Jan. 1, 1946. S. FRANKEL 2,391,891

CLIP FORMING AND APPLYING MACHINE

Filed Jan. 21, 1944 4 Sheets-Sheet 1

Fig.1.

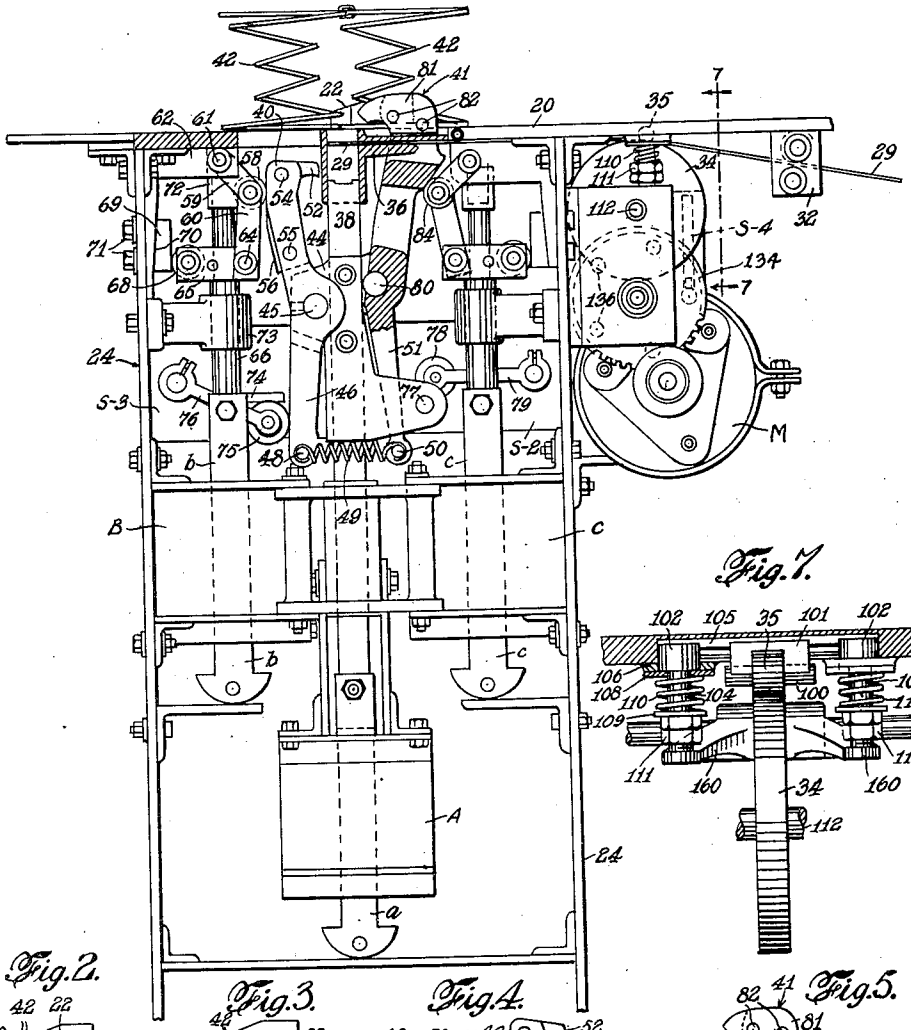


Fig.7.

Fig.2.

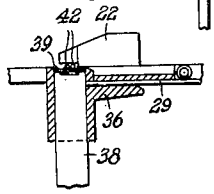


Fig.3.

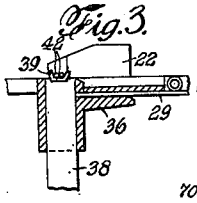


Fig.4.

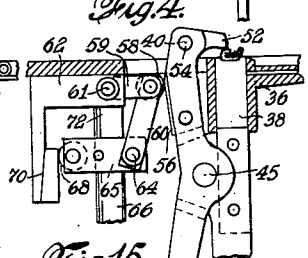


Fig.5.

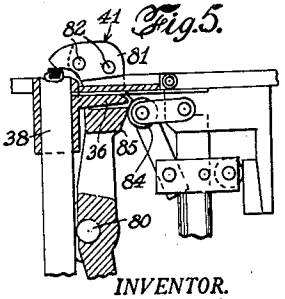


Fig.6.

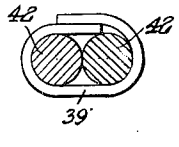


Fig.14.

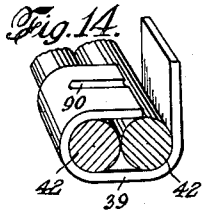
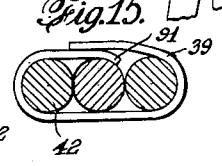


Fig.15.



