Aug. 24, 1948. A. S. ERK 2,447,499

BRUSH-STEM FORMING MACHINE

Filed March 18, 1946 9 Sheets-Sheet 1

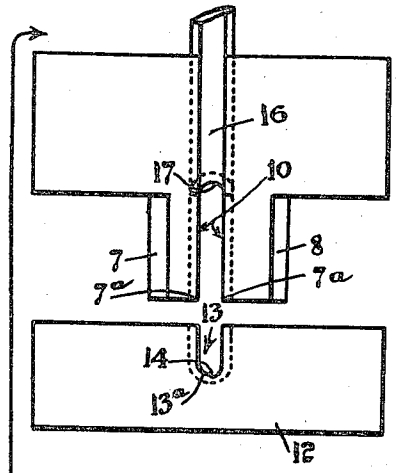


FIG. 1

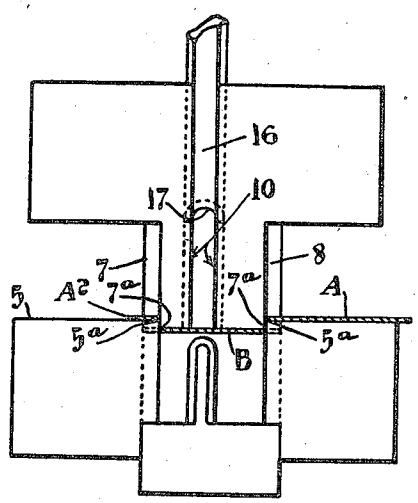
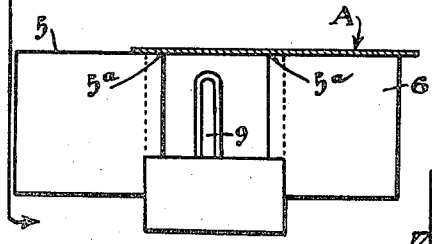


FIG. 2



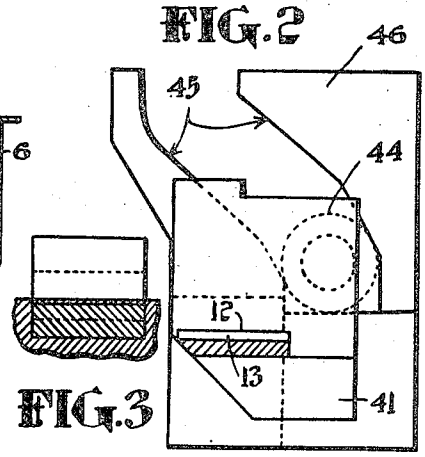


FIG. 3

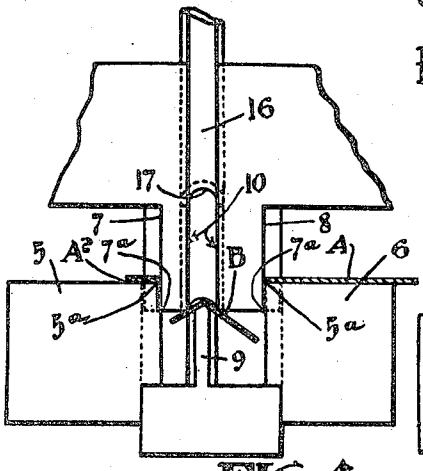


FIG. 4

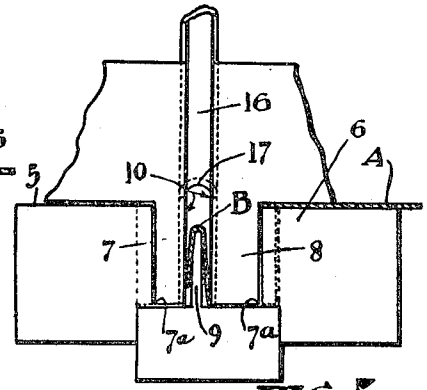


FIG. 5

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BRUSH-STEM FORMING MACHINE

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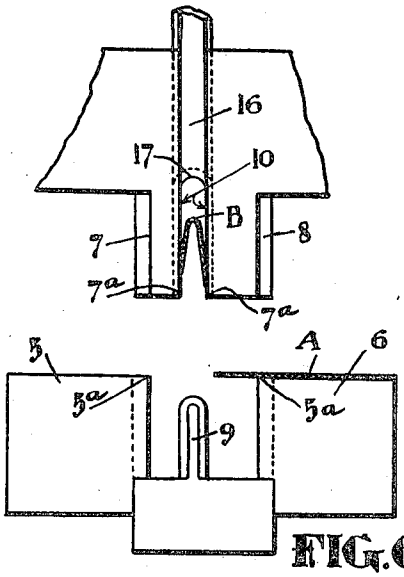


FIG. 6

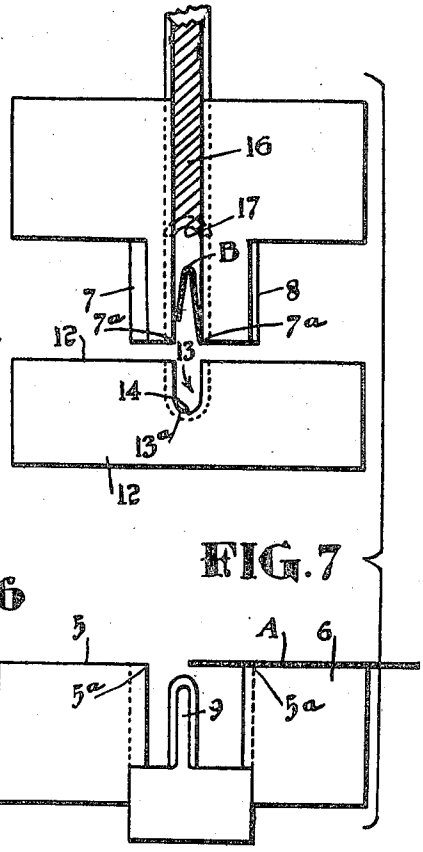


FIG. 7

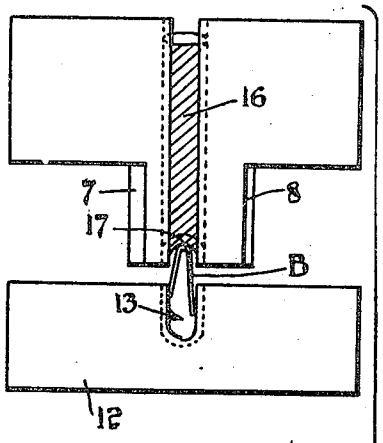
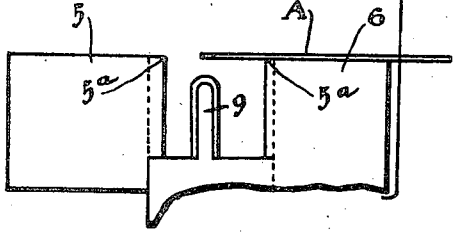


