Sept. 6, 1932. C. BARNETT ET AL 1,875,551

BRUSH MAKING MACHINERY

Filed April 19, 1930 5 Sheets-Sheet 1

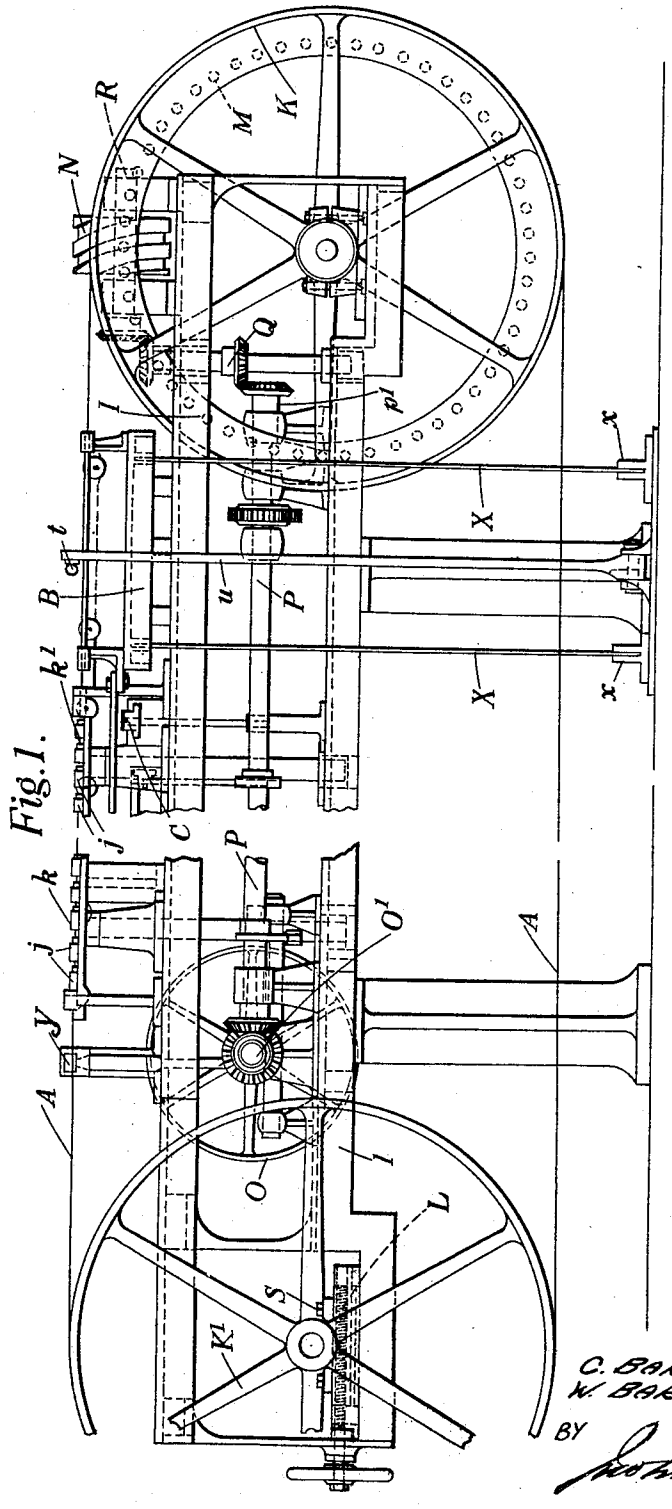

Fig. 1.

