Aug. 19, 1952 A. L. LE FEBVRE ET AL 2,607,630

BRUSHMAKING MACHINE

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FIG. 2

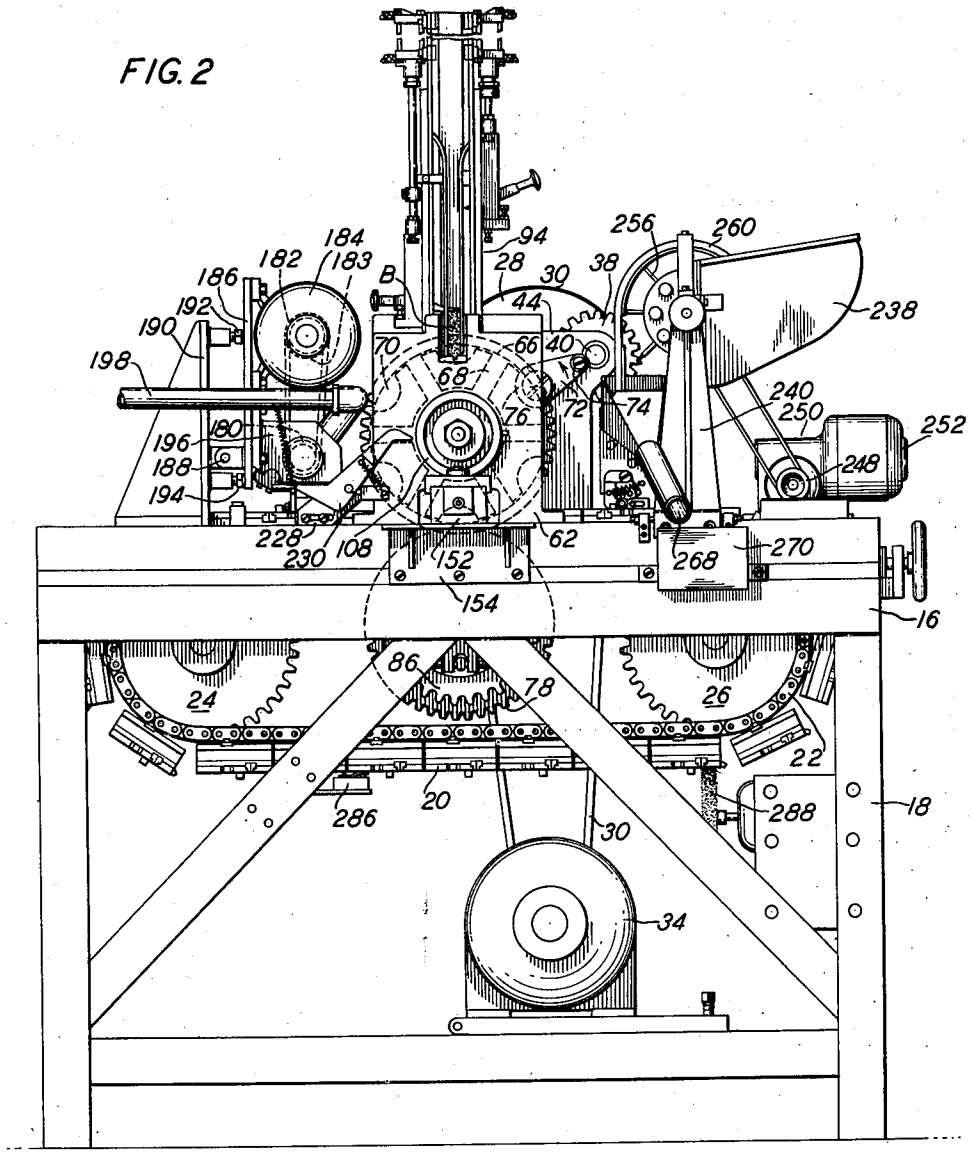
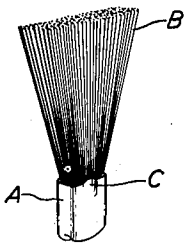


FIG. 1



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BRUSHMAKING MACHINE

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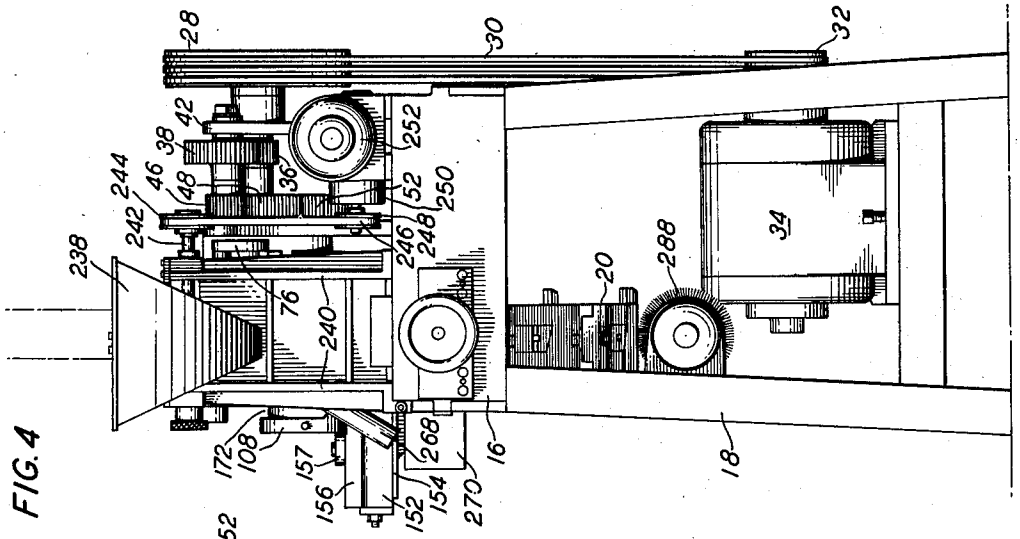


