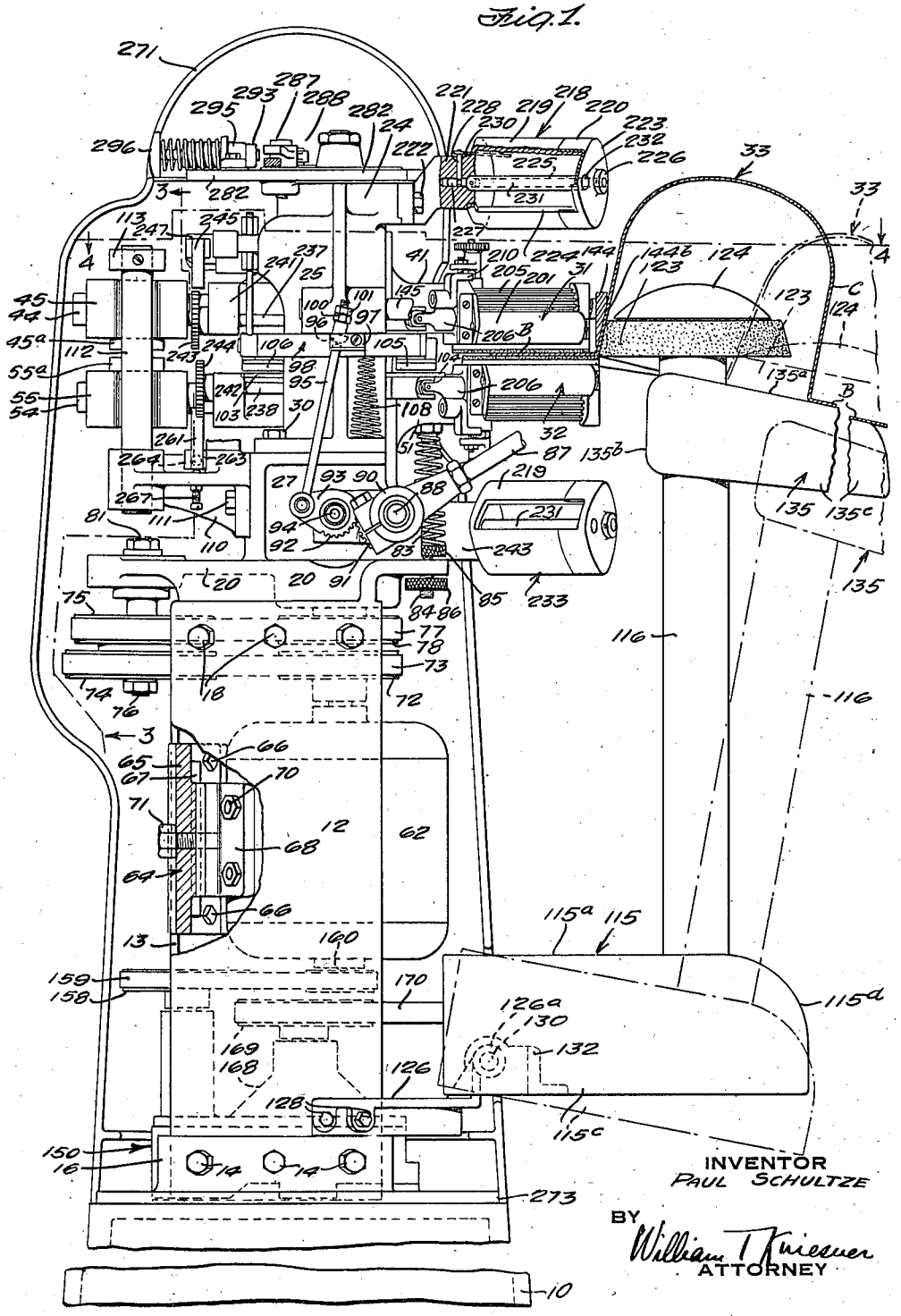
Jan. 26, 1943. P. SCHULTZE 2,309,141

HAT BRIM POUNCING MACHINE

Filed March 22, 1940 5 Sheets-Sheet 1

Fig. 1.

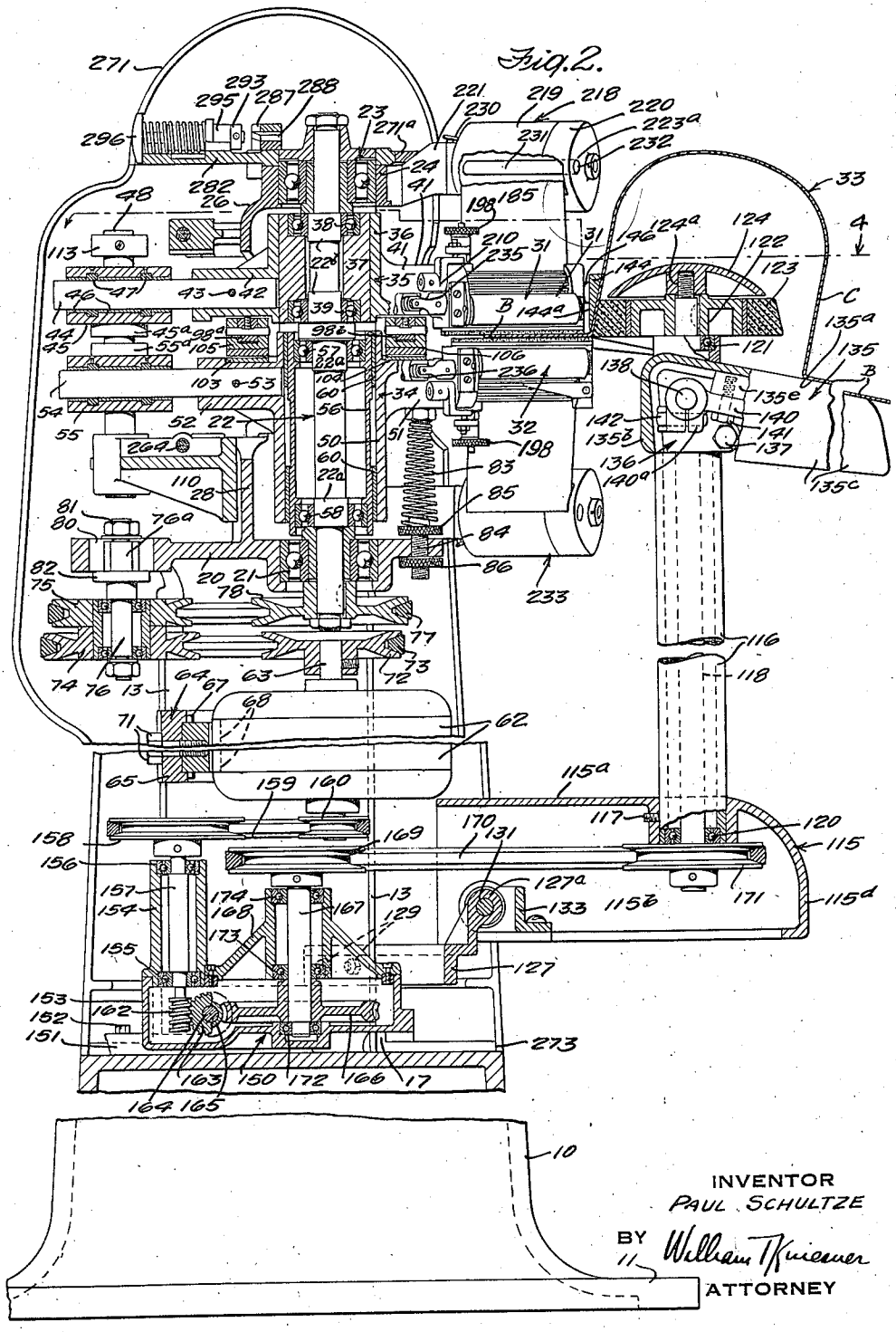


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HAT BRIM POUNCING MACHINE

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Fig. 2.



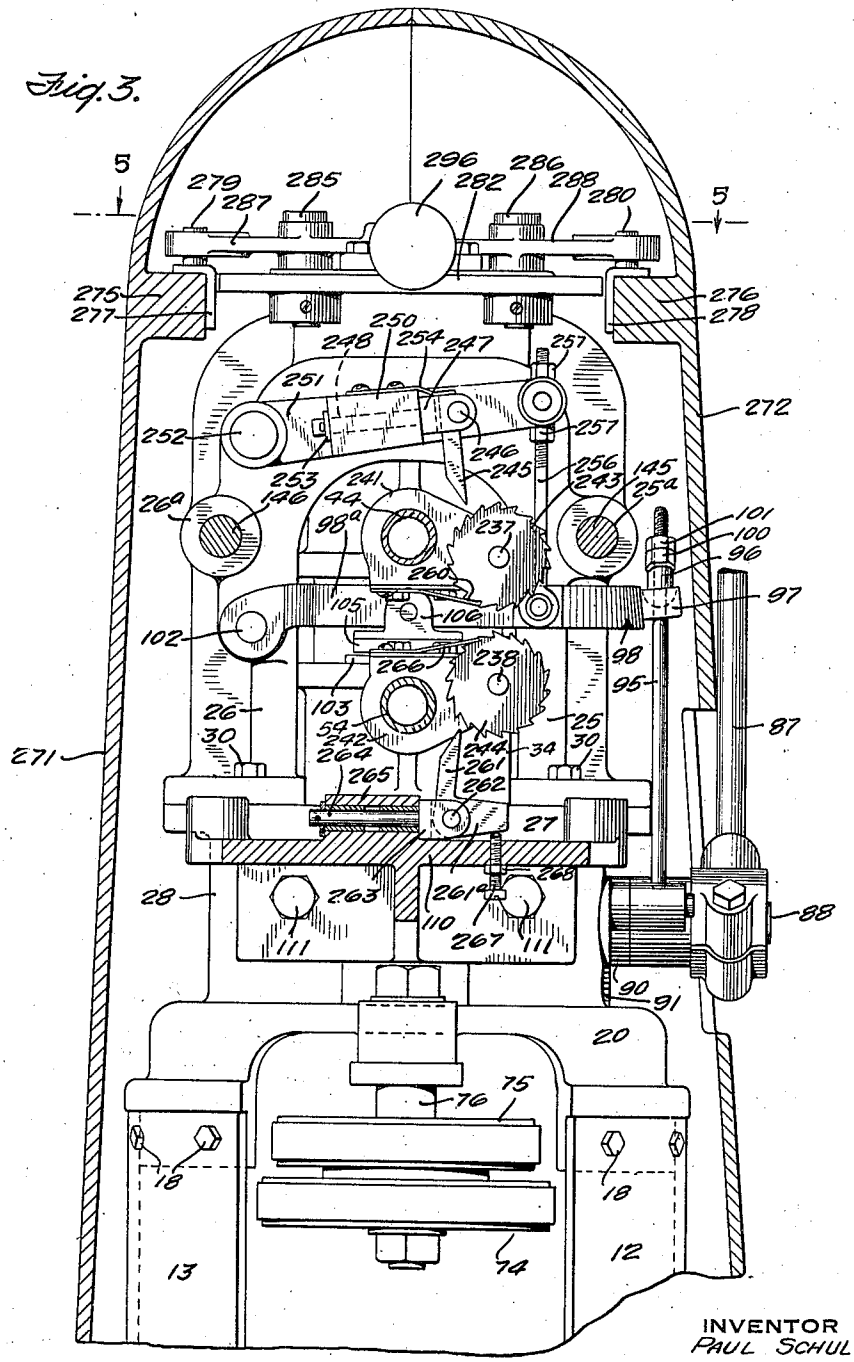
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HAT BRIM POUNCING MACHINE

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Fig. 3.