FIG. 8



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BRUSH-STEM FORMING MACHINE

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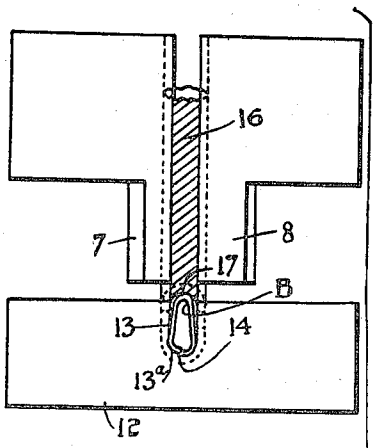


FIG.9

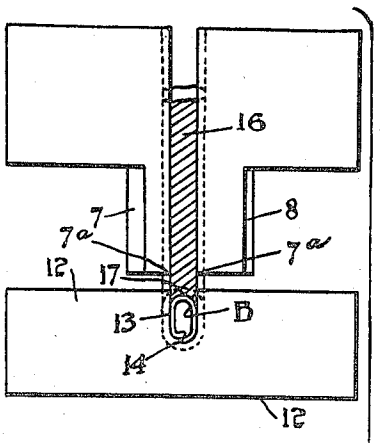
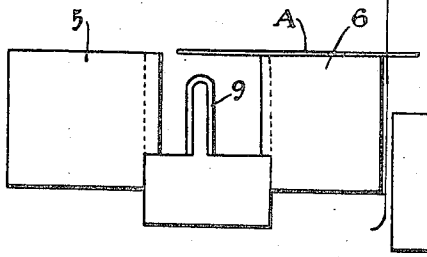
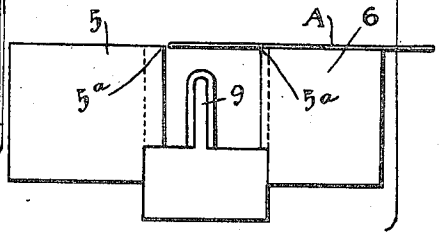


FIG.10





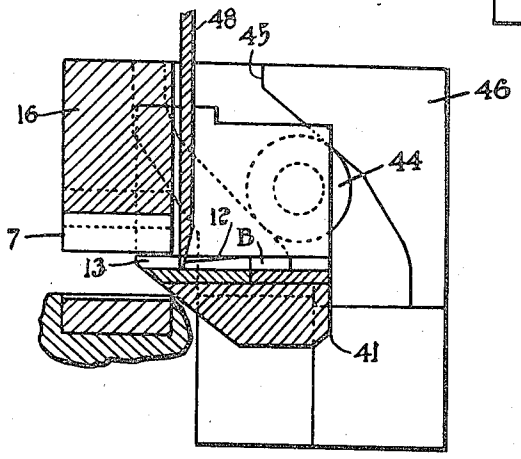


FIG.12



FIG.25

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BRUSH-STEM FORMING MACHINE

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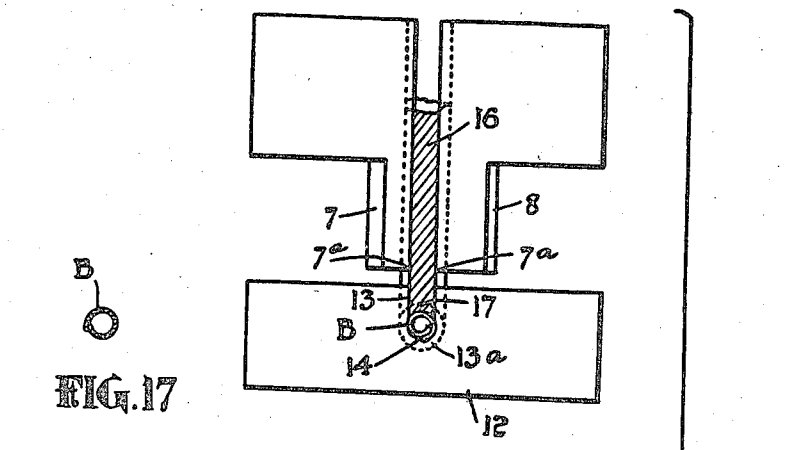
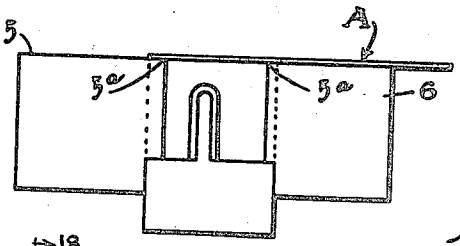


FIG. 11



FIG. 18



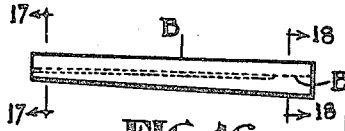


FIG. 16

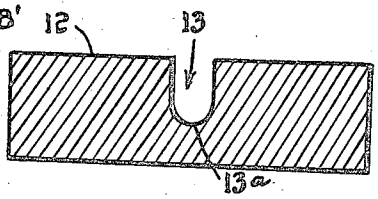


FIG. 15

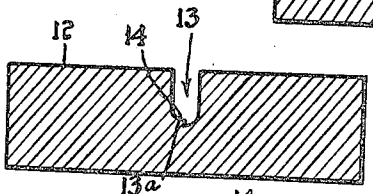


FIG. 14

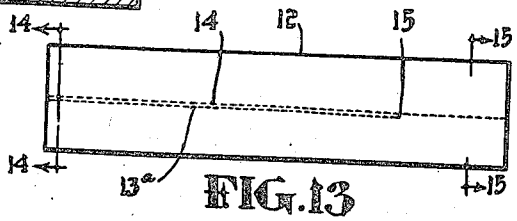


FIG. 13

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BRUSH-STEM FORMING MACHINE

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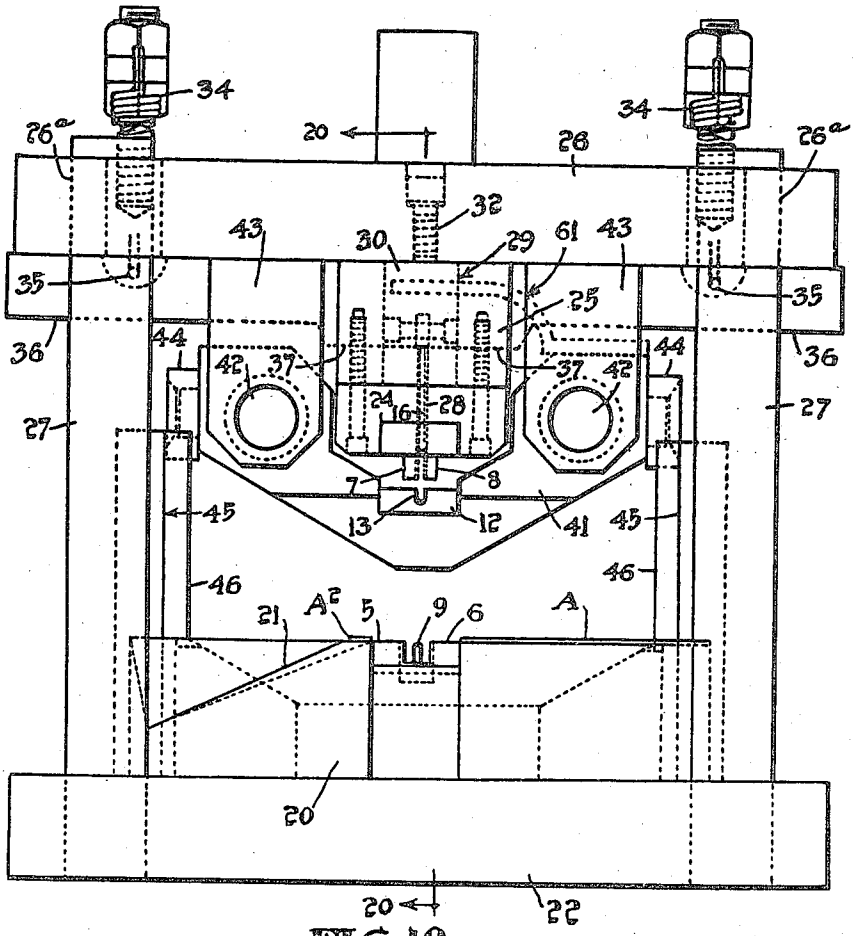


