Sept. 26, 1944. B. MEITNER 2,359,140

PUNCHING AND FEEDING DEVICE

Filed Feb. 3, 1943 2 Sheets-Sheet 1

FIG. 1.

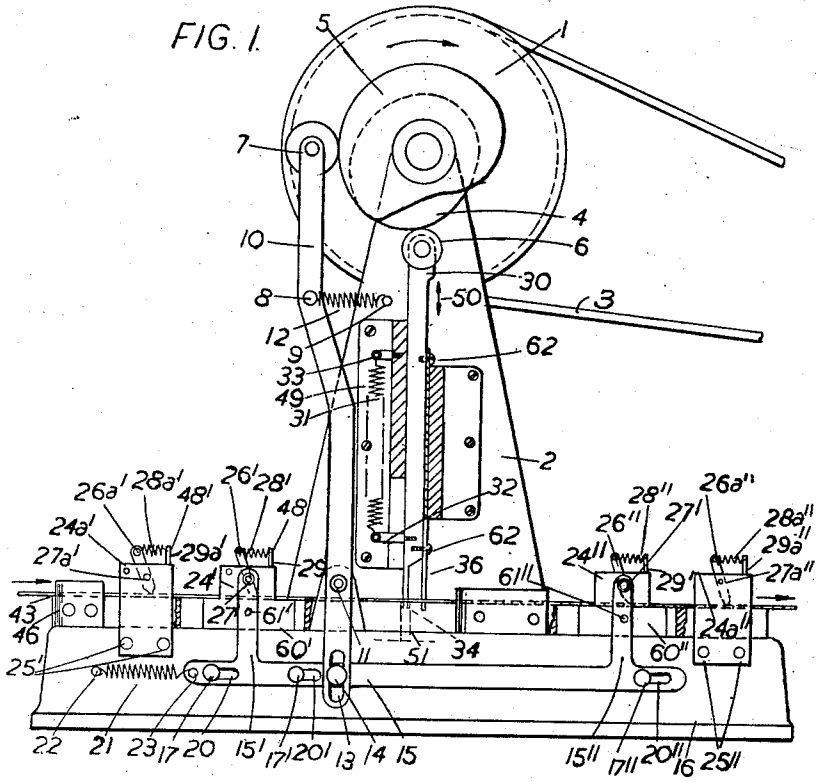


FIG. 2.

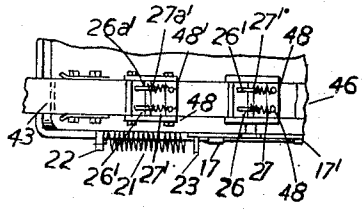


FIG. 3.

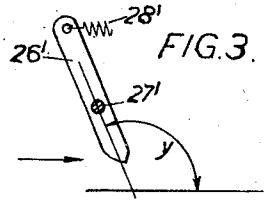


FIG. 4.

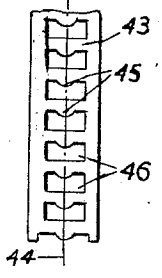
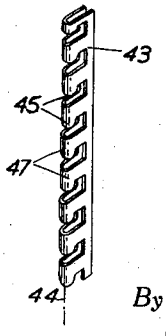


FIG. 5.



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Sept. 26, 1944. B. MEITNER 2,359,140

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Filed Feb. 3, 1943 2 Sheets-Sheet 2

FIG.6.