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HAT BRIM POUNCING MACHINE

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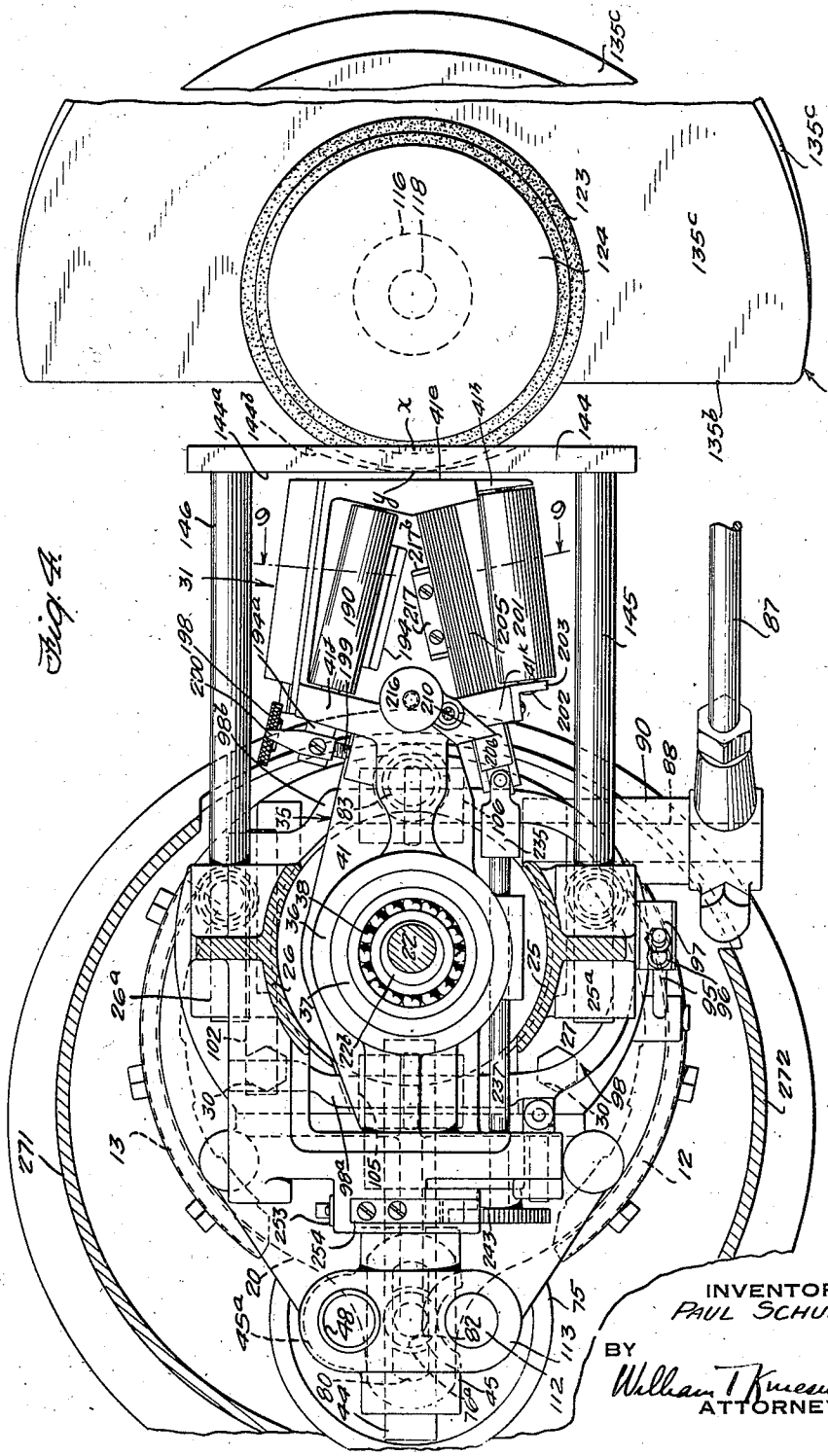


Fig. 4.

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HAT BRIM POUNCING MACHINE

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Fig. 5.

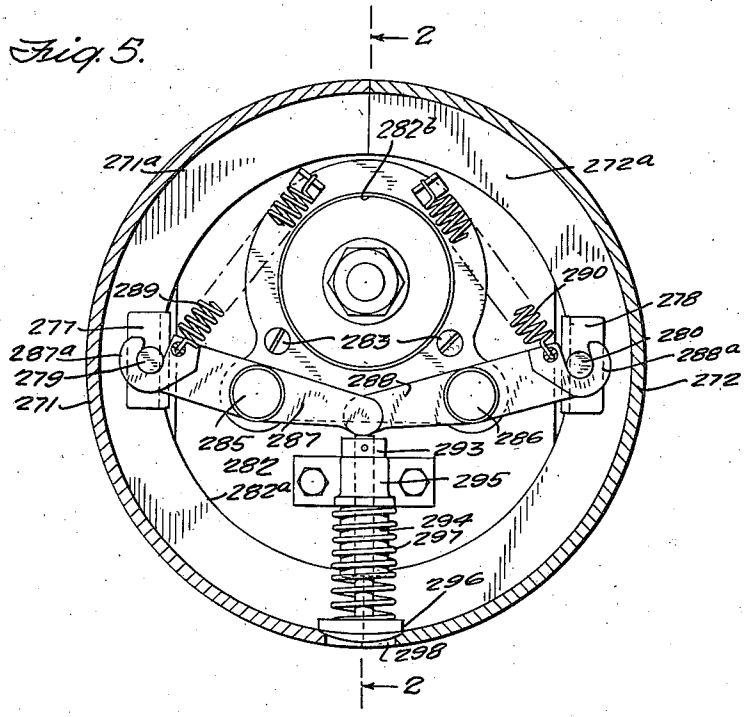
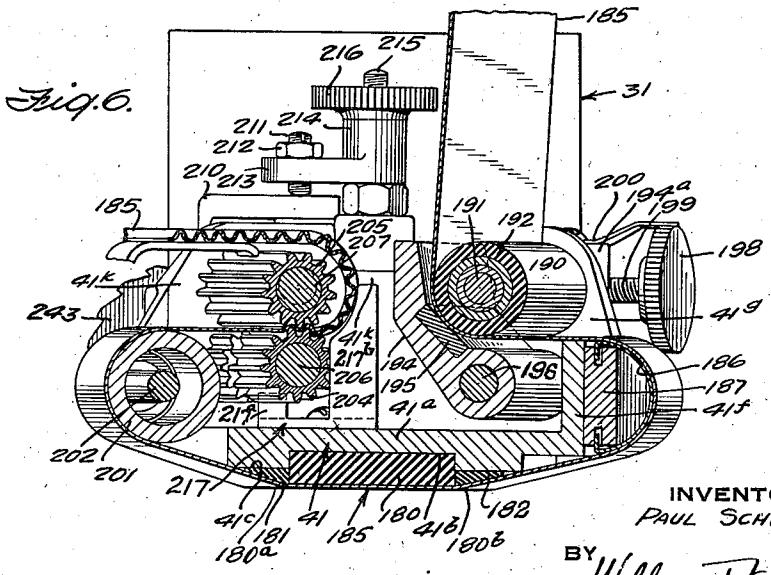


Fig. 6.



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Patented Jan. 26, 1943 2,309,141

UNITED STATES PATENT OFFICE

2,309,141

HAT BRIM POUNCING MACHINE

Paul Schultze, Danbury, Conn., assignor to Doran Brothers, Incorporated, Danbury, Conn., a corporation of Connecticut

Application March 22, 1940, Serial No. 325,295

39 Claims. (Cl. 223—20)

This invention relates to machines for finishing, as by pouncing, or sandpapering, the brims of hat bodies.

One of the objects of this invention is to provide a hat brim pouncing machine that will be of high efficiency and of high precision in action, compact and durable in construction, and of ease and facility of control and operation. Another object is to provide a hat brim pouncing machine in which the advantages of higher surface speeds for the operating or pouncing tools than has heretofore been possible may be achieved in a safe, dependable and practical way. Another object is to provide mountings, drives and controls for the brim operating tool or tools capable of dependable and long-sustained operation at high speeds. Another object is to provide a brim pouncing machine with operating tool or tools and a hat body support and feed that will be capable of producing better and more efficient results than has heretofore been possible and capable of control and operation on the part of an operator, as, for example, in the insertion or replacement of a hat body, that will be simpler and more efficient than in prior practices and that require less skill or manual attention or supervision over prior expedients. Another object is to carry out this last-mentioned object with mechanism that will be simple and compact and constructed and operated so as to afford the operator complete safety and also to insure the desired operation upon the hat body without chance of damaging the latter.

Another object is to provide a brim pouncing machine in which the upper side of the brim may be with complete safety to the hat body itself pounced or finished throughout its entire radial dimension, that is, up to the junction between the brim and the crown, without danger of injury to the crown portion of the hat body. Another object is to provide a brim operating machine in which certain advantages in which giving the brim tool a motion in a closed path may be successfully achieved and may also be made dependably and successfully effective throughout the radial extent of the brim without endangering or harming the crown of the hat in the region where it joins the brim. Another object is to provide in a brim pouncing machine a mechanism, such as a mount and drive, to make possible the functioning of brim pouncing pads, moving in a closed path, at such high surface speeds relative to the brim being operated upon, as will be feasible for sustained operation and as will produce commercially acceptable and superior results. Another object is to provide such a high speed apparatus with a safe and dependable hat support and brim feed, with dependable means for feeding or renewing the tool material, such as abrasive strip or sandpaper, and capable of reliable action and control under the conditions of high speed, and to insure safety of construction and operation.

Another object is in general to provide an improved brim pouncing machine, to facilitate manufacture and assembly, and to achieve greater reliability of construction and performance and thus to achieve improved results at less attendant cost, such as maintenance, and the like. Another object is to provide in a machine of the above-mentioned character simple and dependable means for controlling, regulating or adjusting the action of various parts. Another object is to provide dependable and easily controllable means for replacing or feeding the operative material of the tool or tools, such as abrasive strip or sandpaper. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown by way of illustration one of the various possible embodiments of my invention,

Figure 1 is a side elevation of the complete apparatus with part of the enclosing casing removed, certain parts being broken away and others shown in section in order to show certain features of the construction more clearly;

Figure 2 is a central vertical longitudinal sectional view of the complete machine;

Figure 3 is a view on an enlarged scale, as seen substantially along the line 3—3 of Figure 1, showing portions of the feed mechanism for the abrasive strip material;

Figure 4 is a horizontal sectional view, as seen along the line 4—4 of Figure 1;

Figure 5 is a horizontal sectional view along the line 5—5 of Figure 3, showing more clearly certain of the mechanism for assembling the housing or casing, and

Figure 6 is a transverse or vertical sectional view on an enlarged scale, as seen along the line 6—6 of Figure 4 showing certain features of the pad construction.

Similar reference characters refer to similar parts throughout the several views in the drawings.

Referring first to Figures 1 and 2, I provide a suitable base or standard 10, preferably of round cross-section, and provided, as at 11, with suitable flange means, or the like, whereby it and the high speed apparatus carried by it may be securely anchored to the floor, and carrying at its upper end suitable frame means which are preferably built up as, for example, by two upstanding curved plates 12, 13 (Figures 1, 2 and 4) of suitably heavy material of good strength like steel, their radius of curvature, preferably that of a circle less than the radius of the base 10, giving them great rigidity against distortion or bending. Plates 12—13 are secured as by screws or bolts 14 at their lower ends to correspondingly curved flanges 16, 17 that project upwardly from the upper face of the base 10, whereby frame plates 12—13 are rigidly supported in upstanding parallel relation and preferably arranged concentrically with respect to their curvatures and the center of the round base 10. In thus positioning them, they are preferably located so that the space between their right-hand vertical edges, as viewed in Figures 1 and 2, is greater than the space between their left-hand vertical edges.

At their upper ends the frame plates 12—13 support and have rigidly secured to them, as by screws or bolts 18, a frame part 20, preferably in the form of a casting, the latter being suitably shaped or flanged (see Figure 3) to interfit with the upper ends of the frame plates 12—13 and to form with the latter a strong and rigid upward continuation of the built-up frame structure.

Frame part 20 supports the outer race (see Figure 2) of a combined thrust and radial antifriction bearing 21 whose inner race supports, as by a bushing, as shown, the lower end of a main operating shaft 22 provided with eccentrics as later described. At its upper end shaft 22 is rotatably supported by a companion combined thrust and radial antifriction bearing 23 whose inner race is secured to the shaft and whose outer race is secured in or carried by a frame part 24 which is preferably in the form of a casting and has two horizontally spaced downwardly extending parts 25, 26 (Figures 1, 2, 3 and 4), preferably curved and cross-ribbed, as appears better in Figure 4, to provide strength and rigidity. Side parts 25, 26 are of sufficient downward extent to meet correspondingly spaced upward extensions 27, 28 (Figures 1, 2, 3 and 4) of the frame part 20, these meeting pairs of parts being rigidly secured together as by screws or bolts 30.

The operating shaft 22, driven preferably at high speed, as is later described in detail, actuates two tools or tool structures, generally indicated by the reference characters 31 and 32, being preferably, as is later described in detail, in the form of suitable abrasive material suitably backed up preferably as by a suitable resilient material, like rubber, for operation upon the respective sides of the brim B (Figures 1 and 2) of a hat body generally indicated by the reference character 33 and supported and fed in a preferred manner later described. Preferably, the tools 31, 32 are actuated, preferably in opposite directions relative to one another, so that their operating faces move in a closed path within their respective planes; in order, however, to achieve the advantage of such a path of motion, the linear velocity should be of a high order of magnitude and in brim pouncing machines heretofore proposed it has been impossible to achieve the magnitude of velocity desirable for accomplishing high quality and high efficiency of action and result. In accordance with certain features of my invention, however, I am enabled to achieve velocities of motion of a magnitude and in a manner to make commercial achievement of high quality of brim pouncing feasible.

A form of mechanism for giving the tools 31, 32 sustained high velocity of motion in closed paths is shown in the drawings and may comprise the two above-mentioned eccentric portions 22^a and 22^b of the operating shaft 22 coacting, respectively, with lower and upper tool carriers, generally indicated at 34 and 35, and related coacting parts later described in detail.

Tool carriers 34—35 are preferably made of a suitable alloy having lightness and strength, such as a magnesium alloy, and with the parts they respectively carry, including the tools, they are preferably of generally similar construction.

Thus, carrier 35 may comprise a sleeve-like part 36 (Figure 2) within which is a bushing-like member 37 suitably stepped at its two ends to receive the outer races respectively of two combined thrust and radial antifriction bearings 38, 39 whose inner races are carried by or mounted upon the eccentric portion 22^b of the main shaft 22, that eccentric portion being conveniently, and, as shown, formed out of two axially spaced parts of the shaft.

