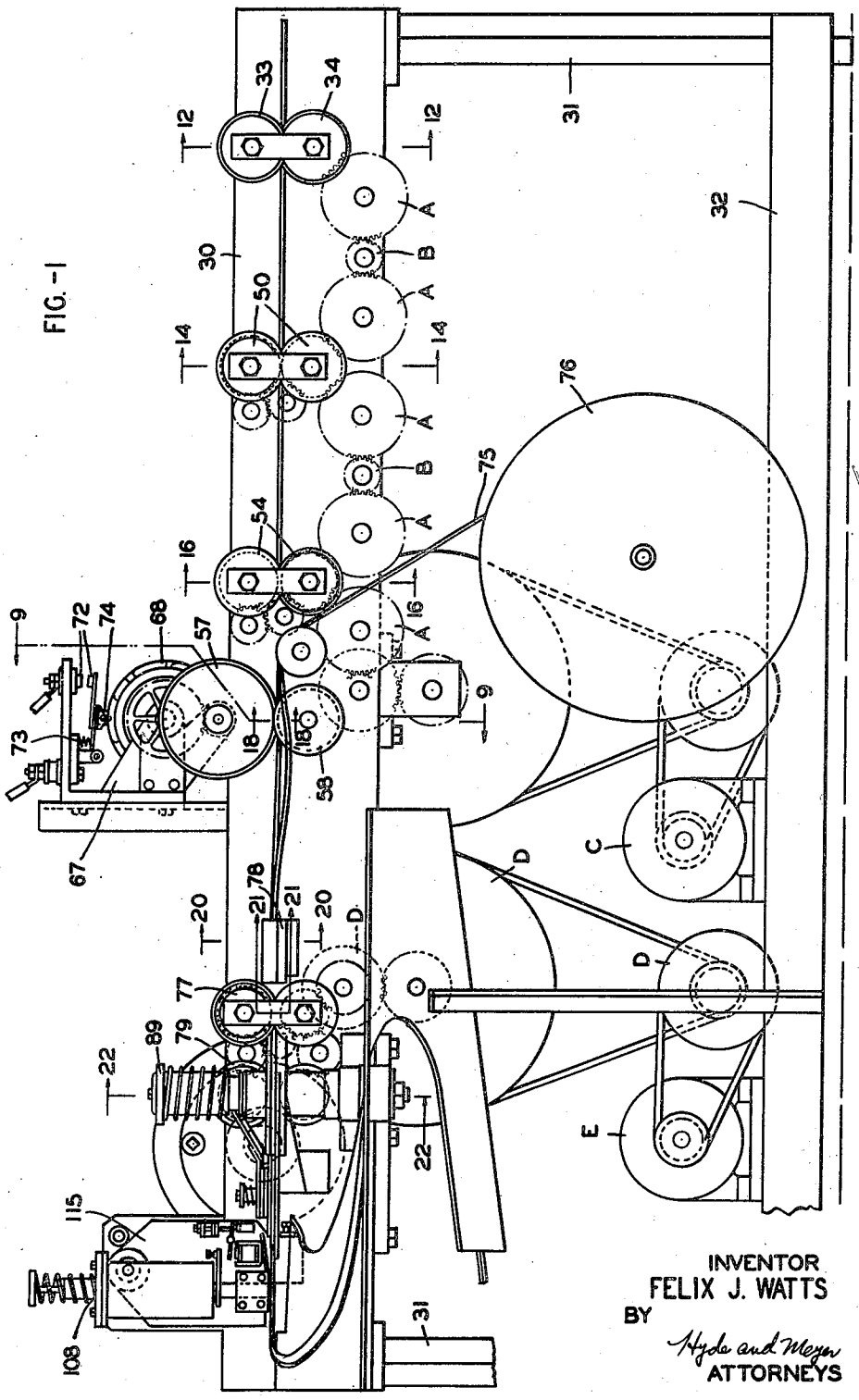
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CONTOURING MACHINE

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FIG. -1



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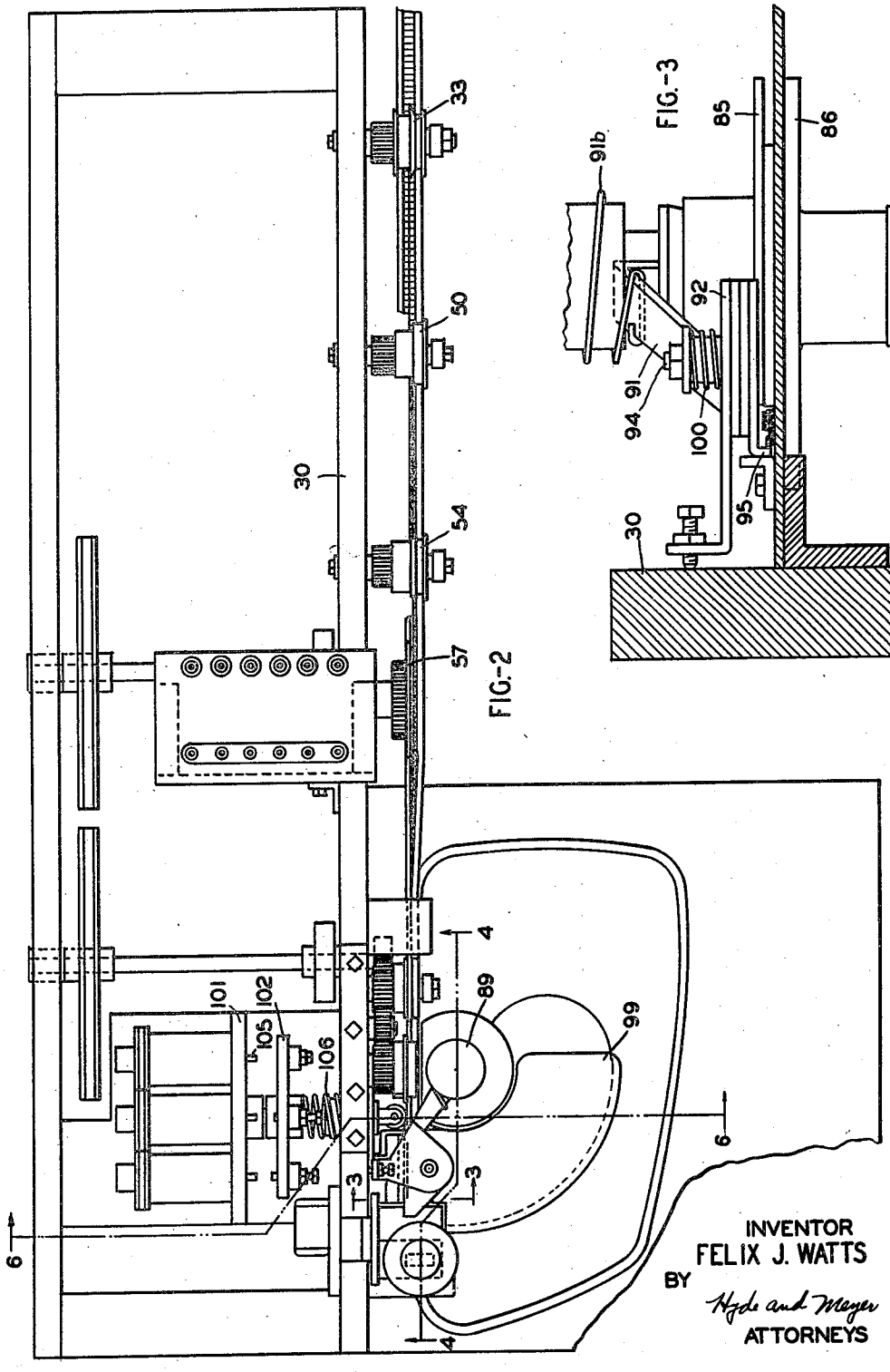


