

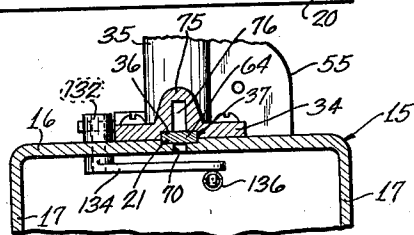
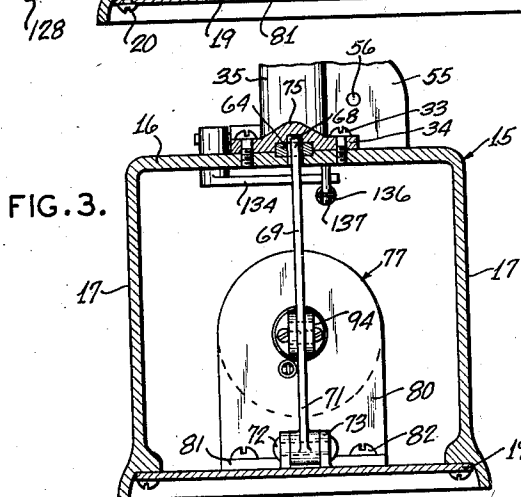
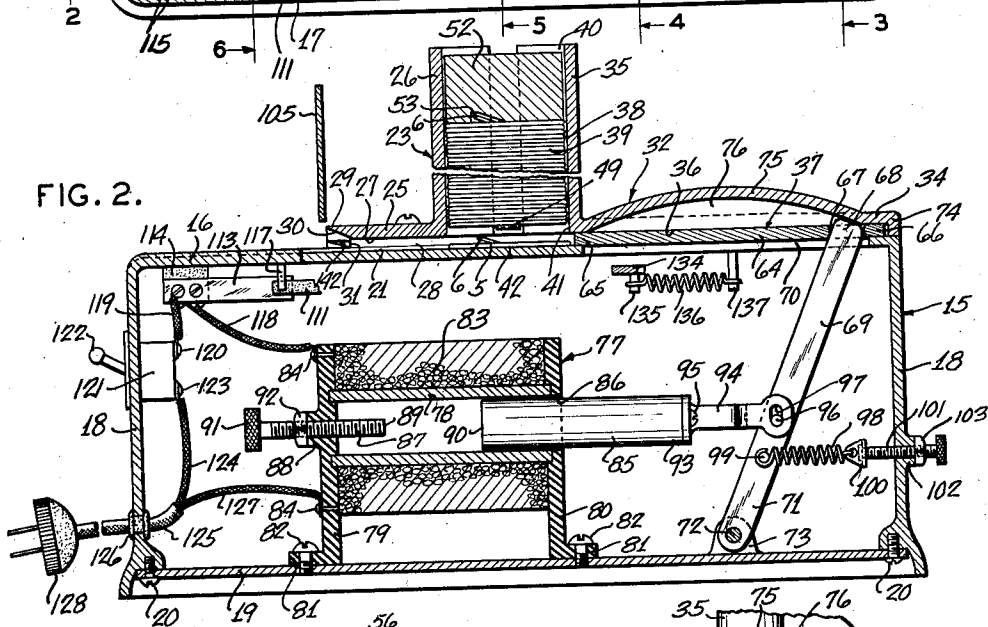
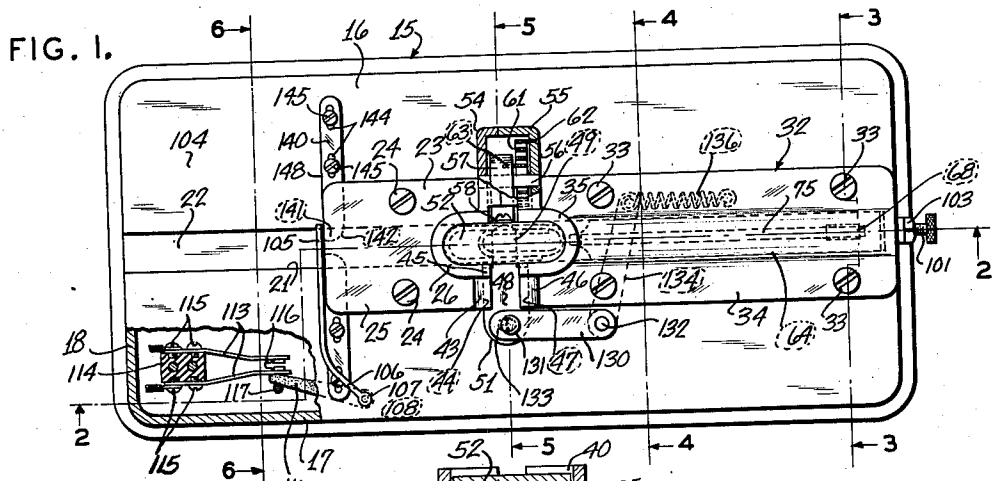
May 16, 1939.

