a brush upon rotation of the arbor in unison with the driving member, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

2. A brush winding machine as set forth in claim 1, wherein the means for rotating the driving member rotates it through a single revolution and then stops the rotation thereof.

3. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion, means for rotating the said member to a predetermined limited extent, an arbor rotatable coaxially with the driving member and having an exposed end portion facing the said end portion of the driving member, a nonrotatable spindle for supporting the rotatable arbor which spindle is longitudinally movable to bring the said arbor into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, means for connecting the leading end portion of the brush strip channel member with the arbor to cause the said strip to be drawn through the said guiding means and to be wound on the said arbor to form a brush upon rotation of the arbor in unison with the driving member, and mechanism for moving the spindle longitudinally to move the arbor into its said engaged position prior to winding and for moving the spindle longitudinally to move the arbor out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

4. A brush winding machine as set forth in claim 3, wherein a releasable detent is provided for resisting rotation of the arbor relatively to the spindle out of the rotative position to which the arbor is moved by the driving member at the end of winding.

5. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion, means for rotating the said member to a predetermined limited extent, an arbor supported independently of the driving member and rotatable coaxially therewith, the said arbor having an exposed end portion facing the said end portion of the driving member and the said arbor being longitudinally movable into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, an abutment projecting longitudinally from the exposed face of the driving member and so spaced from the axis of rotation that the leading end portion of the brush strip channel member is gripped between the said abutment and the said arbor upon longitudinal movement of the latter to its said engaged position, the said abutment and arbor causing the said strip to be drawn through the said guiding means and to be wound on the arbor to form a brush upon rotation of the arbor in unison with the driving member, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after

winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

6. A brush winding machine as set forth in claim 5, wherein the means for moving the arbor longitudinally includes toggle links which are moved into locking relationship when the arbor is moved into its said engaged position.

7. A brush winding machine as set forth in claim 5, wherein a stop pin is provided which projects longitudinally from the exposed end portion of the driving member and is located to limit movement of the leading end of the channel member with respect to the said abutment.

8. A brush winding machine as set forth in claim 5, wherein a stop pin is provided which projects longitudinally from the exposed end portion of the driving member and is located to limit movement of the leading end of the channel member with respect to the said abutment, wherein the stop pin is longitudinally movable and is spring pressed to its projecting position, and wherein means is provided on the arbor for moving the stop pin to a retracted position within the driving member when the arbor is moved to its engaged position.

9. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion which has eccentric longitudinal holes therein, means for rotating the said member to a predetermined limited extent, an arbor supported independently of the driving member and rotatable coaxially therewith which arbor has an exposed end portion facing the said end portion of the driving member, the said arbor being provided at its exposed end portion with eccentric longitudinal pins for entering and fitting the said holes in the driving member and the said arbor being longitudinally movable into and out of an engaged position wherein the said pins are entered in the said holes, guiding means for a brush strip having a channel member which guiding means frictionally resist movement of the channel member of the strip, means for connecting the leading end portion of the brush strip channel member with the arbor to cause the said strip to be drawn through the said guiding means and to be wound on the said arbor to form a brush upon rotation of the arbor by the said pins in unison with the driving member, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

10. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion which exposed end portion has eccentric longitudinal holes therein, a stop pin longitudinally movable in one of the said holes and spring pressed to a projecting position, means for rotating the said member to a predetermined limited extent, an arbor supported independently of the driving member and rotatable coaxially therewith, the said arbor having an exposed end portion facing the said arbor being longitudinally movable into and out of an engaged position with respect to the driving member, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, an abutment projecting longitudinally from the exposed face of the driving member adjacent the said stop pin which abutment is so spaced from the axis of rotation that the leading end portion of the brush strip channel member when engaged with the said stop pin is gripped between the said abutment and the said arbor upon longitudinal movement of the latter to its said engaged position, eccentric longitudinal pins on the arbor at the exposed end portion thereof which pins enter and fit the said holes in the driving member upon longitudinal movement of the arbor to its said engaged position, one of the last said pins engaging the said stop pin to move it longitudinally into the corresponding hole in the driving member and the said pins effecting rotation of the arbor in unison with the driving member to cause the said strip to be drawn through the said guiding means and to be wound on the arbor to form a brush, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

11. A brush winding machine as set forth in claim 10, wherein the pin on the arbor which engages the stop pin has a notch therein provided with a bottom face which is inclined upwardly from the end of the pin for forcing the leading end of the channel member upwardly toward the abutment on the driving member.

12. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion, means for rotating the said member to a predetermined limited extent, a noncylindrical arbor supported independently of the driving member and rotatable coaxially therewith, the said arbor having an exposed end portion facing the said end portion of the driving member and the said arbor being longitudinally movable into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, means for connecting the leading end portion of the brush strip channel member with the arbor to cause the said strip to be drawn through the said guiding means and to be wound on the said arbor to form a brush upon rotation of the arbor in unison with the driving member, means supporting the said guide means for pivotal movement about a longitudinal axis to enable the channel member of the strip to remain tangent to the periphery of the noncylindrical arbor during winding, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

13. In a brush winding machine, the combination of a driving member rotatable about a longitudinal axis and having an exposed end portion, means for rotating the said member to a predetermined limited extent, an arbor supported independently of the driving member and rotatable coaxiablly therewith, the said arbor having an exposed end portion facing the said end portion of the driving member and the said arbor being longitudinally movable into and out

of an engaged position wherein it is connected with respect to the driving member for rotation in unison therewith, guiding means for a brush strip having a channel member which guiding means frictionally resists movement of the channel member of the strip, an abutment projecting longitudinally from the exposed face of the driving member and positioned for the positioning beneath it of the leading end portion of the channel member, the said abutment being so spaced from the axis of rotation that the said leading end portion of the brush strip channel member is gripped between the said abutment and the said arbor upon longitudinal movement of the latter to its said engaged position and the said abutment and arbor causing the said strip to be drawn through the said guiding means and to be wound on the arbor to form a brush upon rotation of the arbor in unison with the driving member, a support for the said guide means enabling the said guide means to be moved about a vertical pivotal axis so that the leading end portion of the channel member may be moved from a position above the said abutment to a position at the end thereof, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

14. A brush winding machine as set forth in claim 13, including means operated by the mechanism which longitudinally moves the arbor for pivotally moving the guide means as stated when the arbor is moved out of its engaged position.

15. In a machine for winding and cutting a brush strip having a channel member, the combination of a rotatable arbor, means for connecting the leading end portion of the channel member of the strip with the arbor, means for rotating the arbor to wind the brush strip thereon, a cutter bodily movable in unison with the arbor and concentrically therewith and also movable relatively thereto, and means automatically operable after rotation of the arbor to a predetermined limited extent for relatively moving the cutter to cut the said channel member.

16. In a machine for winding and cutting a brush strip having a channel member, the combination of a rotatable arbor, means for connecting the leading end portion of the channel member of the strip with the arbor, means for rotating the arbor to wind the brush strip thereon, a cutter bodily movable in unison with the arbor and concentrically therewith and also movable transversely relatively thereto, and means automatically operable after rotation of the arbor to a predetermined limited extent for relatively moving the cutter transversely to cut the said channel member.

17. In a machine for winding and cutting a brush strip having a channel member, the combination of a rotatable arbor, means for connecting the leading end portion of the channel member of the strip with the arbor, means for rotating the arbor to wind the brush strip thereon, a cutter bodily movable in unison with the arbor and concentrically therewith, the said cutter being relatively movable longitudinally relatively to the arbor into and out of a position in register with the channel member and the said cutter being also movable transversely relatively to the arbor for cutting the channel member, and means automatically operable after rotation of the arbor to a predetermined limited extent for moving the cutter longitudinally into register with the wound channel member and for then moving the cutter transversely to cut the channel member.

18. In a machine for winding and cutting a brush strip having a channel member, the combination of a driving member rotatable about a longitudinal axis, means for rotating the said member to a predetermined limited extent, an arbor rotatable coaxially with the driving member and longitudinally movable into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guide means for the channel member of the brush strip, means for connecting the leading end portion of the channel member with the arbor to cause the said strip to be drawn through the said guide means and to be wound on the said arbor to form a brush upon rotation of the arbor in unison with the driving member, a cutter carried by and bodily movable with the driving member and movable relatively thereto, means dependent on the rotation of the driving member and operable near the completion of winding for relatively moving the cutter to cut the channel member of the strip, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