FIG. 19

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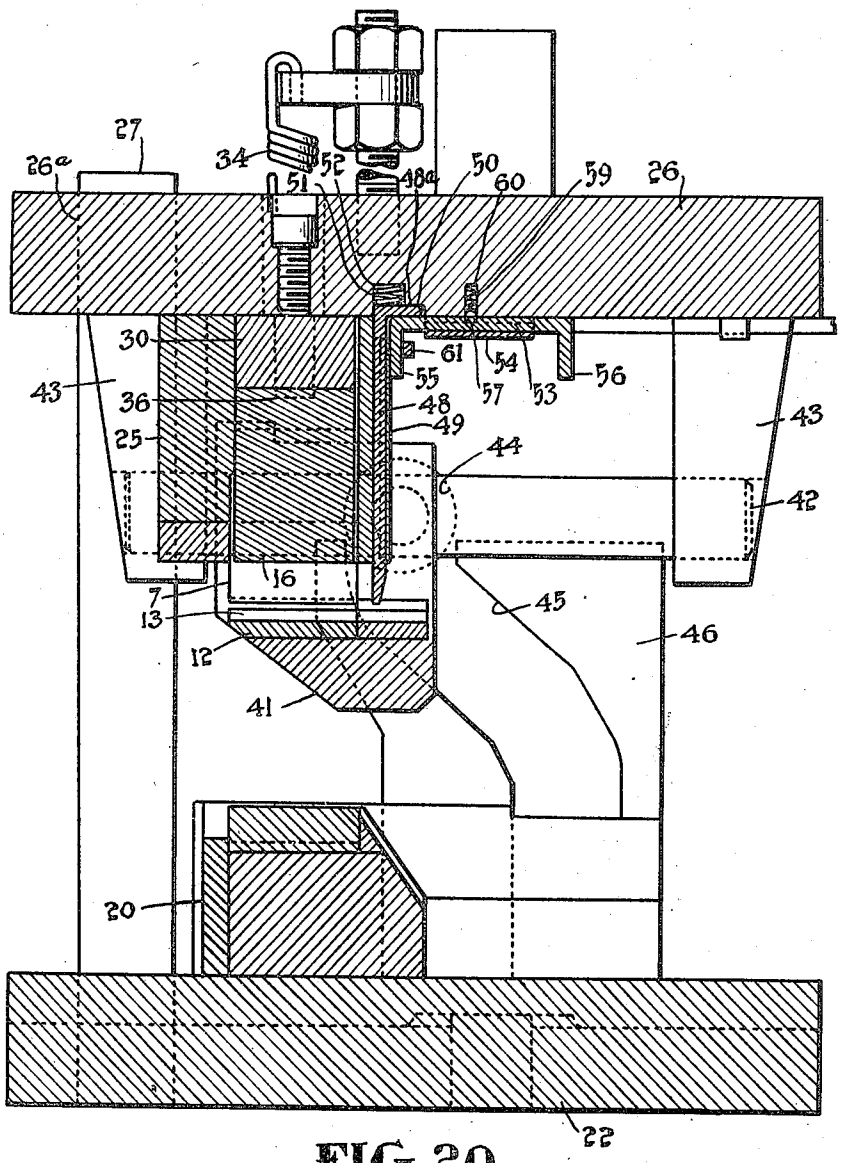


FIG. 20

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BRUSH-STEM FORMING MACHINE

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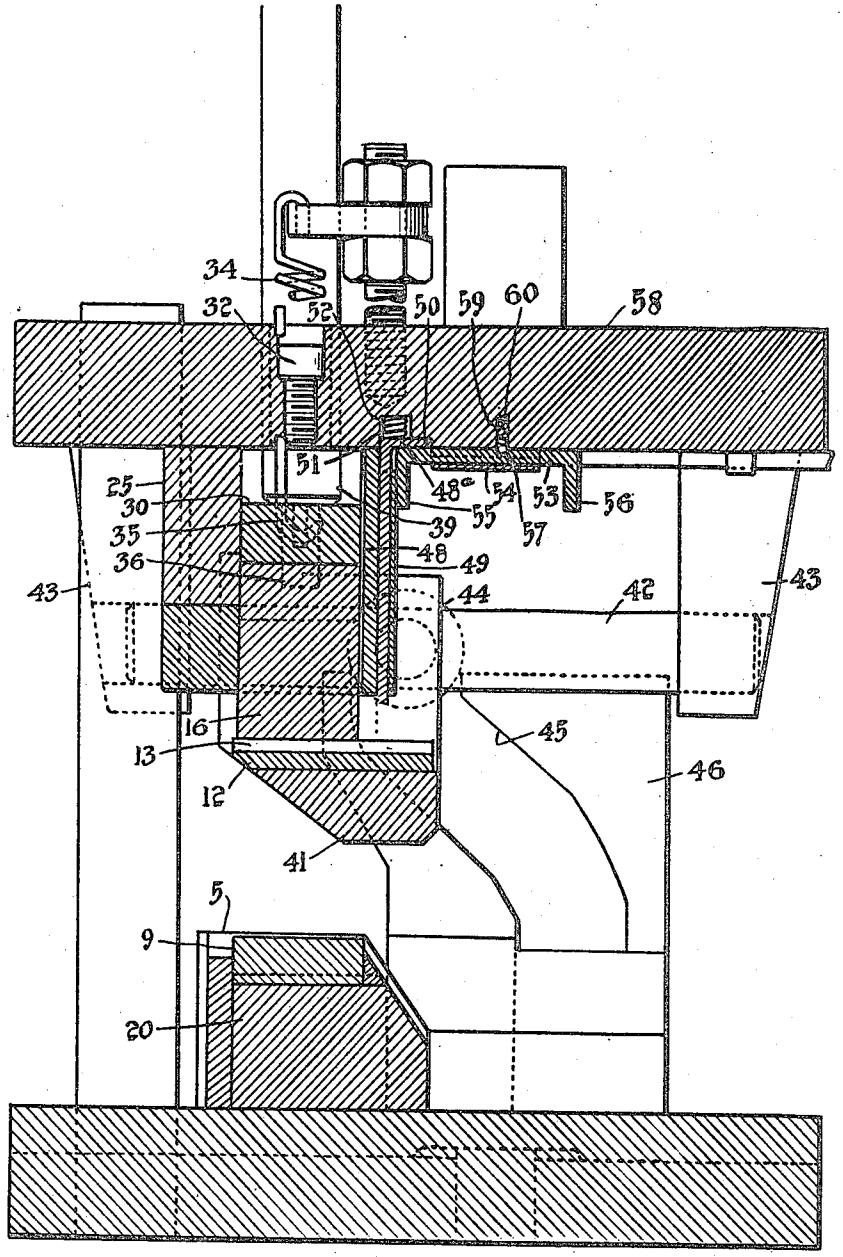