FIG.-2

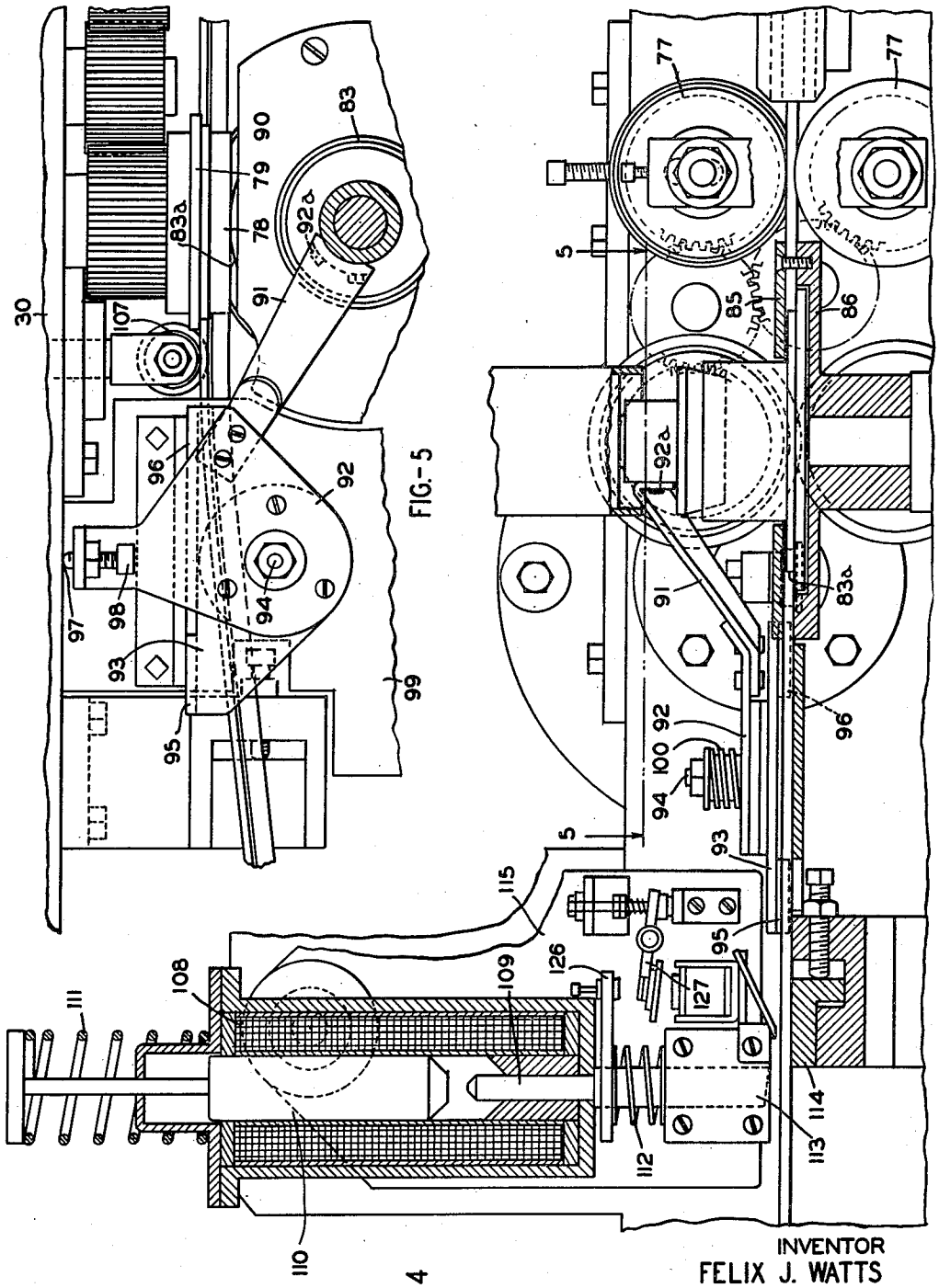
FIG.-3

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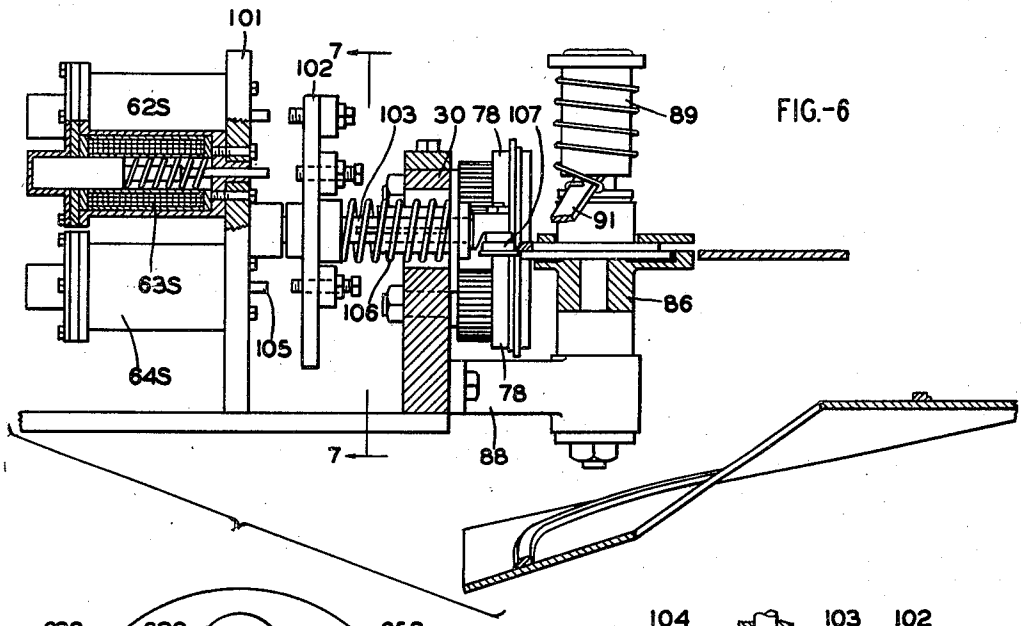