G. A. WOODRUFF
CLIP-ATTACHING DEVICE

2,158,168

Filed May 9, 1938

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

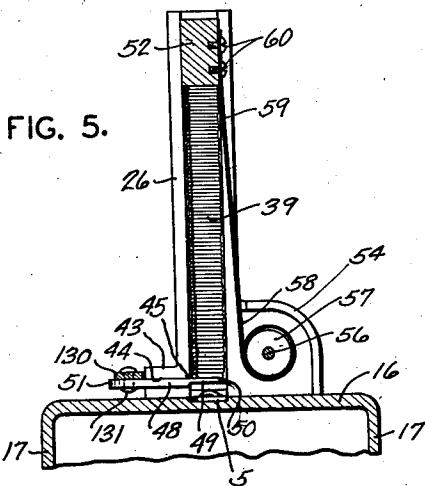


FIG. 5.

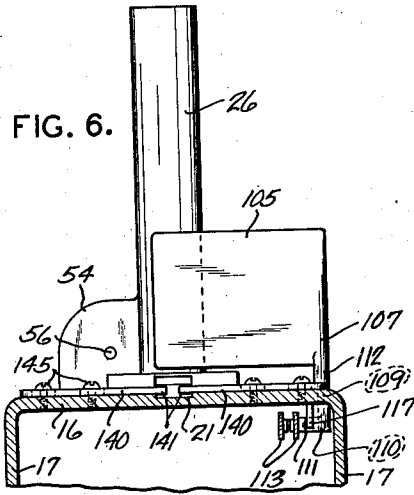


FIG. 6.

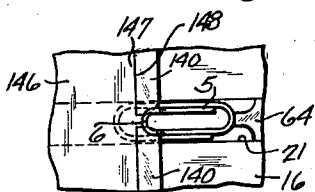


FIG. 7.

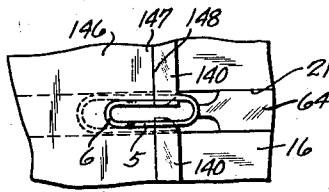


FIG. 9.

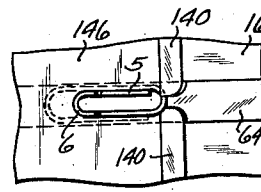


FIG. 11.

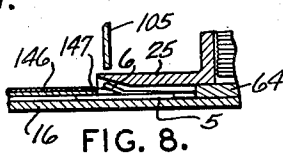


FIG. 8.

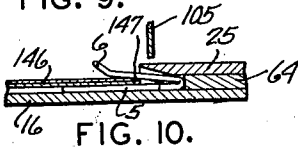


FIG. 10.

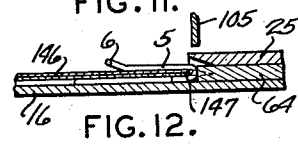


FIG. 12.

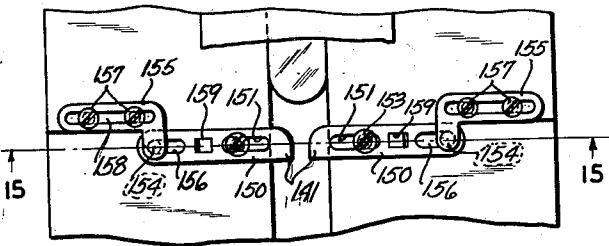


FIG. 14.

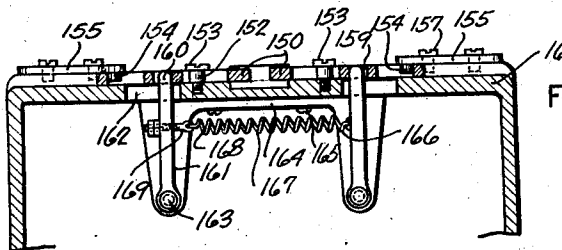


FIG. 15.

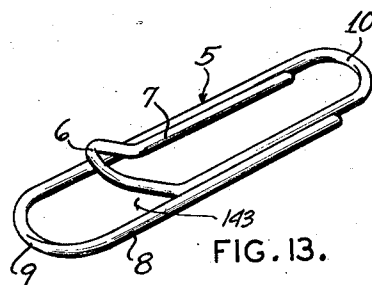


FIG. 13.

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2,158,168

CLIP-ATTACHING DEVICE

George A. Woodruff, Kirkwood, Mo.