In the illustrative embodiment, eccentricity of the portion 22^b is $\frac{1}{8}''$, as is also the case with the other eccentric portion 22^a, these two portions being spaced from each other 180°.

Extending to the right (Figure 2) from the sleeve part 36, the carrier 35 has an extension 41 which supports the tool 31 and extending to the left and diametrically opposed to the extension 41 is a sleeve-like extension 42 in which is fitted and secured, as by a pin 43, a cylindrical member 44 which is preferably constructed to be strong and wear-resisting but relatively light, preferably taking the form of a relatively thin-walled steel tube. It is of sufficient extent in a direction toward the left (Figure 2) to be slidably received within a bearing member 45. Bearing member 45 is preferably lined, as indicated in Figure 2, with suitable bearing material, such as a self-lubricating material, as indicated at 46, and it may also be constructed to accommodate suitable means, for retaining a lubricant, such as felt washers 47. With the operating shaft 22 driven at a suitably high speed, illustratively 3600 R. P. M., the member 44 oscillates or slides back and forth relative to the bearing member 45 at high surface speed and at a high rate, partaking, in the illustration, of 7200 strokes per minute. But because of the circular motion of translation which the eccentric 22^b gives to the sleeve part 36 of the carrier 35, bearing member 45 is arranged to oscillate about a pivot preferably provided by a stud shaft 48 which extends through a lateral extension 45^a (see Figure 4) of the bearing block or member 45 and which is rigidly supported in a manner later described.

Carrier 34 (Figures 1 and 2) is, as above noted, constructed substantially similarly as carrier 35; it has a central sleeve portion 50 from which extends toward the right an extension 51 which carries the tool 32, and a sleeve-like extension 52 (Figure 2) toward the left in which is secured as by pin 53, a steel tube member 54, like member

44, slidably guided in a bearing member 55, like the member 45, and mounted as by the sleeve-like bearing extension 55 to oscillate about the upright shaft 48. Shaft 48, as better appears in Figure 4, may be made tubular, as of steel tubing.

In the preferred arrangement the upper tool carrier 35 is, by the earlier above described assembly to the operating shaft 22, held against movement in a direction lengthwise of the operating shaft 22, the rigid support for the latter, provided by the above-described vertically spaced bearings 21 and 23, in the lower bearing frame 20 and the upper bearing frame 24, permitting it dependably to take up and dissipate to the frame structure moments of force or thrust, such as could be transmitted to the shaft by the reaction of or pressure exerted by the tool 31, it being noted that the tool carrier 35 is in turn and to better transmit such thrusts, carried by the shaft 22 by the bearings 38, 39, which are of substantial spacing lengthwise of the shaft. Thus, rigidity and precision and integrity of structure are dependably maintained. The tool carrier 34 with its tool 32 is, however, preferably arranged for controllable movement axially of the shaft 22 but in a manner to insure the dependable transmission to the shaft 22 and to the supporting frame structure moments of thrust or force due to the reaction of or pressure exerted by the tool 32.

A preferred arrangement for so mounting the tool carrier 34 comprises the above-mentioned sleeve part 50 which is preferably considerably elongated axially to provide an axially long bearing relative to an internal sleeve 56 also of substantial axial length and which is carried by the axially spaced eccentric portions 22^a of the shaft 22 by means of correspondingly axially spaced combined radial and thrust antifriction bearing 57 and 58, the inner races of which are fixed to the crank portions 22^a and the outer races of which are fitted and fixed internally of the sleeve 56.

Sleeve 56 is preferably made of material like steel and preferably its external cylindrical face is machined to provide two axially spaced bearing surfaces adjacent the respective ends of the sleeve 56; internally of the sleeve part 50 of the carrier 34 I preferably provide axially long bushings 60, 60 of a suitable bearing material, such as a self-lubricating or so-called oilless bushing material for coaction, respectively, with the just-mentioned external bearing surfaces at the ends of the internal sleeve 56.

Accordingly, during drive of the shaft 22, the inner races of the upper spaced bearings 38, 39, related to the upper tool carrier 35, rotate with the eccentric portion 22^b of the shaft 22 but relative to the non-rotating parts 36, 37 of the upper tool carrier 35 which partakes of motion of translation that is in a closed circular path as far as the parts 36—37 are concerned, while the inner races of the lower spaced bearings 57, 58 of the lower tool carrier 34, rotate in a similar way with the eccentric portions 22^a of the shaft relative to the non-rotating internal sleeve 56 which is given a motion of translation in a closed path that is circular; a similar motion is by the sleeve 56 conveyed to the sleeve part 50 of the tool carrier 34 but during such actions tool carrier 34 may be moved in an axial direction relative to the axially immovable internal sleeve 56, thus to vary the distance between the faces of the two tools 31, 32, the large coacting bearing surfaces between the internal sleeve 56 and the bushings 60, 60 and their axially spaced relationship insuring not only long wear but also freedom from play and dependable transmission to the shaft and through the latter to the frame structure of thrusts caused by or at the tool 32.

The two tool carriers, being thus moved in opposite phase relations, are, with respect to each other, preferably dynamically balanced in any suitable way. Preferably, to make up for the axially elongated slidable bearing arrangement provided between the internal sleeve 56 and the sleeve part 50 and the resultant weight of these parts, as compared to the shorter axial lengths related to the upper eccentric 22^b, member 37 is shaped or machined to be of substantially the same weight with its tool carrier 35, as is the internal sleeve 56 with its tool carrier 34, related to the lower eccentric 22^a, thus to substantially equalize the masses or weights of the aggregate entities respectively set into and maintained in motion by the two eccentric portions 22^a and 22^b and thus at the high speeds of operation to counteract tendencies to set up couples or forces creative of harmful stresses or vibration. With the two eccentric portions 22^a and 22^b operating 180° out-of-phase from each other, the masses respectively moved by them move substantially in opposite directions and the moments of force they respectively set up, being very substantial at the high velocities of motion, substantially counteract and neutralize each other, with negligible or minimum effect so far as the apparatus as a whole is concerned.

For a preferred embodiment for effecting safely high speed of drive, at say 3600 R. P. M., I prefer to employ an electric motor 62 (Figures 1 and 2) mounted with its shaft 63 extending vertically and preferably in substantial alinement with the operating shaft 22; preferably, motor 62 is accommodated between the curved upright frame plates 12—13, being entered in between them through the wider opening or space at the right-hand edges thereof and being substantially snugly accommodated therein and secured thereto as by a composite bracket 64 which preferably comprises a plate-like member 65 bridged across and internally interfitted with the frame plates 12—13 and secured thereto as by bolts 66, thus also strengthening the frame structure 12—13. Plate-like member 65 is provided with vertically extending ways 67 with which is slidably interfitted a suitably conformed portion of a companion plate-like part 68 which is secured to the motor frame 62 as by screws 70, the two parts 65 and 68 being clamped together, as by a clamping screw 71, this arrangement permitting adjustment of the motor 62 in a vertical direction.

At its upper end motor shaft 63 carries a pulley 72 which, through a suitable belt, preferably a V-shaped rubber belt 73, drives a pulley 74 secured together with a companion pulley 75 and supported for rotation on a downwardly projecting stud shaft 76 carried by a leftward extension (Figures 1 and 2) of the lower bearing frame 20. Pulley 75, through a suitable belt 77, also preferably a V-shaped rubber belt, drives a pulley 78 secured to the lower otherwise free end of the operating shaft 22.

Stud shaft 76 that supports the double pulley 74—75 is preferably adjustably mounted so that the tension of the belts 73, 77 may be fixed or adjusted. Conveniently, for this purpose, stud shaft 76 has an upper portion 76^a that is slidably received in a slot 80 in the extension of frame 20, slot 80 extending in the direction of

the line joining the axes of shaft 76 and shaft 22, and upon fixing the position of stud shaft 76 it may be clamped in place as by a clamping nut 81 between which and a collar 82 on the stud shaft the slotted frame portion becomes clamped.

By thus transmitting the drive from motor shaft 63 to the operating shaft 22, I am enabled to achieve a number of advantages. With a motor of fixed speed characteristic, I am enabled by appropriately varying the pulley diameters to achieve a different rate of drive of operating shaft 22. Also, I am enabled substantially to isolate the motor and the operating shaft and its related mechanisms from each other, thus avoiding the imposition upon the operating shaft and its connected parts of strains or stresses or vibrations inherent in the motor or its operation and vice versa. Also, I am enabled thereby to isolate from the high speed brim operating mechanism the drive of other parts of the apparatus, such as the feed of the hat brim between the two operating tools 31, 32, as is later described.

With the operating shaft driven as above described, thus giving the adjacent faces of the operating tools 31, 32 motions of translation at high velocity but in closed paths within their own respective planes, the drive need not be interrupted to insert or replace a hat brim between the two operating tools or, as is later pointed out, to effect a feed of the abrasive strip which is the preferred form given the operating parts of the two tools. The latter operate upon the brim B while pressed toward the respective sides or faces of the brim with a suitable pressure, and where, as in the preferred form, the lower tool carrier 34 with its tool 32 is movable axially, I prefer to apply to the tool carrier 34 suitable means for urging it and hence the tool 32 upwardly; such means may comprise a spring 83 interposed between the extension 51 of the tool carrier 34 (Figure 2) and a suitable part of the lower bearing frame 20, the spring 83 by its tendency to expand urging the carrier 34 to slide upwardly with its sleeve part 50 relative to the axially immovable internal sleeve 60. Preferably, the action of spring 83 is adjustable and this may be arranged by fitting its lower end over the upper end of a threaded stud 84 threaded into the frame part 20 and provided with a knurled flange 85 by which its axial position, and hence the compression of the spring 83 adjusted, a lock nut 86 being provided to fix or set the adjustment.

To effect separation of the tools 31, 32, I provide means, preferably manually actuated, to effect movement of the movable tool carrier, illustratively tool carrier 34, acting in opposition to spring 83. This means preferably comprises a handle 87 (Figures 1, 3 and 4) projecting normally in a general upward direction to one side of the tools 31, 32 where it is thus located for convenient manipulation by the operator, handle 87 being secured at its lower end to a shaft 88 projecting from and rotatably carried in a suitably shaped portion 90 of the lower bearing frame 20 and secured, as onto the shaft 88, to swing or move with the lever 87, is a toothed or rack member 91 which meshes with the toothed or rack portion 92 of a lever 93 rotatably mounted on a stud shaft 94 projecting from the frame part 20. At its outer end lever 93 has pivotally connected to it a link 95 whose upper end slidably carries a ball member 96 that rests in a socket part 97 at the outer end of a U-shaped yoke, generally indicated by the reference character 98; a nut 100 with a lock nut 101 (Figure 3) permits adjustment of the effective length of link 95.

The two sides or arms 98a and 98b of the yoke 98 (see Figures 4 and 2) extend toward the opposite side of the upper frame part 24, passing directly over the tool carrier extensions 52 and 51, respectively (Figure 2), and at their ends are pivoted by a suitable stud or pin 102 (Figure 3) to the opposed sides of the part 26 of the upper bearing frame 24. The tool carrier extensions 52 and 51, where they underlie the yoke arms 98a and 98b, respectively, are suitably recessed to receive wear plates 103 and 104, respectively, and the two yoke arms 98a and 98b where they overlie these carrier extensions 52 and 51, respectively, have pivotally attached to them shoes 105 and 106, respectively, whose under faces are preferably provided with suitable self-lubricating alloy, such as is employed for so-called oilless bushings. Spring 108 biases yoke 98 upwardly (Figure 3).

Accordingly, if handle or lever 87 is swung in clockwise direction, as viewed in Figure 1, the rack 91 rotates lever or link 93 in counter-clockwise direction, through its engagement with the rack 92 thereon, thereby pulling link 95 (Figures 1 and 3) in downward direction, and swinging yoke 98 in clockwise direction (as viewed in Figure 3) about its pivot support 102 and against the action of spring 108 (Figures 1 and 2), this movement of the yoke bringing its contact shoes 105 and 106 (Figures 2 and 3) into engagement with the wear plates 103 and 104, respectively, of the moving tool carrier 34, and thereafter sliding the latter downwardly relative to the internal sleeve 46 along the axis of the operating shaft 22.

The range of resultant motion in downward direction that is given to the tool 32 is sufficient to achieve a separation between the adjacent tool faces sufficient to remove the brim of a hat body and replace it by another. Preferably, the tool moving mechanism is constructed so as to lock or hold the movable tool in its position of tool separation and preferably, for this purpose, link 95 and the rack lever 93 (Figure 1) are proportioned and related to function as a pair of toggle levers, the range of counter-clockwise rotary movement of lever 93 being sufficient to bring the pivotal connection thereto of link 95 over to the right-hand side of the axis of rotation of rack lever 93, thus locking the parts in lowermost position against the action of spring 83. To restore the displaced tool 32, lever 87 is simply moved in reverse direction, namely, it is swung in counter-clockwise direction and as soon as the pivotal connection between links 95 and 93 passes to the left of the axis of link 93, the retrograde or upward movement of the parts to operating position is aided by the action of spring 83 on carrier 51 and spring 108 on yoke 98.