FIG. 21

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BRUSH-STEM FORMING MACHINE

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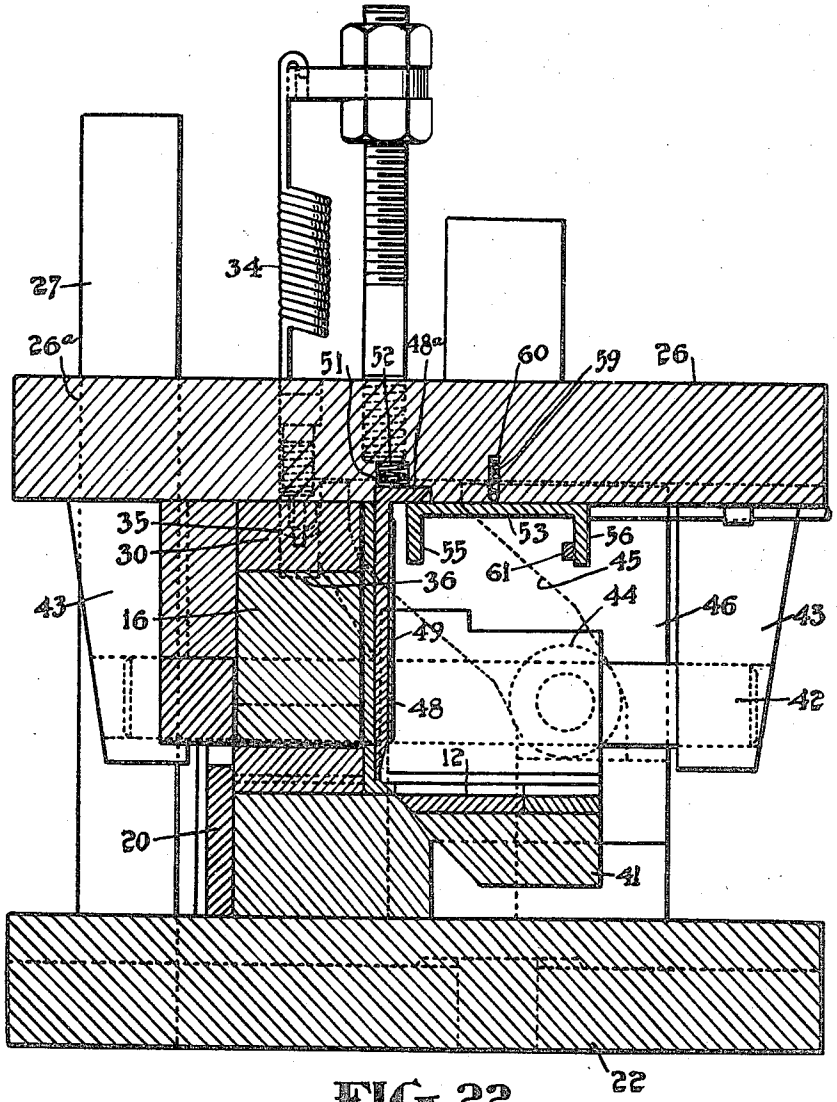


FIG. 22

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BRUSH-STEM FORMING MACHINE

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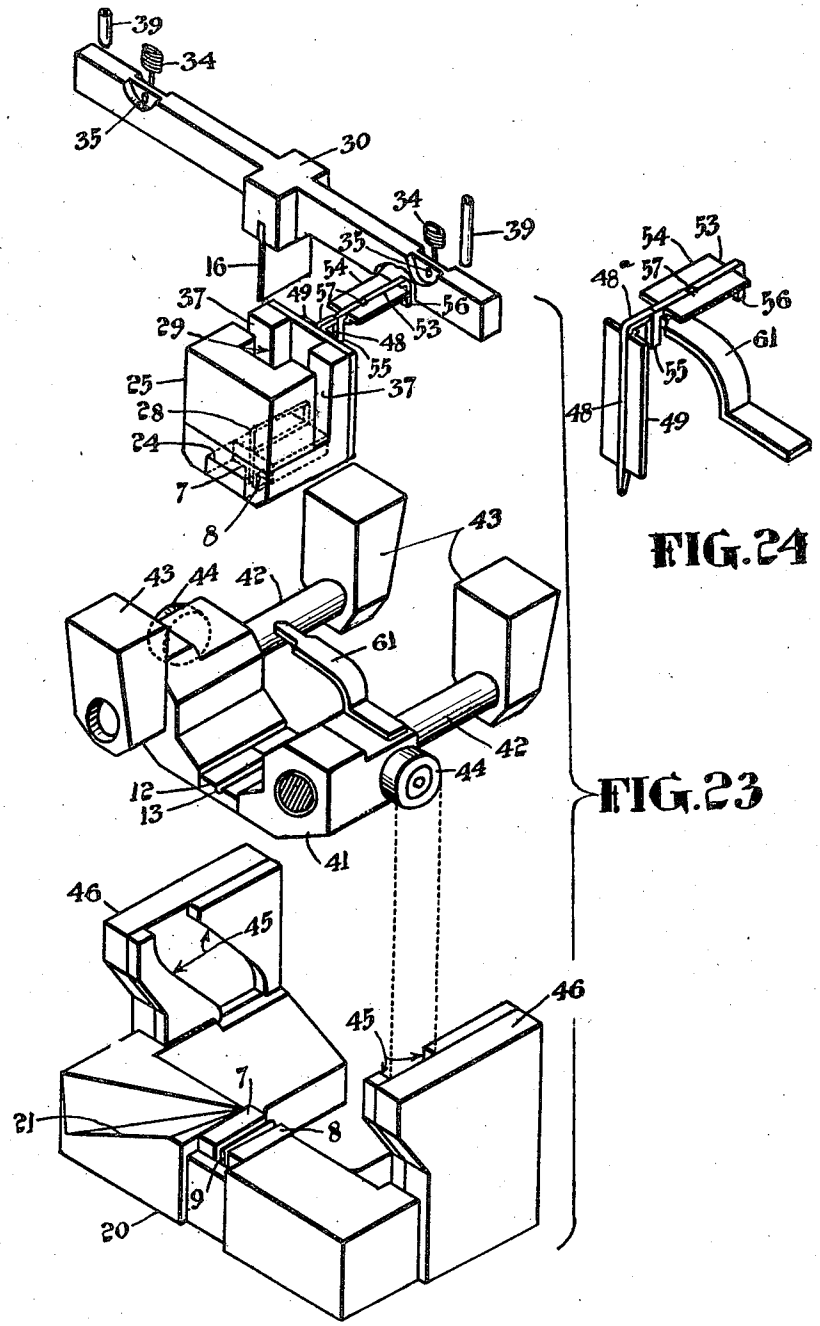