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CLIP FORMING AND APPLYING MACHINE

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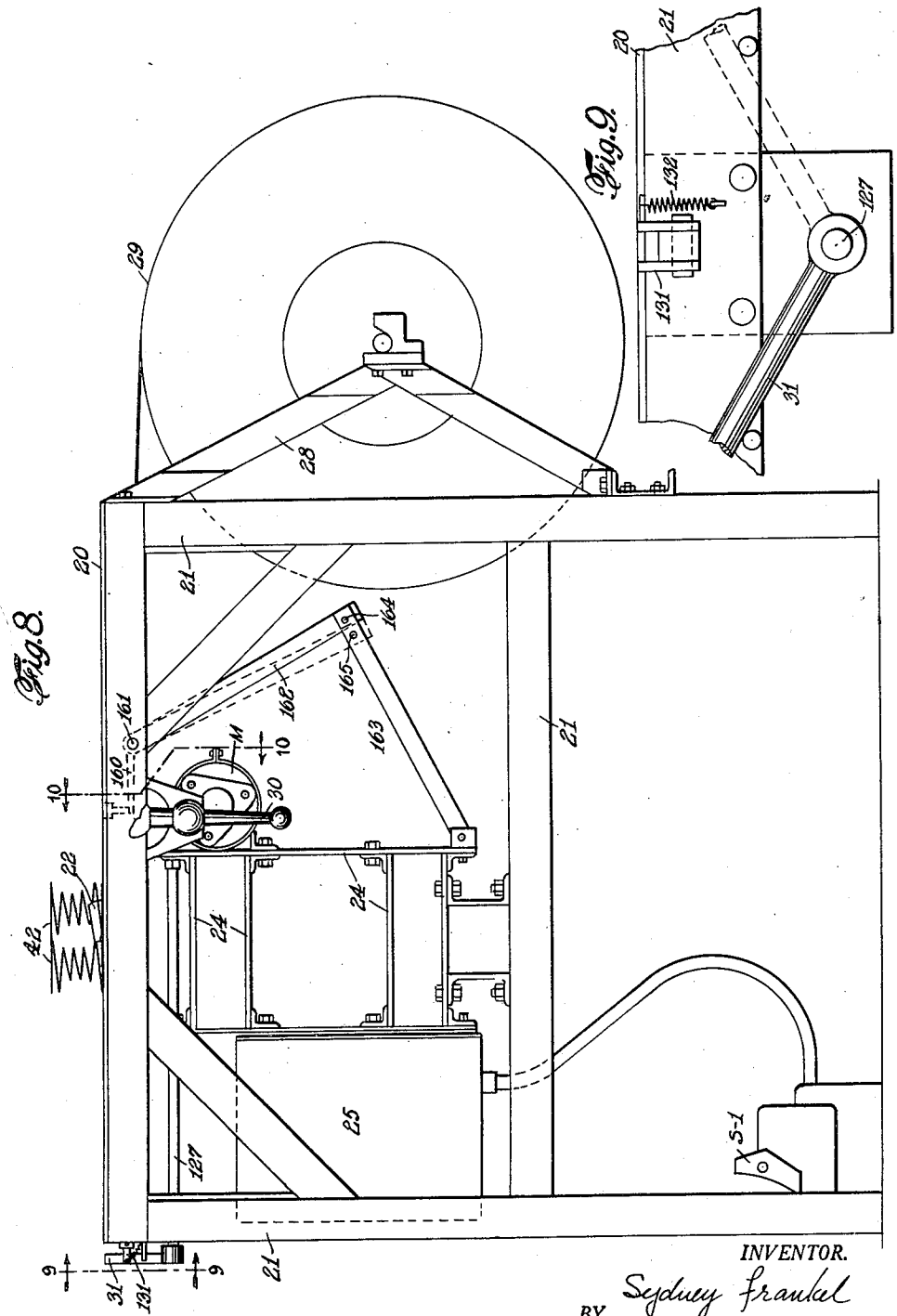

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CLIP FORMING AND APPLYING MACHINE

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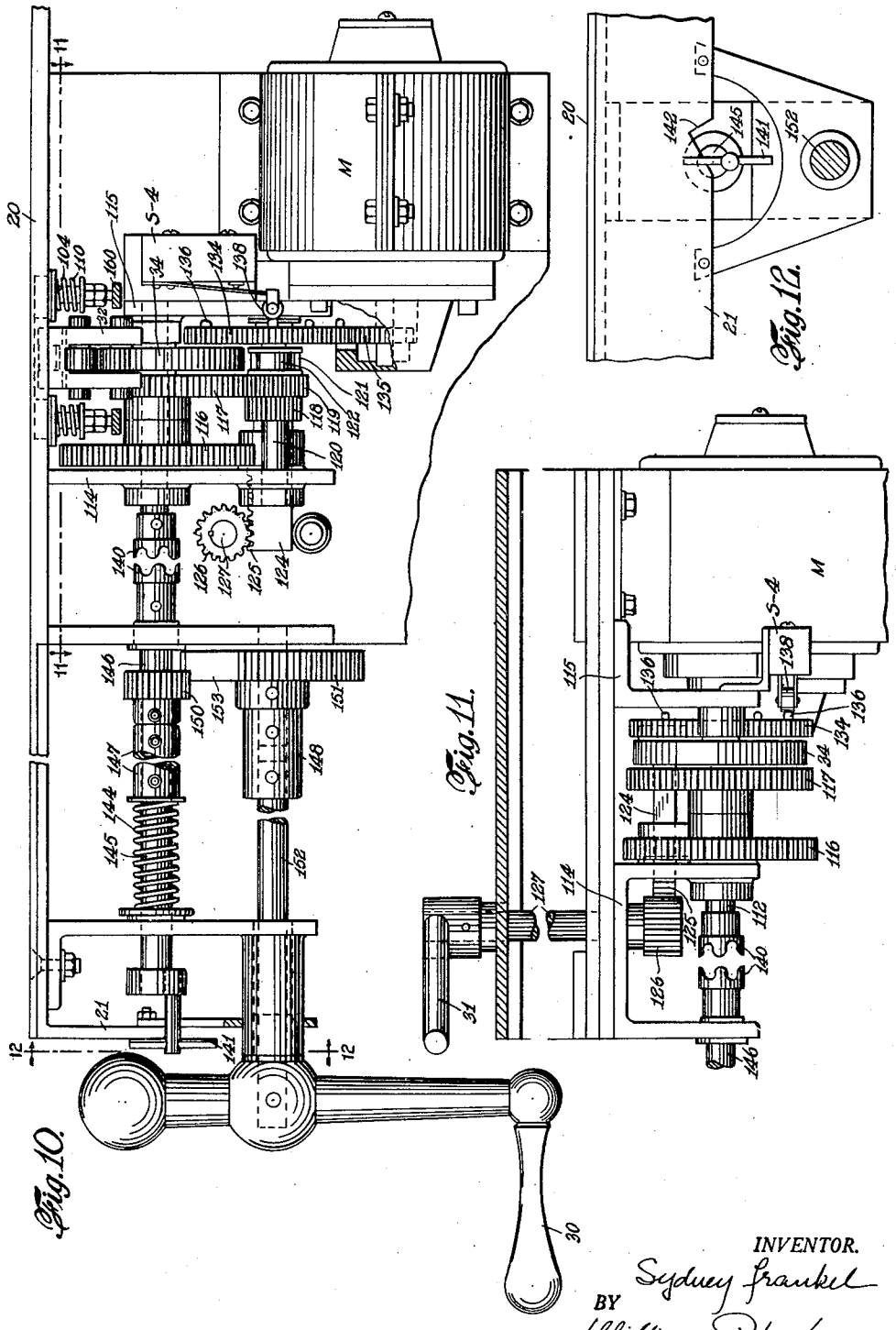