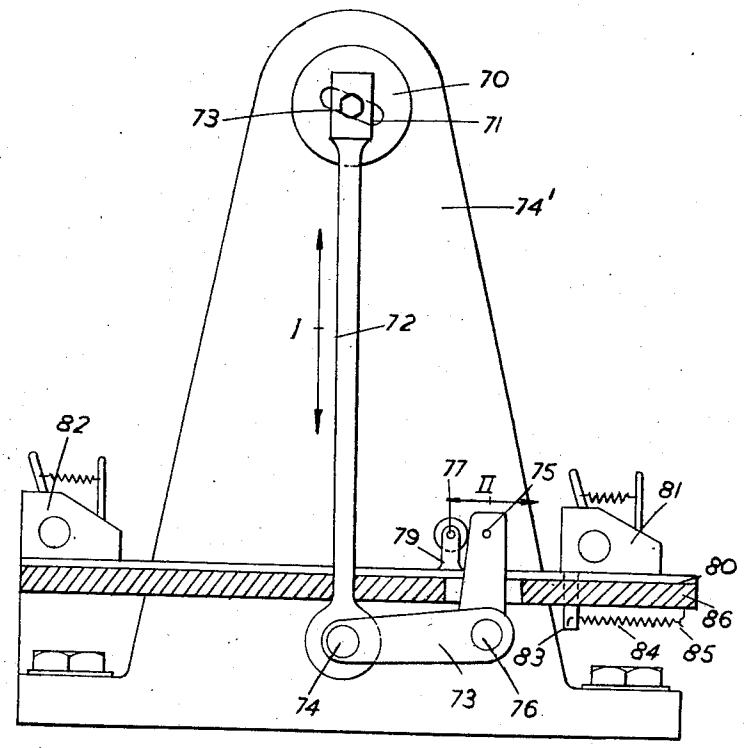
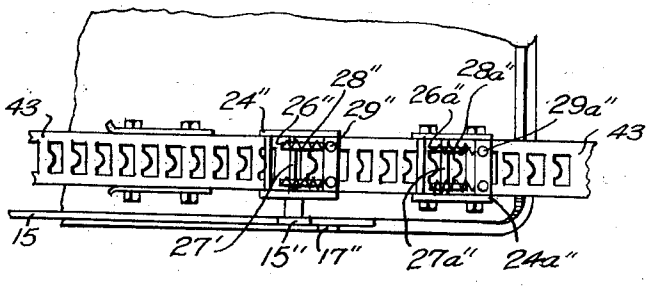


FIG.7.



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UNITED STATES PATENT OFFICE

2,359,140

PUNCHING AND FEEDING DEVICE

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Application February 3, 1943, Serial No. 474,512
In Great Britain July 10, 1942

5 Claims. (Cl. 164—88)

The present invention relates to apparatus for feeding and punching strips of metal or plastic material, particularly for use in the manufacture of sliding clasp fasteners.

It is an object of the invention to provide an inexpensive and practical apparatus of the above described type by means of which a row of connected embryo fastener members is made by suitably punching a strip of material, which strip may subsequently be bent lengthwise so as to assume a U-shape when viewed endwise and to form a row of fastener members which may be bodily attached to a tape, the members being afterwards separated from one another on the tape, for example by means of the apparatus described in the specification of my Patent No. 2,301,064, granted November 3, 1942 (Serial No. 394,416, filed May 21, 1941).

It is another object of my invention to provide an apparatus by means of which the strip is punched at equal distances so as to assure that the connected members of the finished row are as exactly equidistant from one another as possible.

It is a further object of my invention to provide a feeding device for advancing the strip of material in a step by step manner by equal distances and for thus feeding the strip intermittently to the punch proper of the apparatus.

Other objects and advantages of the invention will become apparent from the sub-joined detailed description taken in conjunction with the accompanying diagrammatic drawings, which are given by example only, and in which—

Fig. 1 is a side elevation of an apparatus according to the invention.

Fig. 2 is a plan view of one of the two feeding and holding devices of the apparatus shown in Fig. 1.

Fig. 3 is a side view of a detail of Figs. 1 and 2.

Fig. 4 shows a punched strip of plastic material.

Fig. 5 shows the strip after being bent.

Fig. 6 illustrates a modified feeding arrangement.

Fig. 7 is a plan view similar to that of Fig. 2, but showing the other of the two feeding and holding devices.