FIG. 4

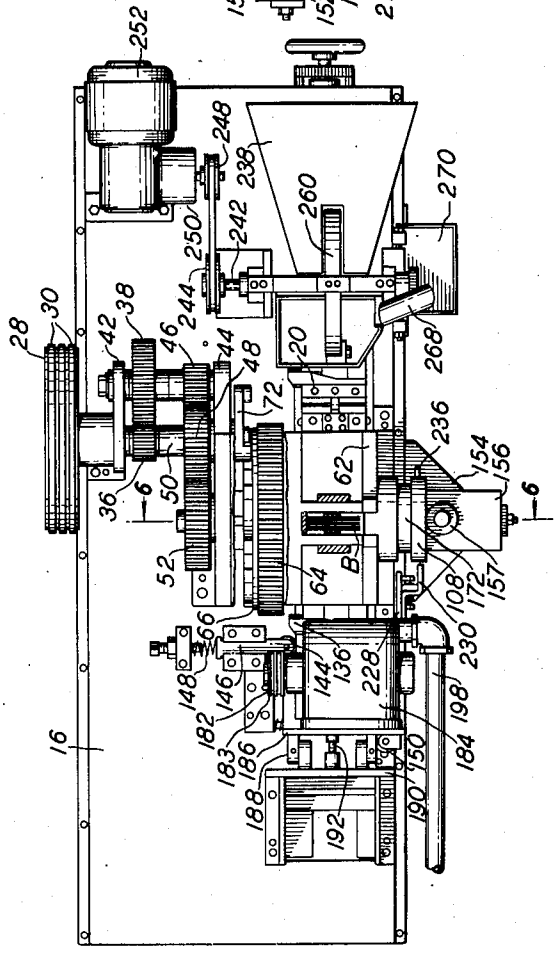


FIG. 3

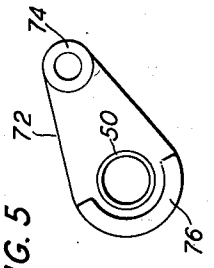


FIG. 5

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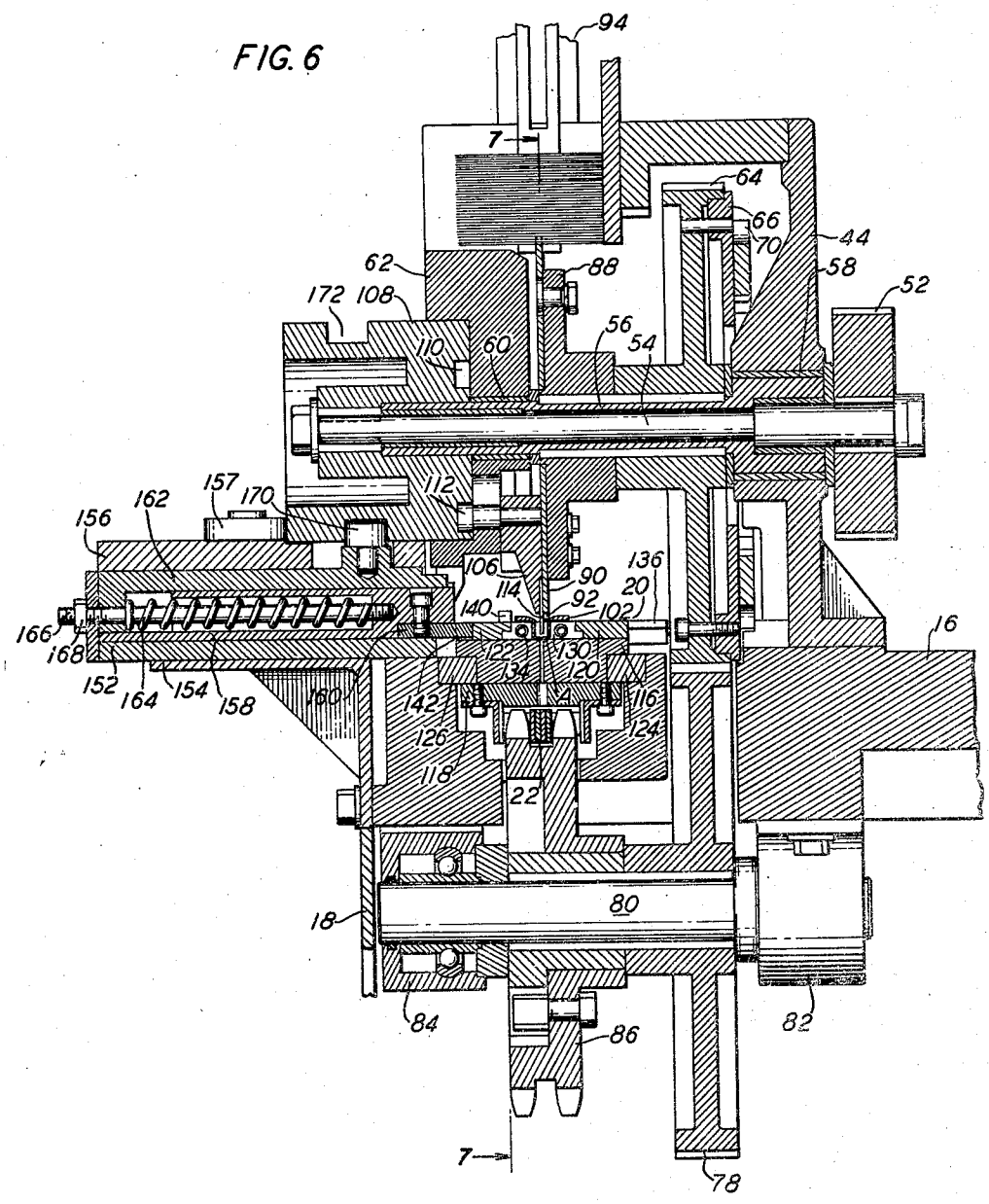
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BRUSHMAKING MACHINE

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FIG. 6



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FIG. 7

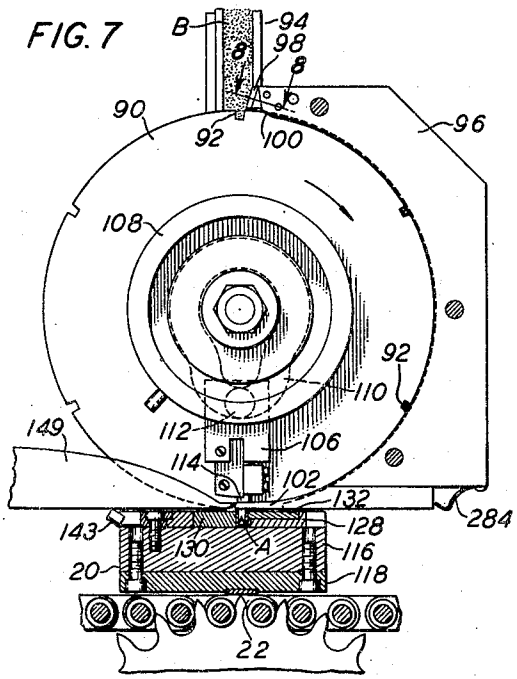


FIG. 12

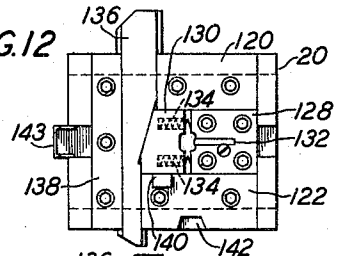


FIG. 13

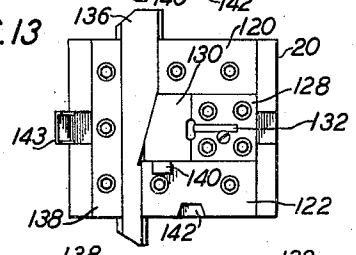


FIG. 14

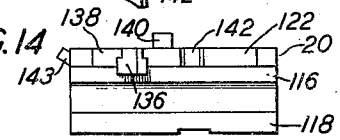


FIG. 9

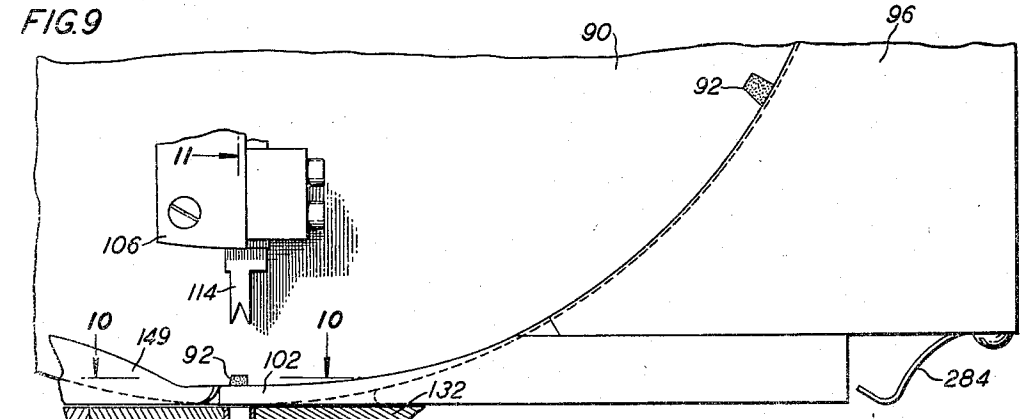


FIG. 11

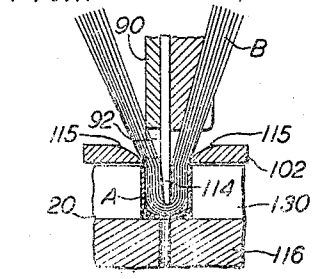


FIG. 8

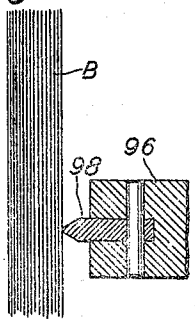
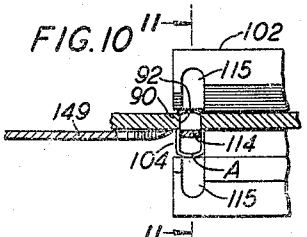