Application May 9, 1938, Serial No. 206,717

15 Claims. (Cl. 120-8)

This invention relates to mechanism for applying holding or clamping elements to sheet material and articles of like nature, and has particular reference to a machine of automatic type, adapted for applying to two or more sheets of paper or other articles to be held together, holding elements or clips of a self-clamping, spring-jaw type which serve to retain the articles together in a normally firm manner, but capable of ready removal when desired. The type of clip employed and the manner of its application by the machine, are such as to preclude tearing, perforating or otherwise damaging the articles to which the clip is applied.

While the machine embodying the features of this invention, is adaptable to a wide variety of useful applications, it has particular utility in the preparation of greeting cards for sales-display purposes. It is general practice in this connection to arrange each greeting card and its envelope in superposed relation, and then to apply thereto holding elements or clips of a readily removable type which will not mar, puncture or otherwise damage either the card or its envelope during application or removal of the clip. An example of a form of clip suitable to this purpose is illustrated in Fig. 13 of the present drawings. Such clip, as will be observed, is entirely devoid of spurs, teeth or sharp projections, thus precluding damage as tearing or puncturing, to the articles engaged by the clip.

Heretofore, the application of such clips to card-envelope units or other similarly related articles to be releasably clipped together, has generally been done by hand, resulting in a slow and tedious process particularly when so applying the clips to a considerable number of card-envelope or other article units. Accordingly, it is the principal purpose of the present invention to provide a simple and effective machine of automatic type, for quickly and easily applying clips of the type described, to article units, the machine being capable of applying clips as rapidly as the article units may be delivered thereto.

Another object is to provide an automatic machine for the purpose described, adapted for applying but one clip at a time, a return of the operating mechanism thereof to an initial condition being a prerequisite to a succeeding clip-applying function of the machine.

A further object resides in the provision of a machine for the purpose described, which is adapted for effecting displacement of a clip from a source of clip supply, to and into clamping engagement with articles to be held thereby, by a

single, continuous operation, initiation of which is under direct control of the operator.

Yet another object is to provide a machine for this purpose, which is characterized by simplicity and compactness, efficiency, economy and durability.

Further objects and advantages will readily appear as the description proceeds and from the accompanying drawings, in which:

Fig. 1 is a plan view of the device, with a portion thereof broken away to disclose a control switch therefor; Fig. 2 is a vertical section longitudinally through the device, as taken from line 2-2 in Fig. 1; Fig. 3 is a transverse section of the device, as viewed from line 3-3 in Fig. 1; Fig. 4 is a fragmentary transverse section, taken from line 4-4 in Fig. 1; Figs. 5 and 6 are each further fragmentary transverse sections of the device, as viewed respectively, from lines 5-5 and 6-6 in Fig. 1; Figs. 7 and 8 are respectively, a fragmentary top view of the clip application zone of the device and a fragmentary, longitudinal section therethrough, each showing a clip in an initial stage of its application; Figs. 9 and 10 are similar views of the application zone, illustrating a clip in a second stage of its application; Figs. 11 and 12 are similar views of the zone, showing a clip in substantially the final stage of its application; Fig. 13 is a view in perspective and greatly enlarged, of a type of clip to which the machine is adapted for applying the same; Fig. 14 is a fragmentary plan view of the machine, illustrating a modified form of certain operating elements thereof, and Fig. 15 is a fragmentary, transverse section of the machine, as viewed from line 15-15 in Fig. 14.

Referring to the drawings by suitable reference characters, the machine embodying the features of the present invention, is adapted to operate upon and apply to articles to be clamped together, a clip of the type illustrated by Fig. 13. The clip, designated generally by the numeral 5, is similar in form to the prevailing, widely used, so-called Gem type of wire paper clip which is entirely manually applied, differing therefrom only in that the leading end portion 6 of one of the clip arms 7 is turned outwardly of and at an angle to the plane of the clip, as shown. The clip arm 8 is longer than arm 7, so that the up-turned portion 6 is disposed rearwardly of the leading end 9 of arm 8. The clip arms which are resilient or spreadable, are joined at the rear end by a rounded bridge element 10. The portion 6 facilitates application of the clip by the machine, as will hereinafter appear. The clip shown, may

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be formed from wire stock having a suitable tempered or spring characteristic.

Turning now to the machine for applying the clips, the mechanism thereof is disposed upon 5 and within a substantially rectangular box-like frame or housing 15 comprised of a top wall or plate 16, side walls 17, end walls 18 and a bottom wall or plate 19 removably secured to the frame by screws 20. Formed centrally in the upper sur- 10 face of the plate 16 and substantially coextensive with the longitudinal dimension thereof, is a relatively shallow channel 21. The channel provides a guide-seat for a clip which is slidably displaced 15 therealong during operation of the machine, as will later appear. The lateral dimension of the channel, accordingly, is but slightly greater than the width of a clip, while the channel depth is by preference, substantially equal to the diameter of the wire stock from which the clip is formed, 20 the latter for a purpose to appear.