19. In a machine for winding and cutting a brush strip having a channel member, the combination of a driving member rotatable about a longitudinal axis, means for rotating the said member to a predetermined limited extent, an arbor rotatable coaxially with the driving member and longitudinally movable into and out of an engaged position wherein it is connected with the driving member for rotation in unison therewith, guide means for the channel member of the brush strip, means for connecting the leading end portion of the channel member with the arbor to cause the said strip to be drawn through the said guide means and to be wound on the said arbor to form a brush upon rotation of the arbor in unison with the driving member, a cutter carried by and bodily movable with the driving member and movable longitudinally relatively thereto into and out of a position in register with the wound channel member, the said cutter being also movable transversely relatively to the driving member for cutting the said channel member, and means dependent on the rotation of the driving member and operable near the completion of winding for relatively moving the cutter longitudinally into register with the wound channel member and for then relatively moving the cutter transversely to cut the said channel member, and mechanism for moving the arbor longitudinally into its said engaged position prior to winding and for moving it longitudinally out of its said engaged position after winding to permit the wound brush to be removed from the arbor at the said exposed end thereof.

20. In a machine for winding and cutting a brush strip having a channel member, the combination of a driving member rotatable about a longitudinal axis, means for rotating the said member to a predetermined limited extent, an arbor rotatable coaxially in unison with the driv-

ing member, guide means for the channel member of the brush strip, means for connecting the leading end portion of the channel member with the arbor to cause the said strip to be drawn through the said guide means and to be wound on the said arbor to form a brush upon rotation of the arbor, a cutter carried by and bodily movable with the driving member, the said cutter being rotatably movable relatively to the driving member about an eccentric longitudinal axis into and out of a cutting position, a spring for biasing the cutter for rotative movement out of the said cutting position, a lever connected with the cutter for movement in unison therewith which lever projects from the periphery of the driving member, a longitudinally movable pin fixed against bodily rotative movement and normally in a projecting position to be engaged by the said lever near the completion of winding, the said pin thereupon serving to relatively rotate the lever and the cutter in opposition to the spring to rotatively move the cutter to its cutting position so as to cut the channel member, and means for retracting the pin after the cutting action to release the lever and to thus enable the spring to move the cutter out of its cutting position and for then restoring the pin to its projecting position for subsequent reengagement with the said lever.

21. A machine as set forth in claim 20, wherein the means for rotating the driving member is a single revolution clutch, and wherein a mechanism is provided for simultaneously retracting the said pin and for starting the action of the said clutch.

22. In a machine for winding and cutting a brush strip having a channel member, the combination of a driving member rotatable about a longitudinal axis, means for rotating the said member to a predetermined limited extent, an arbor rotatable coaxially in unison with the driving member, guide means for the channel member of the brush strip, means for connecting the leading end portion of the channel member with the arbor to cause the said strip to be drawn through the said guide means and to be wound on the said arbor to form a brush upon rotation of the arbor, a cutter carried by and bodily movable with the driving member, the said cutter being rotatably

movable relatively to the driving member about an eccentric longitudinal axis into and out of a cutting position and the said cutter being also movable longitudinally into and out of a position in register with the channel member, a cam which upon relative rotative movement of the cutter to its cutting position serves to move the cutter longitudinally into register with the channel member, a spring for biasing the cutter for rotative movement out of the said cutting position and also for longitudinal movement out of register with the channel member, a lever connected with the cutter for movement in unison therewith which lever projects from the periphery of the driving member, a pin fixed against bodily rotative movement and positioned to be engaged by the said lever near the completion of winding which pin thereupon serves to relatively rotate the lever, the said lever upon being so rotated acting in opposition to the spring and serving in cooperation with the cam to longitudinally move the cutter into register with the channel member and also serving to rotatively move the cutter to its cutting position so as to cut the channel member; and means for retracting the pin after the cutting action to release the lever and thus enable the spring to relatively move the cutter out of its cutting position and to longitudinally move the cutter out of register with the channel member, the last said means then serving to restore the pin to its projecting position for subsequent reengagement with the said lever.

23. A machine as set forth in claim 22, wherein the means for rotating the driving member is a single revolution clutch, and wherein a mechanism is provided for simultaneously retracting the said pin and for starting the action of the said clutch.

ALFRED F. ANDERSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
759,339	Bliss	May 10, 1904
1,130,765	Reese	Mar. 9, 1915
1,355,587	Baldwin	Oct. 12, 1920
2,471,083	Tuttle	May 24, 1949