FIG. 24

FIG. 23

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Patented Aug. 24, 1948 2,447,499

UNITED STATES PATENT OFFICE

2,447,499

BRUSH-STEM FORMING MACHINE

Anthony S. Erk, Montreal, Quebec, Canada, assignor, by mesne assignments, to Northam Warren Corporation, Stamford, Conn., a corporation of New York

Application March 18, 1946, Serial No. 655,195

9 Claims. (Cl. 153—2)

1

This invention relates to improvements in the manufacture of tubular metal brush stems for nail polish and similar brushes.

Brush stems of the kind to which the present invention relates are usually made by forming a sheet metal blank into a tapering tubular stem, with opposite edges of the blank overlapping each other throughout the entire length of the stem. The present method of manufacture requires two separate operations and involves the use of a pin or mandrel around which the blank is formed to the required tapering tubular shape. The machines used for carrying out this method of manufacture are complicated and expensive and the average production of each machine is approximately 3000 stems per hour.

The present invention provides a machine which is capable of producing at least 9000 brush stems per hour and which is of such simple and inexpensive design that the initial and maintenance costs amount to only a small fraction of the corresponding costs of the conventional stem making machines now in use. An important characteristic which contributes to the simplicity, low cost, and high output of stem making machines designed and operated in accordance with the present invention is the elimination of the stem-forming pin or mandrel which is an essential element of conventional stem making machines. This elimination of the conventional stem-forming pin or mandrel is made possible by a novel arrangement of blank cutting and forming elements whereby, in a single cycle of operation, a flat blank is cut from a strip of metal, is bent into substantially V-shape around a pre-forming anvil and is then formed into a tapering tubular stem between appropriately shaped forming surfaces of two opposing tube-forming dies.

A further advantage of the present invention is that it provides a low cost, high output, brush-stem forming machine which, by the simple substitution of one die for another, may be easily and quickly adapted for the production of conventional types of tapering tubular brush stems in which the edges of the stem-forming blank are overlapped throughout the entire length of the stem or for the production of a type of partly tapered and partly cylindrical stem in which the edges of the blank are butted along a small cylindrical portion of the length of the stem adjoining the larger end of the stem and are overlapped for the remaining portion of the tapered length of the stem.

The conventional brush stems, in which the edges of the blank are overlapped throughout the

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entire length of the stem, are usually secured to a container cap by forcing the large end of the stem over a central, solid stem-receiving pin carried by the cap. I have found, however, that a better connection between the stem and the container cap is obtained by forcing the larger end of the stem into the bore of a central tubular stem-receiving member carried by the cap. In making this latter type of connection with a conventional stem in which the edges of the blank are overlapped throughout the entire length of the stem, the difficulty is experienced that the overlapping edges of the stem tend to slide relatively to each other and make it difficult to obtain a sufficiently tight frictional fit between the stem and the tubular cap projection in which the larger end of the stem is fitted. This difficulty disappears when, in accordance with the present invention, the edges of the blank are butted together at the larger end of the stem and are overlapped throughout the remaining portion of the stem.

Other characteristic features and advantages of the invention will be apparent from the following detailed description of the accompanying drawings, in which—

Figs. 1 to 12 inclusive are views illustrating successive stages of a complete cycle of operation of a stem forming machine embodying my invention.

Fig. 13 is a side elevation of a tube-forming die which is used in making tapering tubular stems in which the edges of the stem-forming blank are butted together along a portion of the length of the stem adjacent the larger end of the stem and are overlapped throughout the remaining portion of the stem.

Fig. 14 is a sectional view taken along the line 14—14 of Fig. 13.

Fig. 15 is a sectional view taken along section line 15—15 of Fig. 13.

Fig. 16 is a side view of a brush stem showing the edges of the stem-forming blank butted together for a portion of the length of the stem adjoining the larger end of the stem and overlapped throughout the remaining portion of the length of the stem.

Fig. 17 is a sectional view taken along section line 17—17 of Fig. 16.

Fig. 18 is a sectional view taken along section line 18—18 of Fig. 16.

Fig. 19 is a front elevational view showing the assembly of the blank cutting and tube-forming elements of a brush-stem making machine embodying my invention.

Fig. 20 is a vertical sectional view taken sub-

stantially along the section line 20—20 of Fig. 19.

Fig. 21 is a view similar to Fig. 20 but showing the parts in a different position.

Fig. 22 is a view similar to Figs. 20 and 21 but shows a different relative positioning of the parts.

Fig. 23 is an exploded view of the blank cutting and tube-forming assembly embodying said invention.

Fig. 24 is a perspective view of a stem ejector mechanism forming part of the complete assembly shown in the preceding figures.

Fig. 25 is a plan view of the stem blank shown in the preceding figures.

In describing the essential characteristics and mode of operation of the stem-making machine shown in the drawings reference will be had initially to Figs. 1 to 18 inclusive. As here shown my improved machine comprises a pair of laterally spaced, stationary, blank cutters 5 and 6. These cutters are arranged on a stationary base, as hereinafter described and cooperate with a pair of laterally spaced, vertically movable, blank cutters 7 and 8. The sheet material from which the brush stem blanks are cut is indicated at A and is fed over the stationary cutters 5 and 6 by any suitable feed means.

The stationary cutters 5 and 6 are formed with cutting edges 5a and are partially tapered to provide for the cutting of stem blanks B (Fig. 2) of the partially tapered shape shown in Fig. 25.

The movable cutters 7 and 8 are fixed in relation to each other but are mounted and operated to travel in a vertical direction from the raised position shown in Fig. 11 to the lowered position shown in Fig. 5 and vice versa. The movable cutters 7 and 8 are also tapered and are provided with cutting edges 7a which cooperate with the cutting edges 5a of the cutters 5 and 6 to cut a tapered blank B from sheet material A, when said cutters 7 and 8 are successively moved downwardly through the different positions shown in Figs. 1, 2 and 4 to their lowermost position (Fig. 5) in which they are received between the cutters 5 and 6.

A vertically disposed, blank pre-forming, anvil 9 is rigidly secured in position between and in spaced relation to the stationary cutters 5 and 6. This anvil is located somewhat closer to the cutter 5 than to the cutter 6 and is tapered so that it gradually increases in height and transverse width toward one end thereof. The upper edge of anvil 9 is positioned a slight distance below the cutting edges 5a of cutters 5 and 6.