During such actuation of the movable tool its high speed of actuation, as above described, continues; as the tool carrier 34 slides with its sleeve 50 (Figure 2) downwardly relative to the internal sleeve 56, or upwardly, as the case may be, the bearing member 55 (Figure 2) in which the tube extension 54 of the tool carrier continues to reciprocate partakes of a corresponding downward or upward sliding movement relative to the stationary stud shaft 48. The latter is fixed to a bracket 110 secured as by screws 111 to extend toward the left of the lower bearing frame 20. To insure greater rigidity for the stud shaft 48, aside from its anchorage in the outer end of

backet 110, the latter has similarly anchored to it a member 112 substantially identical to the stud shaft 48, being spaced from the latter but extending parallel to it, with the upper ends of the two members 48 and 112 rigidly tied together by a cross-piece 113. Thus, any tendency of the stud shaft 48 to flex is resisted not only by its own rigidity and that of its mounting, but also by that of the companion member 112. With such an arrangement, the major portions of the bearing members 45 and 55 (Figures 1 and 2) extend between the two parallel members 48 and 112 and, if desired, and as indicated in Figure 1, the members 45 and 55 may be externally shaped or cut away to insure ample clearance between them and the member 112, as they partake of oscillation about the axis of their supporting member 48. Illustratively, part 48 is tubular and part 112 solid.

Also, it will be noted that the rapidly moving parts or tool carrier extensions 44 and 54 thus become confined laterally between the two upright members 48 and 112 and above and below by the cross-piece 113 and the heavy bracket 110, respectively.

With such control of the separation or approach of the two tools, the brim B of a hat body 33 (Figures 1 and 2) may be quickly inserted between the faces of the two tools or removed therefrom; to facilitate replacement of the hat body and a feeding action upon the latter to cause the brim to be progressed during the operation thereon of the two tools, I prefer to employ a mechanism and arrangement better shown in Figures 1 and 2. At the lower part of the apparatus I provide a housing-like member 115 having a top wall 115^a from which extend downwardly and outwardly, in suitable curvature, opposed side walls 115^b and 115^c and an end wall 115^d, for purposes later described. Extending upwardly from the upper wall 115^a is a standard or column, preferably in the form of a tube 116, suitably secured at its lower end to the member 115 as, for example, by interfitting it with a suitable internally flanged aperture in the member 115 and locking it in place as by a set screw 117. Extending through the column 116 and rotatably supported thereby is a shaft 118, as by anti-friction bearings 120 and 121, suitably mounted at the respective ends of the column 116 and acting preferably also as thrust bearings, thus to hold the shaft 118 against axial movement relative to the column 116.

At its upper end shaft 118 carries a means for engaging with the inside of the crown C of the hat body, and in a preferred form it comprises a metal hub 122 secured to the shaft 118 to be rotatable therewith and having a member 123, like a tire, extending peripherally about the hub 122, being made preferably of a material that can engage the felt or other material of the hat body with a good grip free from substantial slippage and preferably also being yieldable or resilient; a peripheral member 123 made of rubber, preferably of substantial radial dimension, as indicated, and of an outside diameter approximating the minor axis of oval hat crowns to be operated upon, I have found to give good results. It is secured to the metal hub 122 in any suitable way, as by cementing, and to avoid exposing any rough edges or rough parts of the construction I preferably surmount the rotary structure 122—123 by a curved cap 124 which conveniently is in the form of a segment of a sphere and which conveniently also is internally threaded, as at 124^a to serve as a nut to clamp the hub member 122 onto the shaft 118, though I prefer also to employ other means, such as a key, to insure that the hub 122 partakes of the same rotation as does the shaft 118.

The peripheral face of the yieldable rotary member 123 is preferably frusto-conical and illustratively may partake of a 12° taper relative to its axis of generation or rotation. Shaft 118 with its supporting column 116 and the housing-like member 115 are supported as a unit from the lower portion of the apparatus but in such a way that the hat-engaging member 123 may move toward or away from the outer or front edge portions of the tools 31, 32 and this I preferably achieve by providing a pivotal connection or support for the housing part 115 with respect to the frame structure of the apparatus. This pivotal support may comprise two laterally spaced brackets 126 and 127 (Figures 1 and 2) having curved portions to seat externally against the curved faces of the frame plates 12 and 13, respectively, to which they are secured as by bolts or screws 128 and 129, respectively, the two brackets presenting toward the front of the machine (the right as seen in Figures 1 and 2) spaced but alined eyes 126^a and 127^a, respectively, for the reception of pins or bolts 130 and 131 to form pivotal connections with brackets 132 and 133, respectively, that are secured to and internally of the opposed side walls 115^b and 115^c of the housing-like support 115.

These parts are so proportioned that when they are swung as a unit in counter-clockwise direction about the axis of the just described pivotal connection and to the position shown in Figures 1 and 2, the substantially horizontal plane of the lower edge of the frusto-conical face of the hat-engaging member 123 is just about coincidental with or slightly below the plane of the under face of the upper tool 31 so that, with the lower tool 32 moved into lowermost position, as above indicated, a hat body appropriately related to the member 123, as is later described, has its brim carried into the space between the separated tools, while if swung in reverse direction, after separation of the tools, a hat body has its brim removed from in between the separated tools.

Coacting with the member 123 is a table-like support 135 carried by the column 116, preferably adjustably, so that its upper face 135^a, which is substantially flat, may be given an angle suited to such factors as the angle of taper of the crown-engaging part 123, the angle between the crown side and the brim, or the like.

Table member 135, aside from the top wall or top face portion 135^a, is preferably constructed to have depending skirt-like flanges or walls, such as an end wall 135^b, which may be substantially straight and which preferably extends at right angles to the longitudinal horizontal axis of the apparatus and a single wall 135^c curved or shaped to comprise opposed side walls and an opposite end wall; the wall portion 135^c may be, in plan, substantially semicircular. With such preferred construction, the mounting of the table 135 to the column 116 and the mechanism for adjusting its angle, may be embodied within the hollow under side of the member 135 and is preferably constructed to provide for up and down adjustment of the table 135 relative to the column 116 and also for adjustment of the angular relationship therebetween.

A suitable mounting means of this character may comprise a sleeve-like bracket 136 through which the column 116 extends, bracket 136 being split and provided with a clamping screw 137 so that the position of the sleeve bracket 136 lengthwise of the column 116 may be set as desired, as well as, where necessary, the angular relationship thereof about the axis of column 116 determined. Sleeve bracket 136 is provided with trunnions 138 preferably one on each side of the bracket 136 and hence one on each side of the column 116, to receive the split sleeve portions 140a of two brackets 140 which extend along and underneath an internal rib 135e to which they are secured as by screws 141, the split sleeve portions 140a having clamping screws 142. By this arrangement the angle of tilt of the top face 135a of the table 135 about the axis of the trunnions 138 may be adjusted. The left-hand central portion of the table 135, as seen in Figures 1 and 2, is, of course, suitably shaped to accommodate the column 116 and to provide adequate leeway for such adjustments as have just been described.

A preferred and illustrative adjustment of these parts is shown in Figure 2 from which it will be seen that the plane of the table face 135a inclines downwardly toward the right when the parts are in position to present the brim B of the hat between the two tools, the plane of the top face, if extended toward the left, just about intersecting the extreme left-hand lower edge portion of the member 123. With a hat body resting upon the table face 135a and with the crown C thereof taking over the driven element 122—123, the major portion of the brim of the hat rests upon the table face 135a but at such an angle as to present the junction between brim B and crown C where the latter is internally engaged by the element 123 to the lower edge of a member 144 that coacts with the rotary element 122—123 to fix the position of that junction relative to the two moving tools and to maintain such position of the junction fixed as the hat body is rotated by the element 122—123.

Member 144 is preferably constructed in the form of a bar of rectangular cross-section, as is better shown in Figure 4, and is preferably rigidly supported at the outer ends of two parallel rods 145, 146, whose inner ends are supported in suitable bores 25a and 26a of the upper bearing frame 24 (Figures 4 and 5), where they are secured or anchored in any suitable way.

The inner face 144a of the bar-like member 144, preferably extends vertically (Figures 2 and 4) and is positioned so that its plane is just about coincident with the edge portions of the upper tool 31 when the latter is in its extreme right-hand position, while the horizontal plane of the lower or under edge of member 144 is substantially coincident with the horizontal plane in which the under face of tool 31 lies or operates. At a middle portion of its right-hand face, as viewed in Figures 2 and 4, the bar-like member 144 is cut or milled away, as at 144b, preferably along a curved plane which is tangent to the right-hand edge of the upper face, as at the point x (Figure 4) and which is tangent to the left-hand edge of the lower face, as at y, the plane of cutting or milling being virtually cylindrical. It is against this curved face 144b that the band or lower portion of the crown C of the hat body (Figures 1 and 2) is pressed by the rotating element 122, 123, and since at the point y the thickness of member 144 is negligible or just sufficient to avoid presenting a sharp or cutting edge, and since the left-hand face 144a of the member 144 is substantially at the limit of the stroke of tool 31 in a direction toward the right, the entire radial dimension of the upper face of the brim B is thus exposed to the scope of operation of the tool and maintained so exposed as the hat body rotates under the action of the rotary element 122, 123, for the same pressure exerted by the yielding rotary feed element 123 to grip and rotate the hat is effective to press the band portion of the crown always against the curved face 144b of the member 144, thus insuring that the entire radial dimension of the brim B, as the latter progresses around and around, is exposed to the operating surface of the tool 31.

While the upper tool 31 is operating on the upper side of brim B, the lower tool 32 is operating upon the under side of the brim, being pressed upwardly by the action of spring 83 (Figures 1 and 2) by a pressure which may be determined by adjustment of the spring 83 as by the adjusting elements 84—85—86 (Figure 2).

Preferably, the extent to which spring 83 urges the lower tool 32 through its tool carrier 34 upwardly, is limited to a sufficient extent to prevent the two tool faces from operating against each other in the absence of a brim B therebetween. Such limiting action may be achieved by setting the uppermost position of the yoke 98 (Figures 1, 2 and 3) with the handle 87 in uppermost or normal position; this may be accomplished by setting the position of the ball member 96 (Figure 3) relative to the link 95 by means of the adjusting nuts 100—101. Thus, as appears clearly in Figures 2 and 3, it will be noted that the under faces of the shoes 105, 106 of the yoke 98 are at such a position as to permit a slight further upward movement of the tool carrier 50 under the action of spring 83 (Figure 2) before the wear plates 103 and 104 are brought into contact with the shoes 105, 106. Thus, though the brim B be removed from in between the tools 31, 32, as viewed in Figure 2, the tool 32 is permitted to approach tool 31 beyond the position shown in Figure 2 but limited by the leeway between wear plates 103, 104 and the yoke shoes 105, 106, respectively.

With the tools actuated preferably at such a high speed as noted above, the cutting speed of any abrasive particle on the tool faces is high and is substantially the same as that of any other point or particle on the tool face, with the result that a uniformity of pouncing action throughout the radial extent of the brim B surpassing prior practices is achievable; the brim is operated upon on both sides throughout its entire radial extent and it might be noted that it has heretofore been impossible to achieve action at those regions of the upper brim side closely adjacent the crown. The rotary pressure and feed element 123 takes part in assuring these actions, maintaining that portion of the brim that is between the two tools always in proper relationship to the latter and due to its relatively slow rotary movement it insures the dependable steady presentation of successive portions of the brim into the operative region between the two tools.

The rotary feed and pressure element 123 is rotated at a speed to give its peripheral hat-engaging surface a relatively very low surface speed; with an external diameter on the order of

5'' or 5½'', the element is rotated at a speed on the order of 17 R. P. M. It is driven preferably by way of the shaft 118, as above indicated, and preferably by driving connections to the high speed motor 62.

In effecting drive of the shaft 118 from the motor 62, I preferably employ a speed-reducing mechanism and a flexible driving connection to permit freedom of tilting of the housing-like carrier 115 which supports the column 116 and the hat-supporting table 135 and related parts. Thus, and illustratively, I preferably provide a casing generally indicated at 150 (Figures 1 and 2) preferably proportioned and constructed to fit in between the curved frame plates 12—13 and to rest upon the upper face of the base 10 to which it is secured preferably adjustably by suitable lugs 151 and bolts or screws 152 (Figure 2). Casing 150 may be and preferably is of a built-up construction, having a base part 153 from which a sleeve-like part 154 extends vertically and upwardly to rotatably support, as by bearings 155, 156, a shaft 157 at whose upper end is mounted a pulley 158 which, by a belt 159, is in driving connection with a pulley 160 upon the lower end of the motor shaft 63. Preferably, pulley 160 is smaller than pulley 158, thus to achieve one step of speed reduction.

At the lower end of shaft 157 is a worm 162 which drives a worm wheel 163 carried by a shaft 164 that extends horizontally and transversely of the base portion 153 of the casing which provides for it suitable bearings (not shown), thus driving shaft 164 at a further reduced speed. Shaft 164 carries a worm 165 which drives at corresponding speed reduction a worm wheel 166 secured to the lower end of a shaft 167 which extends vertically and upwardly through a casing section 168 where it has secured to it a pulley 169 which by a belt 170 drives pulley 171 on the lower end of shaft 118.

Shaft 167 is rotatably supported by suitable bearings, such as a bearing 172 in the base portion 153 of the casing and two spaced bearings 173, 174 in the sleeve-like portion of the casing section 168 which, like the casing section 154, is provided with suitable means for securing it to the base casing section 153.