Fig. 10.

Fig. 11.

Fig. 12.

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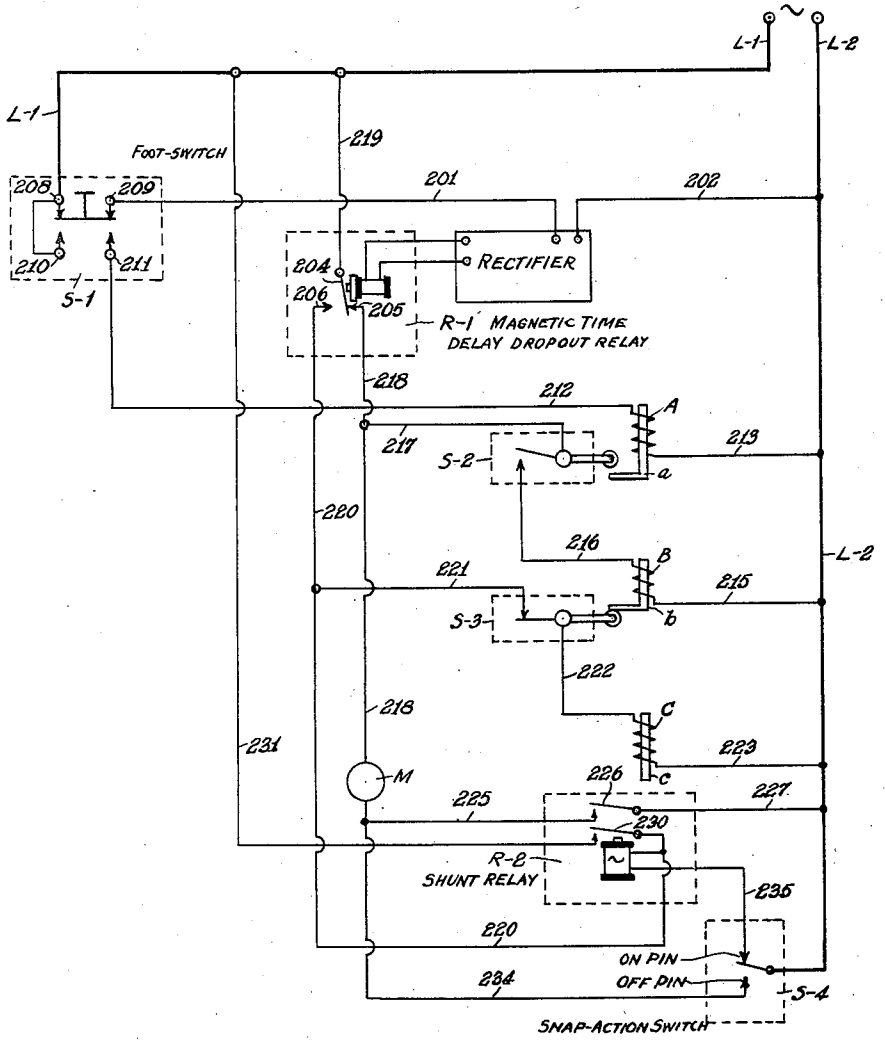
Fig. 13.



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Patented Jan. 1, 1946 2,391,891

UNITED STATES PATENT OFFICE

2,391,891

CLIP FORMING AND APPLYING MACHINE

Sydney Frankel, New York, N. Y., assignor, by mesne assignments, to Murray J. Rymland, Baltimore, Md.