The movable cutters 7 and 8 are designed and spaced so that, when they travel downwardly through the positions shown in Figs. 2 and 4, to the position shown in Fig. 5, the anvil 9 is received in the slot or space 10 separating said cutters. The blank B is pushed ahead of cutters 7 and 8 as the latter travel downwardly between cutters 5 and 6 and is bent into substantially V-shape around the anvil 9 which extends upwardly into the space or slot 10 as shown in Fig. 5. When the cutters 7 and 8 are raised toward their starting or uppermost position they carry the partially formed V-shaped blank B between them as shown in Figs. 6 and 7.

When cutters 7 and 8 and the V-shaped blank B carried thereby reach a predetermined position in their upward travel, a forming die 12, which always travels vertically with cutters 7 and 8 but is capable of independent horizontal movement, is shifted horizontally from a position at one side of cutters 7 and 8 (Figs. 3 and 12) to a position directly below said cutters as illustrated in Figs. 7 to 11 inclusive. Forming die 12 is provided with a longitudinally tapering tube-forming cavity 13 having a transversely curved bottom wall 13a shaped to provide a longitudinal shoulder formation 14 extending from the smaller end of the cavity to a point 15 (Fig. 13) spaced from the larger end of the cavity, the height of the shoulder 14 being slightly less than the thickness of blank B. From the point 15 to the larger end of the cavity 13 the bottom wall 13a thereof extends in a smooth curve across the width of the cavity as shown in Fig. 15. When die 12 is positioned below cutters 7 and 8 as shown in Figs. 7 to 11 inclusive, the tube-forming cavity 13 is positioned below and in vertical alignment with the space 10 between the cutters 7 and 8. The die 12 is mounted (as hereinafter described) so that it always travels upwardly and downwardly with the cutters 7 and 8 in addition to having an independent horizontal motion from a position at one side to a position directly beneath said cutters.

The die 12 cooperates with a second forming die 16 which is a sliding fit between the vertically movable cutters 7 and 8. Die 16 is provided at its lower edge with a longitudinally tapered, transversely curved, tube-forming cavity 17 which, during downward movement of cutters 7 and 8, is positioned a substantial distance above the cutting edges 7a to enable the U-shaped blank B to be pushed upwardly into the slot 10 by the pre-forming anvil 9. Die 16 is mounted (as hereinafter described) so that it travels downwardly with the cutters 7 and 8. During this unitary downward movement of cutters 7 and 8 and die 16, the forming cavity 17 of said die is maintained in the elevated position shown in Fig. 1 relative to the cutting edges 7a of said cutters. When, following the blank cutting and preforming operation, the cutters 7 and 8 have travelled upwardly to a predetermined position below their uppermost position the upward movement of die 16 is arrested and the cutters 7 and 8 continue to travel upwardly relative to said die (Figs. 7 to 11 inclusive). As the cutters 7 and 8 travel upwardly past the die 16 the fold line portion of the V-shaped blank B is engaged by the defining wall of the die cavity 17 (Fig. 8) and is held against further upward travel with the cutters 7 and 8. Since the die 12 (which is now positioned below blank B) continues to travel upwardly with the cutters 7 and 8 and relative to the now stationary die 16, the V-shaped blank B is gradually formed into a tapering tubular brush stem between the tube-forming surfaces 13 and 17 of the dies 12 and 16, as illustrated in Figs. 8 to 11 inclusive.

As previously stated, the pre-forming anvil 9 is located closer to the stationary blank cutter 5 than to the stationary blank cutter 6. This results in the blank B being bent into the form of a V having one leg longer than the other. During the tube-forming operation illustrated in Figs. 8 to 11 inclusive, the side legs of the V-shaped blank are forced downwardly into the tube-forming cavity 13 of die 12 until the longer leg of the V-shaped blank engages the shoulder formation 14 as shown in Fig. 9. As the bottom of cavity 13 of die 12 continues to approach tube-forming surface 17 of die 16, that portion of the shorter leg of blank B which is coextensive with shoulder 14 is forced against and temporarily held by the shoulder-engaging edge of the longer leg which projects slightly above shoulder 14. At the larger end of cavity 13 located beyond shoul-

der 14 the side edges of the non-tapered portion of blank B are forced into abutting engagement, as indicated by B' in Figs. 16 and 18, to form the cylindrical portion of the stem. While the shorter leg of the blank is temporarily held by the portion of the long leg which projects above shoulder 14, the bottom of cavity 13 of die 12 continues to approach tube-forming surface 17 of die 16 and the shaping of blank B proceeds until the change in shape of the blank and the pressure of the dies causes the edge of the shorter leg to spring over and past the engaging shoulder-held edge of the longer leg to thereby permit portions of the side edges of the blank to be overlapped as indicated in Fig. 11 to provide the tapering portion of the brush stem.

During the upward movement of cutters 7 and 8, the strip material A is gradually fed across the stationary cutters 5 and 6 as shown in Figs. 6 to 11 inclusive to provide for the cutting of a second blank therefrom.

When cutters 7 and 8 are again moved downwardly to cut a second blank from the material A the die 16 remains stationary until the cutting edges 7a of said cutters have travelled below the forming cavity 17 of the die 16 the distance shown in Fig. 1. From this point on the cutters 7 and 8 and the die 16 travel downwardly as a unit as illustrated in Figs. 2, 4 and 5. The die 12 also travels downwardly with the cutters 7 and 8 but, in so doing, is gradually shifted horizontally from a position beneath to a position at one side of said cutters so as not to interfere with the second blank cutting operation.

The manner in which the aforesaid component parts of my improved brush making machine are mounted and operated to function as set forth in the preceding description is illustrated by Figs. 3, 12 and 19 to 24 inclusive.

The stationary cutters 5 and 6 and the anvil 9 are rigidly secured to a suitable mounting 20 (Figs. 19 and 23) which is recessed to provide an inclined scrap discharge chute 21 into which the scrap A^2 (Fig. 2), resulting from each blank cutting operation, is pushed by the advancing edge of the uncut sheet material A as the latter is fed across the stationary cutters 5 and 6. The mounting 20 is rigidly secured to a base plate 22 which may constitute or be rigidly secured to the lower stationary platen or base plate of any suitable type of punch press.

The movable cutters 7 and 8 are secured, in laterally separated relation, within a recess 24 provided at the lower end of a combined cutter and die holder 25. The holder 25 is rigidly secured to a vertically movable shoe 26 which, in turn, is rigidly secured in any suitable manner to the upper movable platen (not shown) of the press to travel vertically therewith. Shoe 26 is provided with guide openings 26a for the passage of vertical guide rods 27 extending upwardly from base plate 22. Holder 25 is provided, above recess 24, with a vertical guide slot 28 in which the die 16 works. Holder 25 is also provided, above slot 28, with a rectangular guideway 29 in which a rectangular block 30, to which die 16 is rigidly secured, is slidably fitted. Shoe 26 is provided with an adjustable stop screw 32 against which the die-carrying block 30 is held by two springs 34 during part of the downward and upward movement of holder 25. The lower ends of springs 34 are fastened, as indicated at 35, to side arms 36 extending outwardly from block 30 and working in slots 37 provided at opposite sides of the guideway 29.