Referring first to Figs. 4 and 5 a strip 43 of plastic material, after being punched has equidistant punch holes 46 (see Fig. 4). The contour of each punched hole has a curved part forming a projection 45 arranged substantially in the longitudinal centre line 44 of the strip. The strip is subsequently bent along the line 44 as shown in Fig. 5, thus forming a row of connected fastener members 47, each having a coupling projection formed by the projection 45.

The apparatus for feeding and punching the strip 43 (see Figs. 1, 2 and 3) comprises a driving pulley 1, journalled on a bracket 2 for rotation by a belt 3. The pulley 1 has two cam discs 4 and 5 fixed on the shaft of the pulley 1 or otherwise mounted so as to rotate therewith. A lever 10 pivoted intermediate its ends at 11 carries at one end a roller 7 which is held in engagement with the edge of the cam 5 by a spring 12 which is attached to the lever 10 at 8 and to the bracket 2 at 9. The other end of the lever is slotted at 13 and engages a stud 14 on a slide bar 15 which is mounted on the base 16 of the apparatus by means of studs 17, 17' and 17'' engaging in slots 20, 20' and 20'' respectively in the bar 15. The bar 15 is normally urged towards the left in Fig. 1 by the pull of the spring 12 on the lever 10. A spring 21 fixed to the base 16 at 22 and to the bar 15 at 23 is provided to assist the action of the spring 12. The base 16 has a guide table 46 to receive and support the strip 43 of metal or plastic material. The bar 15 has two upturned parts 15' and 15'' to each of which is secured a reciprocatable member 24' and 24'' respectively. Each reciprocatable member is so shaped as to allow passage for the strip 43. Similarly shaped, but stationary, members 24a' and 24a'' are fixed to the base 16 by screws 25' and 25'' respectively. Each of the members 24', 24'', 24a' and 24a'' carries two levers 26', 26'', 26a' and 26a'' respectively (see also Figs. 2 and 7), one of the levers being illustrated in side view in Fig. 3. The levers are pivoted at 27', 27'', 27a' and 27a'' respectively so that they form obtuse angles y with the direction of movement of the strip 43 which direction is indicated by arrows. The levers bear resiliently against the upper surface of the strip 43 by means of springs 28', 28'', 28a' and 28a'' fixed to studs 48', 48'', 48a', 48a'' at 29', 29'', 29a' and 29a'' respectively. The lever ends bearing against the strip 43 are shaped as more clearly shown in Fig. 3. The parts 60' and 60'' of the guide table 46 are connected by screws 61' and 61'' to the upturned parts 15' and 15'' respectively so as to reciprocate together with the bar 15 and the reciprocating members 24' and 24''.

Mounted in a suitable guide 49 on the bracket 2 are a punch 30 and a positioning rod 36 fixed thereto by screws 62. The punch 30 carries a roller 6 at its upper end which is held in engagement with the edge of the cam 4 by means

of a spring 31 attached to the punch 30 at 32 and to the guide 49 at 33.

The operation of the arrangement is as follows: The pulley 1 is rotated in a clock-wise direction as indicated in Fig. 1 so as similarly to rotate the cams 4 and 5. Under control of the cam 5 and the action of the springs 12 and 21, the lever 10 is actuated to move the slide bar 15 towards the left. During this movement the levers 26′ and 26″ slide along the upper surface, and the parts 60′ and 60″ along the lower surface of the strip 43 which is assumed to be already in the position illustrated in Fig. 1. However, displacement of the strip 43 towards the left is prevented by the levers 26a′ and 26a″ of the stationary members 24a′ and 24a″ owing to friction between the end of the levers 26a′ and 26a″ bearing against the upper surface of the strip 43 under pressure exerted by the springs 28a′ and 28a″. After this movement has taken place the lever 10 is returned under the control of the cam 5 thus moving the reciprocatable members 24′ and 24″ and the reciprocatable parts 60′ and 60″ to the right. During this movement the strip 43 is moved to the right by friction between the upper surface of the strip 43 and the ends of the levers 26′ and 26″ bearing against this surface under the action of the springs 28′ and 28″ and by friction between the lower surface of the strip 43 and the upper surfaces of the reciprocatable parts 60′ and 60″ against which the strip is pressed by the levers 26′ and 26″ respectively.