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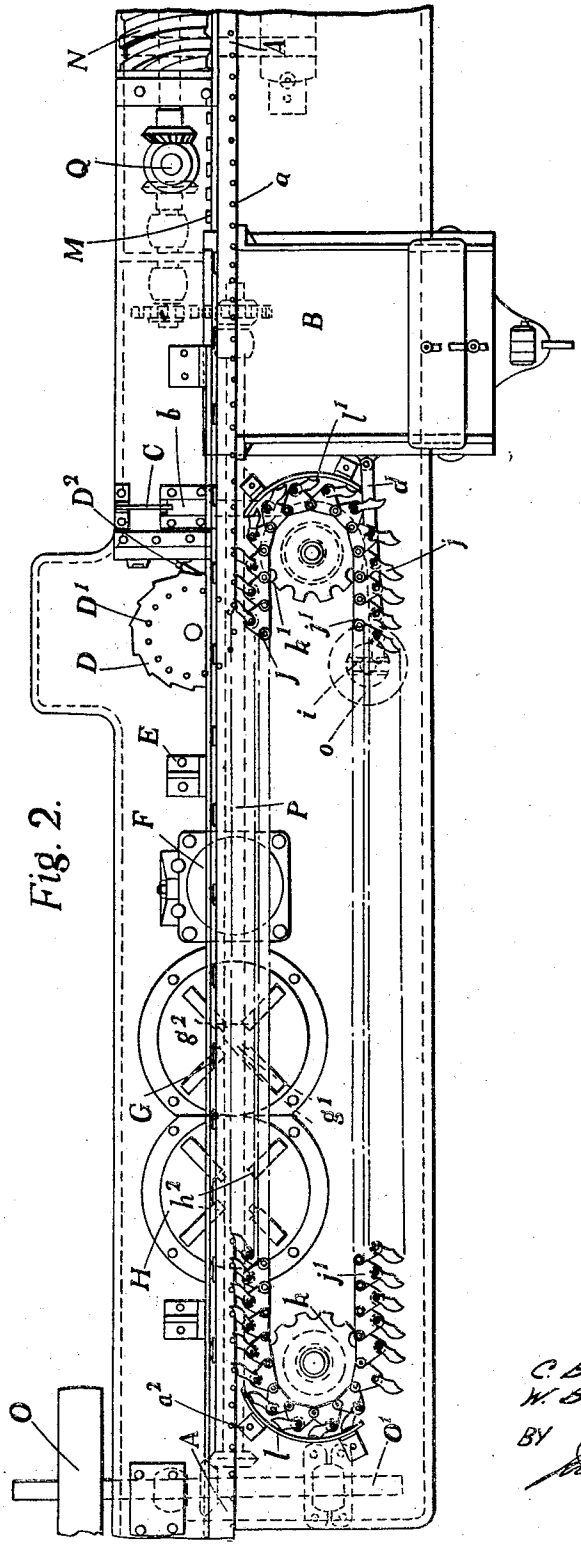

Fig. 2.

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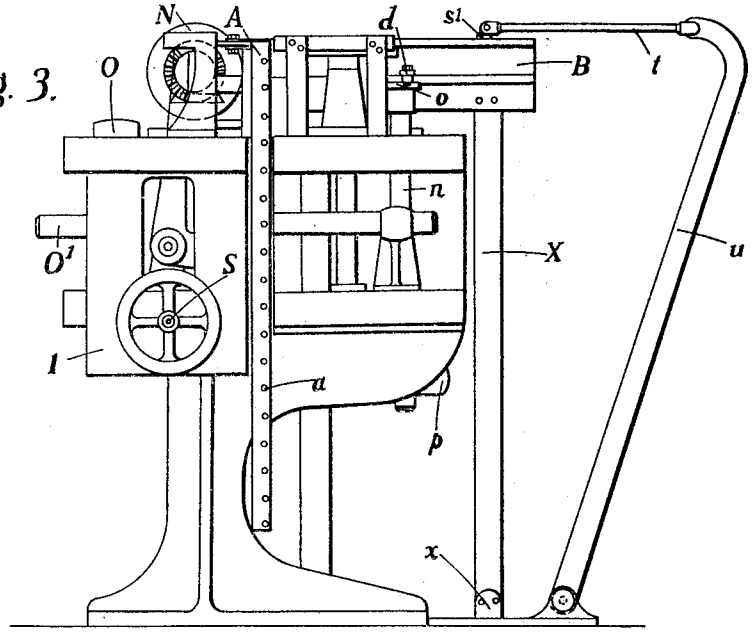
Fig. 3.