Overlying a portion of the channel inwardly of the channel end-section 22, is a member 23 which may be a casting formed of a suitable material such as an aluminum alloy. The member which 25 is secured to the housing top wall 16 as by screws 24, comprises a horizontal plate-like section 25 and a vertical or upstanding section 26 of substantially U-shape. In the under surface of the plate section 25 is formed a channel 27 which 30 registers with the channel 21, the channels 21 and 27 cooperating to provide a bore 28 open at each end, and of a sectional area to accommodate a clip, including the clip lip element 6. The bore is formed to provide a clearance sufficient to per- 35 mit a ready and easy displacement of a clip there-through. The outer end portion of channel 27 adjacent the end 29 of plate 25, is upwardly bevelled, as at 30, for a purpose later appearing, while the plate end 29 is under-cut laterally 40 through the plate, as at 31, also for a purpose which will later appear.

Longitudinally spaced from member 23 and overlying the remainder of the channel 21, is a 45 second member 32 which, like member 23, may be an aluminum casting. The member secured to the housing plate 16 as by screws 33, is comprised of a plate-like section 34 and an upstanding U- 50 shape section 35. In the under-surface of plate section 34 is formed a channel 36 extending longi- tudinally thereof and overlying the channel 21, being in vertical register therewith. The two 55 channels cooperate in forming a bore 37 which is in axial register with bore 28 and of the same sectional area.

As shown by Figs. 1 and 2, the U-shaped sections 26 and 35 are arranged in spaced, opposed 60 relation and cooperate in providing a clip magazine, forming a clip-supply chamber 38 for the reception of a plurality of clips 39. The chamber is open at its upper end 40, and also at its lower 65 or bottom end 41, the latter being in vertical register with the section 42 of channel 21 which axially interconnects the bores 28 and 37 heretofore described. The vertical extent of elements 26 and 35 may be such as to provide a clip- 70 magazine of a capacity to receive within limits, any number of clips, as 50 or 100 thereof. The clips are arranged in the magazine so that the lip 6 of each is uppermost (Fig. 2) and in vertical register with each other, and further, so that the 75 leading end 9 of the arm 8 of each lies adjacent the inner curved surface of the U-shaped element 26. Such pre-arrangement of the clips in the magazine is effected to assure the presentation of the end 9 and lip 6 to the objects to be clamped

together by the clip, upon admission of a clip to the section 42 of channel 21 and its displacement through bore 28 to the open channel section 22, the latter constituting the zone or station of clip application. The operating mechanism for effect- 5 ing displacement of a clip through the bore 28 and thence into clamping engagement with objects to be clamped thereby, will be described hereinafter.

Formed by preference as an integral part of 10 the member 23 and located adjacent to and on one side of the upstanding section 26 near the lower end thereof, is an element or boss 43 which is provided with a horizontal groove 44 (Fig. 5) 15 extending through the element and the adjacent portion 45 of the section 26, in a direction trans- versely of member 23. A like element or boss 46 is formed on the member 32, being similarly 20 positioned and provided with a similarly directed groove 47. The open sides of the grooves are opposed, while the grooves are spaced apart by reason of the relative spacing of the members 23 and 32. Slidably seated in the grooves and span- 25 ning the space therebetween, is a finger element or clip-separator member 48, the member being provided with a reduced end portion or blade 49 which in the normal position of the separator 30 member, projects inwardly of and laterally across the magazine chamber 38, adjacent the lower open end 41 thereof (Figs. 1, 2 and 5). As will be 35 observed in Fig. 2, the blade portion 49 is spaced above the channel section 42 such that the vertical spacing of the under surface of the blade relative to the plane of the magazine bottom opening 41, is substantially equal to the diameter 40 of the wire stock from which the clips are formed, this for a purpose later appearing. The free end 50 of the blade is preferably rounded (Fig. 1), and further, is bevelled to provide a relatively sharp, knife-like end (Fig. 5) for a purpose pre- 45 sently to appear. The outer end 51 of member 48 is coupled to actuating mechanism therefor which will be described hereinafter, while the blade 49, when in its normal position within the magazine 50 chamber, serves to support the clips 39 therein.