FIG. 10



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BRUSHMAKING MACHINE

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FIG. 15

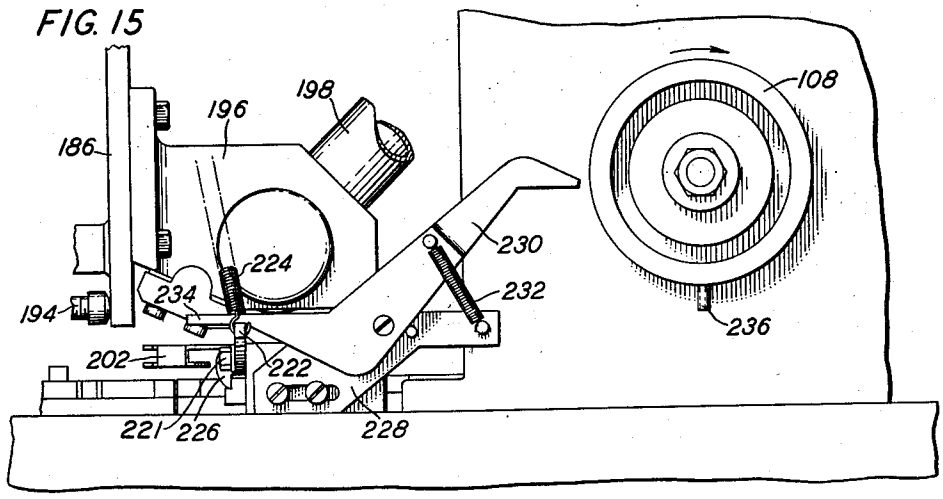


FIG. 16

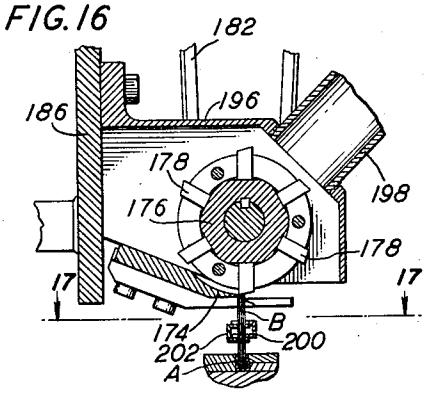


FIG. 17

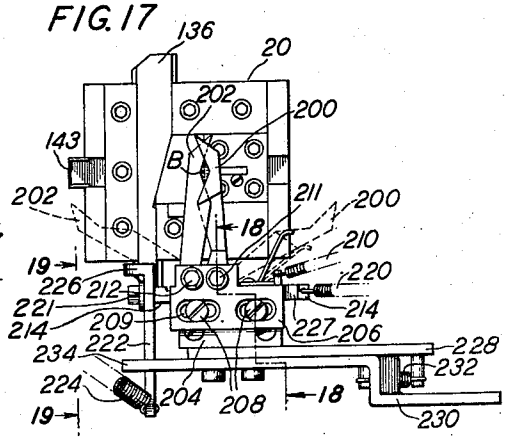


FIG. 18

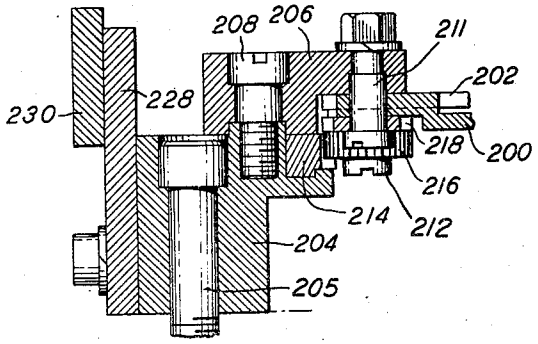
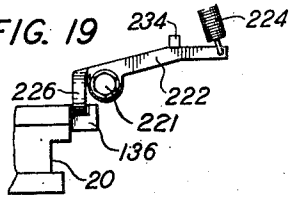


FIG. 19



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BRUSHMAKING MACHINE

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FIG. 21

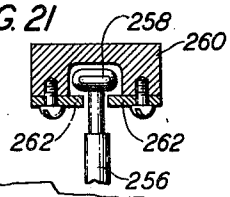
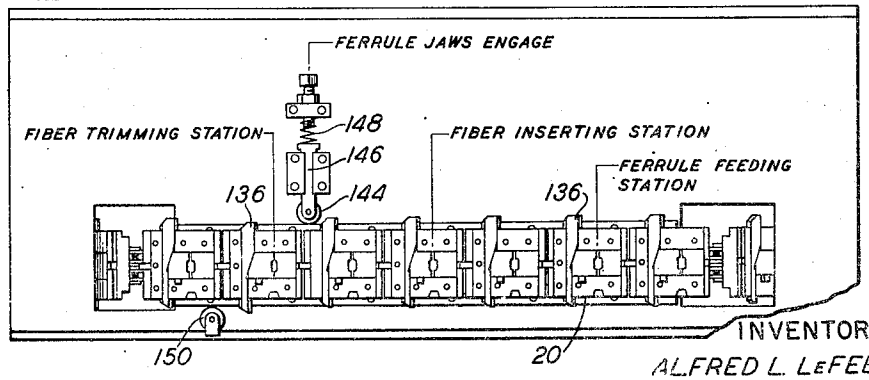


FIG. 20

FIG. 22



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Patented Aug. 19, 1952 2,607,630

UNITED STATES PATENT OFFICE

2,607,630

BRUSHMAKING MACHINE

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Application January 14. 1948, Serial No. 2,196

32 Claims. (Cl. 300—2)

1

The invention relates to a machine for making brushes of the type wherein a quantity of doubled or folded fibers is held by a metallic ferrule. Brushes of this type are commonly provided in connection with erasers for typewriter use.

The general object of the invention is to provide a machine for automatically feeding and moving a succession of ferrules, for inserting folded fibers in the successive ferrules, for squeezing the successive ferrules to hold or lock the fibers in place, and for trimming to the required length the fibers held by the successive ferrules. While the complete machine includes means for feeding ferrules and means for trimming the fibers, it will be understood that the invention is not necessarily limited to a machine having these functions, as the ferrule feeding could be effected manually and as the fiber trimming could be done by a separate machine.

Further and more specific objects of the invention are to provide various features of mechanism and arrangement for attaining the stated general object of the invention.

In the drawings we 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 perspective view of a brush of the type produced by a machine embodying the invention.

Fig. 2 is a front view of a machine embodying the invention.

Fig. 3 is a plan view.

Fig. 4 is a left end view.

Fig. 5 is a detail view of one of the parts of the indexing mechanism.

Fig. 6 is an enlarged fragmentary vertical sectional view taken along the line 6—6 of Fig. 3.

Fig. 7 is a fragmentary longitudinal vertical sectional view taken along the line 7—7 of Fig. 6.

Fig. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of Fig. 7.

Fig. 9 is an enlarged fragmentary front view of the lower portion of the fiber carrying disc and of the parts immediately associated therewith, the fibers being omitted and the vertically movable tool being in its upper position instead of in its lower position as shown in Fig. 7.

Fig. 10 is a fragmentary horizontal sectional view taken along the line 10—10 of Fig. 9, but

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with the vertically movable inserting tool in its lower position.

Fig. 11 is a fragmentary vertical sectional view taken along the lines 11—11 of Figs. 9 and 10, but with the vertically movable inserting tool in its lower position and with fibers inserted.

Fig. 12 is a plan view of one of the ferrule carrying units, this view being on the same scale as Fig. 6.

Fig. 13 is a view similar to Fig. 12 but showing the parts in different relative positions.

Fig. 14 is a front view of one of the units shown in Figs. 12 and 13.

Fig. 15 is an enlarged fragmentary front view of a portion of the machine showing the fiber gathering and trimming mechanisms near the left end.

Fig. 16 is a fragmentary longitudinal vertical sectional view taken along the center line of the machine and showing the trimming knives and the fiber gathering jaws.

Fig. 17 is a fragmentary plan view taken along the line 17—17 of Fig. 16.

Fig. 18 is an enlarged vertical sectional view taken along the line 18—18 of Fig. 17.

Fig. 19 is a fragmentary view looking in the direction of the arrows 19, 19 on Fig. 17.

Fig. 20 is an enlarged longitudinal vertical sectional view of the ferrule feeding mechanism.

Fig. 21 is an enlarged fragmentary sectional view taken along the line 21—21 of Fig. 20.

Fig. 22 is a view showing diagrammatically the positions at which the various operations take place.

Fig. 1 shows a brush of the type which a machine embodying the invention is adapted to produce. The brush includes a metallic ferrule A which is closed at its lower end and open at its upper end. The ferrule A is preferably substantially rectangular in transverse section. Fibers B are carried by the ferrule, and the several fibers are looped or folded with the looped or folded portions thereof inserted into the ferrule to form a tuft. After the fibers are in place, the ferrule is squeezed or indented at least at one side, as indicated at C, so as to lock the fibers in place. After the fibers have been inserted and locked in place, the upper ends thereof are trimmed so as to provide uniformity of length.

The machine as shown in Figs. 2 to 22 comprises a ferrule moving means which is preferably a ferrule supporting mechanism having a plurality of uniformly spaced ferrule receiving recesses, the said mechanism being adapted to be moved intermittently in one direction so as to bring the

ferrule holding recesses to successive stations at which various operations take place. At one station ferrules A are fed into the recesses in vertical positions, and at another station fibers B are folded and inserted into the ferrules in the recesses. Following the insertion of the fibers, the ferrules are squeezed or indented to lock the said fibers in place. At a third station the fibers are trimmed to uniform lengths. Terms such as "horizontal" and "vertical" are herein used to more conveniently set forth relative positions or arrangements. Such terms are not to be construed as in any way limiting the scope of the invention.