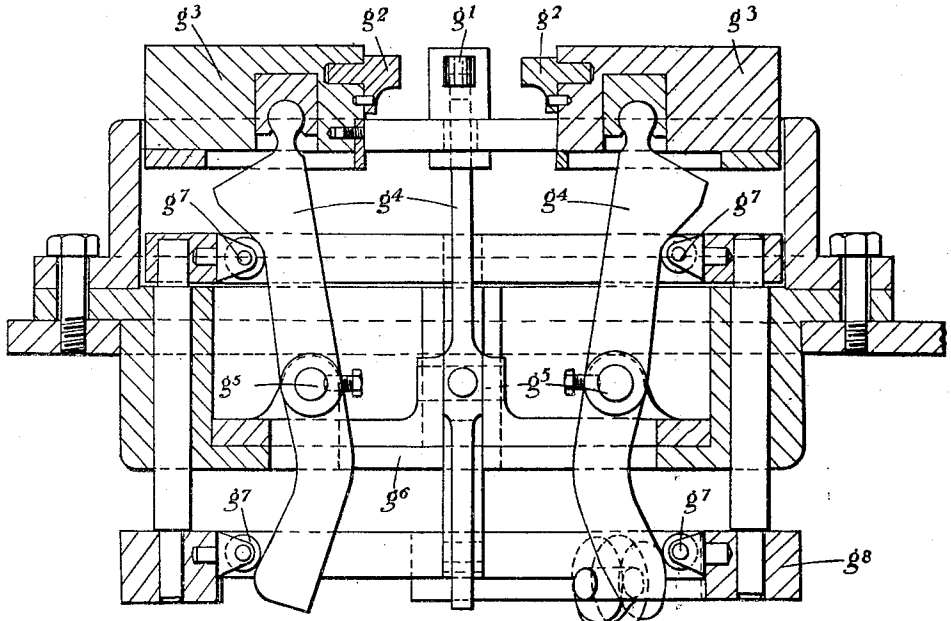


Fig. 5.

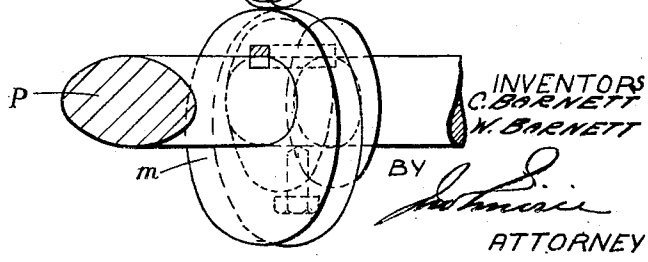


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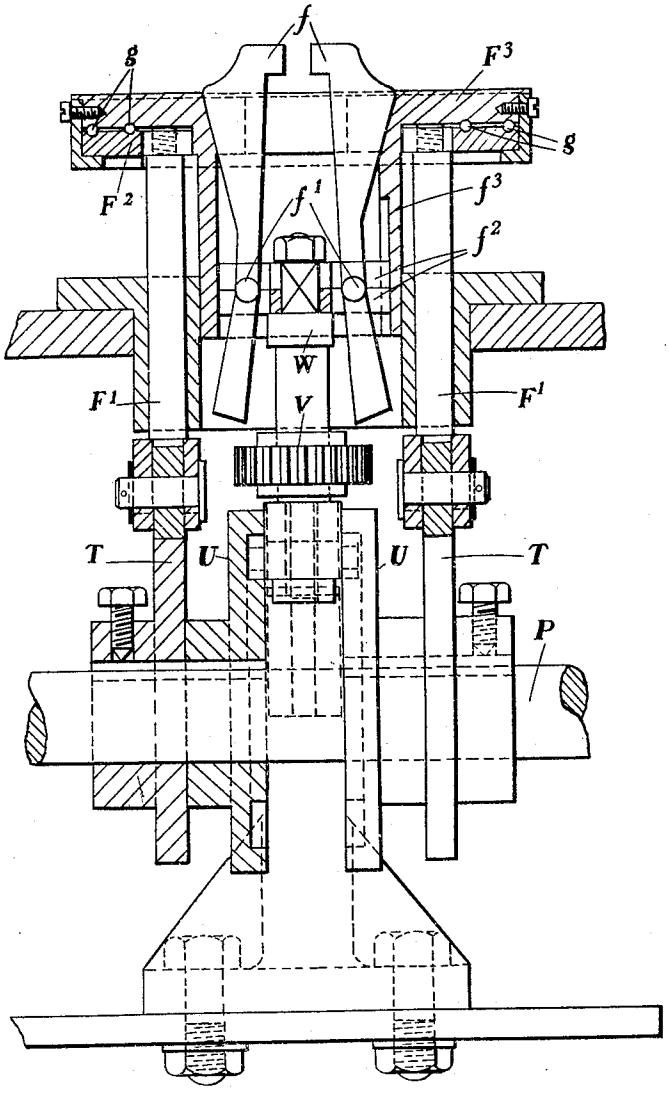
Fig. 4.