When the movable assembly, comprising cutters 7 and 8, die 16, holder 25, shoe 26, and die-carrying block 30, is travelling upwardly from the blank bending position shown in Fig. 5 to approximately the position shown in Fig. 6, the block 30, carrying die 16, is held in the upper part of its guideway 29 and against stop screw 32 of shoe 26 by the upward pull of springs 34 and the forming surface 17 of die 16 is elevated above the cutting edges 7a of cutters 7 and 8 approximately as shown in Fig. 7. As the cutters 7 and 8, holder 25 and shoe 26 continue to travel upwardly to their uppermost position (Figs. 11 and 21) the upward movement of die 16 and its carrying block 30 is arrested by engagement of the arms 36 with the lower ends of two adjustable, vertically disposed stop bolts 39 which project below shoe 26 when said shoe is in its uppermost position. When the upward travel of die 16 is thus arrested the V-blank B continues to travel upwardly with the cutters 7 and 8 until it is stopped by engagement of its fold line portion with the now stationary forming surface 17 of die 16. At this time the die 12 is positioned directly beneath the V-blank B and is travelling upwardly with the cutters 7 and 8 so that it continues to approach the stationary die 16 until the blank is formed into a tube between the tube-forming surfaces 13 and 17 of the two dies.

When cutters 7 and 8, holder 25 and shoe 26 start their downward movement they travel independently of die 16 which remains stationary against stop bolt 39 until the stop screw 32 of shoe 26 engages block 30 and causes it to move downwardly therewith and out of contact with said stop bolt.

Die 12 is mounted in a horizontally movable slide 41 arranged to travel on horizontal guide rods 42 carried by supporting posts 43 depending from shoe 26. Slide 41 is equipped with rollers 44 arranged to travel in cam grooves 45 provided in stationary members 46 extending upwardly from base plate 22.

Cam grooves 45 are shaped so that rollers 44 and slide 41 are caused to travel horizontally in one direction along guide rods 42 during downward movement of the slide and are caused to travel in the opposite direction along said guide rods during upward movement of the slide. During its downward movement the slide 41 is shifted from a position beneath cutters 7 and 8 (Figs. 6 to 11 inclusive and Figs. 20 and 21) to a position at one side of said cutters (Figs. 12 and 22). During upward movement thereof, slide 41 travels from the position shown in Fig. 22 to the position shown in Figs. 20 and 21.

As shown in Fig. 12, the completely formed brush stem is carried by die 12 as the latter travels horizontally with slide 41 to a position at one side of cutters 7 and 8. During the next horizontal movement of die 12 to a tube-forming position beneath cutters 7 and 8 the previously formed tube B is ejected from said die by a vertically shiftable ejector bar 48 which is then positioned so that its lower end extends downwardly into the die cavity 13 and engages the smaller end of the brush stem to sweep it from said cavity 13 as the latter moves horizontally past said ejector bar to its tube-forming position beneath cutters 7 and 8.

Ejector bar 48 (Figs. 20 to 24 inclusive) slides vertically in a guide channel provided in a plate 49 fastened to the vertically movable holder 25. The upper end 48a of bar 48 is bent at right angles and provided with an inclined end edge 50,

A spring 51 bears against the bent end 48a and urges the bar 48 in a downward direction. This spring is fitted in a spring pocket 52 provided in shoe 26.

An ejector bar operating strap 53 is arranged to slide horizontally in a guide channel provided in a horizontal plate 54 secured to the underside of shoe 23. Strap 53 is provided with downwardly directed end portions 55 and 56 and with a detent-receiving recess 57 formed in its upper surface substantially midway between its end portions. Recess 57 is adapted to receive therein a spring-pressed ball detent 58 located at the lower end of a spring 59 arranged in a spring pocket 60 provided in shoe 26.

A strap shifting arm 61 has one end fastened to slide 41 (Figs. 19, 20, 22 and 23) so that the other end of said arm is positioned between the downwardly directed ends 55 and 56 of strap 53 as shown in Figs. 22 and 23.

In describing the complete action of the brush-stem ejector mechanism it will be assumed that ejector bar 48 is down in its lowermost position as shown in Fig. 12 and that the slide 41 is moving upwardly with the cutters 7 and 8. During its upward movement slide 41 is shifted horizontally to the left by the rollers 44 travelling upwardly in the cam groove 45. As the slide 41 and die 12 travel to the left past ejector bar 48, the lower end of said bar serves as a stop by which the previously formed brush-stem is swept from the cavity 13 of die 12 as the latter proceeds to its stem-forming position beneath the upwardly moving cutters 7 and 8. As the die 12 reaches said stem-forming position, the arm 61 which is moving horizontally with slide 41 engages the downwardly directed end 55 of strap 53 and shifts said strap against the inclined end edge 50 of ejector bar 48 so that the bent end 48a of said bar is raised against the resistance of spring 51 to permit the leading portion of said strap to pass therebeneath and support the ejector bar in a raised position in which its lower end is elevated above the bottom of die cavity 13 a distance greater than the diameter of the brush stems formed therein.

The ejector bar 48 is retained in its elevated position by straps 53 until the next stem-forming operation is completed and the slide 41 and die 12 have been shifted to a predetermined position to the right of the cutters 7 and 8. When slide 41 reaches this predetermined position to the right of cutters 7 and 8, the arm 61 travelling with said slide engages the downwardly directed end 56 of strap 53 and shifts said strap to the right so that said strap is withdrawn from beneath the bent end 48a of ejector bar 48 which is then moved downwardly by spring 51 to position the lower end of the ejector bar in a stem-ejecting position opposite the smaller end of the newly formed brush stem carried in the die cavity 13 of die 12.

When it is desired to form a brush stem in which the opposite edges of the blank are overlapped throughout the entire length of the stem this may be conveniently accomplished by using a die 12 in which the shoulder 14 extends the full length of the stem-forming cavity 13. In this case the full length of the shorter leg of the V-blank B is forced upwardly over the shoulder and into overlapping engagement with full length of the opposite shoulder-held edge of the blank.

Having thus described the nature of my invention and a preferred embodiment thereof, it will be apparent that various modifications may be

resorted to within the scope and spirit of the invention as defined by the appended claims.