Driving and indexing mechanisms

Referring more particularly to Figs. 1 to 6, 16 represents a base which carries the major portion of the operating parts of the machine. The base is shown as being generally rectangular, and it is supported on a framework 18 which may have any suitable or convenient form. The before-mentioned ferrule supporting mechanism preferably comprises an endless series of ferrule supporting units 20. While the invention is not necessarily so limited, the several units 20 are preferably secured to an endless chain 22. The chain 22 extends around and is supported by idler sprockets 24 and 26 which are supported on transverse shafts rotatable in bearings secured to the base 16. The ferrule supporting units 20 will be hereinafter described in greater detail and it is sufficient for present purposes to say that each of them has a recess which is open at the top when the unit is in upright position. Each recess is of such size as to permit a ferrule to be readily fed into it, the open end of the ferrule being exposed at the top.

At the rear of the machine is a belt pulley 28 which is carried by a short transverse main drive shaft. The pulley 28 is driven by means of belts 30 which extend around a pulley 32 carried by the shaft of a motor 34 on the main frame 18. Secured to the main drive shaft is a pinion 36 which meshes with a gear 38 secured to a short jack shaft 40. The jack shaft is mounted in bearings carried by brackets 42 and 44. Also secured to the jack shaft 40 is a pinion 46 which meshes with a gear 48 secured to a sleeve 50, this sleeve being rotatably mounted on the main drive shaft. It wli be seen that by means of the gearing described, the sleeve 50 is rotated at a speed considerably less than that of the belt pulley 28 and of the main drive shaft.

The gear 48 meshes with a gear 52 secured to a transverse shaft 54 which is shown most clearly in Fig. 6. The gears 48 and 52 are of the same size and therefore rotate at the same speeds, but in opposite directions. The shaft 54 is rotatable within a transverse sleeve 56, which is rotatable independently of the shaft. The sleeve 56 is supported at the rear in a bearing 58 carried by the before-mentioned bracket 44 and is supported at the front in a bearing at 60 in a bracket 62 adjacent the front of the machine.

Secured to the sleeve 56 is a gear 64 which carries an indexing plate 66 constituting part of an indexing mechanism of the Geneva motion type. As shown in Fig. 2, the plate 66 is provided on its rear face with a plurality of radial grooves 68, 68, six such grooves being shown. The plate 66 is provided at its periphery and between the respective grooves 68, 68 with partly cylindrical recesses 70, 70. Secured to the front end of the sleeve 50 is a crank 72 which is shown in detail in Fig. 5. The crank carries at the front side thereof a roller 74 which is adapted to enter successive radial grooves 68 in the index plate 66. The crank 72 also carries at the front thereof a partly cylindrical projection 76 which is adapted to enter and fit successive recesses 70, 70 in the index plate 66. When the crank 72 is in the position shown in Fig. 2, the projection 76 thereon is entered in one of the recesses 70 of the index plate and this locks the index plate against rotation. The directions of rotation of the several parts are such that the crank 72 moves in the counterclockwise direction. As it so moves, the roller 74 thereon enters the next adjacent radial groove 68 and at the same time the projection 76 moves out of the corresponding recess 70. Engagement of the roller 74 in the groove 68 causes the index plate and the parts directly connected thereto to move in the clockwise direction. The index plate is moved through an angle corresponding to the angle between successive radial grooves, that is, through 60°. As the roller 74 emerges from the groove 68, the projection 76 on the crank enters the next following recess 70 and again locks the index plate against rotation. The crank 72 rotates continuously and serves during each rotation to index the plate 66 and the gear 64 in the clockwise direction through successive angles of 60°.

The gear 64 meshes with a gear 78 which is most clearly shown in Fig. 6. The gear 78 is secured to a transverse shaft 80 which is rotatable in bearings 82 and 84 secured to the underside of the base 16. Carried by the shaft 80 is a sprocket wheel 86 which meshes with the underside of the upper run of the before-mentioned endless chain 22. It will be seen that by means of the indexing mechanism and the other parts that have been described, the chain 22 and the ferrule supporting units 20, 20 carried thereby are moved intermittently. The construction is such that each intermittent movement is equal to the distance between the ferrule receiving recesses in successive units. As already stated, the shaft 54 is rotated continuously and its rate of rotation is such that it makes one complete revolution for each operation of the indexing mechanism and for each intermittent movement of the chain and of the units carried thereby.

Fiber inserting mechanism

Ferrules A are fed into the recesses of the several units 20, 20 as they pass a ferrule receiving station near the right end of the machine, such feeding being preferably effected by means of mechanism to be hereinafter fully described. By reason of the intermittent movements that have been described, the units 20, 20 are successively moved to a station near the center of the machine at which fibers are inserted therein. This fiber inserting station is vertically beneath the axis of the before-mentioned transverse shaft 54.

Connected to the sleeve 56 which is intermittently rotated by the indexing mechanism is a hub 88 to which is secured a fiber carrying disc 90 which is shown most clearly in Figs. 6 and 7. The axis of the disc 90 is horizontal and it preferably extends as shown transversely of the direction of movement of the ferrule carrying units. The disc 90 has therein at its periphery a plurality of fiber receiving notches 92, 92, and when the sleeve 56 and the disc 90 are indexed through 60° as has been described there are six notches. The notches are so positioned that at the end of each indexing movement one of them is at a transfer position at the bottom and is vertically

above and opposite the open end of a ferrule A carried by the corresponding ferrule supporting unit 20.

Positioned vertically above the disc 90 is a fiber magazine indicated generally at 94. The details of the magazine 94 do not constitute any part of the present invention and it is sufficient to say that the magazine serves to maintain a mass of horizontally and preferably transversely arranged fibers B in a position above and in contact with a portion of the upper periphery of the wheel. As each successive notch 92 passes the mass of fibers B, a quantity of fibers sufficient for one brush enters the notch and by reason of the successive indexing movements is carried to the before-mentioned position at the bottom of the disc. At the last-mentioned position the fibers are horizontal and they extend across the upper open end of the corresponding ferrule at the fiber inserting station.

In order that the fibers B may be retained in the successive notches 92, 92, there is provided a guard 96 which is shaped to closely fit the disc at one side thereof. Preferably, the guard 96 is grooved so that the peripheral portion of the disc 90 is entered in the groove. In order to insure the entry of uniform quantities of fibers into the notches, the guard 96 preferably carries a separating member 98 which is shown in Fig. 7 and which is also shown in section in Fig. 8. The member 98 has a narrow edge which is inclined outward and in the direction of disc movement as shown in Fig. 7. The inner edge of the said member is substantially at the periphery of the disc 90. When the disc is indexed, the corresponding notch 92 passes beneath the lower edge of the member 98 and any fibers in excess of the required quantity are restrained from movement with the disc. The guard 96 has an inclined guiding surface at 100 which engages the fibers in the notch and forces them inward and compacts them to a limited extent.

Referring particularly to Figs. 9, 10 and 11, it will be seen that a portion 102 of the lower end of the guard 96 extends toward the left beyond the position of the lowermost notch 92. The extended portion 102 of the guard does not exactly follow the curvature of the periphery of the disc 90, but is inclined relatively inward so that the fibers in the lowermost notch are bent upward to a slight extent. The portion 102 of the guard has a slot 104 therein adapted for the passage of the fibers and of a vertically movable fiber inserting tool to be now described.

A slide 106 is provided which is vertically reciprocable in suitable guideways provided in the bracket 62. Secured to the shaft 54 and rotatable therewith is a cam drum 108 having a cam groove 110 in the inner or rear face thereof. The slide 106 is provided with a stud carrying a roller 112 which is positioned within the cam groove 110. As will be apparent from an inspection of Fig. 7, the cam groove 110 is so shaped that it serves to reciprocate the slide 106, the slide being moved to its lowermost position immediately following each intermittent movement of the ferrule carrying units 20. Carried by the slide 106 is a fiber inserting tool 114, the lower portion of the tool being of such size that it can enter the corresponding ferrule A. As clearly shown in Fig. 9, the lower end of the tool is grooved or bifurcated so as to be adapted to embrace the fibers in the notches 92 and maintain them in compact relationship. The tool 114 is so connected with the slide 106 that it is immediately adjacent the disc 90.

Fig. 9 shows the tool 114 in the upper position which it occupies during each intermittent movement of the carrying units 20. Immediately following each intermittent movement of the units the tool is moved downward from the position shown in Fig. 9 to the position shown in Figs. 10 and 11. In moving downward the tool engages the fibers in the corresponding notch 92 and forces them downward through the slot 104 in the guard extension 102. Movement of the tool causes the fibers to be looped or folded and the tool inserts the looped or folded fibers into the corresponding ferrule A as shown. Preferably the extension 102 is grooved as indicated at 115 to facilitate the folding of the fibers. As soon as the fibers have been inserted into the ferrule to form a tuft, the tool 114 is moved upward and remains in its upper position until after the next intermittent movement of the ferrule supporting units.