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BRUSH MAKING MACHINERY

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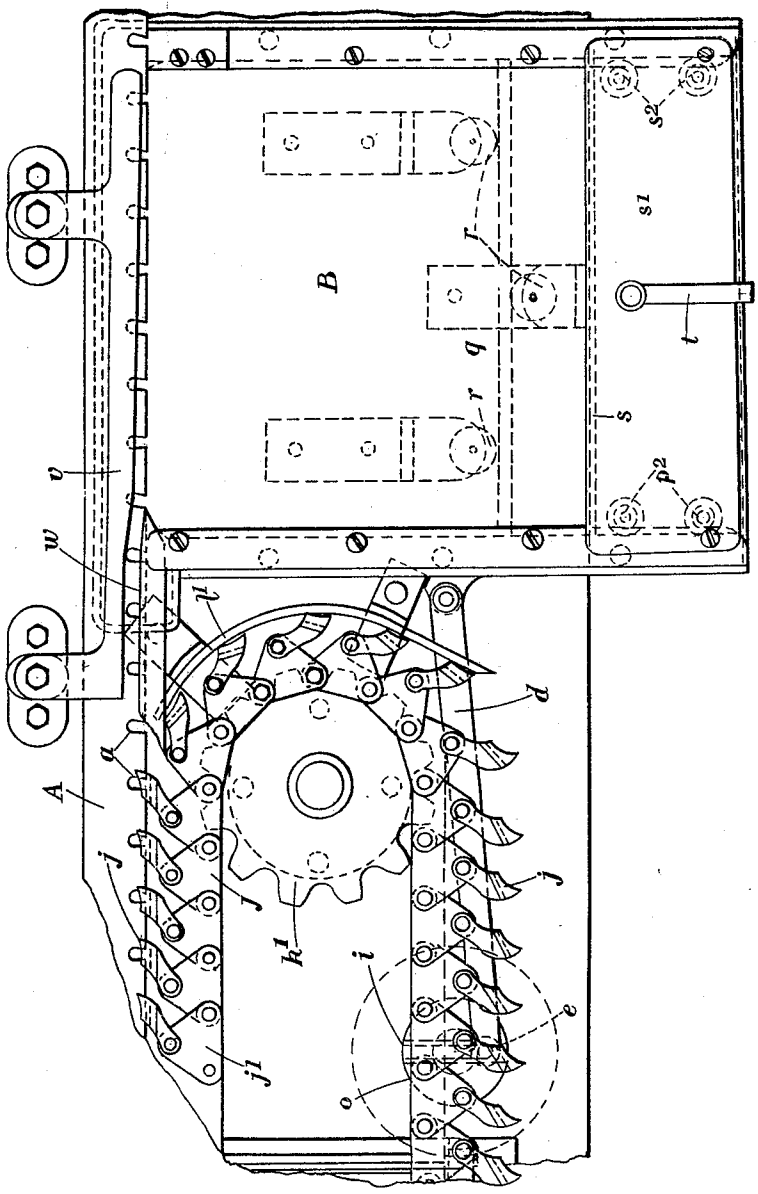

Fig. 6.