Application January 21, 1944, Serial No. 519,106

7 Claims. (Cl. 140—11)

The invention relates to a machine for making metal clips and applying them to articles to be secured together. More particularly, it relates to a machine for converting flat blanks of metal or other suitable material into clips and bending them around the articles to be fastened thereby, with particular application to the assembling of the several elements of spring cushion elements. In the preferred form of the invention the clips are formed directly from continuous strip material.

In assembling the coil springs, tie wires, border wires and similar elements of upholstery spring assemblies and like structures, adjacent spring elements are commonly fastened together at their points of contact and are also fastened to tie and border wires. For this purpose there are often used small metal straps or clips which are bent around the wire elements to be held together. Such clips are usually preformed or partially bent to shape and thereafter assembled on the parts to be joined and compressed or clinched by some suitable tool. These operations are obviously laborious and time consuming.

The principal objects of this invention are:

(*a*) To provide a machine for forming clips directly from continuous strip stock and applying them to the objects to be bound together;

(*b*) To provide such a machine which forms and finishes the clips directly on the objects to which they are applied;

(*c*) To provide a semi-automatic clip forming and applying machine in which the operator has merely to insert and remove the elements to which the clips are applied and to operate a single control;

(*d*) To provide an electrically operated machine in which the sequence of necessary operations is carried out by automatic electrical controls;

(*e*) To provide novel clip forming and applying apparatus adapted for operation by any suitable source of reciprocating motion sequentially applied to the elements thereof;

(*f*) To provide a clip-forming machine which may be adjusted to form clips of different sizes;

(*g*) To provide strip-material feeding apparatus which will deliver a measured amount of stock to the clip-forming mechanism.

Other objects and advantages of the invention will in part appear and in part will be obvious from the detailed description of the present preferred embodiment of the invention.

The invention accordingly comprises the features of construction, combination of elements, and arrangements of parts hereinafter exemplified. Although the invention is illustrated as embodied in a machine for applying clips to spring assemblies, it is to be understood that it is not limited to this use and may be used for making and applying clips to other objects.

In the drawings,

Fig. 1 is a side elevation of the apparatus for forming and applying clips;

Figs. 2, 3, 4 and 5 are detailed views of some of the clip forming and applying parts showing the sequence of operations in the making of a finished clip;

Fig. 6 is an end view of one form of clip, greatly enlarged, bent about two wires for joining them together;

Fig. 7 is a detailed view, taken on the line 7—7 of Fig. 1, showing the mechanism for supporting the upper feed roller and for releasing the tension thereon:

Fig. 8 is a side elevation showing the general construction of the machine, some parts being omitted;

Fig. 9 is a detail of the gear shifting lever, taken on the line 9—9 of Fig. 8;

Fig. 10 is a side elevation, taken on the line 10—10 of Fig. 8, of the feeding mechanism, both automatic and hand operated, for the strip material;

Fig. 11 is a plan view of the automatic strip feeding mechanism, taken on the line 11—11 of Fig. 10;

Fig. 12 is a detail view of the clutch release, taken on the line 12—12 of Fig. 10;

Fig. 13 is a circuit diagram showing the electrical controls and their connections;

Fig. 14 is a perspective view of a partially formed clip provided with an indentation to prevent slipping; and

Fig. 15 is an end view of a clip, greatly enlarged surrounding three wires.

General description

The embodiment of the invention shown in the drawings is an electrically operated machine adapted for assembling spring cushion elements by clipping together the several parts thereof. As shown in Fig. 8 the machine is in the general form of a table having a flat top 20 supported by a suitable frame 21. The table top is unencumbered, so that the assembled spring structure will freely slide across its surface as it is made, except for a holding device 22 under which the end coils of the springs and the other parts to be clipped together are inserted.

The mechanism which forms and applies the metal clips is supported beneath the table top in and on a frame 24 to which is also attached a box 25 in which some of the electrical apparatus is enclosed. At the floor level in a convenient position for the operator, who stands or sits at the left side of the machine as shown in Fig. 8, is a foot switch S—1 by which the machine is controlled. At the back of the machine is a bracket 28 holding a reel of metal strip 29 from which the clips are made.

On the right side of the machine (the front in Fig. 8) is a crank 30 for manually feeding the strip material into the clip forming mechanism when the machine is first started or when a new reel of material is inserted therein. In front of the operator, on the left side of Fig. 8, is a gear shift lever 31 which is used for changing the gear ratio in the feeding mechanism to change the size of the clip.

Referring to Fig. 1, the strip material 29 comes into the machine through a pair of guide rollers carried by the bracket 2, thence through the feed rollers 34 and 35 and across the guide 36 in which a die 38 reciprocates. The die moving upwardly cuts from the strip 29 a blank 39 (Fig. 2) from which the clip is formed. In its upward movement the die causes the blank to impinge upon the articles to be clipped together and since the die has a face formed with a central depression it bends the ends of the blank upwardly about the object, giving it a U-shape with upstanding wings on either side of the object as shown in Fig. 3.

A first clincher 40 moves up and down with the die and as the die completes its initial stroke the clincher is pushed inwardly as shown in Fig. 4 to bend down one of the wings of the partially formed clip. Following this the clincher 40 is retracted and while the die is still in raised position against the clip a second clincher 41 is pushed in from the opposite side to bend down the other wing of the clip as shown in Fig. 5, into the final form shown in Fig. 6 or 15. The clincher 41 is then withdrawn, the die and the first clincher 40 descend to their original position, the proper amount of strip material 29 is automatically fed into the guide 36 and the machine is ready to repeat its cycle of operations. The movements of parts described above are brought about by means of the three solenoids A, B and C which are operated in properly timed sequence by the electrical mechanism hereinafter described.