FIG.-6

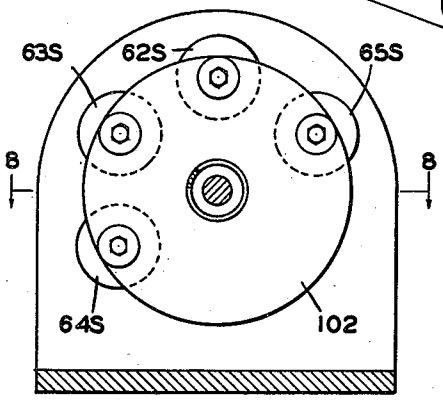


FIG.-7

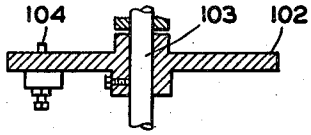


FIG.-8

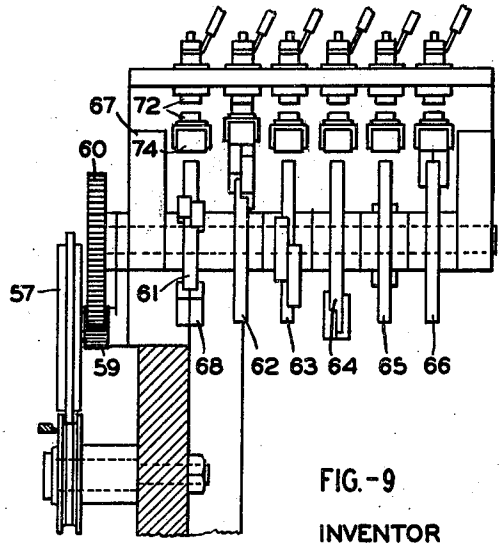
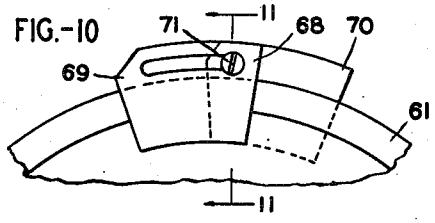


FIG.-9

FIG.-10



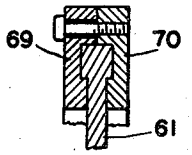


FIG.-11

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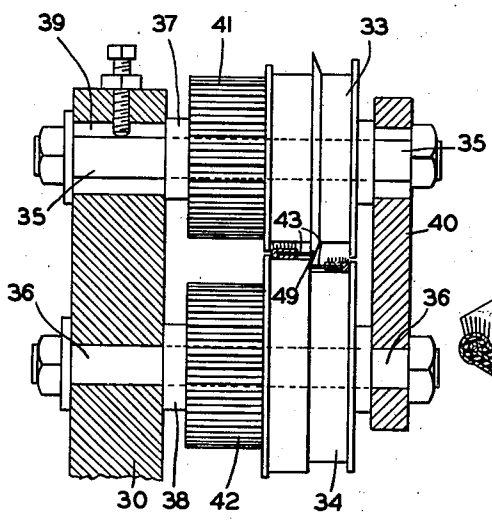


FIG.-12

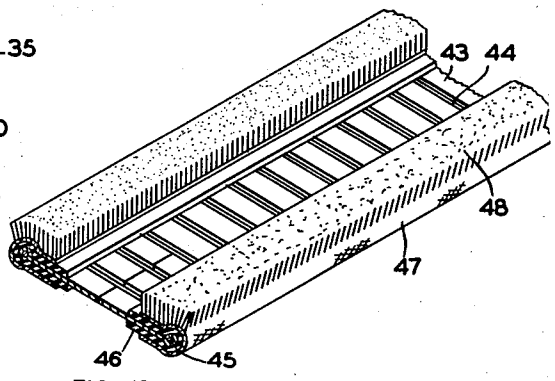


FIG.-13

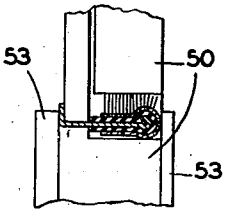


FIG.-14

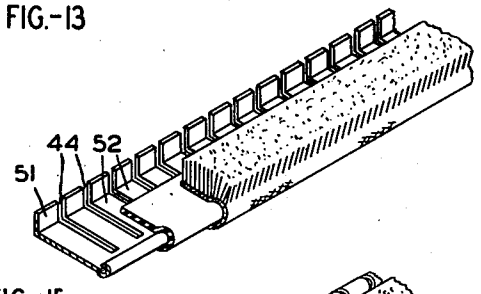


FIG.-15

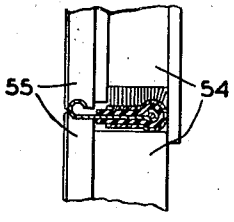


FIG.-16

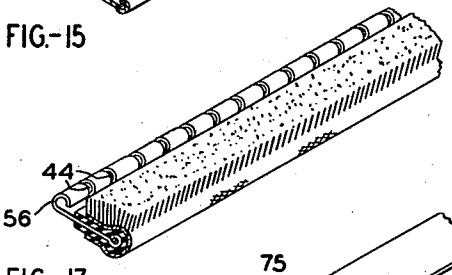


FIG.-17

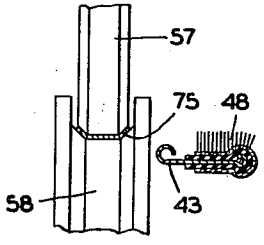


FIG.-18

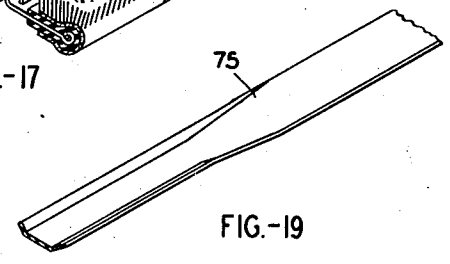


FIG.-19

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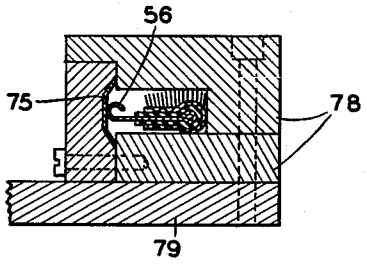