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UNITED STATES PATENT OFFICE

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BRUSH-MAKING MACHINERY

Application filed April 19, 1930, Serial No. 445,694, and in Great Britain April 26, 1929.

This invention relates to brush making machinery and has for its object to provide an improved automatic machine for selecting a "knot" or "tuft" (hereinafter called "knot") of bristles, and subjecting it in steps to the various operations required to form a completed knot which can afterwards be inserted into a stock to form a brush or broom.

The material from which the knots are to be made will be referred to in this specification as "bristles", but it is to be understood that this term is to include bass and any other material suitable for use in the manufacture of brooms and brushes.

A further object of the invention is to provide a machine in which an endless band preferably of metal is provided near one edge with a number of equally spaced openings to act as collectors for the bristles and to convey the knot of bristles thus selected to the stations in which the various operations are performed.

These knot openings extend to the edge of the band, the opening at the edge being approximately half the diameter of the whole but such as to enable the bristles to be gathered into the openings.

A further object is to provide an improved knot selector mechanism in which a bristle box is provided with gravity or other means for pressing the bristles up against the edge of the band and is given a reciprocating movement, preferably by means of an eccentric, to keep the bristles in a constant state of agitation.

With these and other objects in view the invention consists in the improved constructions, combinations and arrangements comprised within the machine described in detail later and set out in the claims which follow.

The improved machine is particularly applicable for the manufacture of knots forming the subject matter of application No. 445,695 of even date herewith; in this improved form of knot the individual bristles leave the sleeve, cup or other binding in a direction inclined to planes passing through the axis of the knot and intersecting the bristles at points at which they leave the sleeve, and the machine is provided with means by which the bristle is subjected to a twisting action during the crimping of corrugated metal sleeves around the bristles.

Referring to the accompanying drawings which illustrate the invention in a diagrammatic manner,

Fig. 1 represents a front elevation of the machine with the centre portion thereof cut away to save space,

Fig. 2 represents a plan view of the machine with the two end portions cut away,

Fig. 3 represents an end elevation of the machine taken on the left hand side of Fig. 1.

Fig. 4 is a detail view to larger scale illustrating the crimping dies for giving the initial compresson to the sleeves.

Fig. 5 is a detail view to enlarged scale illustrating a set of dies for giving a compression operation, after the crimping action.

Fig. 6 is a detail view to enlarged scale illustrating especially the bristle feed box mechanism.

Referring first to Figs. 1 to 3, the endless band A is provided at equally spaced intervals with openings *a* of diameter conforming to the diameter of the knot, these openings extending to the edge of the band. The band passes over pulleys K, K^1 at each end of the machine, the pulley K being driven by means of crown pins M which are engaged by means of a cam N of cylindrical form and provided with a cam track so as to give intermittent motion to the wheel K. This cam N is mounted on a shaft R driven from the main driving pulley O of the machine and cross shaft O^1 through a longitudinal main shaft P, supplementary shaft O^1 and vertical shaft Q. The pulley K^1 is provided with tensioning means by means of which the tightness of the endless band A can be adjusted, this tensioning means preferably taking the form of a tensioning screw L which operates a saddle S upon which the pulley K^1 is mounted and which is removable at the opening at the end of the machine framing I.

The bristles are housed with axes vertical in a feed box B later to be described in detail and pass from this feed box into the band A

which carries them past the various operating stations.

These stations comprise the following in the machine illustrated; an end trimmer C; a sleeve threading mechanism D; a bath E for providing pitch or other adhesive to the under side of the bristles when desired; a crimping die F in which the bristles are given a twisting motion relatively to the cup prior to the crimping action and first and second compressing dies G and H at which the cups are given a final pressing action.

The threading mechanism comprises a turret plate D^1 into which sleeevs are fed and which is rotated intermittently by a pawl D^2; a plunger is raised intermittently to thread a sleeve on each knot of bristles as the openings *a* come under the plunger. As the plunger rises a pair of jaws (not shown) encircle the bristles above the plunger and so holds the ends of the bristles compact to enable the sleeve (preferably of conical form) easily to pess on to the knot of bristles. The completed knots are ejected from the band A by an ejector Y, Fig. 1.