Clip forming mechanism

Referring to Fig. 1, supported beneath the table top 20 in the framework 24 is the mechanism for cutting blanks from the strip material 29 and forming it into clips around members to be joined together, such as the coil springs 42 which are held against upward movement by the holding device 22. This mechanism will now be described in detail.

The guide 36 is secured in the table top 20 and provides a bearing in which the die 38 reciprocates. The die is connected to the plunger *a* of the solenoid A and is moved upwardly thereby. Connected to the die 38 is a bracket 44 on which the clincher 40 is pivoted by a pin 45 so that the die and clincher reciprocate together.

The clincher 40 is an arm which is solid in its lower part 46, through the end of which a pin 48 extends for attachment of a spring 49 coupling it to a similar pin 50 at the end of the lower part 51 of the clincher 41. Thus the spring 49 serves to yieldingly hold the clinchers 40 and 41 in their retracted positions. The upper part of the clincher 40 is bifurcated so as to provide space for the bracket 44 through which the pin 45 passes and so that a removable nose piece 52 may be inserted therein and held by means of the pins 54 and 55. The lower part of the nose piece 52 extends slightly beyond the clincher 40 so as to provide a bearing surface 56 against which presses the roller 58 attached to the middle pivot at the knee of a toggle-joint comprising the links 59 and 60. The upper link 59 is pivoted at 61 to a bracket 62 attached to the frame. The lower link 60 is pivoted at 64 to a cross member 65 fixed on the vertical shaft 66 and carries a roller 68 which bears against the face of a block 69. This block has a sloping face 70 which bears against a part of the frame having a similar slope and is held in place by the bolts 71 inserted through slots in the frame so that by moving the block 69 up and down its contact with the rollers 68 may be accurately adjusted to provide a good bearing surface.

The shaft 66 reciprocates in bearings 72 and 73 and is attached at its lower end to the plunger *b* of the solenoid B. Attached to the shaft 66 is a lug 74 which engages the roller 75 on the arm 76 of a switch S—3 which is mounted in the frame 24. With the parts in the position shown in Fig. 1, the circuit through this switch is closed and this circuit will be opened by upward movement of the solenoid plunger *b* and lug 74, the switch S—3 having an internal spring tending to rotate the arm 76 counterclockwise from the position shown.

From the foregoing description it will be seen that when solenoid A is energized its plunger *a* will rise, carrying with it the die 38 and the clincher 40. The bracket 44 which is attached to the die will rise with it and in doing so a pin 77 carried in the lower offset portion of the bracket will contact the roller 78 attached to the arm 79 of the switch S—2 which is mounted in the frame. The circuit through switch S—2 is open when the parts are in the position shown in Fig. 1 and elevation of the bracket 44 closes this circuit, which controls the flow of current to solenoid B. Switch S—2 contains a spring tending to return its arm 79 to the position shown in the drawings.

When solenoid B is energized, its plunger *b* is raised carrying with it bracket 65 attached to shaft 66, thus moving toward one another the pivots 61 and 64 of the toggle-joint. This moves the roller 58 toward the clincher 40, exerting a powerful pressure against the clincher and moving it across the face of the die 38 into the position shown in Fig. 4 to bend down one side of the clip, as shown on an enlarged scale in Fig. 14.

From the successive views shown in Figs. 2, 3, 4 and 5 it will be seen that the die in its upward movement first shears off a blank 39 from the strip 29, driving it against the coils of the springs 42. The face of the die is so shaped that it bends the ends of the blank upwardly into a U-shape, forming a pair of upstanding wings as shown in Fig. 3. Upon movement of the parts to the position shown in Fig. 4, one of these wings is bent down upon the coils by the nose 52 of the clincher 40. The electrical circuit is such that as soon as this has been accomplished the solenoid B is deenergized, allowing the plunger *b* to drop. This retracts the toggle-joint and the

clincher 40 moves away from the die under the influence of spring 49.

To bend down the other wing of the clip, there is provided on the opposite side of the die the clincher 41 which rotates about the fixed pivot 80. This clincher is bifurcated at its upper end and carries a nose piece 81 held in place by pins 82. Clincher 41 is moved across the face of the die in the same manner as in the clincher 40, by means of a toggle-joint having a roller 84 at its middle pivot which bears against a sloping face 85 on the clincher and operates in precisely the same manner as the other toggle-joint, obtaining its motive power from the plunger c of solenoid C. The movement of these parts may be seen from a comparison of Fig. 1 with Fig. 5.

The nose pieces 52 and 81 of the clinchers 40 and 41 respectively are made removable so that they may be replaced when worn and so that nose pieces of varying shapes may be inserted in the machine to produce clips of different types or sizes. Referring to Fig. 14, it may be desirable, for example, to use in the clincher 40 a nose piece provided with a longitudinal ridge adapted to indent the clip as shown at 90 for the purpose of fixing the clip on the wires in such manner that it will not slip. Such an indentation also tends to strengthen the clip. Or a nose piece may be used which will bend the end of the clip down slightly around a wire as shown at 91 in Fig. 15. Other variations of an advantageous nature will readily occur to those skilled in the art.