It will be appreciated that when the leading end of the strip is inserted between the reciprocatable member 24′ and the part 60′ the feed of the strip commences, the strip being advanced intermittently by the action of the member 24′ and the part 60′. When the leading end of the strip reaches the reciprocatable member 24″ and the part 60″ the strip is advanced by the action of both the members 24′ and 24″ and both the parts 60′ and 60″, as described hereinbefore. When the rear end of the strip has cleared the member 24′ and the part 60′ the feed of the strip is continued by the member 24″ and the part 60″ until the rear end of the strip leaves the member 24″ and the part 60″. Thus the provision of the two feeding devices (24a′, 24′ 60′ and 24a″, 24″ and 60″), one on either side of the punch 30, enables the entire length of the strip to be fed through the apparatus.

The timing of the cams 4 and 5 is such that between successive feeding movements of the feeding devices under the control of the cam 5, the punch 30 and the positioning rod 36 are operated and retracted under control of the cam 4. The punch 30 and positioning rod 36 are moved bodily downwards, their arrangement being such that the positioning rod 36, which is somewhat longer than the punch 30, engages in a hole previously punched, in the immediate vicinity of the punch while the cutting edge 34 of the punch punches a hole into the strip. The purpose of the rod 36 is to position accurately the strip immediately in the vicinity of the punch so as to ensure that the punch operates at its correct place on the strip.

The guide table 46 is provided with a die 51 and a suitable recess to accommodate the downward travel of the punch 30 during the actual punching movement and the end of the positioning rod respectively. After the punching has been completed the punch 30 is raised under control of the cam 4 and the action of the spring 31, whereby the punch 30 and the rod 36 are lifted bodily clear of the strip 43. When the punch and positioning rod are disengaged from the strip, the strip is ready to be advanced again preparatory to the punching of the next hole.

Many modifications of the embodiment just described are possible without departing from the invention. For example, instead of equipping the punch with a single cutting edge and arranging for the feed to advance the strip a distance equal to the distance between two adjacent punch holes at a time, the punch may be equipped with a plurality of cutting edges, and the feed adapted to advance the strip a corresponding number of punch holes at a time. In this case, the holes would be punched successively in groups instead of individually as in the former case. Again, instead of arranging for the feed and co-acting punch and positioning device to be actuated once per revolution of the driving pulley of the apparatus, the cams controlling the actuation of these parts may be contoured so that these parts are actuated a number of times, say twice, per revolution of the driving pulley.

A modified feeding device is illustrated in Fig. 6 in which only the reciprocatable members and parts and their actuating means are shown, while the stationary members (corresponding to the members 24a′ and 24a″ of Fig. 1), the punch, the positioning rod and the like have been omitted.

In Fig. 6, a disc 70 is journalled on a bracket 74′. The disc 70 is rotatable together with the cam (not shown) for actuating the punch and positioning rod, and is provided with a slot 71 for attaching eccentrically a connecting rod 72 by means of a nut 73. The connecting rod 72 is pivotally connected at 74 to one arm 73 of a bell-crank lever 75 pivoted at 76. A roller 77 is fixed to an upright 79 which is mounted on a reciprocatable part 80 of the guide table for the strip of material. The reciprocatable members 81 and 82 are fixed to the reciprocatable part 80. Each member is so shaped as to allow passage for the strip of material between the member and part 80, and carries a pair of levers, the construction, arrangement and function of which are similar to the corresponding levers described hereinbefore with reference to Figs. 1, 2 and 3. Fixed to the reciprocatable member 81 is a stud 83 to which one end of a spring 84 is attached, the other end of the spring being attached to the frame 86 of the apparatus at 85. The spring 84 urges the reciprocatable member 81 and therewith the part 80, the upright 79, the roller 77 and the reciprocatable member 82 to the right, thus causing the roller 77 to bear against the bar 75.