FIG.-20

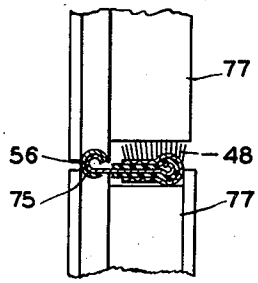


FIG.-21

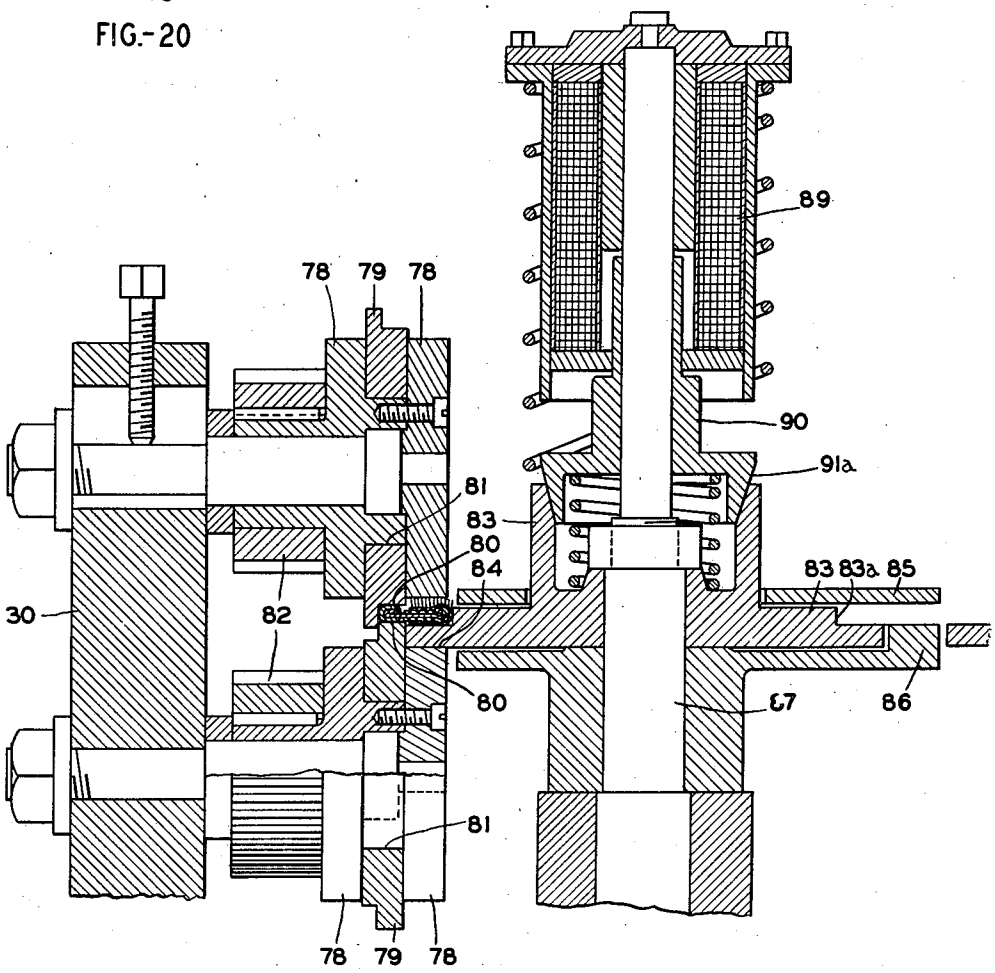


FIG.-22

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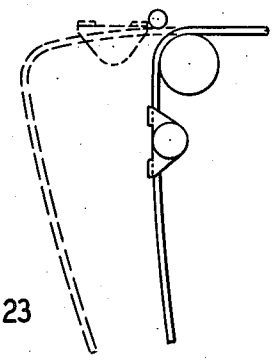