The clips 39 are continuously urged or biased 55 downwardly in the magazine chamber, as through a member or block 52 which is slidably seated in the chamber and in engagement with the top clip of the group 39. The means for urging the 60 block downwardly in the magazine will presently appear. A slot 53 is provided in the under side of the block to receive the lip 6 of the uppermost clip, whereby the block may uniformly engage 55 such clip as shown in Fig. 2. Thus the downward force exerted on the clip column through the block 52, is distributed equally in the column, thereby preventing jamming of the clips in the 65 magazine.

The block 52 may be a weighted member, gravi- 70 ty actuated to bias the clips downwardly in the magazine. However, it is preferred in the present example to provide a mechanism for actuating the block in a positive manner. Referring to 75 Figs. 1 and 5, a two-part housing structure is provided laterally adjacent the base of the up- standing elements 26 and 35 and on the side thereof opposite the bearing bosses 43-46, the 80 structure comprising housing section 54 preferably formed as an integral part of element 26 and a mating housing section 55 formed inte- 70 grally with the element 35. Journalled in the housing sections is a shaft 56 which operatively supports a drum element 57. A flexible strip 58 wound on the drum and connected thereto at 75

one end (not shown), has its end portion 59 extended upwardly between the members 26 and 35 as shown in Fig. 5, for connection to the block 52, as by suitable screws 60. Coaxially of the shaft is a spiral spring 61 having one end 62 secured to the housing section 55 and its opposite end 63 secured to the drum 57, the spring serving to apply a rotary bias to the drum in a direction to wind the strip 58 thereupon. Thus through the spiral spring, the strip exerts a downward bias on the block 52 for the purpose above described.

In the application of a clip to objects to be clamped thereby, the lowermost clip in the magazine is admitted to the channel portion 42 underlying the magazine in a manner later appearing, and thence is displaced through the bore 28 and outwardly thereof, into clamping engagement with objects to be held together. The mechanism for effecting such clip displacement will be now described.

Seated in channel 21 for reciprocable displacement within the bores 28 and 37 and the intermediate channel section 42, is a clip-impelling member or plunger 64, which by preference, is formed so as to have a minimum operating clearance with the walls of the bores. In its initial or inoperative position, shown in Fig. 2, the plunger is disposed within the bore 37, so that its leading or clip-engaging end 65 clears the lower open end 41 of the magazine (Fig. 2). Formed in the plunger near the rear end 66 thereof, is a slot 67 provided to receive the upper end portion 68 of a plunger actuating member or lever 69. A longitudinal slot 70 of a predetermined extent, is formed in the housing plate 16 in underlying relation to the bore 37. Slot 70 is disposed so that the plunger slot 67 is in vertical register therewith throughout plunger travel, and is provided to accommodate the lever 69 which extends there-through and downwardly in the housing 15. The lower end 71 of the lever is pivoted as by a pin 72, to a forked bracket 73 secured in any suitable manner to the bottom housing plate 19. Thus the lever is adapted for pivotal movement in a direction longitudinally of the bore 37, through an arc of a predetermined extent. In the present example, the arcuate extent of lever movement may be determined on its rearward travel by abutment of the rear-end 66 of the plunger 64 with the rear wall 74 of the plate section 34, and on its forward travel by an adjustable means later appearing.

By reason of the pivotal mounting of the lever 69 and the seating of its upper end 68 in the plunger slot 67, the lever end 68 during pivotal movement of the lever, will be displaced relative to the plunger slot 67, upwardly therethrough as the lever acts to displace the plunger, and further, will move in an arcuate path vertically above the plunger. Accordingly, to accommodate the arcuate travel of the lever end 68 above the plunger, the plate section 34 of member 32 is formed to provide a longitudinal upstanding boss 75 which is by preference, of arcuate contour as shown in Fig. 2. Formed within the boss is an arcuate slot 76 in vertical register with the plate slot 70, this slot being of a vertical depth sufficient to permit the lever end 68 to travel therethrough during lever movement.

Pivotal actuation of the lever to effect displacement of the plunger, may be attained either manually, as by a hand-operated crank (not shown), or automatically by a suitable motor means. In the present example and for advantageous reasons later appearing, it is preferred to actuate

the lever automatically, by an electric motor 77 of an electro-magnetic plunger type. The motor is comprised of a spool-like structure formed of a cylindrical core 78 supported by end plates 79 and 80. The end plates are each provided with a flanged base portion 81 which rests upon the bottom housing plate 19, and is secured thereto by screws 82. Wound about the core 78 and between the end plates, is an energizing or field winding 83 the ends of which are connected to terminals 84 mounted on end plate 79. Slidably seated in the core 78 is an armature element 85 formed of magnetic material and adapted for movement in a direction axially of the core and through an aperture 86 provided therefor in the end plate 80. The extent of armature movement inwardly of the core is determined by an adjustable screw 87 threaded through a boss 88 on the end plate 79 and having its end 89 projected inwardly of the core for abutment with the end 90 of the armature. A knurled head 91 is formed on the outer end of the screw to facilitate manual adjustment thereof, while a locknut 92 is provided for maintaining screw adjustment.