I claim:

1. A brush-stem forming machine comprising a pair of stationary, laterally spaced, blank cutters provided with cutting edges extending along their inner upper, longitudinal corner portions, means for feeding sheet material over said cutters so that the sheet material bridges the space between the cutters, a pair of movable, laterally spaced, blank cutters arranged to travel on a vertical path and to be received between the stationary cutters when moved downwardly to their lowermost position, said movable cutters being provided along their outer, lower, longitudinal corner portions with cutting edges coacting with the cutting edges of the stationary cutters to cut a brush-stem blank from the sheet material during downward travel of the movable cutters, a stationary anvil around which the blank is bent into substantially V-shape by the movable cutters as they travel downwardly between the stationary cutters, said anvil being arranged between the stationary cutters, so that it is received in the space between the movable cutters during the blank bending operations, said movable cutters serving to retain and carry the V-shaped blank between them as they travel upwardly following the blank cutting and bending operation, and a pair of tube-forming dies between which the V-shaped blank is formed into a tubular brush-stem during upward travel of the movable cutters, one of said dies being arranged between the movable cutters and the other die being arranged so that it travels vertically with said movable cutters and is also shifted horizontally to and from a tube-forming position beneath the space between the movable cutters, the arrangement being such that, before the movable cutters reach their uppermost position the upward travel of the V-shaped blank is stopped by the tube-forming surface of the die arranged between said cutters and the other die is shifted horizontally to a tube-forming position beneath said blank so that the blank is formed into a tube between the two dies as the horizontally shiftable die continues to travel upwardly with the cutters and relatively to the stationary blank.

2. A brush-stem forming machine as set forth in claim 1, including a vertically movable member carrying said movable cutters, a slide suspended from said member by means supporting said slide for horizontal travelling movement to and from a position beneath said cutters, said slide carrying said horizontally shiftable die and slide actuating means functioning automatically to shift said slide horizontally to a position beneath said movable cutters as the latter and the slide are carried upwardly by said member, said slide actuating means also serving to shift said slide horizontally to one side of said cutters as the latter and the slide are carried downwardly by said member.

3. A brush-stem forming machine as set forth in claim 1, including a vertically movable member carrying said movable cutters, a slide suspended from said member by means supporting said slide for horizontal travelling movement to and from a position beneath said cutters, said slide carrying said horizontally shiftable die and slide actuating means functioning automatically to shift said slide horizontally to a position beneath said movable cutters as the latter and the slide are carried upwardly by said member and to shift said slide horizontally to one side of said

cutters as the latter and the slide are carried downwardly by said members, said slide actuating means comprising rolls carried by said slide and stationary cam grooves in which said rollers travel as the slide is carried upwardly and downwardly by said member.

4. A brush-stem forming machine as set forth in claim 1, in which the formed stem is carried by the horizontally shiftable die as the latter travels horizontally from its tube-forming position following the tube-forming operation and stem ejecting means functioning to eject the formed tube from the horizontally shiftable die as the latter travels toward its tube-forming position beneath the movable cutters.

5. In a brush-stem forming machine of the kind described a pair of laterally spaced stationary blank cutters, means for feeding sheet material over said cutters, a pair of laterally spaced movable cutters arranged to travel in a vertical path and to be received between the stationary cutters when moved downwardly to their lowermost position of travel, said movable cutters coacting with said stationary cutters to cut a brush-stem blank from said material and serving to push said blank downwardly between the stationary cutters, an anvil around which the blank is bent into substantially V-shape by the movable cutters as they travel downwardly between the stationary cutters, said anvil being arranged between the stationary cutters so that it and the V-shaped blank is received in the space between the movable cutters as the latter travel downwardly over said anvil, said movable cutters serving to carry the interposed V-shaped blank between them as they travel upwardly following the blank cutting and bending operation, a pair of tube-forming dies between which the V-shaped blank is formed into a tubular brush-stem during upward travel of the movable cutters, one of said dies being slidably arranged between the movable cutters to have a limited vertical travel therewith and the other die being arranged to travel vertically with said movable cutters and to have a horizontal travel to and from a tube-forming position beneath the space between the movable cutters, a vertically movable member carrying said movable cutters, springs connecting the die positioned between the movable cutters to said member and serving to draw said die against said member, stationary stops arranged to arrest the upward travel of the die positioned between the movable cutters before the latter reach the limit of their upper travel so that, during their final upward travel, the movable cutters move upwardly past the lower edge of the die interposed therebetween, a slide suspended from said member by means supporting said slide for horizontal travelling movement to and from a position beneath said movable cutters, said slide carrying said horizontally shiftable die, and slide actuating means functioning automatically to shift said slide to a position beneath said movable cutters as the latter and the slide are carried upwardly by said member, said slide actuating means also serving to shift said slide horizontally to one side of said movable cutters as the latter and the slide are carried downwardly by said members, the arrangement being such that before the movable cutters reach their uppermost position the upward travel of the V-shaped blank is stopped by a tube-forming surface at the lower edge of the die arranged between said movable cutters and the other die is shifted horizontally by the slide to a tube-forming position beneath said blank so that the blank is formed into a tube between the two dies as the horizontally shiftable die continues to travel upwardly with the cutters and the slide relatively to the stationary blank.

6. An apparatus for forming tubular brush stems from sheet material, comprising a stationary female die unit having an anvil permanently positioned within its cavity, a reciprocating unit including a male die movable vertically relative to the face plane of the female die to cut a blank from stock and shape the blank into an embryo formation, said unit also including a shaping member for the embryo formation mounted within and movable with and relative to the male die, and a shaping die element having a cavity mounted for movement into and out of the path of movement of the male die and movable with and relative to the reciprocating unit, said stationary female die unit, said reciprocating unit and said shaping die element being correlated in operation to provide the following automatic cyclar sequence of activities in the production of the stem; with the stock mounted on the face of the stationary female die, and with the reciprocating unit moving through its downward stroke and approaching the end of such stroke and with the shaping member and the shaping die element inactive, the reciprocating male die contacts the stock, cuts the blank therefrom and carries the blank into engagement with the anvil to shape the blank into the embryo formation during completion of such downward stroke and thereby placing the embryo formation within the male die; upon reversal of the stroke of the unit, the male die member moves the embryo formation out of and above the stationary female die unit and into engagement with the shaping member, the latter having been rendered stationary to permit relative movement between the die and shaping member; while maintaining movement of the shaping die element with the reciprocating unit, automatically moving the shaping die element from an inactive position to place the shaping cavity of the element in operative alinement with the now-stationary shaping member to complete the stem by co-action of the shaping member and said element shaping cavity during completion of the upward stroke of the unit with the shaped stem located within the element cavity; and, during the earlier portion of the succeeding downward stroke of the unit moving the shaping die element to its inactive position and also rendering the shaping member active to travel with the male die with the shaping member in inactive position.

7. An assembly as in claim 6 characterized in that the anvil of the stationary female die unit is positioned out of the center of the die cavity in the direction of length of the blank, and further characterized in that the shaping member of the unit and the channel within which the member is active are positioned in the unit in vertical axial alinement with such anvil to thereby present the shaped embryo formation as of inverted V-shape (approximate) with the sides of the formation differing in their respective lengths.

8. An assembly as in claim 6 characterized in that the shaping die element travels with the reciprocating unit through both strokes of the latter, the direction of movement of the element between its active and inactive positions being lateral with respect to the path of travel of the male die with the lateral travel cam-controlled

and produced by and during the travel of the element with the unit.

9. An assembly as in claim 8 characterized by an ejector element carried by and movable with and relative to the unit, said ejector element being normally inactive with respect to the lateral travel path of the shaping die element and movable into a position of activity within the shaping cavity of the shaping die element while the latter is in its inactive position to thereby eject the shaped stem from the cavity by and during the travel of the shaping die element to its active position.

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