In order to maintain the bristles in the endless band after they have passed out of a guard plate forming part of the feed box mechanism a number of fingers *j* are carried upon and endless conveyor J mounted between horizontal pinions *k*, k^1 provided at each end of the machine. These fingers *j* project outwardly from triangular links j^1 and are spring pressed outwards and controlled in their movements at each end by means of guide plates *l*, l^1.

The various dies and other operative mechanisms are operated by a suitable cam and lever mechanism from the main shaft P. The trimming cutter C takes the form of a reciprocating blade *b* which acts on the under side of the projecting bundle of bristles and trims the bundle so that the bottoms of all the bristles are at the same depth.

Referring now to Fig. 4, the crimping mechanism comprises ten arms *f* which point radially towards each other and are normally spaced sufficiently far apart to pass upwards outside the bristles projecting below the sleeve. The arms *f* are mounted on pivots f^1 in plates f^2 carried by a vertical shaft W. These plates are splined in a cylindrical sleeve f^3 projecting downwards from the top plate F^3 of the die. This plate is mounted with ball bearings *g* which allow it to partake of a rotary movement relative to a lower plate F^2. The openings in the plate F through which the arms *f* pass are tapered and the arms *f* are correspondingly tapered as shown so that relative axial movement between the plate F^3 and the shaft W will cause the dies to move radially inwards. The lower plate F^2 is supported by rods F^1 engaging cams T on the main shaft P and the shaft W engages cams U, the lower part of the shaft W being capable of rotary movement in relation to the portion which engages these cams. The shaft W carries a pinion V which is in mesh with a long pinion (not shown) to which periodical angular movement is given by cam mechanism and the various cams are so timed that the die as a whole moves upwards to bring the arms *f* level with the corrugated sleeve which was threaded on to the nut at the station D. The plate f^3 then moves relatively to the shaft W so as to cause the arms *f* lightly to grip the sleeve and the shaft W is then given a part rotation which causes the sleeve to twist and as the bristles are held in the opening *a* in the conveyor at a point near to the top thereof, a twisting action is given to the knot which causes the bristles to be arranged appropriately in relation to the sleeve. The arms *f* are then moved further in to give the full crimping action, whereupon the bristles are fixed in the sleeve with the requisite inclination which gives a fan-like effect to the top when the knot is released.

The compressing dies each comprise two pairs of opposed dies which alternately move radially against the sleeve encircling the bristles. One pair of dies g^1 h^1 has semi-circular ends and the other pair g^2, h^2 has flat ends, the flat ends coming first into action of the pair.

Referring now to Fig. 5, the dies g^1, g^2 are carried in radial slides g^3 engaged by pivoted arms g^4 mounted in pivots g^5 in a frame g^6. Rollers g^7 mounted in a cage g^8 are caused by a cam *m* to move vertically relatively to the frame g^6 and the arms g^4 are so shaped as to cause the dies to move radially in the requisite sequence.

The feed box mechanism which forms an important feature of the invention is shown in Figs. 1, 2, 3 and 6. The feed box B is supported by flexible arms X secured in base members *x* and the feed box has connected to it on one side a link *d* which is pivoted to a crank pin *e* mounted adjustably in a slot *i* in a plate *o* carried at the top of a shaft *n* (Fig. 3) driven from a pulley *p*. The box B is therefore given a reciprocating movement parallel to the direction of movement of the band A, the amount of the reciprocation depending upon the adjustment of the pin *e* in the slot *i*. To assist in guiding the box in this movement it carries underneath it a projecting flange *q* which passes between rollers *r* mounted in pedestals on the framework of the machine.

The bristles are placed with axes vertical in the box B and are pressed forwards by means of a depending back plate *s* carried by a top slide s^1 which is guided by rollers s^2 and is connected by a link *t* which is pivoted to an arm *u* (Figs. 1 and 3) which is constantly pressed forwards by suitable spring or gravity means not shown. The link *t* is

connected to the top plate s^1 and to the arm u by a universal joint which enables the reciprocating movement of the box B to take place.