The opposite, normally exposed end 93 of the armature carries a forked element 94 which may be secured thereto in any suitable manner, as by screws 95. The arms of the forked member straddle the lever 69 at a point intermediate the lever ends and near the lever pivot support. Operative connection thereof to the lever is made by preference, through a pin 96 carried by the lever and having its ends projecting laterally of either side of the lever. The projecting pin ends are seated in slots 97 formed in the forked arms of member 94. Thus through the described connection, linear movement of the armature will effect a corresponding pivotal movement of the lever, the slots in the forked member serving to permit pin displacement therein during pivotal movement of the lever. It is to be noted here that the forked member 94 is formed preferably of a suitable non-magnetic material, in order to prevent a magnetization of the lever 69 and plunger 64 by the armature 85 when the latter is magnetized in the operation of the device.

A suitable spring 98 is provided for biasing the lever 69 toward the limit of its rearward travel, as to the position shown in Fig. 2. In such position of the lever as attained by the spring 98 when the armature 85 is not energized, the plunger 64 will be disposed within bore 37 such that its leading end 65 clears the clip magazine opening 41, while the armature 85 will be extended a substantial distance outwardly of the core 78 as appears in Fig. 2. One end of the spring is connected to the lever through a pin 99 carried by the lever and located by preference, between the lever pivot support and the lever-armature connection, while the opposite spring end is connected to an element 100 carried by the end of a screw 101. The screw extends through a threaded aperture in a bossed portion 102 of the housing rear end wall 18, the outer screw end being provided with a knurled knob to facilitate manual actuation of the screw to effect tension adjustments of the spring. A lock nut 103 serves to maintain the adjustments effected. It is to be noted that the element 100 is connected to the inner end of the screw in a manner to permit rotation of the screw relative thereto, so that axial rotation of the spring will not occur during tension adjustments thereof, this being a well known expedient employed in adjustable spring mountings of the type shown.

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Energization of the motor winding is controlled by a preferred form of switching device which is, by preference, actuated by means located at the zone of clip application, as the end surface 104 of the housing top plate 16 in which is located the exposed portion 22 of the clip-channel 21. Referring to Figs. 1, 2 and 6, there is shown a plate 105 disposed in a vertical plane and located laterally of the housing plate 16, adjacent to and slightly above the end 29 of plate section 25. The end portion 106 of the plate 105 is by preference, curved in a direction rearwardly of the housing and out of the zone 104, and is provided with a socketed portion 107 for the operative reception of a pivot rod 108 by which the plate is supported for pivotal movement. The rod 108 extends vertically through and is journaled in an aperture 109 provided therefor in the housing plate 16, the lower end 110 of the rod projecting inwardly of the housing for operative connection to a switch actuating arm 111. It is noted that the socketed portion 107 of the plate 105 is provided with an extension 112 at its lower end, which rests upon the upper surface of the housing plate 16 and serves to space the plate 105 vertically above the surface 104 and slightly above the end 29 of plate 25 (Figs. 2 and 6).

The switch actuating arm 111 is preferably formed of a suitable, rigid insulating material, and as shown in Fig. 1, extends horizontally toward and into abutting engagement with one of a pair of leaf springs 113. The leaf springs are carried on opposite sides of an insulating block 114 supported in any suitable manner from the under side of housing plate 16, each spring being connected to the block by screws 115 one of which serves as a conductor terminal. The free ends of the springs are arranged in substantially parallel adjacence and carry cooperating contacts 116 which are normally spaced apart, as in Fig. 1. In the normal open condition of the switch, the free end of the actuating arm engages on one side, one of the leaf springs and on its opposite side a stop element 117 depending from the housing plate 16.

The motor operating circuit comprises a conductor 118 which connects one of the winding terminals 84 to one of the leaf spring screw terminals, and a conductor 119 connecting the opposite leaf spring screw terminal to one terminal 120 of a master switch 121. The master switch which may be of toggle type, is preferably carried by the forward end wall 18 of the housing 15 and has its switch actuating member 122 projecting externally of the end wall for ready manipulation thereof. The opposite terminal 123 of the master switch has connected thereto one lead 124 of a flexible conductor cord 125 which extends through an insulating bushing 126 seated by preference, in the end wall 18. The other lead 127 of the cord is connected to the other terminal 84 of the motor winding. The cord which may be of any length desired, is provided with a suitable plug terminal 128 for ready connection to a wall or other socket (not shown) providing a source of electric current for operating the motor. It is to be understood of course, that the master switch and the cord passage into the housing may be located at any other convenient point in the housing structure.