FIG.-23

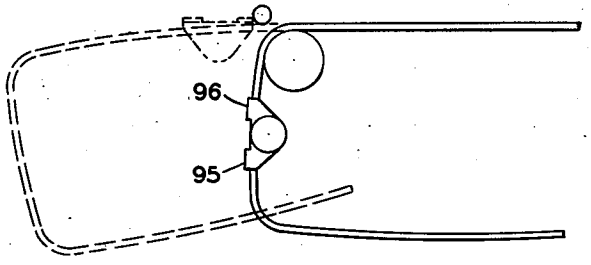


FIG.-24

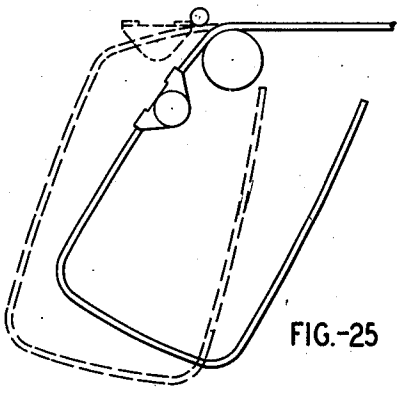


FIG.-25

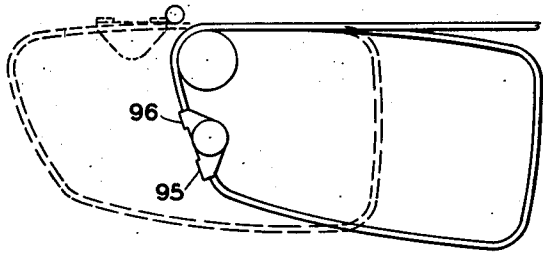


FIG.-26

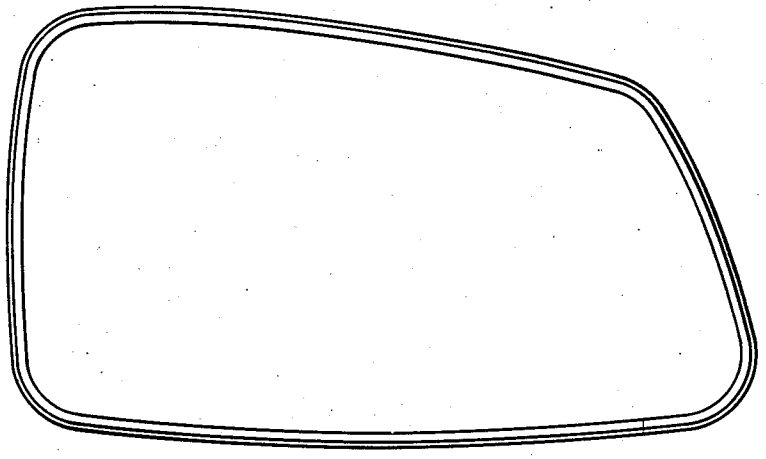


FIG.-27

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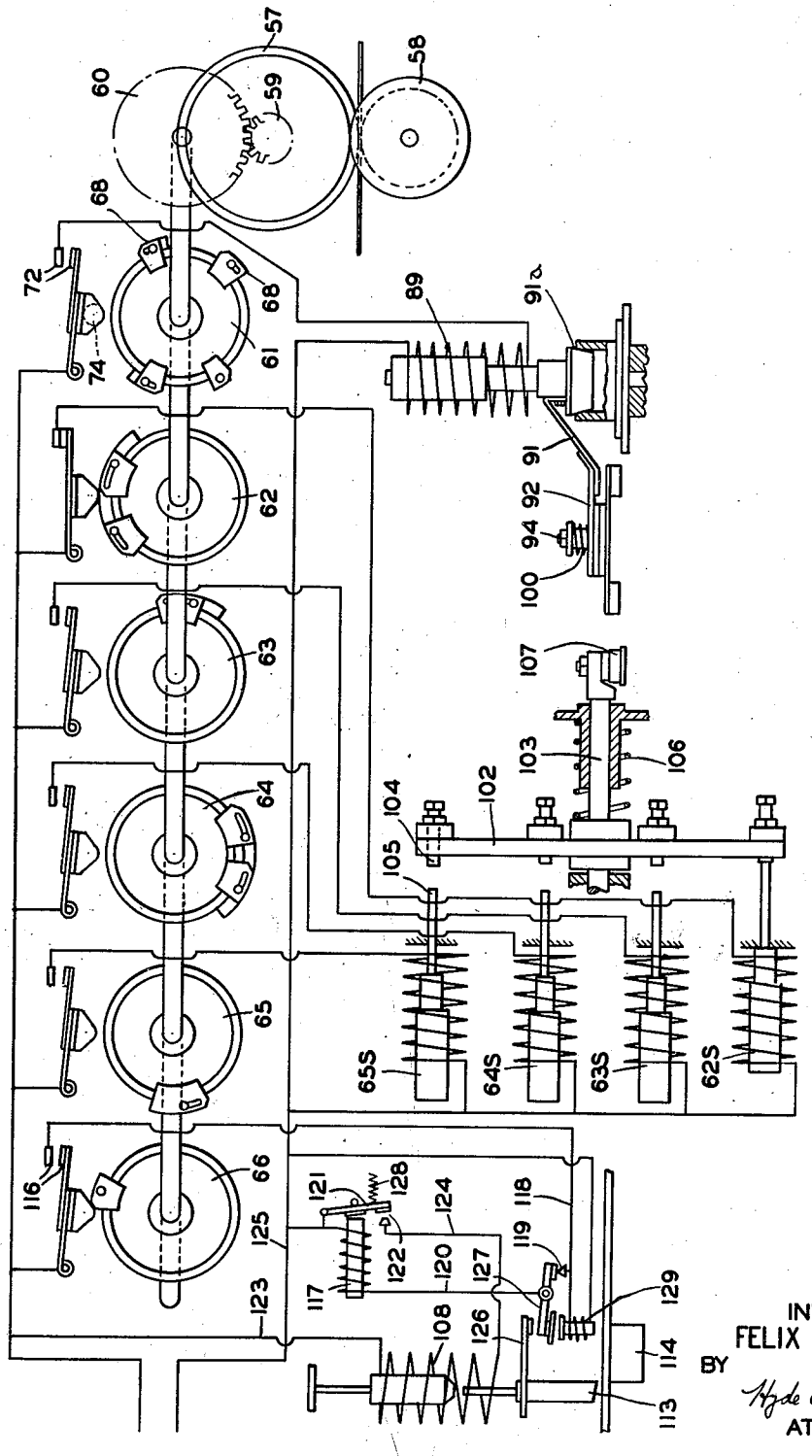


FIG.-28

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Patented June 15, 1943 2,321,637

UNITED STATES PATENT OFFICE

2,321,637

CONTOURING MACHINE

Felix J. Watts, Detroit, Mich., assignor to The Standard Products Company, Port Clinton, Ohio, a corporation of Ohio

Application August 26, 1940, Serial No. 354,149

5 Claims. (Cl. 153—2)

This invention relates to an apparatus for forming and shaping yieldable sealing strip material of the type used, for instance, in weather proofing and cushioning slidable windows in automobile bodies. The invention particularly relates to an apparatus for automatically shaping a preformed composite sealing strip.

In this specification and the appended claims, I use the term "forming" to indicate the steps involving the assembling, in permanent relationship, of the components which constitute the final or complete composite sealing strip, the preferred components, in the present instance, being a flexible metallic backbone member, upon which is applied a plastic material bearing, at certain operative points, a pile fabric, the whole being reinforced where needed by an outer flexible metallic binding strip. I use the term "shaping" to indicate the steps involving the bending of the formed composite strip to a contour such that it can be applied, in fitted relationship, to window or door openings, or in other places where such sealing strip is utilized.

Heretofore, in the manufacture of sealing strips of this type, it has been deemed impossible, or at least impracticable, to shape the composite sealing strip to final contour after a clamping, or locking operation, in which a metallic binding tape is tightly clamped along one or both edges of the sealing strip. The shaping operation involves bending the strip within its lateral plane and if both edges were tightly clamped the operation could not heretofore be performed without buckling the sealing strip so that it became unfit for use.

In the practice of the method disclosed herein, by means of my novel apparatus, that edge of the sealing strip, which lies on the outside of all curves, is formed so as to be more or less longitudinally yieldable and the completed strip is shaped after the last forming operation.

My invention further provides means for automatically controlling the shaping operation to any predetermined angularity or curvature, and automatically cutting the formed strip at the proper point so that it may be assembled, in its operative position, without further forming, shaping or trimming operations.

One important object of the invention, therefore, is the provision of an improved apparatus for producing from a strip, while it is continuously fed, an endless band, of open form, shaped with a plurality of distinct, curved portions, separated by intervening relatively straight portions.

A further object is the provision of an improved apparatus for automatically shaping preformed composite sealing strips.

A further object of the invention is the provision of an improved apparatus for automatically forming, shaping and cutting a sealing strip by a continuous operation.

Another object of the invention is the provision of an improved apparatus for producing sealing strip shaped to any predetermined contour.

Further objects and advantages will appear as the description proceeds. A preferred embodiment of my novel apparatus is illustrated in the accompanying drawings, in which

Fig. 1 is a side elevation of the machine;

Fig. 2 is a top plan view;

Fig. 3 is a section taken on the line 3—3 of Fig. 2;

Fig. 4 is a section taken on the line 4—4 of Fig. 2;

Fig. 5 is a section taken on the line 5—5 of Fig. 4;

Fig. 6 is a section taken on the line 6—6 of Fig. 2;

Fig. 7 is a section taken on the line 7—7 of Fig. 6;

Fig. 8 is a section taken on the line 8—8 of Fig. 7;

Fig. 9 is a section taken on the line 9—9 of Fig. 1;

Fig. 10 is a view showing the cam mechanism;

Fig. 11 is a section taken on the line 11—11 of Fig. 10;

Fig. 12 is a section taken on the line 12—12 of Fig. 1;

Fig. 13 is a perspective view of the partially formed strip shown in section in Fig. 12;

Fig. 14 is a section taken on the line 14—14 of Fig. 1;

Fig. 15 is a perspective view of the partially formed strips as shown in section in Fig. 14;

Fig. 16 is a section taken on the line 16—16 of Fig. 1;

Fig. 17 is a perspective view of the partially formed strip as shown in section in Fig. 16;

Fig. 18 is a section taken on the line 18—18 of Fig. 1;

Fig. 19 is a perspective view of the metal binding tape which is shown in section in Fig. 18;

Fig. 20 is a section taken on the line 20—20 of Fig. 1;

Fig. 21 is a section taken on the line 21—21 of Fig. 1;

Fig. 22 is a section taken on the line 22—22 of Fig. 1;

Figs. 23 to 27 inclusive, show a sealing tape

after successive shaping stages, Fig. 27 showing the final shaped product;

Fig. 28 shows a wiring diagram for automatic control of the apparatus to be described hereinafter.