At the front of the box there is provided an adjustable guide plate v (Fig. 6), which nearly masks the openings a in the band A at the entry side and gradually opens greater depths of the openings a as it passes towards the exit end of the box. At this exit end a guide plate w is provided which directs the bristles which have moved into the openings a towards the rear thereof and holds them into position until they come under the influence of the fingers j. The combined action of the forward pressure of the back plate s and the reciprocating movement of the box B causes the bristles gradually to work their way into the notches until by the time the notches have passed out of the box they have collected the requisite number of bristles to form the knot.

When the completed knots have passed out of the influence of the fingers j at the left hand side of the machine as illustrated in Figs. 1 and 2 of the drawings they are ejected from the band A by a cam-operated ejector Y and pass then into a suitable receptacle or may pass direct by automatic conveyor mechanism to apparatus for fixing them in brush or broom stocks.

It is to be understood that the invention is not restricted to the exact details shown and described but embraces such modifications as come within the ambit of the accompanying claims.

We claim:—

1. A machine for making knots for brooms and brushes having in combination a series of operating stations and a flexible band conveyor having equally spaced notches in its side, means for inserting knots of bristles in said notches, and a plurality of spaced members moving parallel to said band holding the knots in said spaced notches.

2. A machine for making knots for brooms and brushes having in combination a conveyor, means for feeding knots of bristles into said conveyor, means for trimming the ends of said bristles, means for threading a sleeve on said bristles, means for compressing said sleeve around said bristles in a plurality of stages and means for ejecting said knots from the conveyor.

3. A machine for making knots for brooms and brushes having in combination means for clamping a sleeve around a knot of bristles and means for twisting said knot relatively to said sleeve prior to the closure of the clamping means.

4. A machine for making knots for brooms and brushes having in combination means for clamping a sleeve around a knot of bristles and means for giving said clamping means an axial and a rotary movement in relation to the axis of said knot.

5. A machine for making knots for brooms and brushes having in combination means for clamping a sleeve around a knot of bristles and sets of opposed dies moved radially alternately to compress said sleeve around the knot, the first set to come into operation having flat faces and the second set having curved faces.

6. A machine for making knots for brooms and brushes having in combination a bristle feed box, a member having notches in the front thereof to receive knots of bristles, means for moving said member step by step across the feed box, means for pressing the bristles against said notched member and means for giving reciprocations to said feed box along the front of said notched member.

7. A machine for making knots for brooms and brushes having in combination a bristle feed box, a member having notches in the front thereof to receive knots of bristles, means for moving said member step by step across the feed box, means for pressing the bristles against said notched member, means for giving reciprocations to said feed box along the front of said notched member and means for adjusting the amplitude of said reciprocations.

8. A machine for making knots for brooms and brushes having in combination a bristle feed box, a member having notches in the front thereof to receive knots of bristles, means for moving said member step by step across the feed box, means for pressing the bristles against said notched member, means for giving reciprocations to said feed box along the front of said notched member and flexible supports for feed box permitting said reciprocations.

9. A machine for making knots for brooms and brushes having in combination a bristle feed box, a member having notches in the front thereof to receive knots of bristles, means for moving said member step by step across the feed box, means for pressing the bristles against said notched member, means for giving reciprocations to said feed box along the front of said notched member and an adjustable guide plate substantially masking the notches in said notched member at the entry side thereof and gradually opening greater depths of said notches as the member passes towards the exit side of the feed box.

10. A machine for making knots for grooms and brushes having in combination a notched conveyor, means for feeding bundles of bristles into said notches, means for moving said conveyor step by step to a series of operating stations and a series of fingers projecting from a second conveyor running parallel to the said notched conveyor and closing the open ends of said notches.

11. A machine for making knots for brooms and brushes having in combination a feed box for containing bristles, a series of operating stations, an endless flexible conveyor provided with notches for holding bundles of bristles, said conveyor passing in front of said feed box and conveying bundles of bristles from said feed box to said operating stations until the knots are completed.

In testimony whereof we affix our signatures.

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