Automatic strip feed

Referring to Figs. 1, 7, 10 and 11, the strip 29 is automatically fed into the guide 36 at the proper time and in a measured amount by the mechanism here described.

After the strip passes through the guide rollers held in the bracket 32, it passes between the feed rollers 34 and 35. Referring to Fig. 7, the upper feed roller 35 is mounted on an axle 100 which is pressed downwardly by a yoke 101 attached on either side to the cylindrical heads 102 of threaded studs 104. Heads 102 are mounted in a slot 105 in the table top 20. Each stud 104 passes through a boss 106 welded to the table top and having a hole the same size as the head and providing a bearing holding it in place. Each stud is provided with a pair of washers 108 and 109 between which is a coil spring 110 tensioned by nuts 111. It will be seen that this structure resiliently presses the roller 35 against the roller 34.

The larger feed roller 34 is fixed on a shaft 112 which rotates in bearings attached to the brackets 114 and 115 (Fig. 10) which are attached to the frame. Also fixed on this shaft are the gears 116 and 117 which differ in size and are driven respectively by the gears 118 and 119, which are an integral gear cluster and are slidable on a shaft 120 to which they are keyed or which may be a splined shaft. They may be shifted on this shaft by means of a yoke 121 which rides in a collar 122 forming a part of the gear cluster. The yoke is attached to the end of a slider 124 which has a rack gear 125 driven by a pinion 126 on the end of the shaft 127. The slider 124 is supported by a roller 128 positioned underneath the pinion 126. The shaft 127 extends beyond the frame 21 to the front of the table where it is attached to the gear shift lever 31. By turning lever 31 the gear cluster comprising the gears 118 and 119 can be shifted into engagement with either of the gears 116 or 117.

Referring to Fig. 9, when the lever 31 is in a vertical position the sets of gears just mentioned will be wholly disengaged so that shaft 112 may be rotated without rotating the gears connected with the motor M. The lever 31 may be held in this neutral position by means of a pivoted catch 131 which may be held in either the raised or lowered position by the spring 132 attached to it and to the frame 21.

Keyed on the shaft carrying the gears 118 and 119 (Figs. 10 and 11) is the large gear 134 which meshes with the small gear 135 on the shaft of the motor M. Spaced at regular intervals on the right-hand side of gear 134 are protruding pins 136 spaced at regular intervals around the circumference of a circle as shown in dotted lines in Fig. 1. There are five such pins in this embodiment and as they rotate they engage the roller 138 of a snap action switch S—4 of the double-throw single-pole type. This switch functions to stop the motor after a predetermined amount of rotation of the gear 134 which, in this instance, would be ⅕ of a revolution. This limited rotation controls, together with selection of the gear ratios of the rest of the gear train, the amount of strip fed by the feed rollers 34 and 35. It will be seen that by shifting from the gear pair 117—119 to the pair 116—118 the linear travel of the feed roller 34 will be reduced and the amount of strip fed will be less.

The manner in which the amount of strip fed by this mechanism is automatically controlled and delivered at the proper time will be shown in the course of describing the electrical circuit.

Manual strip feed

For the purpose of initially introducing the strip into the machine when it is first started or when a new coil of strip is inserted, it is advantageous to have means for manually driving the feeding mechanism independent of the motor drive. Before operating the manual feed the gear shift lever 31 is placed in neutral position and the dog clutch 140 is engaged by releasing the catch 141 from engagement with frame 21, turning it clockwise until it drops through the notch 142 cut in the frame. Under the influence of the spring 144 surrounding the shaft 145, the two parts of the clutch will be positively engaged through longitudinal motion of the shaft 146. The shafts 145 and 146 are connected by a coupling 147 and may rotate together inasmuch as the catch 141 is free to rotate in the space inside the frame 21 when the clutch 140 is engaged.

Fixed on the shaft 146 is a gear 150 which meshes with the teeth on the gear 151 connected to the crank 30 by the coupling 148 and shaft 152. The gear 151 has some of its teeth removed, as shown at 153, those remaining being sufficient to rotate the shaft 146 through the gear 150 to deliver a predetermined amount of strip material into the machine when the crank 30 is given one complete turn. This amount is preferably slightly less than the distance between the point of contact of the feed rollers 34 and 35 and the left-hand wall of the guide 36, as shown in Fig. 1.

The initial introduction of the strip 29 is accomplished by raising the upper feed roller 35 by means of the fork 160 (Fig. 7) which is fixed on shaft 161. Also fixed on this shaft is a lever 162 (Fig. 8) extending beneath the table and secured in a bracket 163 by a pin 164. By removing this pin, depressing the lever 162 into the position

shown in dotted lines in Fig. 8 and re-inserting the pin in the hole 165, the fork 160 will lift up on the studs 104 and relieve the tension between the two feed rollers. A measured amount of strip may then be introduced between them and the fork 160 released. Since the amount of strip which will be propelled by one turn of the crank 30 is known, it is a simple matter to introduce the correct amount of strip between the feed rollers for threading up a machine so that one turn of crank 30 will bring the end of the strip 29 across the face of die 38.

When this operation has been finished, the catch 141 is withdrawn and turned counterclockwise into engagement with the frame 21, thus disengaging the dog clutch 140, and the gear shift lever 31 is shifted to the right or left to give the desired gear ratio according to the size of clip to be made. The machine is then ready to operate automatically as hereinafter described.