My apparatus is designed for the production, from a straight metallic strip, of predetermined polygonal shapes comprising substantially straight portions alternating with curved portions. Although hereinafter illustrated in the manufacture of a roughly rectangular sealing strip, it will be apparent that the invention may be utilized to produce triangles, pentagons, or indeed any desired contour which involves successive directional changes comprising straight portions with deviations therefrom, or portions of slight curvature alternating with curves of shorter radius.

The specific apparatus hereinafter described receives a partially formed strip such as shown in Fig. 13, splits it longitudinally, and then performs, upon each portion, certain additional forming operations shown in sequence in Figs. 14 to 19 inclusive. The final forming operation involves the application of a steel binding tape to a serrated edge of said strip, the binding tape being clamped thereon. The composite sealing strip is thereafter subjected to shaping means so as to produce a roughly polygonal shape including curved portions and substantially straight portions alternating in predetermined sequence. The inception of each directional change, the distance between directional changes, and the total length of strip operated upon in each complete cycle are controlled by a suitable timing mechanism. The passage of the strip through the mechanism operates the elements of the timer through the instrumentality of a timing roll in frictional engagement with one of the elements of said strip.

Referring now to the drawings showing specifically a preferred embodiment of the apparatus, a horizontally disposed table or frame member 30 is supported by uprights 31 fixed on a base 32. Spindles 35 and 36 are locked in the frame 30 as shown in Fig. 12. Bushings 37 and 38 are carried by the spindles 35 and 36 respectively. Spindle 35 is vertically movable in slot 39 in the frame and in a link member 40 to permit adjustment. Rolls 33 and 34 are attached by suitable screws or otherwise to gears 41 and 42, the roll and gear assembly rotating on the spindles 35 and 36. The gears 41 and 42 are actuated through the medium of a suitable driving mechanism such as driving gears A in mesh with idler pinions B driven by a motor C, or by other convenient method.

The cutting rolls 33 and 34 are adapted to receive, therebetween, a partially formed blank such as shown in perspective in Fig. 13. The blank comprises a resilient metallic foundation or backbone member 43 provided with a series of spaced transverse slots or perforations 44. The longitudinal edges of the blank are turned inwardly over a wire 45 to form a bead. Surrounding the bead and extending laterally towards the center and longitudinally along the edges is a coating 46 of a pliable material of adhesive characteristics such as rubber. Adhering to said plastic composition is an external layer of fabric material 47 carrying a nap or pile 48. This partially formed blank is inserted between the coacting surfaces of the cutting rolls 33 and 34 and split longitudinally by the cutting edge 49 as shown in Figs. 12 and 13. From this point onward the forming and shaping operations may be performed in duplicate but for simplicity the method is described as applicable to one sealing strips such as shown in Fig. 15.

It is obvious, of course, that two separate machines may be provided to receive, respectively, the two portions of the strip which have been split apart as just described. It is further obvious that two separate forming and shaping units may be mounted on the same frame which units may or may not be operated simultaneously on identical or dissimilar final products. The constructional changes required to render the machine described herein suitable for duplicate operation are comprehended within the knowledge of the skilled mechanic.

Referring to Figs. 1 and 14, 50 indicates a coacting pair of rolls which form upon the sealing strip a discontinuous flange resulting from a succession of upturned flanges 51 along the serrated edge of the spaced tongues 52 separated by the slots 44. The flanges 53 on the lower roll position the advancing strip, and their spacing and contour may be varied as desired. The rolls 50 may be driven in synchronization with the rolls 33 and 34 by the train of driving gears hereinabove mentioned and are mounted on the frame 30 in manner similar to that described for the said rolls 33 and 34.

From rolls 50 the strip is advanced to a further set of forming rolls 54 mounted and driven as described hereinabove for the cutting and flanging rolls. This last mentioned pair of coacting rolls, and the strip as formed thereby are best shown in Figs. 16 and 17 respectively. The upturned flange 51 travels between two peripherally concaved portions 55 on the working surfaces of the rolls 54 whereby the flange is turned inwardly and downwardly as shown in perspective in Fig. 17, providing a bead 56 interrupted by the slots 44 as heretofore described.

Referring now to Figs. 1, 9, 13 and 19, reference numbers 57 and 58 indicate a set of coacting rolls mounted as hereinbefore described for the preceding set of rolls. Roll 57, hereinafter termed a timing roll, carries coaxially therewith a gear 59 (best seen in Fig. 9) which meshes with another gear 60 thereby driving, in synchronized relationship with each other and with the timing roll, the cam wheels 61, 62, 63, 64, 65, and 66. The cam wheels are shown as mounted for rotation on a bracket 67 attached to the frame 30 but may be supported and operated by any convenient means permitting synchronous operation with the timing roll 57. Since all these cam wheels and the mechanism actuated thereby are similar in operative principle, the operation will be described with relation to cam wheel 61.

A rider 68 (see Figs. 10 and 11) is adjustably mounted on the periphery of the wheel 61. The rider is assembled from two matched members 69 and 70 which are separately slidable along the periphery of wheel 61 and may be secured in fixed relationship by tightening the bolt 71. Contact points 72 (Figs. 1 and 9), normally maintained in open circuit by spring 73 are closed when the cam 68 makes contact with roller 74. It is apparent that by adjusting the length of the cam as described immediately hereinabove the closing of the circuit may be controlled as to inception and duration since the roller 74 is wide enough to ride on both halves of the cam. The function and operative relationship of the various circuits will be hereinafter described.

A steel binding tape 75 unwinds from an idly rotatable drum 76 and passes between the cooperating rolls 57 and 58 which are idler rolls, ac-

tuated by their respective pressures on opposed faces of tape **75**, which tape is in turn drawn through the rolls by the action of further rolls **77**, later to be described.