Ferrule supporting units

Figs. 6, 7, 12, 13 and 14 show in detail one of the ferrule supporting units 20. Each unit comprises a body 116 to which is secured an inner plate 118, the plate 118 being directly connected with one of the links of the chain 22. Secured to the outer face of the body 116 and near opposite ends thereof are plates 120 and 122. As shown in Fig. 6, the body 116 is formed at its sides with two longitudinal notches which cooperate with the inner plate 118 to form two longitudinal grooves. Longitudinal guide rails 124 and 126 on the base 16 enter these grooves and serve to guide the unit 20 for longitudinal movement.

The inner edges of the plates 120 and 122 are parallel and ferrule engaging jaws 128 and 130 are positioned between them. The jaws 128 and 130 are provided with registering notches which cooperate to provide the before-mentioned ferrule receiving recess. The jaw 128 is rigidly connected to the base 16 and the inner face of the notch therein is preferably provided with a projection 132 which is shown more clearly in Fig. 9. The projection 132 may be formed as a separate piece inserted in the jaw 128. The jaw 130 is longitudinally movable, being guided for such movement in undercut grooves in the opposite plates 120 and 122. Springs 134, 134 positioned in holes in the movable jaw 130 tend to hold the said jaw in the position shown in Fig. 12 wherein it is separated from the jaw 128. The left end face of the movable jaw 130 is inclined and this inclined face engages a corresponding inclined face on a transversely movable cam slide 136. This slide is guided in undercut grooves in the plates 120 and 122 and in an additional plate 138.

The plate 122 has an upward projecting boss 140 which serves a purpose to be presently described. The plate 122 also has in its front edge a notch 142 having oppositely inclined edges. The purpose of the notch 142 will be presently described. Preferably, each unit 20 has a notch at its leading end in which is positioned a sheet metal clip 143. This clip is adapted to project into a corresponding notch in the next adjacent unit. The purpose of the clip 143 will be hereinafter explained.

During the insertion of the fibers B into the ferrule A, as shown in Figs. 7 and 11, the movable jaw 130 is separated from the jaw 128 as shown in Fig. 12. Following the insertion of the fibers,

the slide 136 is moved toward the front so as to force the jaw 130 toward the right, the ferrule A being thus squeezed between the two jaws. This squeezing action serves to lock the fibers in place. Preferably and as shown, the projection 132 serves during the squeezing action to indent the ferrule as shown at C in Fig. 1, locking of the fibers being thus effected. It will be seen that the squeezing of the ferrule between the jaws 130 and 128 serves not only to lock the fibers in place but also to grip the ferrule and securely hold it during the subsequent trimming operation.

The before described movement of the slide 136 is preferably effected during a subsequent intermittent movement of the ferrule supporting unit. During such a movement, the rear end of the slide 136 is engaged with a suitable means such as a roller 144 which serves to force the slide toward the front. The roller 144 is preferably mounted, as shown in Fig. 3, on a transversely movable slide 146. The slide and the roller are biased in the forward direction by means of a spring 148. The roller 144 is positioned between the fiber inserting station and the fiber trimming station, and it is preferably so located that movement of the slide 136 is effected during the second intermittent movement of each ferrule carrying unit following the insertion of the fibers.

During movement of each unit 20 from the inserting station to the position wherein the slide 136 is moved forward, the ferrule A and the fibers B therein are loosely held in the recess in the unit. In order to prevent any transverse tilting during this interval, a guide bar 149 is preferably provided, as shown in Figs. 7, 9 and 10. This guide bar is in alignment with the inserting tool 114, and the folded fibers B extend upward at the sides of the bar. Thus the bar serves to hold the fibers and the ferrule in upright positions until the latter is squeezed and gripped by the jaws 130 and 128.

After each ferrule carrying unit has passed the trimming station, the front end of the slide is engaged by a suitable means, such as a roller 150, which serves to move the slide rearward from the position shown in Fig. 13 to the position shown in Fig. 12. The position of the roller 150 is shown in Fig. 3. When the slide 136 is moved rearward the movable jaw 130 is released and is moved toward the left by the springs 134, 134. Movement of the jaw 130 toward the left releases the completed brush so that it can drop out into a suitable container, not shown, when the successive intermittent movements bring the unit to an inverted position.

Preferably, a locking means is provided for accurately positioning the ferrule supporting unit which is at the fiber inserting station. It is obviously necessary that this unit be very accurately positioned in order that the inserting tool 114 may always enter the ferrule A. On account of cumulative lost motion in the indexing mechanism and in the gears and in the engagement of the sprocket 86 with the chain 22, the required accuracy might not be attained without a special positioning and locking means.

As shown, a transversely extending guide 152 is provided which is carried by a bracket 154 secured to the base 16 The guide 152 has a cover 156. A roller 157 is preferably carried by the cover 156, this engaging the front of the cam drum 108 and assisting in preventing endwise movement thereof in the forward direction. Transversely slidable in the guide 152 is a slide 158 carrying a tooth 160 at its rear end which is positioned and shaped to enter the notch 142 in the plate 122 of the ferrule supporting unit. There is also provided a second slide 162 above the slide 158. A coil spring 164 supported on a guide rod 166 biases the lower slide 148 for rearward movement with respect to the upper slide 162, relative rearward movement being limited by means of a nut 168 on the guide rod 166. The upper slide 162 has an extension which projects through an opening in the cover 156 and which carries a roller 170. The roller 170 is entered in a cam groove 172 formed in the periphery of the before-mentioned cam drum 108. The cam groove 172 is so shaped that the slides 158 and 162 are moved rearward after each intermittent movement of the ferrule supporting units, the tooth 160 on the slide 158 entering the notch 142 to accurately position the corresponding unit and lock it in place while the fibers are being inserted. Following insertion of the fibers, the slides are moved forward to withdraw the tooth 160 from the notch 142 to permit the next following intermittent movement. The extent of movement of the lower slide 158 carrying the tool 160 is slightly less than the extent of movement of the upper slide 162 which is operated by the cam groove 172. The difference in the extent of movement of the two slides is compensated for by the spring 164, the spring serving to firmly press the tooth 160 into its notch.

Gathering and trimming mechanisms

After the fibers have been inserted in the ferrule and locked in place as described, their upper ends must be trimmed to insure the correct uniform lengths. To facilitate the trimming operation it is necessary, or at least desirable, to provide a gathering mechanism which brings the fibers together into a relatively compact bunch while they are being trimmed. The gathering and trimming station is preferably at the second unit beyond the fiber inserting station.

As shown most clearly in Fig. 16, the trimming unit comprises a stationary knife 174 which has a transverse cutting edge at the right, the said cutting edge being preferably approximately vertically above the center of the brush at the said trimming station. Associated with the stationary knife 174 is a rotatable drum 176 carrying a plurality of transverse cutting knives 178 adapted to cooperate with the stationary knife 174. The drum 176 is carried by a transverse shaft which is mounted in suitable bearings and which carries at its rear end a belt pulley 180. Belts 182, as shown in Fig. 2, engage the pulley 180 and also engage a pulley 183 at the rear end of the main shaft of a motor 184 positioned above the drum 176. The motor 184 and the trimming mechanism are carried by a supporting plate 186 pivoted at 188 to a bracket 190 carried by the base 16. By means of screws 192 and 194 the plate 186 and the motor 184 may be adjusted about the pivot 188. By adjusting the trimming mechanism and the motor about the axis at 188, the cutting position of the knives can be raised or lowered to change the lengths of the trimmed fibers.

The cutting knives of the trimming mechanism are preferably partly enclosed by a housing 196 which is connected by a pipe 198 with a suitable exhaust fan, not shown. The housing and the pipe, together with the fan, serve to carry away the clipped ends of the fibers.

Located beneath the trimming mechanism is a gathering mechanism which is shown in Figs. 17 to 19. The gathering mechanism comprises two jaws **200** and **202** which are in the positions shown by dotted lines in Fig. 17 during each intermittent movement of the ferrule carrying units and which are moved to the positions shown by full lines in the said figure immediately prior to the engagement of the fibers by the cutting knives. The jaws **200** and **202** are shaped in section as shown in Fig. 16 and they have oppositely disposed notches. When the jaws are moved to the positions shown in Fig. 16 and shown by full lines in Fig. 17 they overlap each other at positions adjacent the notches so that they gather the fibers into a compact bunch preparatory to trimming.