By such an arrangement a speed reduction of from 3600 R. P. M., the illustrative speed of the motor 62, to 17 R. P. M., the illustrative speed for the rotary pressure and feeding element 123, is achieved. Like the belt drive between the motor 62 and the main operating shaft 22, these driving and speed reducing connections are located in an out-of-the-way position and, moreover, will be seen to be nicely and neatly compacted in the space between the main frame plates 12—13 and, as far as the belt 170 and pulley 171 are concerned, underneath and within the housing-like support or bracket 115. The arrangement, furthermore, will be seen to place the axis of pivoting of the structure 115—116, as determined by the pivot pins or studs 130, 131 (Figures 1 and 2) in close proximity to the line or plane of the driving belt 170, as better appears from Figure 2; the belt 170, like the other belts, is preferably a V-shaped belt and preferably of a suitable rubber composition having a suitable degree of elasticity. Accordingly, tilting of the tiltable structure 115—116, etc., in clockwise direction, as viewed in Figures 1 and 2, and to the broken line position shown in Figure 1, appropriate to remove or insert the brim B relative to the tools, may thus take place without interrupting the drive and with a minimum amount of stretch of the belt 170.

The adjustability of mounting of the casing structure 150 (Figures 1 and 2) provide sufficient leeway for adjusting the tension of the belts 159 and 170 and in the preferred arrangement the axes of the motor shaft 63, casing shafts 157 and 167, and the shaft 118 of the feed and pressure element 123 are alined along the central longitudinal plane of the apparatus.

The tool structures 31, 32 (Figures 1, 2 and 3) are preferably of identical or symmetrical construction and hence only one need be described in detail. Each tool structure is built up onto the right-hand extensions 41 and 51 (Figure 2) of the respective tool carriers 35 and 34 and, considering the details of construction of the two, reference may be had to the detailed arrangement of construction of the upper tool 31, better shown in Figures 4 and 6. The tool carrier extension 41 terminates in a flat portion 41ª that is in general trapezoidal in shape, being of lesser width at its outer end than near its inner end in a ratio commensurate substantially with the ratio of the inner and outer circumferences of the brim B. On its under face it has a recess 41ᵇ (Figure 6) of commensurate trapezoidal shape and in the recess is secured, as by cementing, or the like, a pad 180 of a suitable yieldable material, preferably resilient, like rubber, being of a thickness greater than the depth of the recess 41ᵇ and having along its oblique or outwardly converging side edges 180ª and 180ᵇ, pad extensions 181, 182; exposed faces are inclined or beveled off to substantially merge into the under face 41ᶜ of the carrier extension 41. The front edge of the latter end of the pad 180, being the right-hand faces or edges, as seen in Figure 4, coincide, as indicated at 41ᵉ in Figure 4, and extend at right angles to the longitudinal axis of the entire tool carrier 35.

It is against the under face of pad 180 (Figure 6) that the operative material of the tool, preferably taking the form of a suitable abrasive material in strip, sheet, or band-like form, usually in the form of so-called sandpaper, is held or supported to partake of the movement of the pad structure itself, and in Figures 2 and 6 the sandpaper in band form is indicated at 185, being of a width commensurate with the length of the pad 180 along the longitudinal axis of the tool carrier and with its front or right-hand edge, as viewed in Figures 2 and 4, alined or coinciding with the corresponding edge or face of the pad 180. The band material 185 extends preferably at right angles to the just-mentioned longitudinal axis and extends over the oblique edges 180ª and 180ᵇ of the pad 180 and is provided with suitable means for holding it taut and preferably with means for effecting an advancing movement thereof to move worn abrasive portions away from the under face of the pad 180 and to bring new or unused abrasive portions into operative position.

For these purposes, a preferred arrangement is as shown in Figure 6. Thus, from the right-hand oblique edge 180ᵇ of the pad 180 the band material 185 passes over an arcuate support or guide 186 whose surface is preferably cylindrical and which is preferably supported so that the axis of curvature of its surface is parallel to the oblique edge 180ᵇ. Thus, the tool carrier extension 41 may have at its one end, as seen in Figure 6, a flange 41ᶠ extending parallel to the pad edge 180ᵇ and to which is secured a member 187 to which in turn the arcuate guide 186 is secured as, for

example, by providing the member 187 with longitudinal slots in its upper and lower faces and providing the sheet metal guide 186 with inwardly directed flanges respectively received in the slots of member 187.

Passing over member 186, the band material 185 then passes over a roller 190 suitably supported so that its axis is parallel or approximately so to the oblique pad edge 180b, as by a stud shaft 191 carried at its opposite ends in flange parts 41g and 41h of the carrier extension 41.

Roller 190 is preferably provided with a yielding external covering, such as a rubber sleeve-like part 192, and pressing against the band material 185, as the latter lays against the resilient roller 190—192, is a shoe 194 provided with a wear plate 195 of a material like steel and suitably mounted for movement to adjust the pressure with which the wear plate 195 presses the band material 185 against the roller 190—192. Such a mounting may comprise a stud shaft 196 rigidly supported at its ends in the flange parts 41g and 41h (see Figure 4) of the tool carrier extension 41, so that the axis about which the shoe 194 may be moved is parallel to the axis of roller 190—192.

Suitable means are provided for adjusting the position of shoe 194 and hence for adjusting the pressure with which the band material 185 is gripped or held between the wear plate 195 and the yieldable roller 190—192. Such a means may comprise a thumb screw 198 (Figures 4 and 6) whose threaded shank 199 is threaded through an extension 194a (Figure 4) of the shoe 194, the free end of the threaded shank bearing against an abutment 41j (Figure 4) of the tool carrier part 41.

Accordingly, if thumb screw 198—199 is turned in one direction so as to move the shoe extension 194a upwardly, as viewed in Figure 4, and away from the abutment 41j, the pressure of the shoe 194 against the roller is increased. A suitable means, such as a leaf spring 200 (Figures 4 and 6) coacting with the notched periphery of the thumb wheel 198 serves to hold the thumb screw in the position in which it is set.

With such an arrangement, therefore, the resistance to movement of the band material 185 lengthwise of itself and crosswise of the face of pad 180 in a direction away from the roller and shoe structure 190—195, may be set or determined at will, and to hold the band material 185 taut across the face of pad 180 and to effect, when desired, movement thereof in opposition to this resistance, I provide suitable means, such as a roller 201 (Figures 4 and 6) journaled on a stud 202 carried at one end in a bracket 203 secured to the upstanding flange-like part 41k, and supported at its other end in the upstanding flange part 41h, the axis of roller 201 being parallel to the other oblique edge 180a of the pad 180, whence the band material 185, after passing over the roller 201, passes between suitable means for holding and, when desired, effecting a pull upon the band material. Such a means may comprise two toothed drums 204 and 205 mounted upon shafts 206 and 207, respectively, preferably with the axes at an angle approximating parallelism to the axis of roller 201. The toothed drums 204, 205 mesh with each other and receive the band material 185 therebetween, in the manner better shown in Figure 6, whereby the band material may be tightly gripped and, if either or both of the drum members are rotated, a pull is exerted on the band material 185 against the resistance offered by the roller and shoe structure 190—195, thus to give the band material 185 an advancing movement relative to the face of pad 180.

It is desirable to adjust the spacing between the two toothed drum members 204, 205 to adjust them to different thicknesses of band material or to insure adequate tightness of gripping of the band material between the meshing toothed elements of the drums, I preferably provide an adjusting arrangement so coacting with other means that also the drums may be quickly separated, as might be necessary to feed or insert the band material therebetween by hand and to permit quick restoration thereof into gripping relation, without disturbing the just-mentioned adjustment.

Such a preferred arrangement may comprise mounting the toothed drum member 204 on its shaft 206 so as to be driven thereby and providing a fixed support for the shaft 206, as by suitable journals in the upstanding flange parts 41k and 41h (Figures 4 and 6). Drum member 205 is, however, mounted on its shaft 207 so as to be rotatable relative to the shaft, the latter being provided with eccentric end portions one of which is journaled in the front upstanding flange part 41h and the other of which is journaled in the upstanding flange part 41k through which a crank-like extension thereof extends into the sleeve portion of a bracket 210 (Figures 1, 2 and 6). Bracket 210 has a portion that overlies the upstanding flange part 41k where it is acted upon by a screw 211, provided with a lock nut 212, threaded through an arm 213 of a bracket 214 movably mounted upon the upstanding flange-like part 41k, as by a threaded stud 215 secured in the part 41k and provided with a thumb nut 216 by which the bracket 214 may be clamped or anchored in position relative to the part 41k.

By anchoring the bracket 214, by means of the nut 216, so that the arm 213 thereof with the screw 211 overlies the bracket 210, as appears better from Figures 4 and 6, the screw 211, slotted at its upper end so as to be operable by a tool like a screw driver, may be set relative to the now fixed arm 213 to move and hold the bracket 210 in a downward position such that, through its crank-like connection with the eccentric shaft 207, the latter is so swung or rotated as to press the upper toothed drum 205 toward the lower toothed drum 204, with the band material 185 therebetween, with the desired force or pressure, so as to grip the band material 185 sufficiently to hold it taut and also to pull it, when the toothed members are rotated in appropriate direction, against the holding or gripping action of the roller and shoe structure 190—194; the lock nut 212 permits locking of the screw 211 in its adjusted position so as to insure maintenance of the desired setting.

If, however, it becomes necessary to quickly separate the toothed drum member 205 from its companion member 204, as, for example, when stringing or threading the band material 185 through the various parts, thumb nut 216 is loosened up, thus permitting the bracket 214 to be swung about the axis of the threaded stud 215 so as to move the arm 213 with its adjusting screw 211 out of the position over the bracket 210, thus releasing the latter for manual movement upwardly and through its crank-like connection with the eccentric shaft 207 to rotate the latter throughout a sufficient angle to effect separation of

the two drum members to the desired extent. Having strung or threaded the band material through the mechanism, bracket 210 is manually depressed, whereupon bracket 214 is swung back to bring its arm 213 and screw 211 over the bracket 210, whence tightening up of the hand wheel or thumb nut 216 to lock the bracket 214 in its restored position effects also a restoration and holding of the bracket 210 in its initial position and with the initially adjusted gripping pressure therebetween of the band material restored. Drum 204 has spaced peripheral grooves 204a, 204b into which extend two upstanding guides 217a, 217b of U-shaped member 217 to guide band 185 off of drum 204 and upwardly.

As indicated in the drawings, the band material 185 extends from roller 90 upwardly to a magazine generally indicated by the reference character 218 (Figures 1 and 2) where a roll of the band material is accommodated. Magazine 218 is preferably of generally cylindrical construction and preferably comprises two separable parts 219 and 220, of which part 219 is preferably fixedly secured in any suitable way to a bracket 221 fastened to the upper part of the upper bearing frame 24, as by bolts or screws 222.

Part 219, closed by the end face of bracket 221, and part 220, closed by its end face 223, together form a substantially completely enclosed cylindrical container or magazine, the cylindrical walls of the parts 219 and 220 being cut away to provide a slot or opening 224 through which the band material 185 emerges from the interior of the magazine and passes on downwardly to the tool carrier, specifically to the roller and shoe structure 190—194 (Figure 6).

As better appears in Figure 1, end part 220 of the magazine 218 is preferably arranged to be detachable from the part 219 and the two parts are constructed to form a ready and convenient support for a roll of the band material 185. A preferred arrangement comprises a rod or shaft 225 fixed, as at 226, at the center of the disk-like end part 223 so as to form with the part 220—223 a single unit or entity. Rod 225 is of greater length than the length of the magazine 218 and its left-hand end (as viewed in Figure 1) is of smaller diameter to be received into a hole 227 in the bracket 221 where it is releasably anchored or held, as by a pin 228, pressed inwardly as by a leaf spring 230, thus to cause the pin 228 to enter a peripheral slot in the end portion of the rod 225.

Accordingly, by withdrawing the pin 228 against the action of spring 230 sufficiently to release the inner end of rod 225, the end magazine part 220 with the rod 225 may be removed, a roll of band material may then be slipped onto the rod 225 and the latter with the magazine section 220 reassembled to the bracket 221 and the magazine section 219, the rod 225 thereafter functioning as an axis to support the roll for such rotary movements as correspond to the advancing movement of the band material relative to the pad of the tool structure.

Preferably, as is better shown in Figure 2, I provide a roller over which the band material 185 moves as it is drawn out through the slot 224 of the magazine 218. In Figure 2 the roller is indicated at 231 and it is mounted upon a stud shaft 232 whose left-hand end is permanently fixed in the bracket 221 and whose right-hand end, when the magazine parts are assembled as above described, enters a hole 223a in the removable magazine part when the latter is assembled to the fixed magazine part, the stud shaft 232 thus insuring that the magazine part 220 is properly alined relative to the fixed magazine part 221, particularly with respect to the cut away portions of each (see Figure 1) that form the slot or opening 224 out of which the band material 185 emerges after passing over the roller 231.

Though the magazine with the supply roll remains fixed, being supported by a fixed part of the frame structure, the tool structure 31 with the above-described means (see Figure 6) for holding the band material in place and for giving it an advancing movement, partakes of the movement communicated to it by the tool driving means, as above-described, the vertically extending strip of band material 185 (see Figure 2) from the magazine to the tool structure permitting these actions freely to take place.