The sealing strip blank does not pass between rolls **57** and **58** but is routed laterally, as shown in Figs. 1 and 18. The cooperating male and female faces of timer roll **57** and roll **58** bow the binding strip slightly in preparation for the succeeding operation. As the binding strip **75** emerges from rolls **57** and **58** it is given a quarter turn, through 90 degrees, and passes into engagement with guiding blocks **78** mounted on a bracket **79** affixed to the frame **30**. The sealing strip also passes within the guide blocks **78**, and as best seen in Fig. 20, the sealing strip and binding strip are positioned at right angles to each other so that, in the succeeding operation, the binding strip may be crimped around the serrated bead **56** thus forming a composite strip having a reinforced, continuous bead. The crimping operation is performed by rolls **77**, which are formed with peripherally concaved working faces as shown in Fig. 21. Rolls **77** are rotatably mounted on frame **30** and are driven, through intermediate driving means D—D—D from motor E.

In the embodiment shown herein a single rotation of the timing roll **57** bears a definite fractional ratio to the length of the shape formed. A single rotation of roll **61** coincides, in peripheral travel, with the length of the shape being formd. Roll **57** may therefore rotate through any even number of times necessary to produce one rotation of cam roll **61**. It is further obvious that, in the embodiment illustrated, each increment of length of binding strip passing under the timing roll corresponds to an identical increment of length around the circumference of the roll **57**. Finally it will be apparent that if there is to be a change in the overall length of the finished sealing strip there must be a corresponding change in the circumference of the timing roll. This is the most simple method of changing the machine operation for a new length, although it is also apparent that by using a train of gears between the timing roll and the cam shaft, any desired relationship may be established by merely changing gears.

Since the accuracy of the shaping and cutting operations, now to be described, depends on the maintenance of a precise rolling contact between the timer roll **57** and the steel binding strip, I have found it most desirable to provide a second driving means E, which, through suitable intermediate gears and sepecifically rolls **77**, pulls the binding tape under the roll **57** while the sealing strip, which is relatively more yieldable, hangs loosely between rolls **77** and **54**. All convenient precautions should be taken to prevent slippage between the aforesaid timer rolls and the steel tape.

The final forming operation (to be distinguished from shaping as defined hereinbefore and hereinafter described) is performed in coacting rolls **78** (Figs. 1 and 22). Coaxial with said driven rolls **78** is a pair of idler rolls **79** which operate through friction between their working faces **80** and the sealing tape, and to a lesser degree by friction at the reduced portions **81** of the driven rolls. The driven rolls are actuated by gears **82** in operative connection with motor E. The roll assembly **78—79** is mounted adjustably on the frame **30**.

A horizontal disk, **83** (Fig. 22) is rotatably mounted so that its outer edge is in frictional engagement with the circumferential face of lower roll **78**, at **84**. The bottom roll is preferably of a special molded friction material. Disk **83** rotates in synchronism with rolls **78**, and the coacting operation of rolls **78, 79**, and **83** performs the final crimping operation on the sealing tape. Stationary surface plate **85**, housing **86** and spindle **87** are supported in any suitable fashion, as by a bracket **88** on frame **30**. The lost motion permitted by idler rolls **79** supplies a lateral speed differential effect during the bending operations incidental to shaping the tape as immediately hereinafter described.

Mounted on the upper end of spindle **87** is a solenoid with a reciprocable armature **90**. The armature **90** has a conical lower portion **91***a* which, when engaged, matches a similarly beveled counterbore on an upper annular portion of disk **83** and forms therewith the engageable surfaces of a clutch. In normal operation this clutch is disengaged and the armature **90** is at rest. An arm **91** (Figs. 4 and 5) is bolted to the clutch member **90** at **92***a* so as to pivot counterclockwise, as seen from above (Fig. 2) when the clutch is engaged. It is apparent that the duration of clutch engagement determines the extent of swing of arm **91**. Affixed to the extremity of arm **91** is a hand member **92** carrying a bracket member **93** which is mounted so as to allow for pivotal motion around the axis **94**. The bracket member is equipped with fingers **95** and **96** extending from its lower surface and adapted to engage the sealing tape as it issues from rolls **78** (Fig. 5).

In normal position, when the clutch is disengaged, the hand member bears against frame **30** at **97**, its position being adjustable by a set screw and lock nut **98**. In this position the sealing tape issues from rolls **78**, and runs straight past fingers **95** and **96**. When the solenoid is energized the armature **90** engages the clutch faces, and the arm **91** rotates carrying bracket **93** and fingers **95** and **96** across the surface plate. The fingers adjust themselves to bear against the sealing tape and swing it horizontally through an angle determined by the duration of clutch engagement, the arm thereafter being returned to a rest position by spring **91***b*, Fig. 3. The reciprocation of the armature tending to produce a corresponding up and down movement in the bracket member **93** is counteracted by the spring mounting **100** of the bracket on the hand member **92**.

The counter imparted to the sealing strip is further controlled by a sweep mechanism consisting of a series of solenoids **62S, 63S, 64S, 65S** arranged on a mounting plate **101** at the rear of the frame (Figs. 2, 6, and 28) and attached to said frame by suitable bracket means. A plunger plate **102**, reciprocable on a shaft **103** carries adjustable tappets **104** upon which plungers **105** abut when the solenoids are energized. The setting of a particular tappet determines the extent of forward travel of the plunger plate when the corresponding solenoid is energized so as to advance its plunger to bear upon the tappet. On the forward end of the shaft **103**, and normally retracted by spring **106**, is a roller **107** disposed, when in operative position by reason of advance of one of the solenoid plungers, to bring pressure to bear against the edge of the sealing tape as it emerges from rolls **78** and immediately

preceding its engagement by fingers 95 and 96 on the movable clutch arm. In this operation the shoulder 83a of the rotating disk 83 serves as an anvil member, the dynamic cooperating element which bears against the composite strip being the roll 107. By varying the pressure of the roll 107 against the tape it is apparent that any length of sweep can be achieved, including radii considerably greater than those formed by the clutch mechanism, said sweep being controlled by the length and positioning of the timing cams operating the solenoids 62S, etc. Each solenoid is controlled by a separate cam wheel as will hereafter be described with reference to the wiring diagram shown in Fig. 28, and each tappet is, in practice, set for a different amount of advance, as indicated in Fig. 28.

The development of a particular sealing tape contour, such as shown in Fig. 27, is illustrated in progressive steps in Figs. 23 to 26 inclusive, the broken lines in each figure representing the position of the contoured strip when the shaping means has returned to normal resting position after shaping the strip as shown in the full line position of the same figure. The effect of the action of the sweep mechanism is illustrated by the gentle curvature of the sides of the composite strip, as seen for instance in Fig. 27.

The cut-off mechanism is best shown in Figs. 1 and 4. It comprises a solenoid 108 in the axis of which reciprocates a plunger 109 which is actuated, when the solenoid is energized, by an armature 110. Both armature and plunger are normally retracted by springs 111 and 112 when the solenoid circuit is open. At its lower end the plunger carries a cutting tool which provides, in conjunction with a lower block 114, a pair of cutting edges between which the sealing tape passes at the termination of the shaping operation. This cut-off assembly is mounted on a bracket 115 on frame 30.