Electrical circuit

The functions of the electrical circuit are, first, to bring about in rapid succession and properly timed relationship the three clip forming operations, namely, (1) reciprocation of the die and first clincher, (2) movement of the first clincher across the face of the die and (3) movement of the second clincher across the face of the die. All three of these operations can be performed in one second or less. Secondly, the circuit functions to control the motor which operates the strip feeding mechanism in properly timed relation to the clip forming mechanism.

Referring to Fig. 13, the circuit will be seen to comprise the switches S—1, S—2, S—3 and S—4, the solenoids A, B and C, and the motor M, previously mentioned in describing the mechanical apparatus. Additionally there are two relays and a rectifier for one of the relays. The entire circuit operates on alternating current.

The condition of the circuit shown in the drawings corresponds to the positions of the moving parts shown in Figs. 1 and 10. With the footswitch S—1 in its released position, relay R—1 is connected to the lines L—1 and L—2 through the rectifier, switch S—1 and wires 201, 202. Relay R—1 is of the adjustable magnetic time delay dropout type, operating on direct current supplied by a copper oxide full-wave rectifier. When energized it immediately closes contacts 204 and 205 and when deenergized it opens these contacts and closes contacts 204 and 206 after a delay determined by its adjustment.

After inserting the objects to be clipped together in the machine, the operator steps on the footswitch S—1, opening the circuit through contacts 208 and 209 and closing the circuit through contacts 210 and 211. This immediately energizes solenoid A through wires 212 and 213, connecting it directly to the line.

As plunger *a* of solenoid A rises it closes switch S—2 and connects solenoid B to the line through wires 215, 216, 217, 218, contacts 204 and 205 of relay R—1 and wire 219. Relay R—1 is set to remain in the position shown for long enough to energize solenoid B and raise its plunger *b* to do its work in moving the first clincher 40 across the face of the die, after which it automatically opens the circuit including contacts 204 and 205, thus deenergizing solenoid B although switch S—2 remains closed.

While solenoid B is energized, its plunger *b* releases and opens the normally closed switch S—3 controlling the circuit to solenoid C, which operates the second clincher 41, so that when relay R—1 releases contact 204 to close against contact 206, solenoid C will not be energized until after the plunger *b* of solenoid B has returned to normal. This assures having the first clincher free to move out of the way before the second clincher is operated. Even if spring 49 does not retract the first clincher, because it sticks on the clip, for example, it will be pushed out of the way by the second clincher. After relay R—1 is released and switch S—3 has closed, therefore, solenoid C is energized by connection to the line through wires 219, contacts 204 and 206, 220, 221, 222 and 223.

The foregoing operations complete the three clip-forming operations described above and we turn now to the motor circuit which is completed, upon release of the footswitch S—1, and after the return of solenoids A, B and C to their deenergized normal positions. Solenoid B, of course, is at that time already deenergized by the opening of contacts 204 and 205 upon the release of relay R—1. Solenoid A is deenergized by the release of the footswitch S—1, opening contacts 210 and 211. Closing of contacts 208 and 209 by the release of footswitch S—1 energizes relay R—1 and immediately opens the circuit to solenoid C at the contacts 204 and 206.

As soon as contacts 204 and 205 of relay R—1 close, the motor M starts, current passing through wires 219, 218, 225, switch 226 of relay R—2 and wire 227, at which time switch 226 is closed.

The closing of switch 226, which is a shunt for the "off-pin" position of switch S—4, previously had been accomplished as follows: The snap-switch S—4 was in the position shown in Fig. 13 with its roller 138 engaging one of the pins 136 on gear 134, as shown in Fig. 10. This connected one side of relay R—2 with line L—2 through wire 235. When relay R—1 released, closing contacts 204 and 206, it connected the other side of relay R—2 to line L—1 through wire 219, contacts 204 and 206 and wire 220, thereby closing switch 226, and also closing switch 230 of relay R—2 which is a holding switch establishing a shunt circuit around the contacts 204 and 206 of relay R—1, thereby connecting relay R—2 directly with line L—1 through wire 231.

As soon as motor M has turned the gear 134 a short distance, switch S—4 snaps to the "off pin" position which shifts the circuit connecting motor M with line L—2 from the switch 226 of relay R—2 to the snap-switch S—4 through wire 234, simultaneously deenergizing relay R—2 by breaking its connection with line L—2 through wire 235. As soon as switch S—4 is engaged by another pin 136 it snaps to the "on pin" position and stops the motor since switch 226 in relay R—2 is then open. As soon as this happens the components of the circuit have all returned to the positions shown in Fig. 13 and are in condition to repeat the cycle of operations as soon as the footswitch S—1 is again depressed, held until the clinching operations have occurred, and then released.

It will be obvious from the foregoing description that the cutting of the ribbon and the clinching operations take place while the footswitch S—1 is held depressed; and that the feeding of the ribbon takes place, following the clinching operations, when the footswitch S—1 is released and rises.

The motor M found suitable for use in this embodiment is a self-starting synchronous in-

duction motor geared to deliver about 75 R. P. M. at the driving shaft.