The tool structure 32 is constructed in a similar manner though substantially inverted, the magazine for the band material, indicated by the reference character 233, being accordingly, positioned downwardly from the tool structure 32 and being similarly constructed but secured to the lower bearing frame 20 by a bracket 234 (Figure 1); in the drawings corresponding parts of the two tool structures and of the two magazines are designated by similar reference characters.

As appears better in Figures 1 and 2, and with the symmetrical or similar construction of the upper and lower tool structures 31 and 32, there are thus presented, substantially one above the other and directed toward the operating mechanism carried by the frame structure, the two driving shafts 206, 206 of the driven toothed drums 204, 204 of the two tool structures; these two shafts are connected by flexible couplings 235 and 236 to two shafts 237 and 238 that extend parallel to each other and one above the other (see Figures 1, 3 and 4), shaft 237 being slidably supported in suitable bearings 241 formed in the side portions of the upper bearing frame 24 and shaft 238 being rotatably supported in suitable bearings 242 formed in the lower tool carrier 34, as is indicated in Figure 1. At their ends the shafts 237 and 238 have mounted upon them ratchet wheels 243 and 244, respectively (Figures 1 and 3).

As is better shown in Figure 3, I provide a pawl 245 to coact with the ratchet wheel 243, pawl 245 being of greater width (see Figure 1) than the width of ratchet wheel 243, since the latter partakes of a reciprocating movement axially with its shaft 237, because of the connection of the latter to the upper tool structure 231.

Pawl 245 is pivotally mounted by a pin 246 in the forked end of a pawl carrier 247 (Figures 1 and 3) which has a round shank 248 (Figure 3) journaled in a bearing portion 250 of a lever arm 251 pivotally supported or fulcrumed, as at 252, by the upper bearing frame 24. Suitable means, such as a pin and washer 253, hold the pawl carrier 247 assembled to the bearing portion 250, while a leaf spring 254, anchored to the bearing portion 250 and having its free end bearing against the upper flat end face of the pawl 245 acts yieldably to resist rotary movement of the pawl carrier 247 about the axis of its journaled shank 248 and acts yieldingly to bias the pawl 245 in counter-clockwise direction and to hold it yieldingly in the positions shown in Figures 3 and 1.

The right-hand end of the pawl-carrying lever 251 (Figure 3) is in swiveled connection with a link 256 whose lower end, swiveled to the yoke 98

which is actuated when the manual member or handle 87 is actuated, as earlier above described. The effective length of link 256 is preferably adjustable or variable in any suitable way as, for example, by two nuts 257 (Figure 3) one above and the other below the pin that forms the swivel connection between lever 251 and link 256.

Accordingly, when the manual member 87 is actuated to separate the operating tools for the removal or insertion or replacement of a hat brim therebetween, the downward or clockwise swinging of yoke 98 (Figure 3) causes, through link 256, a corresponding downward or clockwise swinging of lever 251 with the pawl 245, whence the pawl engages the ratchet wheel 243 to give it a step of rotary movement which is communicated by shaft 237 to the driven toothed drum 204 of the upper tool structure, in clockwise direction, as viewed in Figure 6, thus advancing the band material 185 by a corresponding amount relative to the face of the tool pad 180.

This action takes place during the continued actuation of the tool structure 31 and, as above indicated, is accompanied by a rapid reciprocation of ratchet wheel 243 (see Figure 1) in an axial direction. The effective width, however, of the pawl 245 is sufficient to maintain engagement of the pawl with the reciprocating ratchet wheel and, depending upon the force of engagement between pawl 245 and the ratchet wheel 243, the pawl 245 can oscillate or swing about the axis of its 248 in response to the reciprocation of the ratchet wheel 243.

When the handle member 87 is restored so as to let the lower tool carrier move upwardly, thus swinging the yoke 98 (Figure 3) in counter-clockwise direction, pawl-carrying lever 251 partakes of a commensurate movement, the parts reassuming a position substantially like that in Figure 3, but ratchet wheel 243 being held against reverse rotation by a spring pawl 260.

The downward or clockwise swing of yoke 98 (Figure 3) in response to actuation of the handle 87 to effect separation of the two tools 31, 32 effects, as above described, a downward movement of the lower tool carrier 34 (Figures 1 and 2), thus carrying with it and in downward direction, the ratchet wheel 244 (Figures 1 and 3). Positioned in the path of downward movement of ratchet wheel 244 is an upstanding pawl 261 which is pivotally mounted by pin 262 in the forked end of a pawl carrier 263 that has a cylindrical shank 264 journaled in a bearing portion 265 formed in the bracket 110. The pawl 261 may be constructed like a bell crank lever and hence to have an arm 261a (Figure 3) which serves also to bias the pawl 261 in clockwise direction about its pivot 262.

Accordingly, as the lower tool carrier 34 moves downwardly and carries the ratchet wheel 244 downwardly with it, the wheel is engaged by the pawl 261 and given a step of rotary movement which is communicated through shaft 238 to the driving drum 204 of the lower tool structure 32, thus to draw and advance the abrasive band material across the upper face of the pad of the lower tool 32. This takes place during the continued actuation of the lower tool 32 which communicates to the ratchet wheel 244 a reciprocation axially; but, as better shown in Figure 1, the pawl 261 is broader faced than the ratchet wheel 244 so that the latter cannot reciprocate out of engagement with the former. Moreover, depending upon the pressure of engagement between the ratchet wheel 244 and the pawl 261, the reciprocation of the former may be communicated to the pawl 261 which may oscillate about the axis of the shank 264 due to the latter being journaled in the bearing portion 265.

When the handle 87 is actuated to permit restoration in upward direction of the lower tool carrier 34, the upward movement of the latter moves the ratchet wheel 244 upward to substantially the position shown in Figure 3, but a spring pawl 266 anchored to a suitable part of the tool carrier 34 prevents reverse rotation of the pawl 244 and holds it in the position in which it had been turned by pawl 261.

Thus, a feeding or advancing movement of the abrasive strip or band material associated with the two tool structures is dependably achieved, it being noted, referring to Figure 6, that the desired tension or tautness of each strip, as determined by the control member 198, is dependably maintained, the pull exerted by the toothed feed drums, when they are actuated in the above-described manner, being yieldingly opposed by the controllable resistance offered by the members 195—192 and by the friction of other parts relative to which the band material is drawn, such as the guiding support 186 and the pad 180. Moreover, by the above-described arrangement, it will be seen that the feeding action takes place even though the high speed actuation of the tool structures continues uninterruptedly but also, and preferably, during inactiveness of the tools upon the hat brim and thus to facilitate the advancing or feeding movement.

Preferably, and as better appears from Figure 3, a certain amount of lost motion takes place after actuation of the control lever 87 commences before the feeding or advancing movement of the band material of the two tools commences, thus to insure, in the preferred arrangement, that sufficient separation between the two tools takes place to relieve them of the load they carry or pressure they exert when operating upon the brim and so that the feeding movement takes place with the abrasive strips relieved of the burden of work; a convenient and preferred point in the train of mechanism to interpose this lost motion is between the pawls and their respective ratchet wheels. Thus, as shown in Figure 3, where the parts are shown positioned during operation of the tools on the brim, pawl 245 partakes of a certain amount of movement before it engages the ratchet wheel 243 and ratchet wheel 244 partakes of a certain amount of movement before it engages the pawl 261.

Also, I provide suitable means for setting the amount or extent of feeding movement and this I prefer to achieve by varying at will the amount of the above-mentioned lost motion between the pawls and their respective ratchet wheels. Thus, by way of nut 100 and lock nut 101 (Figure 3), I may change the position of ball member 96 and hence alter the effective length of link 95, thereby bringing the yoke 98 and hence the axis of ratchet wheel 244 nearer to or farther away from the end of pawl 261; such an adjustment may also be effected by altering the normal position of pawl 261 relative to the axis of the pivot pin 262, as by an adjusting screw 267 (Figure 3) which is threaded in the frame part 27 and whose upper end bears against the arm 261a of the pawl, a lock nut 268 fixing the adjustment. Thereby the upper end of the pawl 261 may be swung toward or away from the

vertical plane through the axis of pawl 244, and the amount of lost motion accordingly varied.

The amount of lost motion between pawl 245 and ratchet wheel 243 is preferably achieved by varying the effective length of link 256 by which the pivoted pawl-carrying arm 251 is connected to be moved by the yoke 93. As above indicated, this adjustment may be effected by shifting the positions of nuts 257.

Spring 108 (Figure 1), urging the yoke 98 upwardly about its pivot 102, causes the yoke 98 to follow faithfully the control movements of link 95, and when the yoke 98 is restored to uppermost position, the spring thus also, through the link connection 256 between the yoke 98 and the pawl-carrying arm 251, insures restoration of the pawl 245 to uppermost position and hence prepares it for a succeeding down stroke.

Thus, having set the mechanism to effect the desired extent of feed or advancing movement for each of the abrasive strips, continuity of operation of the machine may be carried on, the apparatus, aside from the operations by the operator in effecting separation of the tool structures and replacing the hat bodies, requiring substantially no attention on the part of the operator except to renew the supply of abrasive band material in the manner above described, it being noted that the magazines 218 and 233 (Figures 1 and 2) are constructed to effect speedy and quick recharging with new rolls of abrasive band material.

Details of the operation of the mechanism will be clear in view of what is set forth above; it might be noted, however, that the work on the part of the operator is simple and foolproof. Thus, the motor 62 having been started and putting the various mechanisms above described into operation and with the two tool structures set into motion, preferably at the high speeds abovementioned, and the hat-feeding or rotating member 122—123 thus set into motion at relatively low speed, the operator, having actuated the lever 87 which is conveniently positioned to be operated by the left-hand to separate the two tool structures, simply leaves the lever 87 and the parts controlled by it in their locked position due to the toggle action between links 93 and 95 (Figure 1), and is free to place a hat body over the rotary member 122—123 with the greater portion of its brim resting upon the top face 135a of the support 135 (Figures 1 and 2), the latter parts being manually swung into the dotted line position shown in Figure 1. Swinging the latter structure back toward and into its full line position, the brim B is entered between the separated tool structures 31, 32, while the yielding rotary member 123 presses the lower side portion of the crown C against the curved face of the member 144 (Figures 1, 2 and 4), the coaction between members 123 and 144 insuring that the brim is positioned completely within the range of action of the two tool structures, particularly the upper one, and effecting also a slow rotary movement of the hat body to traverse the brim at the desired speed but steadily and uniformly relative to the two tool structures whose operative surfaces are at once made effective upon the hat brim when the operator restores the lever 87 to bring the lower tool structure 32 in an upward direction and to permit the spring 83 to come into action to effect the desired pressure of operation of the two tools upon the brim that is interposed between them.

As the tools operate a steady and uniform progression of the brim B relative to the two tools proceeds, thus insuring that the cutting or abrading action of the two tools, above described, is uniformly effected throughout the entire extent of the brim not only circumferentially but also radially, the rotary member 123 insuring not only a steady feeding or rotating action on the hat body but also that the entire radial extent of the upper face of that portion of the brim B that is between the two tools is always exposed to the upper tool beyond the thin and almost knife-like edge of member 144 in the region of point *y* of Figure 4; this latter action is effective to insure that the entire radial extent of that portion of the hat brim that is at any moment between the tools is also presented to the lower tool 32.

Rotary hat-feeding member 122—123 may be urged toward the curved face of member 144 by any suitable means. Preferably, the tension of belt 170 (Figures 1 and 2) is utilized to effect this action, it being noted that, upon swinging the hat-supporting structure 135—115 in clockwise direction, to, for example, the dotted line position of Figure 1, the structure has its center of gravity shifted sufficiently to the right so as to overcome the tension of the belt 170 and hence so that the structure remains in such position while the operator replaces the hat body. Preferably, suitable means are provided to limit movement in clockwise direction, as by the engagement of the side walls of the housing-like part 115 with the hinge brackets 126, 127, as indicated in Figure 1.

The operator, of course, swings the hat-carrying structure in clockwise direction after having actuated the control lever 87 to separate the tool structures and it will be noted that the manual control of the hat-carrying structure is easy and simple. In swinging it away from the tools, the movement is aided by the increasing leverage through which the weight of the parts acts as the center of gravity is shifted toward the right, as viewed in Figure 1, while in restoring the hat-carrying structure, the tension of the belt 170 assists in such movement.

Thus, it will be seen that the manual manipulations on the part of the operator are simple and may be carried on with rapidity and ease and more particularly with reliability as to precision of association of the brim with the operating tools.

The entire apparatus excepting for the two tool structures, the two magazines, the operating lever, and the hat-carrying structure, is preferably totally enclosed to protect it against foreign material, particularly the particles of fibers cut off or abraded from the brim by the operating tools and also to protect the personnel working with or around the apparatus. A preferred form of enclosure comprises two casing sections 271 and 272 of suitable sheet-like material, preferably in the form of aluminum castings. The two casing sections are substantially identical in shape and together give the appearance of a frustrum of a cone whose lower peripheral portions fit into a peripheral bezel 273 provided at the upper end of the base 10 (Figures 1 and 2), the frusto-conical side portions of the casing merging at their upper ends into substantially a hemisphere but at the rear of the machine, that is, at the left, as seen in Figures 1, 2 and 4, the two casing sections 271, 272 bulging outwardly to accommodate or enclose certain of the parts that project in that direction to a greater distance

than others. As appears clearly from Figures 1–4, the two casing sections are broken or cut away from their mating edges at the front (toward the right in Figures 1, 2 and 4) to form suitable apertures through which the housing-like support 15 projects near the lower end and also, in the upper regions, through which the operating lever 87 and its shaft 88, the brackets for the upper and lower magazines, and the tool carrier extensions 41 and 51, together with the feed drive shafts 237 and 238, project.