Referring particularly to Figs. 17 and 18, **204** is a bracket rigidly secured to the base **16** by bolts **205**. The bracket **204** carries a slide **206** which is longitudinally movable along the bracket **204**, being guided by screws **208** in slots **209**. A tension spring **210** tends to move the slide **206** toward the right. The jaws **200** and **202** are connected with the slide **206** by means of vertical pivot pins **211** and **212**. Longitudinally movable in the bracket **204** is a rack **214** and a pinion **216** connected with the jaw **202** meshes with the rack. The pinion **216** is wider than the rack **214** and projects above it. A relatively thin pinion **218** connected with the jaw **200** meshes with the upper portion of the pinion **216**, but does not mesh with the rack **214**. It will be seen that when the rack **214** is moved toward the right, the pinion **216** is rotated in the counterclockwise direction, thus moving the jaw **202** to its open position. As the pinion **216** is rotated in the counterclockwise direction, the meshing pinion **218** is rotated in the clockwise direction, thus moving the jaw **200** to its open position. When the rack **214** is moved toward the left, the motions are opposite and the jaws are moved to their closed positions. A tension coil spring **220** is connected with the rack **214** and tends to move it toward the right and this tends to move the jaws to their open positions.

Carried by the rack **214** by means of a pinion **221** at the left end thereof is an arm **222** which is pivoted for movement about the longitudinal axis of the pin. A spring **224** tends to move the arm **222** in the counterclockwise direction, as viewed in Fig. 19. The rear or inner end of the arm **222** is provided with a depending finger **226** which is in the path of movement of the forward projecting end of the slide **136** of the corresponding ferrule supporting unit **20**. As each unit moves toward the trimming station the corresponding slide **136** engages the finger **226** to move the arm **222** and the rack **214** toward the left, thus moving the jaws **200** and **202** to their closed fiber engaging positions, as shown in Figs. 16 and 17. The slides **136** therefore serve not only for the purpose before described, but also serve as parts of the actuating means for the gathering jaws.

The parts are so positioned that the jaws engage the fibers B before they are engaged by the trimming knives. As soon as the jaws have engaged the fibers, an abutment **227** on the rack **214** engages the slide **206** to move it toward the left. The engagement of the abutment **227** with the slide **206** is shown in Fig. 17. Thus the jaws move bodily with the fibers until the trimming station is reached.

Secured to the front of the bracket **204** is a vertical plate **228**. Pivoted to the plate **228** is an arm **230**, shown in Figs. 15, 17 and 18, which is biased for movement in the clockwise direction by a spring **232**. A tail portion **234** of the arm **230** extends toward the left and overlies the forward end portion of the arm **222**, as shown in Fig. 15. The before-mentioned cam drum **108** is provided with a pin **236** which is adapted to engage the right end of the arm **230**. When the pin engages the arm **230**, the said arm is rocked in the counterclockwise direction, the tail portion **234** thereof thus forcing the forward end of the arm **222** downward. As the forward end of the arm **222** moves downward, the rear end thereof carrying the finger **226** moves upward, the finger thus being disengaged from the forward end portion of the slide **136**. This disengagement permits the arm **222** and the rack **214** to be moved toward the right by the spring **220**, thus moving the jaws **200** and **202** to their open positions as shown by dotted lines in Fig. 17. The pin **236** is so positioned on the drum that the opening of the jaws **200** and **202** is effected immediately after the completion of trimming so as to permit the trimmed brush to be moved toward the left. As the rack **214** moves toward the right it permits the slide **206** to be moved toward the right by the spring **210**. Thus the jaws are bodily moved toward the right and are positioned for engagement with the fibers carried by the next following unit **20**.

Ferrule feeding mechanism

As before stated, a suitable mechanism is preferably provided for feeding ferrules successively into the recesses in the ferrule supporting units when the said units are at a station near the right end of the machine. If desired the ferrule feeding mechanism could be omitted and the ferrules could be fed manually.

The ferrule feeding mechanism as shown comprises a hopper **238** carried by brackets **240, 240** on the base **16**. Rotatably mounted in bearings in the said brackets **240, 240** is a transverse shaft **242**. Secured to the shaft **242** at the rear end thereof is a belt pulley **244** which is engaged by a belt **246** passing over a pulley **248**. The belt pulley **248** is carried by a shaft projecting from a speed reducing gearing generally indicated at **250** and connected with a motor **252**. The motor and the power transmitting parts connected therewith serve to rotate the shaft **242** in the counterclockwise direction.

Carried by the shaft **242** is a disc **254** having a plurality of arms **256, 256** projecting radially therefrom. The left wall of the hopper **238** is slotted to receive the disc **254** and the arms **256**. Each of the arms **256** carries a prong **258** which extends in the direction of rotation.

A guide **260** is provided having its upper portion arcuate to conform to the path of movement of the prongs **258** at the ends of the arms **256**. The prongs travel within the guide and the guide carries flanges **262** which extend inward to form a partly closed channel, as shown in Fig. 21. A slot is provided between the inner edges of the flanges **262** through which the end portions of the arms **256** can travel. The guide **260** has a vertical portion **264** which constitutes a channel extending approximately to the level of the tops of the ferrule supporting units **20**. The said channel is closed at the right by a plate **266**, and the upper end of the plate **266** is so positioned as to permit the prongs **258** to pass by it without interference.

A quantity or mass of ferrules A is placed in the hopper 238, the upper level of the mass being preferably maintained as high as the level of the shaft 242 and preferably somewhat higher. As the shaft 242 is rotated, the prongs 258 are forced through the mass of ferrules and each of the prongs enters a ferrule to carry it upward from the mass. The ferrules engaged by the prongs 258 are carried into the curved portion 260 of the guide and over the top. As the prongs 258 travel toward the left and become inverted, the ferrules are separated therefrom by gravity and drop into the channel 264. The dimensions of the channel are such as to maintain the ferrules in vertical positions and in superposed relationship. The prongs 258 operate at such a speed that they pick up ferrules at a rate greater than required for the operation of the machine. When the channel 264 is filled above the level of the top of the plate 266, excess ferrules are discharged into a chute 268 shown in Fig. 2 and thence into a receptacle 270. The ferrules which accumulate in the receptacle 270 can be from time to time transferred manually to the hopper 238.

Preferably an escapement mechanism is associated with the channel 264 to release the ferrules successively for entry into the recesses in the units 20. As shown, there are two rock members 272 and 274 which are independently movable about a common axis at 276. The member 272 is biased for movement toward the right by a spring 278 and the member 274 is held in normally fixed relation to the member 272 by a spring 280. The member 272 carries a roller 282 which is engageable by the before-mentioned bosses 140 on the successive units 20, the member 272 being moved toward the left by the bosses and toward the right by the spring 278. With the rock members in the positions shown, a ledge (not shown) on the member 274 is entered in the channel 264 to support the column of ferrules. When the members are released by the boss 140 they move toward the right and the ledge on the member 274 is withdrawn from the channel and a ledge (not shown) on the member 272 enters the channel. The column of ferrules is dropped from the second said ledge onto the first said ledge. When the members are again moved toward the left, the ledge on the member 274 enters between the lowermost ferrule and the one next above it. At the same time, the ledge on the member 272 releases the lowermost ferrule for entry into the recess in the unit 20. Thus one ferrule is released upon each movement of the rock members by a boss 140.

Preferably a spring wiper 284 is provided at the bottom of the guard 96 as shown in Figs. 7 and 9. This tends to press downward into its recess any ferrule that may be partly but not fully entered therein. In the event that a ferrule fed through the channel 264 should lie on top of its unit 20 instead of being entered in its recess, there is a possibility that jamming might result. Any ferrule lying on top of its unit will be engaged by the wiper 284 and will be held against longitudinal movement. Such a ferrule will fall into the opening in the clip 143 on the next following unit. Upon subsequent inversion of the unit the ferrule will fall out.

Operation

The manner of operation of the machine will be apparent from the foregoing description, but it will be summarized with particular reference to Fig. 22, which is a diagrammatic plan view of the series of ferrule-carrying units.

The endless series of ferrule supporting units 20 is intermittently moved toward the left, so that recesses in the said units are successively moved to the "Ferrule Feeding Station," to the "Fiber Inserting Station" and to the "Fiber Trimming Station." The said stations are spaced apart by distances equal to the effective length of two units.

While each unit is at the ferrule feeding station, a single ferrule is fed to the ferrule recess therein by the feeding mechanism that has been described. While each unit is at the fiber inserting station, a quantity of fibers is folded and is inserted in the ferrule in the recess of the unit by the mechanism that has been described. Following insertion of the fibers, the relatively movable jaw of each unit is moved so as to squeeze the ferrule and lock the fibers and so as to grip the ferrule to maintain it in position for subsequent fiber trimming. This relative movement of the movable jaw of each unit is effected during movement of the unit to the trimming station, by engagement of the roller 144 with the transverse slide 136. Immediately before the fibers in each ferrule reach the trimming station they are engaged by the jaws of the gathering mechanism. While at the trimming station the ends of the bunched fibers of each brush are cut to the required length by the described trimming mechanism.