The electrical control system may be considered with reference to three separate functions, namely, the clutch arm control, the sweep control, and the cut-off control.

With reference to Fig. 28, the cam wheel 61 revolves in synchronism with the timing wheel 57 through the meshed gears 59 and 60. As cam 68 passes under roller 74 it closes contact points 72 and the circuit is completed through solenoid 89 engaging the clutch at 91a and rotating the arm 91 until the circuit is opened by the travel of cam 68 past the roller 74. As hereinabove described this produces a bend in the sealing strip. Except as otherwise influenced by the sweep mechanism described in the next paragraph hereinbelow, the strip again assumes a direct path parallel to frame member 30 until the next cam actuates its contact, at which time another bend is produced. The spacing of the cams determines the spacing of straight portions and curves on the sealing strip.

The sweep control mechanism is actuated by solenoids 62S, 63S, 64S and 65S when their respective circuits are closed through the medium of cam wheels 62, 63, 64, and 65. The cam spacing is so arranged that not more than one solenoid is energized at the same time so that the plunger disk 102 is controlled as to its length of travel by the setting of a tappet corresponding to the energized solenoid.

The cut-off mechanism is controlled by cam wheel 66. When the cam closes the contact points 116 the circuit is completed through line 118, contact points 119 (normally closed), line 120 and coil 117. As coil 117 is energized the armature 121 closes points 122 (normally open). A circuit is thereupon established through line 123, coil 108, line 124, points 122, and line 125. The main solenoid 108 being energized the plunger actuates cutting tool 113 and cuts the sealing tape. As the plunger descends an arm 126 carried thereby strikes armature 127 opening points 119. This breaks the circuit through coil 117 whereupon armature 121 is retracted by spring 128 thereby breaking the circuit through solenoid 108. The plunger with its cutting tool 113 is immediately withdrawn to its normal position, where it remains until the cam wheel 66 again closes contact points 116 to repeat the cycle. While contact points 116 are closed, the coil 129 is energized only to the extent that it cooperates with plunger arm 126 to open points 119. Points 119 are normally closed even though armature 127 is under the influence of the magnetic flux generated in coil 129.

From a consideration of the method of forming and shaping the sealing strip as hereinabove described, it is apparent that the strip has been completely formed, including the application of the binding strip, before the desired shape is imparted, as shown. With special reference to Fig. 22, and considering a shaping operation as being performed on the sealing tape as it moves towards the observer while being carried generally towards the right by the clutch arm, it can be seen that the portion of the sealing tape which carries the pile is on the inside of the curve, whereas the portion to which the steel tape is applied is on the outside of the curve and is subject to increased tension. The uneven pull on the rolls is compensated for by the idler mounting of rolls 79 which may, as required, travel faster or slower than driven rolls 78, and the tendency of the outer edge of the tape to be stretched is eased by the slotted arrangement of one edge of the tape, as shown in Figs. 15 and 17, which permits a certain amount of play, even within the steel binding.

When a definite length of strip has been formed and shaped to the desired regular or irregular polygonal contour, and has been cut from the advancing strip as described above, the loose ends may be welded or otherwise joined together so as to form a closed frame member for sealing the interstices of a window or door opening, or for any suitable purpose to which the embodiment hereinabove described may be adapted.

While I have shown a preferred apparatus for carrying out the steps hereinabove described, it is apparent that modifications thereof will occur to those skilled in the art, which modifications do not alter the essential characteristics of the machine. It is further apparent that the disclosed apparatus, as included within the scope of the appended claims, may be used to perform shaping operations on material other than sealing strip, but exhibiting a general similarity thereto.

In the appended claims the term "polygonal" is used in connection with the contour of the finished articles for want of a better term of breadth commensurate with the variety of shapes capable of being produced by my apparatus. By the term "polygonal" or "polygonal shape" I mean contours similar to that illustrated in one embodiment in Figs. 23 to 27 inclusive of the drawings appended herewith. I may, of course, produce shapes of obviously regular appearance, such as substantially rectangular contours hav-

ing straight sides and rounded corners, or I may produce articles such as shown in Fig. 27 wherein the sides have a slightly curved sweep, and a certain misshapen appearance is incident on the variation in the length of the sides and the curvature of the corners. The applicability of this latter shape to automobile vehicle windows of modern design is rather obvious.

What I claim is:

1. Apparatus for producing polygonal shapes from continuous strip comprising means for continuously advancing said strip, shaping means including a swinging arm, a clutch member operatively connected thereto, the circumferential extent of swing of said arm being determined by the period of engagement of said clutch member, said swinging arm being disposed to intermittently engage said strip and bend it in contact with a curved anvil member, and timing means for determining the period and duration of engagement of said swinging arm.

2. Apparatus for producing sealing strip members of polygonal shape comprising means for continuously advancing a continuous sealing strip element through forming rolls, means for shaping an interrupted succession of curves along said advancing sealing strip, and timing means including a series of rotatable cam wheels, a series of cam followers respectively operated by said cam wheels for actuating make-and-break contacts, a series of solenoids respectively energized by the intermittent closing of said contacts, said solenoids being operatively connected to said shaping means, for controlling the application and extent of said shaping means, said timing means being actuated by the advance of said binding strip between timer rolls geared to said cam wheels.

3. Apparatus for producing sealing strip members of polygonal shape comprising means for continuously advancing a sealing strip element between forming rolls, shaping means comprising a swinging clutch arm intermittently energized so as to produce an interrupted succession of longitudinal curves along said advancing composite strip, additional shaping means including a sweep mechanism comprising a member intermittently moved into engagement with the advancing edge of said composite strip to produce longitudinal curvatures of longer radii than developed by said clutch arm means, and timing means in operative contact with said advancing strip for controlling the application and extent of swing of said clutch arm and the movement of said sweep mechanism.

4. Apparatus for producing sealing strip members of polygonal shape comprising means for continuously advancing a sealing strip element between forming rolls, shaping means comprising a swinging clutch arm intermittently energized so as to produce an interrupted succession of longitudinal curves along said advancing composite strip, and additional shaping means including a sweep mechanism comprising a member intermittently moved into engagement with the advancing edge of said composite strip to produce longitudinal curvatures of longer radii than developed by said clutch arm means.

5. Apparatus for producing sealing strip members of polygonal shape comprising means for continuously advancing a sealing strip element between forming rolls, shaping means comprising a swinging clutch arm intermittently energized so as to produce an interrupted succession of longitudinal curves along said advancing composite strip, additional shaping means including a sweep mechanism comprising a member intermittently moved into engagement with the advancing edge of said composite strip to produce longitudinal curvatures of longer radii than developed by said clutch arm means, and timing means for controlling the application and extent of swing of said clutch arm and the movement of said sweep mechanism.

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