Thus, there remains exposed normally such parts as need be accessible for normal operation, such as the tool structures, the hat-supporting and feeding structure, the operating lever, the magazines for the abrasive material, and the controls for tensioning the abrasive band material and for threading it through the tool structures.

Preferably, the enclosure, preferably made up of the two casing sections 271 and 272, is arranged to be readily detachable to gain access to the mechanism or parts enclosed thereby, and in the preferred arrangement, with the lower substantially semi-circular edge portions of the sections 271, 272 fitted into the base 10, as above-described, I provide suitable means operative preferably at the upper ends of the sections to hold them together and to attach them to the built-up frame of the apparatus.

Thus, at their upper midpoints the two casing sections (Figure 3) are provided with lugs 275 anl 276 to which, as by brackets 277 and 278, respectively, are secured upstanding pins or studs 279 and 280 which, as better appears from Figure 5, are positioned preferably substantially diametrically opposed to each other relative to the circular cross-section of the assembled casing sections 271, 272.

Lugs 275 and 276 may be formed as part of internal flanges 271a and 272a formed integrally with or secured to the casing sections 271 and 272, respectively, flanges 271a and 272a, when the casing sections are assembled, forming an inwardly directed circular flange whose inner circular edge face takes against the circular periphery 282a of a disk-like frame element 282 (Figures 2, 3 and 5) which is secured to be concentric or coaxial with the circular bezel 273 in the base 10 and with which the lower edge portions of the casing sections interfit (Figures 1 and 2). This frame element 282 is secured to the upper end of the upper bearing frame 24 (Figures 1, 2 and 3), as by screws 283, being provided with an eccentric aperture 282b which fits about the upper end bearing structure 23, as appears better in Figure 2.

By means of pins or studs 285 and 286, there are pivoted to the plate member 282 (Figures 3 and 5) levers 287 and 288, respectively, provided at their outer ends with hook portions 287a and 288a for engagement, respectively, with the pins 279 and 280 carried by the casing sections 271, 272, thus to hold the latter against separation from each other and from their above-mentioned concentric supports.

These levers are preferably spring biased, as by springs 289 and 290, in a direction to hold them hooked about the pins, as shown in Figure 5, and the inner ends of the two levers preferably overlie one another and are engaged by a collar or other enlargement 293 carried by the inner end of a plunger 294 slidably mounted in a bracket 295 secured to the frame part 282. Plunger 294 has at its outer end a head 296 between which and the bracket 295 is a spring 297 that biases the plunger in a direction to hold the enlargement 293 against one face of the bracket 295 and thus also to position the head 296 closely adjacent an aperture 298 in the enclosing casing and formed by two appropriate cutouts in the two casing sections 271, 272.

Accordingly, when it is desired to release the casing sections from the frame, the plunger 294 is pressed inwardly by actuating the head 296 through the aperture 298 against the action of spring 297, thus forcing the inner ends of levers 287 and 288 in directions to move their hooked ends out of engagement with the pins 279 and 280, whence the casing sections may be removed. Assembly of the casing sections to the frame structure is accomplished by a reverse sequence of operations.

Thus, it will be seen that there has been provided in this invention an apparatus in which the various objects hereinabove noted, together with many thoroughly practical advantages, are successfully achieved. The apparatus is well adapted for such high speeds of actuation of its operating tools as pointed out above, is of durable and safe construction to function at such high speeds, and is of highly effective and efficient operation and action. Moreover, it is well adapted to meet the varying conditions of hard practical use.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In apparatus of the class described, in combination, a frame structure having a base portion and spaced upstanding side portions between which is mounted a driving motor and having an upper frame portion, two tools for operating upon the respective sides of the brim of a hat, mechanism supported by said upper frame portion for actuating both of said two tools and for permitting movement of separation therebetween to permit insertion or removal of the brim of a hat, means for holding a hat body and for giving it a rotary movement to progress the brim relative to said two tools and comprising an external member having means mounting it from said frame structure and in a position adjacent said two tools to limit the extent of insertion of the brim between said two tools by engagement with said member of part of the outside face of the side portion of the crown of the hat and a rotary member of lesser axial height and lesser radius than those of the hat crown engaging tangentially the inside face of the part of the side portion of the crown engaged by said first-mentioned member with means causing said rotary member to press the part of the side portion of the crown engaged by it against said first-mentioned member to maintain rolling driving contact with the inside face of the side portion of the crown and to force successive portions of the brim inwardly between said two tools to the extent permitted by said first-mentioned member, means forming driving connections between said motor and said mechanism to actuate said tools at suitable operating speed and means forming driving connections between said motor and said rotary member to drive the latter at a rela-

tively low peripheral speed to effect progression of the brim between said two tools at the desired rate.

2. An apparatus as claimed in claim 1 in which said tool-actuating mechanism comprises a substantially vertically extending shaft means, said driving motor having a shaft in substantial alinement with said shaft means, the driving connections between said mechanism and said motor being between said shaft means and said motor shaft and adapted to counteract transmission of vibrations from one to the other.

3. An apparatus as claimed in claim 1 in which said tool-actuating mechanism comprises a substantially vertically extending shaft means, said driving motor having a shaft in substantial alinement with said shaft means, the driving connections between said mechanism and said motor comprising pulley means on said shaft means and upon said motor shaft, a jack shaft having pulley means, and belt means for said pulley means.

4. An apparatus as claimed in claim 1 in which there are provided means comprising an auxiliary frame for rotatably supporting said rotary member and means supporting said auxiliary frame for movement relative to said frame structure in directions to move said rotary member toward or away from said external member to respectively start or halt rotary movement of the hat body according as the engaged portion of the hat body is pressed against said external member upon movement of said rotary member toward the latter or is released from being pressed thereagainst upon movement of said rotary member away from said external member, and to permit insertion or removal of the portion of the hat relative to said coacting rotary member and external member when it is desired to effect insertion or removal of a hat brim relative to said tools.

5. An apparatus as claimed in claim 1 in which there are provided means mounting said rotary member for movement in a direction toward or away from said external member and the driving connections between said driving motor and said rotary member include a generally vertically extending driven shaft having at its upper end driving connection with said rotary member and having adjacent its lower end flexible driving connections with said motor to maintain drive of said shaft and rotary member during movement of the latter toward or away from said external member.

6. An apparatus as claimed in claim 1 in which a driving shaft extends downwardly from said rotary member, auxiliary frame means supporting said driving shaft for rotation and having means supporting it from said frame structure to pivot about an axis adjacent the lower end of the latter, said driving connections between said rotary member and said driving motor comprising said driving shaft, and flexible means connected to the lower end of said driving shaft to maintain driving connection during movement of said auxiliary frame about its axis of pivoting.

7. An apparatus as claimed in claim 1 in which a driving shaft extends downwardly from said rotary member, auxiliary frame means supporting said driving shaft for rotation and having means supporting it from said frame structure to pivot about an axis adjacent the lower end of the latter, the driving connections between said rotary member and said driving motor comprising belt and pulley means, one of which pulley means is on the lower end of said driving shaft, said belt and pulley means being so related to the axis of pivoting of said auxiliary frame that pivoting movement of the latter may take place without disrupting the drive of said belt and pulley means.

8. An apparatus as claimed in claim 1 in which there is provided means including a manually operable member for effecting movement of separation between said two tools, and means mounting said rotary member moveable relative to said external member and throughout a range of movement toward or away from said tools on the order of the radial dimension of the brim, and means for controlling movement of said rotary member, whereby, upon said rotary member being moved away from said external member, the space between the two is adequate to accommodate the radial dimension of the brim as the hat body is inserted or removed relative to the two tools.

9. An apparatus as claimed in claim 1 in which there is provided means including a manually operable member for effecting separating movement between said two tools, said means having means for locking the movable tool in separated position, and means for effecting movement of approach or of separation between said rotary member and its coacting external member to respectively start or stop rotary movement of the hat body and upon movement of separation to permit removal of a hat body therefrom and of the hat brim from in between the separated tools.

10. An apparatus as claimed in claim 1 in which there is provided means including linkages that form a toggle and a manually operable member for actuating said means to effect movement of separation between said two tools, said toggle-forming linkages assuming self-locking positions upon completion of said separating movement.

11. In apparatus of the class described, in combination, two juxtaposed tool means having means movably mounting one of them for movement toward or away from the other to permit the insertion or removal of a portion of a hat body like the brim, said tool means each comprising operating material in band-like form and means for supporting said material with means adapted upon actuation to feed said band-like material relative to said supporting means, driver means for each of said feeding means, the driver means for the feeding means of said movable tool having means mounting it to partake of movement with said tool, movable means for effecting movement of said movable tool and of said movable driver means, means responsive to movement of said movably mounted driver means operating to drive it, and means responsive to movement of said movable means operating to drive the other driver means.

12. An apparatus as claimed in claim 11 in which one of said driver means comprises a ratchet wheel and its driving means comprises a pawl.

13. An apparatus as claimed in claim 11 in which at least one of said driving means includes means having a lost motion connection.

14. An apparatus as claimed in claim 11 in which both of said driver means comprise ratchet wheels, the driving means for the ratchet wheel movable with the movable tool comprising pawl means relatively fixed, thereby to effect rotary movement of the ratchet wheel, and the driving means for the other ratchet wheel comprising pawl means and means causing it to move in response to movement of said movable means.

15. In apparatus of the class described, in combination, a tool for operating upon a hat and having an effective operating portion in the form

of strip material with means adapted upon actuation to give the latter an advancing movement, means for supporting and actuating said tool to give it a movement relative to the hat body operated upon that comprises motion of reciprocation, a ratchet wheel for driving said strip-advancing means and connected to partake of reciprocation with said tool, a movable member relative to which said ratchet wheel reciprocates, and pawl means carried by said movable member and actuatable thereby to operate said ratchet wheel and effective upon the latter throughout the range of reciprocation thereof.

16. In apparatus of the class described, in combination, a tool for operating upon a hat and having an effective operating portion in the form of strip material with means adapted upon actuation to give the latter an advancing movement, means for supporting and actuating said tool to give it a movement relative to the hat body operated upon that comprises motion of reciprocation, a ratchet wheel for driving said strip-advancing means and connected to partake of reciprocation with said tool, a movable member relative to which said ratchet wheel reciprocates, pawl means for coaction with said ratchet means, and means movably mounting said pawl means on said movable member to partake of movement in response to the reciprocating movement of said ratchet wheel.

17. In apparatus of the class described, in combination, a tool for operating upon a hat and having an effective operating portion in the form of strip material with means adapted upon actuation to give the latter an advancing movement, means for supporting and actuating said tool to give it a movement relative to the hat body operated upon that comprises motion of reciprocation, a ratchet wheel for driving said strip-advancing means and connected to partake of reciprocation with said tool, said tool-mounting and driving means comprising also means adapted upon actuation to effect movement of said tool and of said ratchet wheel in the direction of the plane of the ratchet wheel, pawl means, and means mounting said pawl to hold it against movement upon movement of said ratchet wheel in the direction of its plane, thereby to effect rotary movement of said ratchet wheel.

18. An apparatus as claimed in claim 17 in which the mounting means for said pawl includes movable connections permitting the pawl to partake of reciprocation in response to the motion of reciprocation of the ratchet wheel.

19. In apparatus of the class described, in combination, a frame having tool means for operating upon the brim of a hat, a hat support having substantially flat means upon which at least a portion of the hat brim may rest, a member adjacent said tool means and positioned to be engaged by the side portion of the crown of the hat and thereby to substantially fix the position of the brim portion operated upon by said tool means relative to the latter, and driven rotary means of lesser axial height and of lesser radius than the interior of the crown of the hat, said driven rotary means having means mounting it relative to said hat support in a position to extend freely into the hat crown and tangentially engage in rolling contact a portion of the inside face of the side portion of the crown in juxtaposition to said member for effecting a rotary movement of the hat and movement of progression of the brim relative to said tool means.

20. In apparatus of the class described, in combination, a frame having tool means for operating upon the upper face of the brim of a hat, a hat support having means upon which at least a portion of the hat brim may rest, a member adjacent said tool means and positioned to be engaged by the side portion of the crown of the hat and thereby to substantially fix the position of the brim portion operated upon by said tool means relative to the latter, and driven rotary means of lesser axial height and of lesser radius than the interior of the crown of the hat, said driven rotary means having means mounting it relative to said hat support in a position to extend freely into the hat crown and tangentially engage in rolling contact a portion of the inside face of the side portion of the crown in juxtaposition to said member for effecting a rotary movement of the hat and movement of progression of the brim relative to said tool means, said member having a face in the direction toward said tool means shaped to permit the latter to operate up to the junction of the crown with the brim and having that face thereof that engages the side of the crown curved in the direction of curvature of the crown side.