From the foregoing it will be observed that, assuming the plug 128 to be connected to a source of electrical energy and the toggle switch 121 of electrical energy and the toggle switch 121 disclosed, pivotal actuation of the plate 105 in a direction rearwardly of the housing and toward

the clip magazine, will effect a circuit closure of the contacts 116 through actuation of the leaf springs by the arm 111. As a result, the motor winding 83 will be energized to magnetize the armature 85 and to draw the armature inwardly of the core 78 into abutment with the screw 87. The armature thus displaced, serves to pivotally actuate the lever 69 and thereby to displace the plunger 64 forwardly of the housing structure, through the channel section 42 and bore 28. Upon release of the plate 105, the leaf spring engaged by arm 111 will as a result of its spring characteristic, actuate the arm toward and against the stop 117, thus returning the plate 105 to its normal position above the surface 104. At the same time, the leaf spring movement serves to open-circuit the contacts 116, and hence to de-energize the motor winding. There being no longer any magnetic pull on the armature 85, the armature- and lever-return spring 98 will immediately actuate these elements to their normal inoperative positions as shown in Fig. 2, whereby the plunger 64 will be retracted to its inoperative position within the bore 37.

Actuation of the lever 69 by the motor, serves, through the resulting forward displacement of the plunger 64, to displace a clip received in the channel section 42, through the bore 28 and therebeyond into clamping engagement with objects to be held together thereby. The clip as it leaves the bore 28, is acted upon by mechanism later to be described, which facilitates its application to the objects. Admission of a clip to the channel section 42, preparatory to its application displacement by the plunger 64, is effected by the clip-separator device 48 elsewhere herein described, this device being actuated preferably by the lever 69 and in timed relation to the plunger displacement, in the preferred manner now to be described.

The free end 51 of the clip-separator element 48 is pivotally connected to one end of a lever 130, as by a pin 131, the lever being directed transversely of the element 48 and having its opposite end connected to a stub-shaft 132 which extends vertically through the housing plate 16 to the housing interior (Fig. 4). Thus the lever is supported for pivotal movement, and when actuated, serves to effect a linear displacement of the element 48. By reason of this type of mechanical connection, the end of lever 130 which is connected to the element 48 by the pin 131, is provided with a slot 133 in which the pin seats, thus providing for lost-motion between these members.

Operatively connected to the shaft projection within the housing, is an arm 134 which is directed horizontally adjacent to and laterally of the housing plate 16, extending below and across the forward end of the plate slot 70 (Figs. 1 and 3). The free end of the arm 134 supports a pin 135 to which is connected one end of a tension spring 136. The opposite end of the spring is supported by a pin 137 depending from plate 16. The operative arrangement of the lever and arm as appears in Fig. 1, is such that the spring normally biases the arm 134 in a direction to pivotally urge the lever 130 toward the magazine structure, and through its connection with the clip-separator element 48, such lever bias serves to displace the element 48 in the direction to project its blade portion across the clip chamber of the magazine.

Actuation of the clip separator for separating the lowermost clip in the magazine from the re-

maining clips therein, preparatory to its displacement through bore 28, is effected through the plunger actuating lever 69 striking the arm 134 and pivotally displacing it against the tension of spring 136. This occurs upon energization of the motor to actuate lever 69, which in turn displaces the plunger 64 forwardly and through the bore 28, the lever striking arm 134 as it approaches its forward limit of pivotal travel. Continued movement of the plunger and its actuating lever to the limit of their forward movement, as determined in the present example by abutment of the armature 85 with the screw 87, serves through the lever 69, to pivotally actuate arm 134 in the direction to effect through the lever connection 130, a retraction of the clip separator blade portion 49 from within the clip magazine. As the blade is retracted, the column of clips in the magazine will drop downwardly therein under the biasing influence of the spring-urged block 52, and since at such time, a portion of the plunger 64 occupies the channel section 42, the clip column will bear upon the upper surface of such portion of the plunger. Thereafter and upon deenergization of the motor, the plunger and its actuating lever will be returned to the initial positions thereof, as heretofore described. But during such return of these elements, lever 69 will release arm 134 so that the spring 136 will pivot the arm to its initial position, the return of the arm 134 serving to actuate through lever 130, the clip separator blade 49 inwardly of the magazine and between the lowermost clip and the next adjacent one thereabove. In order that the blade 49 may separate but the lowermost clip from the column in the magazine, and this while the clip column rests upon the plunger 64, its operative location as heretofore indicated, is such that the under surface of the blade is vertically distant above the plane of the upper surface of plunger 64 substantially equal to the diameter of the wire stock from which a clip is formed. Thus the knife-like end 50 of the blade may enter between the lowermost clip seated on top of the plunger and the next clip thereabove. Such separation of the lowermost clip occurs while the plunger is being displaced rearwardly through the channel section 42, hence the separated clip will rest upon the plunger and between it and the blade 49. As the plunger is fully retracted from the channel section 42 into the bore 37, the separated clip will drop down into the channel 42, as shown in Fig. 2. Thereafter, upon energization of the motor, the plunger will be displaced forwardly in the channel section 42 and through bore 28, its leading end 65 abutting the rear end portion 10 of the clip, and thereby displacing the clip ahead of the plunger, forwardly through bore 28.