In operation, rotation of the disc 70 causes the rod 72 to move up and down as indicated by the vertical arrows I. Thereby, the lever arm 75 is caused to move in a horizontal direction as indicated by the horizontal arrows II. When the arm 75 moves to the left it pushes the roller 77, and therewith the reciprocatable part 80 and members 81 and 82, to the left. When the arm 75 moves to the right the reciprocatable part 80 and members 81 and 82 are moved to the right under the action of the spring 84. During each complete cycle of movement the strip of material is advanced by one step similarly as explained hereinbefore with reference to Figs. 1, 2, and 3.

The nut 73 allows the rod 72 to be fixed more or less excentrically with respect to the disc 70. It will easily be seen that when the nut 73 is shifted towards one end of the slot 71 the vertical movement of the rod 72 and thereby the horizontal movement of the arm 75 are increased, thus increasing the length by which the strip of material is advanced during each step. Thus, the feed may be adjusted according to requirements.

Again modifications of the feeding device illustrated in Fig. 6 are possible. For example, the disc 70 may be replaced by a cranked shaft to which the rod 72 is attached so as to be caused to move up and down.

It will be appreciated from the foregoing description that the invention provides a simple apparatus which effects correct feeding and punching of strips of plastic or metallic material, as is particularly required in the manufacture of sliding clasp fasteners, with greater speed and precision than was for this purpose obtainable hitherto by reason of the automaticity, continuity and regularity afforded by the apparatus.

What I claim is:

1. Apparatus for punching a strip of material at equidistant places along its longitudinal direction comprising: a driving shaft, a device for feeding the strip of material, a punch, a cutting edge on said punch for punching holes into the strip of material, a positioning device arranged to engage and position with respect to said cutting edge a previously punched hole in the vicinity of said cutting edge, a first actuating member for actuating said feeding device intermittently to advance the strip a predetermined distance, a second actuating member for actuating said punch and said positioning device in timed relationship to the feeding movements of said feeding device so as to render said punch and said positioning device operable in the intervals between successive feeding movements, and cams mounted on said driving shaft for actuating said two actuating members.

2. Apparatus as claimed in claim 1, said cams being contoured to provide for one feeding movement and one punching operation per revolution of the cams.

3. Apparatus for punching a strip of material at equidistant places along its longitudinal direction comprising: a driving shaft, a device for feeding the strip of material, a punch, a cutting edge on said punch for punching holes into the strip of material, a positioning device arranged to engage and position with respect to said cutting edge a previously punched hole in the vicinity of said cutting edge, a first actuating member for actuating said feeding device intermittently to advance the strip a predetermined distance, a second actuating member for actuating said punch and said positioning device in timed relationship to the feeding movements of said feeding device so as to render said punch and said positioning device operable in the intervals between successive feeding movements, said first actuating member including a rod attached excentrically to said driving shaft, and means mounted on said driving shaft for actuating said second actuating member.

4. An apparatus as claimed in claim 3, comprising means for adjusting the amount of excentricity of said rod.

5. A feeding device for advancing a strip of material in a step by step manner comprising: a member reciprocatable in the direction of movement of the strip, and a stationary member, each of said members carrying two levers, the levers of each member being arranged at either side of the longitudinal centre line of the strip, each lever being arranged and adapted to bear resiliently against a surface of the strip, the line connecting the pivot of each lever to the lever point that bears against the strip forming an obtuse angle with the forward direction of movement of the strip whereby, in operation, the reciprocatable member during each forward stroke advances the strip of material by one step owing to the friction between the strip and the levers of the reciprocatable member, while during each rearward stroke the levers of the reciprocatable member slide over the strip, rearward movement of the strip being prevented by friction between the strip and the levers of said stationary member.

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