Following the trimming operation, the relatively movable jaw of each is movable away from its mating jaw so as to release the completed brush. This relative movement of the movable jaw is effected by engagement of the roller 150 with the transverse slide 136. The ferrule of the brush remains in the recess of the unit, but when the unit is moved to an inverted position the brush falls out into a suitable receptacle. If any ferrule is supported by a clip 143, this will also fall out.

A safety switch 286 may be provided for engagement with any brush that is held by jamming or otherwise so that it does not fall out. When the switch 286 is so engaged, it opens the circuit of the main motor 34 to stop the operation of the machine.

A rotary brush 288 may be provided, this being driven by a motor 290. The brush 288 serves to remove any short lengths of clipped fibers that may be retained between the jaws 128 and 130.

What is claimed is:

1. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of intermittently acting means for horizontally moving a succession of vertical ferrules to a predetermined fiber inserting station with their upper open ends exposed, a magazine for containing a mass of horizontal fibers, a disc rotatable about a horizontal axis parallel with the fibers and above the said fiber inserting station and so positioned that a portion of the disc periphery engages the mass of fibers in the magazine, the said disc having a plurality of notches in its periphery each of such size as to be adapted to receive from the magazine a quantity of horizontal fibers sufficient for one brush, means operable in timed relation with the ferrule moving means for indexing the disc to bring successive notches with horizontal fibers therein into transfer positions with the notches opposite and facing the upper open ends of successive vertical ferrules at the said station, a vertically movable fiber

inserting tool immediately adjacent the disc and in alignment with the position of the ferrules at the said fiber inserting station, and means for vertically reciprocating the tool in timed relation with the movements of the ferrules and with the indexing of the disc so that the tool moves downwardly into the successive ferrules through the upper open ends thereof, the said tool upon each downward movement removing the horizontal fibers downwardly from the corresponding notch in the said transfer position and folding the said fibers and pressing them into the corresponding ferrule.

2. A machine as set forth in claim 1, wherein the fiber inserting tool is bifurcated so as to embrace the fibers in the successive notches and so as to maintain them in compact relationship during insertion into the ferrules.

3. A machine as set forth in claim 1, including an arcuate guard extending along the periphery of the disc from the magazine to the fiber inserting station, the said guard being grooved to receive the peripheral portion of the disc and having an arcuate fiber retaining surface at a radius slightly less than that of the disc and the said guard also having a fiber guiding surface adjacent the magazine which is inclined inward toward the axis of the disc and which terminates at the said arcuate fiber guiding surface.

4. A machine as set forth in claim 1, including a guard extending along the periphery of the disc from the magazine to the fiber inserting station, the said guard having a portion which extends past the said station and which is slotted for the passage of the fiber inserting tool so that the walls of the slot serve to fold the fibers during insertion.

5. A machine as set forth in claim 1, including means operable in timed relation with and following the insertion of fibers into the ferrules for squeezing the successive ferrules to lock the fibers in place therein.

6. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of a ferrule supporting means having a series of spaced recesses into which ferrules may be fed, means for intermittently moving the ferrule supporting means to bring the several recesses therein successively to and away from a fiber inserting station, a magazine adjacent the inserting station for containing a mass of transverse fibers, a disc rotatable about a transverse axis so positioned that a portion of the disc periphery engages the mass of fibers in the magazine, the said disc having a plurality of notches in its periphery each of such size as to be adapted to receive from the magazine a quantity of fibers sufficient for one brush, means operable in timed relation with the ferrule supporting means for indexing the disc to bring successive notches with fibers therein opposite the ends of successive ferrules at the said station, a fiber inserting tool immediately adjacent the disc and radially movable in alignment with the position of the ferrules at the said station, means for reciprocating the tool in timed relation with the movements of the ferrule supporting means and with the indexing of the disc so that the tool removes the fibers from the successive notches in the disc and folds them into the successive ferrules, means carried by the ferrule supporting means and operable after the successive ferrules have been moved from the inserting station for squeezing the successive ferrules to lock the folded fibers in place therein, and a longitudinal guide bar in alignment with the inserting tool and engaging the fibers in successive ferrules to prevent transverse movement thereof prior to the action of the squeezing means on the ferrules.

7. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of means for intermittently moving to and away from a predetermined fiber trimming station a succession of ferrules with tufts of untrimmed fibers held thereby, means adjacent the said station and operably movable in timed relation with the ferrule moving means for engaging the fibers held by the successive ferrules to gather them into closely grouped bunches, and means for trimming the fibers held by the successive ferrules while engaged by the said gathering means.

8. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of means for intermittently moving to and away from a predetermined fiber trimming station a succession of ferrules with tufts of untrimmed fibers held thereby, cooperating knives at the said station spaced from the ferrule moving means and serving to trim to uniform lengths the fibers held by the successive ferrules, two fiber gathering jaws oppositely movable in paths which are substantially perpendicular to the fibers and which are between the said knives and the said ferrule moving means, actuating means operable immediately before the fibers in successive ferrules reach the said station for moving the jaws in the said paths toward each other to engage the fibers and to gather them into closely grouped bunches preparatory to trimming, and means operable after trimming for separating the jaws so as to permit the said ferrules and fibers to be moved in the said paths away from the said station.

9. A machine as set forth in claim 8, wherein the two jaws are formed with oppositely disposed fiber receiving notches, and wherein portions of the jaws adjacent the said notches overlap each other when the jaws are in their fiber engaging positions.

10. A machine as set forth in claim 8, wherein the jaws are also bodily movable longitudinally, and wherein the said actuating means moves them bodily in unison with the fibers after they are engaged therewith.

11. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of a ferrule supporting means having a series of spaced recesses adapted for receiving ferrules with tufts of untrimmed fibers held thereby, means for intermittently moving the ferrule supporting means to bring the several recesses therein successively to and away from a fiber trimming station, cooperating knives at the said station spaced from the ferrule supporting means and serving to trim to uniform lengths the fibers held by the successive ferrules, two fiber gathering jaws oppositely movable in paths which are substantially perpendicular to the fibers and which are between the said knives and the said ferrule supporting means, actuating means carried in part by the ferrule supporting means and operable upon each movement thereof for moving the gathering jaws in the said paths toward each other to engage the fibers and to gather them into closely grouped bunches for trimming, and means serving after the trimming of the fibers held by each successive ferrule for moving the gathering jaws in the said paths away from each other so

as to permit the ferrules and fibers to be moved away from the said station.

12. A machine as set forth in claim 11, wherein the gathering jaws are pivoted for movement about vertical axes at one side of the path of movement of the ferrule supporting means, wherein meshing gears are connected with the jaws for moving them in opposite directions, wherein there is a longitudinally movable rack which meshes with one of the gears and is biased for movement in one direction to move the jaws away from each other and wherein the portion of the said actuating means carried by the ferrule supporting means serves upon each movement of the latter to move the rack in the opposite direction to move the jaws toward each other into engagement with the corresponding fibers.

13. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of a ferrule supporting means having a series of spaced recesses into which ferrules may be fed, means for intermittently moving the ferrule supporting means to bring the several recesses therein successively to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said inserting station for inserting folded fibers into ferrules in the successive recesses so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the successive recesses so as to lock the tufts in folded fibers in the said ferrules, and means at the said trimming station for trimming the tufts of fibers held by the ferrules in the successive recesses.

14. A machine as set forth in claim 13, wherein the means for squeezing the ferrules is operable during the movements of the successive ferrules from the inserting station to the trimming station.

15. A machine as set forth in claim 12, including means adjacent the trimming station and operable in timed relation with the intermittent movements of the ferrules for engaging the fibers held by the successive ferrules to gather them into closely grouped bunches prior to the action of the trimming means on the said fibers.

16. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of a ferrule supporting means having a series of spaced recesses into which ferrules may be fed, means for intermittently moving the ferrule supporting means to bring the several recesses therein successively to and away from a fiber inseritng station and to and away from a fiber trimming station, a magazine adjacent the inserting station for containing a mass of transverse fibers, a disc rotatable about a transverse axis so positioned that a portion of the disc periphery engages the mass of fibers in the magazine, the said disc having a plurality of notches in its periphery each of such size as to be adapted to receive from the magazine a quantity of fibers sufficient for one brush, means operable in timed relation with the ferrule supporting means for indexing the disc to bring successive notches with fibers therein opposite the ends of successive ferrules at the said inserting station, a fiber inserting tool immediately adjacent the disc and radially movable in alignment with the position of the ferrules at the last said station, means for reciprocating the tool in timed relation with the movements of the ferrule supporting means and with the indexing of the disc so that the tool removes the fibers from the successive notches in the disc and folds them into the successive ferrules, means carried by the ferrule supporting means and operable between the inserting station and the trimming station for squeezing the successive ferrules to lock the folded fibers in place therein and to grip the ferrules preparatory to trimming, a longitudinal guide bar in alignment with the inserting tool and engaging the fibers in successive ferrules to prevent transverse movement thereof prior to the action of the squeezing means on the ferrules, and means at the trimming station for trimming the tufts of fibers held by the successive ferrules.

17. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of a ferrule supporting means having a series of spaced ferrule receiving recesses, means for intermittently moving the ferrule supporting means to bring the several recesses therein successively to and away from a ferrule feeding station and to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said feeding station for feeding ferrules to the successive recesses with their open ends exposed, means at the said inserting station for inserting folded fibers into ferrules in the successive recesses so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the successive recesses so as to lock the tufts of folded fibers in the said ferrules, and means at the said trimming station for trimming the tufts of fibers held by the ferrules in the successive recesses.

18. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, each of the said units having two jaws formed to provide the said recess between them and one of the jaws being movable relatively to the other, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a fiber inserting station, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, and means operable after the insertion of the fibers for moving the movable jaws of the successive units to squeeze the corresponding ferrules so as to lock the tufts of folded fibers in place.

19. A machine as set forth in claim 18, wherein one of the jaws of each unit is provided with a projection at the ferrule receiving recess, the said projection upon the said relative movement of one of the jaws serving to indent the corresponding ferrule so as to lock the tuft of folded fibers therein.

20. A machine as set forth in claim 18, wherein the movable jaw of each unit is movable longitudinally, wherein each unit also includes a relatively movable cam member for moving the movable jaw, wherein means is provided for moving the cam members of successive units in one direction to squeeze and grip the corresponding ferrules after the insertion of fibers therein, and wherein means is provided for subsequently moving the cam members of successive units in the opopsite direction to release the corresponding ferrules.

21. A machine as set forth in claim 20, wherein each relatively movable cam member is a transversely movable slide.

22. A machine as set forth in claim 18, wherein the movable jaw of each unit is movable longi-

tudinally, wherein each unit also includes a relatively movable cam member for moving the movable jaw, wherein means fixed against longitudinal movement is provided for engaging the cam members of successive units during movements of the said units and for moving the said members in one direction to squeeze and grip the corresponding ferrules after the insertion of fibers therein, and wherein means fixed against longitudinal movement is provided for subsequently engaging the cam members of successive units during movements of the said units and for moving the said members in the opposite direction to release the corresponding ferrules.

23. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the recesses of successive units so as to lock the tufts of folded fibers in place, and means at the trimming station for trimming the tufts of fibers held in the ferrules in the recesses of successive units.

24. A machine as set forth in claim 23, wherein the means for squeezing the ferrules is operable during the movements of the successive units from the inserting station to the trimming station.

25. A machine as set forth in claim 23, including means adjacent the trimming station and operable in timed relation with the intermittent movements of the units for engaging the fibers held by the ferrules in the recesses of successive units to gather them into closely grouped bunches prior to the action of the trimming means thereon.

26. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a ferrule feeding station and to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said feeding station for feeding ferrules to the recesses in the successive units with their open ends exposed, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the recesses of successive units so as to lock the tufts of folded fibers in place, and means at the trimming station for trimming the tufts of fibers held in the ferrules in the recesses of successive units.

27. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the recesses of successive units so as to lock the tufts of folded fibers in place and so as to grip the ferrules, cooperating knives at the trimming station spaced from the ferrule supporting units and serving to trim the fibers held in the ferrules in the recesses of the successive units, two fiber gathering jaws oppositely movable in paths substantially perpendicular to the fibers and between the said knives and the ferrule supporting units, means operable by the successive ferrule supporting units as they approach the trimming station for moving the jaws in the said paths toward each other so that they engage the fibers to gather them into closely grouped bunches for trimming, and means operable after trimming for moving the jaws in the said paths away from each other so as to permit the said ferrules and fibers to be moved away from the said trimming station.

28. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, each of the said units including two jaws formed to provide the said recess between them and one of the jaws being movable longitudinally relatively to the other and each of the said units including a transversely movable cam member for moving the movable jaw, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a fiber inserting station and to and away from a fiber trimming station, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, means fixed against longitudinal movement and located between the two stations for engaging the cam members of successive units during movements of the said units and for moving the said members in one direction to squeeze and grip the corresponding ferrules after the insertion of fibers therein, means at the trimming station for trimming the tufts of fibers held in the ferrules in the recesses of successive units, means adjacent the trimming station for engaging the fibers held by the ferrules in the recesses of successive units to gather them into closely grouped bunches prior to the action of the trimming means thereon, means engaged by the successive cam members of the units as they approach the fiber trimming station for operating the fiber gathering means, and means fixed against longitudinal movement and located beyond the trimming station for engaging the said cam members of successive units during movements of the said units and for moving the said members in the direction to release the corresponding ferrules.

29. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless series of connected ferrule supporting units each having a recess therein into which a ferrule may be fed, each of the said units having a detent receiving notch, means for intermittently moving the ferrule supporting units of the said series to bring the several recesses therein successively to and away from a fiber inserting station and to and away

from a fiber trimming station, a movable locking detent adjacent the said inserting station, means operable immediately after each intermittent movement of the ferrule supporting units for moving the detent into the notch in the unit at the said station, the said means being also operable before the next following intermittent movement to withdraw the detent from its engagement with the said unit, means at the said inserting station for inserting folded fibers into the ferrules in the recesses of successive units so as to form tufts, means operable after the insertion of the fibers for squeezing the ferrules in the recesses of successive units so as to lock the tufts of folded fibers in place, and means at the trimming station for trimming the tufts of fibers held in the ferrules in the recesses of successive units.

30. In a machine for making brushes respectively comprising tufts of fibers held by ferrules, the combination of an endless chain, supporting and guiding sprockets for the chain rotatable about transverse horizontal axes, an endless series of ferrule supporting units secured to the chain and each having a recess into which a ferrule may be fed, a horizontal transverse shaft above the said chain and the said units, drive mechanism including means for rotating the shaft continuously, a gear concentric with the shaft and rotatable independently thereof, means operated by the drive mechanism for intermittently rotating the gear through successive predetermined angles, mechanism driven by the gear for intermittenly moving the said chain and the said units to bring the several recesses in the latter successively to and away from a fiber inserting station directly below the axis of the horizontal shaft, a magazine above the said shaft for containing a mass of traverse fibers, a disc concentric with the shaft and connected with the aforesaid gear to be rotated intermittently therewith, the said disc having a plurality of notches in its periphery each of such size as to be adapted to receive from the magazine a quantity of fibers sufficient for one brush and the notches being so spaced that upon each intermittent movement of the disc one of them is brought into register with a ferrule in the recess in the ferrule supporting unit at the inserting station, a fiber inserting tool immediately adjacent the disc and vertically movable in alignment with the position of the ferrule in the recess at the unit at the said inserting station, and a cam rotating with the horizontal shaft and serving to reciprocate the tool in such timed relation that it is moved downward immediately after each notch in the disc is brought into register with a corresponding ferrule, the tool serving upon each downward movement to remove the fibers from the corresponding notch in the disc and to fold them into the corresponding ferrule.

31. A machine as set forth in claim 30, wherein each of the said ferrule supporting units has a detent engageable portion, wherein there is a movable locking detent adjacent the said inserting station, and wherein there is a cam rotatable by the said horizontal shaft and serving immediately after each intermittent movement of the units to move the detent into engagement with the detent engageable portion of the unit at the inserting station, the said cam also serving before the next intermittent movement of the units to withdraw the detent from its engagement with the unit at the said station.

32. A machine as set forth in claim 30, wherein the ferrule supporting units are also moved to and from a trimming station, wherein there are cooperating knives at the trimming station spaced from the ferrule supporting units and serving to trim the fibers held in the ferrules in the recesses of the successive units, wherein there are two fiber gathering jaws oppositely movable in planes subtantially perpendicular to the fibers and between the said knives and the ferrule supporting units, wherein there are means operable by the successive ferrule supporting units as they approach the trimming station for moving the jaws toward each other so that they engage the fibers to gather them into closely grouped bunches for trimming, and wherein there is a means operable by the horizontal shaft after trimming for causing the separation of the gathering jaws so as to permit the ferrules and fibers to be moved away from the trimming station.

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