Summary

From the foregoing detailed description of the present preferred embodiment of the invention it will be seen that there has been provided a high-speed, automatically operated machine for making and applying clips to objects to be secured together. As shown, this machine can make such clips directly from continuous strip automatically fed into the machine in measured amounts, which amounts may be varied for the purpose of making clips of different sizes. It is apparent, however, that the clip forming and applying means could operate equally well without change if used with means for supplying precut blanks to the die instead of continuous strip. It might likewise be operated by other means than solenoids as a source of motive power, means within the contemplation of the invention including either mechanical or hydraulic apparatus for reciprocating the parts shown herein as operated by the solenoids. It is also to be understood that the invention is not limited to applying clips to spring assemblies but is adaptable to various other uses, which might require changes in details within the skill of a mechanic to suitably modify the size or shape of the clips or of other parts such as the holding device or clincher noses. The description is therefore to be taken as merely illustrative and the invention is to be construed broadly within the purview of the claims.

What is claimed is:

1. A machine for forming clips from strip material comprising, means for cutting blanks from said strip, a rotating member for feeding strip to said cutting means, means for rotating said member including a plurality of gear trains having different gear ratios, means for selectively shifting from one gear train to another, a motor adapted to drive the selected gear train, and means for stopping the motor after a predetermined number of revolutions, whereby the length of strip fed will depend upon the gear ratio selected.

2. In a machine for forming clips from strip material, in combination, cutting means for severing blanks from said strip, a feed roller for advancing the strip to said cutting means, a gear train adapted to drive said roller, an electric motor adapted to drive said gear train, a switch adapted to open the circuit to the motor, and means moving with said gear train adapted to actuate said switch after a predetermined amount of movement of said feed roller.

3. The machine of claim 2 in which said means moving with said gear train comprises a plurality of evenly spaced switch actuating means associated with one of the gears of said gear train adapted to actuate said switch as said gear rotates.

4. In a clip forming and applying machine characterized by means for holding in fixed position objects which are to be clipped together, a die movable toward and away from said position, a reciprocating member supporting said die, means for feeding strip material into the path of said die beneath the objects which are to be clipped together, said die serving to cut a clip-blank from said strip material and bend said blank into a channel form containing said objects, two pivotally mounted clinchers each adapted at its top to engage an end of the clip-blank and bend it over said objects, and spring means tending to hold said clinchers in their non-clinching positions; two toggle-joints respectively cooperating at its knee with one of said clinchers to move the latter into clinching position against the influence of said spring means, each of said toggle-joints having its upper end pivotally attached to a fixed point, two reciprocating members respectively attached to the lower end of one of said toggle-joints, and means for causing sequential movement of said three reciprocating members.

5. In a clip forming and applying machine characterized by means for holding in fixed position objects which are to be clipped together, a die movable toward and away from said position, a reciprocating member supporting said die, and means for feeding strip material into the path of said die beneath the objects which are to be clipped together, said die serving to cut a clip-blank from said strip material and bend said blank into a channel form containing said objects; a clincher pivotally mounted at a point intermediate its ends on said reciprocating member and adapted at its top end to engage one end of the clip-blank and bend it over said objects, another clincher pivotally mounted at a point intermediate its ends at a fixed point and adapted at its top end to engage the other end of said clip-blank and bend it over said objects, a spring connecting the lower ends of said clinchers and tending to hold said clinchers in their non-clinching positions, two toggle-joints respectively cooperating at its knee with one of said clinchers to move the latter into clinching position against the tension of said spring, each of said toggle-joints having its upper end pivotally attached to a fixed point, two reciprocating members respectively attached to the lower end of a toggle, and means for causing sequential movement of said three reciprocating members.

6. In a clip forming and applying machine having a die and two clinchers; three solenoids respectively operating said die and clinchers, and means for controlling the sequential energization of said solenoids comprising a delay drop-out relay, a switch adapted to be actuated by the operator which in its normal position causes energizing of said delay drop-out relay and its depressed position causes deenergizing of said relay and energizing of the die-operating solenoid, a normally-open switch closed upon operation of said die and located in the circuit of the solenoid operating one of said clinchers, a normally-closed switch opened upon operation of the said clincher and located in the circuit of the solenoid for operating the other clincher, contacts closed by said delay drop-out relay when it is energized in the circuit through the solenoid operating the said clincher, and contacts closed by said delay drop-out relay when it is deenergized in the circuit of the solenoid operating the other clincher.

7. In a clip forming and applying machine having a die, two clinchers and a clip-feeding mechanism; three solenoids respectively operating said die and clinchers, a motor operating said clip-feeding mechanism, and means for controlling the sequential energization of said solenoids and said motor comprising a delay drop-out relay, a switch adapted to be operated by the operator which in its normal position causes energizing of said delay drop-out relay and in its depressed position causes deenergizing of said relay and energizing of the die-operating solenoid, a normally open switch closed upon operation of said

die and located in the circuit of the solenoid operating one of said clinchers, a normally closed switch opened upon operation of said clincher and located in the circuit of the solenoid for operating the other clincher, contacts closed by said delay drop-out relay when it is energized in the circuit through the solenoid operating said first clincher and in the circuit through said motor, contacts closed by said delay drop-out relay when it is deenergized in the circuit of the solenoid operating the said second clincher, and a shunt relay energized upon the closing of said last mentioned contacts having a contact in the circuit of said motor and contacts in a holding circuit both closed upon energization of said last mentioned relay, and a snap-action switch operated by said clip feeding mechanism which in its normal position closes both the actuating and the holding circuits of said last mentioned relay and in its off-normal position closes a circuit in shunt to the contacts of said last mentioned relay which are in the circuit of said motor.

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