21. In apparatus of the class described in which there is frame means having a hat-operating tool that has an operating means in strip form with means for supporting and feeding the operating means relative to the tool means and means for giving said tool means motion relative to the hat body operated upon, the combination of a magazine for the strip form of operating means comprising a magazine casing of at least two separable parts, means mounting one of the parts on the frame means, means detachably securing the other part thereto, said magazine casing having an opening through which the operating means in strip form passes to said tool means, said means for detachably securing the separable casing part comprising a shaft-like stud secured to the latter and functioning to support a roll of the operating means in strip form, said magazine casing having a stud-like member adjacent its opening to guide withdrawn strip form of operating means therethrough, said stud-like member being secured at one end thereof to said frame means, said separable casing part and the other end of said stud-like member having portions that interfit upon assembly of said separable casing part to the other.

22. In apparatus of the class described, in combination, two members supporting respectively two tools for operating upon the opposed faces of the brim of a hat, and means for effecting separation thereof to permit insertion or removal of a hat brim and comprising toggle means the links of which have a range of operation to assume such alinement as effects locking, and means for actuating said toggle means.

23. In apparatus of the class described, in combination, two members supporting respectively two tools for operating upon the opposed faces of the brim of a hat, driving means for said two members to actuate said two tools relative to the hat brim, said driving means comprising two eccentric means having operative connections respectively with said two members, one of said operative connections comprising sleeve-like means on one of said members slidable axially relative to its eccentric means whereby said member is movable axially in directions to effect separation or approach between said two tool means, and means for controlling axial movement of said member.

24. An apparatus as claimed in claim 23 in which the eccentric means relative to which the sleeve means is axially movable comprises a cylindrical support for said sleeve means, a driven eccentric, and bearing means between said eccentric and said cylindrical support, whereby said bearing means permits relative rotary movement between said eccentric and said support and the movement between said sleeve means and said support is primarily a sliding movement.

25. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting and actuating said tool carriers to give their tools operating motions and to give the tool operating upon the upper side of the brim a motion such that any operating point on the tool moves in a curved closed path, whereby said upper brim tool has a component of movement toward and away from the side of the crown of the hat, a relatively fixed means positioned adjacent said upper brim tool and substantially at the end of its movement in the direction toward the crown of the hat and to thereby prevent the tool from engaging the side of the hat crown, and means engaging the inside of that portion of the side of the hat crown that is engaged by said relatively fixed means for urging the crown side against said relatively fixed means and thereby to insure that the inner radial portions of the upper side of the brim are within the scope of the aforesaid motion of said upper brim tool, said relatively fixed means having a cross-section that is tapered in a direction toward the apex of the angle between the brim and the crown side to thereby interpose a minimum, if any, thickness between the upper brim tool when at its outermost position and the crown side.

26. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting and driving said two tool carriers to give the two tools operating motions relative to the hat brim received therebetween, said means comprising shaft means having two eccentric means, means in the form of a rotary bearing forming a connection between one of said eccentric means and one of said tool carriers, means forming a combined rotary and axially-shiftable connection between the other of said eccentric means and the other of said tool carriers comprising a sleeve-like member mounted rotatably relative to said other eccentric means and a sleeve-like part on the other of said tool carriers substantially telescopically fitted over said sleeve-like member and axially shiftable relative thereto, whereby said other tool carrier may be shifted axially of its eccentric means to change the spacing between the two tools, and means for controlling the shifting axially of said other tool carrier.

27. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting and driving said two tool carriers to give the two tools operating motions relative to the hat brim received therebetween, said means comprising shaft means having two eccentric means, means in the form of a rotary bearing forming a connection between one of said eccentric means and one of said tool carriers, means forming a combined rotary and axially-shiftable connection between the other of said eccentric means and the other of said tool carriers whereby said other tool carrier may be shifted axially of its eccentric means to change the spacing between the two tools, means for controlling the shifting axially of said other tool carrier, means for urging said axially shiftable tool carrier axially toward the other and thereby lessen the distance between said two tools, said controlling means comprising a member movable in the direction of axial shift of said other tool carrier, the latter and said movable member having coacting bearing portions whereby the operating motion of said other tool carrier may freely take place relative to said movable member, and means for actuating said movable member.

28. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting and driving said two tool carriers to give the two tools operating motions relative to the hat brim received therebetween, said means comprising shaft means having two eccentric means, means in the form of a rotary bearing forming a connection between one of said eccentric means and one of said tool carriers, means forming a combined rotary and axially-shiftable connection between the other of said eccentric means and the other of said tool carriers whereby said other tool carrier may be shifted axially of its eccentric means to change the spacing between the two tools, means for controlling the shifting axially of said other tool carrier, said axially shiftable tool carrier having two portions one on each side of its axis, said shift-controlling means comprising a movable yoke-like member whose two portions are respectively juxtaposed to said two carrier portions, and means for controlling movement of said yoke-like member.

29. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting and actuating said tool carriers to give their tools operating motions and to permit movement of one carrier toward the other thereby to vary the spacing between said tools, spring means urging said movable tool carrier in a direction to lessen the distance between said two tools and means for controlling the separation between said two tools and for limiting their approaching movement comprising controllable movable means, said movable means and said movable tool carrier having coacting portions through which when said movable means is moved in one direction said movable tool carrier is moved in a direction to separate said tools against the action of said spring means, and means limiting movement of said movable means in reverse direction to form a stop to prevent said spring means from moving said movable carrier sufficiently to cause its tool to contact the tool of the other carrier.

30. In apparatus of the class described, in combination, a frame structure comprising a base portion supporting an upstanding frame portion,

the latter supporting movable tool-carrier means and mechanism for actuating said carrier means to actuate tool means carried thereby, hat-operating tool means carried by said carrier means and by the latter positioned to be accessible at a side of said frame structure for operation upon a hat, casing-like means substantially enclosing said frame structure and the parts carried thereby, said enclosing means being cut away to expose said tool means, and means detachably securing said enclosing means to said frame structure, said enclosing means comprising a plurality of sections, said base portion and said sections having interfitting parts, said securing means comprising pairs of disconnectable elements, one pair for each section, for detachably securing each section to said frame structure, and means for conjointly controlling all of said pairs of elements.

31. In apparatus of the class described, in combination, a frame having tool means for operating upon the brim of a hat, a hat supporting table upon the surface of which at least a portion of the hat brim may rest, rotary driving means extending substantially transversely of the table surface and supporting above the latter a rotary hat-feeding member having an axial height and a radius less than those of the crown of a hat received thereover and whose brim rests flatwise upon said table surface, said rotary member having a peripheral band-like portion exposed above said table surface and of lesser axial extent than said hat crown for engaging tangentially and in rolling driving contact against a part of the inside face of the side portion of said crown, a member having means mounting it relative to said frame and adjacent said tool means and in a position to engage the outside face of that part of the side portion of the crown whose inside face is engaged by the peripheral portion of said rotary member and by the engagement of the outside face of the side portion of the crown with said second-mentioned member to fix the radial extent of hat brim presented to said tool means as said rotary member in coaction with said second-mentioned member effects a rotary movement of the hat and movement of progression of the brim relative to said tool means, and means for driving said rotary driving means to give the peripheral portion of said rotary feeding member a relatively low linear speed.

32. An apparatus as claimed in claim 31 in which the peripheral band-like portion of said rotary feeding member comprises a band of a resilient material, and means coacting between said second member and said rotary member to urge one of them toward the other to effect a yielding gripping of the side portion of the crown as said rotary member effects rotary movement of progression of the hat.

33. In apparatus of the class described, in combination, a frame having tool means for operating upon the brim of a hat, a hat supporting table upon the surface of which at least a portion of the hat brim may rest, rotary driving means extending substantially transversely of the table surface and supporting above the latter a rotary hat-feeding member having dimensions to freely receive thereover the crown of a hat whose brim rests upon said table surface and having a peripheral portion for engaging tangentially and in rolling driving contact against a part of the inside face of the side portion of the crown, a member positioned adjacent said tool means to engage the outside face of the side portion of the crown in juxtaposition to the part of the inside face engaged by the peripheral portion of said rotary member, whereby the latter in coaction with said second-mentioned member effects a rotary movement of the hat and movement of progression of the brim relative to said tool means, and means for driving said rotary driving means to give the peripheral portion of said rotary feeding member a relatively low linear speed, an auxiliary frame supporting said rotary driving means, with means movably supporting said auxiliary frame from said first-mentioned frame for movement in a direction to move said rotary feeding member toward or away from said tool means, and means yieldingly urging said auxiliary frame and hence said rotary feeding member in a direction to press that portion of the side of the crown that is engaged by said rotary member against said second-mentioned member with a force sufficient to effect rotary movement of the hat without substantial slippage between the contacting surfaces of the peripheral portion of the rotary member and the inside face of the side portion of the crown.

34. In apparatus of the class described, in combination, a frame having tool means for operating upon the brim of a hat, a hat supporting table upon the surface of which at least a portion of the hat brim may rest, rotary driving means extending substantially transversely of the table surface and supporting above the latter a rotary hat-feeding member having dimensions to freely receive thereover the crown of a hat whose brim rests upon said table surface and having a peripheral portion for engaging tangentially and in rolling driving contact against a part of the inside face of the side portion of the crown, a member positioned adjacent said tool means to engage the outside face of the side portion of the crown in juxtaposition to the part of the inside face engaged by the peripheral portion of said rotary member, whereby the latter in coaction with said second-mentioned member effects a rotary movement of the hat and movement of progression of the brim relative to said tool means, and means for driving said rotary driving means to give the peripheral portion of said rotary feeding member a relatively low linear speed, an auxiliary frame supporting said rotary driving means, with means movably supporting said auxiliary frame from said first-mentioned frame for movement in a direction to move said rotary feeding member toward or away from said tool means, and means yieldingly holding said auxiliary frame in either of two positions in one of which said rotary feeding member has its peripheral portion urged toward said second member to grip a part of the side portion of the crown therebetween and in the other of which said rotary feeding member is displaced from said second member and from the tool means to permit removal or replacement of the hat.

35. A high speed brim pouncing apparatus comprising two members supporting respectively two tools for operating upon the opposed faces of the brim of a hat, driving means for said two members to actuate said two tools relative to the hat brim, said driving means comprising two eccentric means having operative connections respectively with said two members to give the latter and their respective tools motion of translation in cycles per unit of time depending upon the speed of drive of said eccentric means, one of said operative connections comprising axially

elongated and relatively thin-walled sleeve-like means on one of said members and slidable axially relative to its eccentric means whereby said member is movable axially in directions to effect separation or approach between said two tool means, and the other of said operative connections comprising axially relatively short rotary bearing means between the other of said members and its eccentric means proportioned as to mass and weight distribution to substantially match the mass and weight distribution of said first-mentioned operative connection, whereby the moments set up by said two members when actuated by their respective eccentric means are substantially equal, said two eccentric means being in such out-of-phase relation that said moments act in substantially opposite directions and substantially neutralize one another, and means for controlling axial movement of said axially movable member.

36. In apparatus of the class described, in combination, a pair of tool carriers each having at one end thereof an abrasive tool, said abrasive tools facing each other and adapted to receive therebetween a portion of the brim of a hat, means mounting said tool carriers for relative movement therebetween in a direction to effect separation or approach thereof and of their tools, means for driving said two tool carriers to give them and their respective tools operating motions to effect operation upon the two sides of the hat brim by the two tools, and means for controlling the separating and approaching movement between said two tools, said controlling means comprising a member having means mounting it for movement in said direction and presenting a plurality of distributed bearing portions to one of said tool carriers, said one tool carrier having substantially correspondingly distributed bearing portions respectively engaging the bearing portions on said movable member for relative movement therebetween in response to the movement of drive of said one tool carrier, and means for controlling said movable member in said direction to effect relative movement of separation or approach between said tool carriers.

37. An apparatus as claimed in claim 36 in which said movable member is in the form of a pivoted yoke having means pivotally supporting it for movement in said direction and in which said controlling means comprises means for shifting the position of said yoke about its axis of pivoting.

38. In apparatus of the class described, in combination, a frame having tool means for operating upon the brim of a hat, a hat support having substantially flat means upon which at least a portion of the hat brim may rest, a member adjacent said tool means and positioned to be engaged by the side portion of the crown of the hat and thereby to substantially fix the position of the brim portion operated upon by said tool means relative to the latter, and driven rotary means of lesser axial height and of lesser radius than the interior of the crown of the hat, said driven rotary means having means mounting it relative to said hat support in a position to extend freely into the hat crown and tangentially engage in rolling contact a portion of the inside face of the side portion of the crown in juxtaposition to said member for effecting a rotary movement of the hat and movement of progression of the brim relative to said tool means, and mounting means for said hat support with adjusting means for adjusting the angle of said substantially flat means and hence of the plane of the brim portion resting thereon relative to the plane of the brim portion being operated upon by said tool means.

39. An apparatus as claimed in claim 25 in which there is provided means moveably mounting said hat support and said driven rotary means for movement as a unit toward or away from said member and means operating upon said last-mentioned mounting means for effecting movement of separation from said tool means with said member of said hat support with said driven rotary means for removing or inserting a hat body relative to said member and said driven rotary means.

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