Located at the forward end of bore 28 which communicates with the open channel section 22, are clip-arm spreading or camming elements 140 which extend laterally, one on each side of the channel 22. The elements are positioned adjacent the end 29 of plate 25 and within the undercut portion 31 thereof (Figs. 1 and 2), the inner ends 141 of the elements overlying the channel 22 adjacent the forward opening of bore 28 and being spaced apart a predetermined distance, as shown in Figs. 1 and 6. Each end 141 is, by preference, rounded on the edge thereof facing the bore opening, and further, the rounded edge is bevelled as shown in Figs. 2 and 8, to present a sharp entering edge 142 to the clip jaw 143 provided by the clip arm 8 and the clip lip 6 (Figs. 8 and 13). As shown in Figs. 1 and 6, each ele-

ment 140 is provided with slots 144 through which extend securing screws 145, the screws threadedly engaging the housing plate 16. The slots provide for adjustment of the elements for determining the relative spacing of the ends 141 thereof in overlying relation to channel section 22.

The operation of the device may be described from the initial relation of the parts as shown in Fig. 2, wherein a clip is seated in channel section 42 below the clip-separator 49. At such time, the material to be clipped together, as a card and its envelope indicated at 146 in Figs. 7 and 8, is placed upon the surface 104 of the housing plate 16 so that the forward margins 147 of the card and envelope are adjacent to or abut the exposed edges 148 of the clip-spreader elements 140, the card and envelope thus overlying the channel section 22 from the zone of the elements 140 outwardly therefrom. Upon positioning the card and envelope, and preferably coincidentally therewith, the operator may pivotally displace the plate 105 toward the clip magazine, as by engaging and actuating the plate with a part of the operator's hand utilized to hold the card and envelope. Displacement of the plate 105 serves as heretofore described, to close switch contacts 116, which effects energization of the motor winding 83, and hence operation of the motor 77 to actuate plunger 64. As the plunger is displaced, the end 65 thereof engages the rear end 10 of the clip and displaces the clip through the bore 28, toward the clip spreading elements 141. The initial engagement of the clip with the spreader elements 141 is illustrated by Figs. 7 and 8, wherein the clip arm 8 lies beneath the elements 141 and projects into the channel section 22 and beneath the card and envelope 146, while the upturned end 6 of arm 7 engages the upper, beveled surfaces of elements 141. Thus the sharp entering edges 142 of the elements 141 are seated in the clip jaw 143.

A further displacement of the clip by plunger 64 to the position thereof shown in Figs. 9 and 10, serves to deflect and dispose clip arm 7 on the upper surface of elements 141 so that a portion of the arm and the lip 6 overlie the upper surface of the card and envelope 146, while the clip arm 8 is further projected beneath the card and envelope. It is to be noted that the bevel 30 in the clip channel portion above the spreader elements 141 permits the upward spread of clip arm 7 relative to arm 8, as the clip is projected through and outwardly of the bore 28, this as clearly appears in Fig. 10.

Figs. 11 and 12 illustrate the clip fully applied to the card and envelope, the end 65 of the plunger which as noted, is formed so that it may project between the elements 141, having substantially displaced the rear end 10 of the clip between the elements 141, as facilitated by the rounded edges 142 thereof. In the final position of the clip, the arms 7 and 8 fully overlap the related marginal portions of the card end envelope, and thus by reason of the spring characteristic of the clip, clamp or hold them together.

The plunger remains in its forward limit as shown in Fig. 11, until release of the plate 105, which then opens the motor switch to deenergize the motor and thus permit spring 98 to retract the plunger to initial position. During the forward and return actuation of the plunger 64 and its actuating lever 69, the succeeding lowermost clip in the magazine will be delivered to the channel section 42 in the manner heretofore described in connection with the function of the

clip separator blade 49. Thereafter, the device is conditioned for applying the succeeding clip. It is to be understood that each clip is conveyed from the channel section 42 through the bore 28, past the spreader elements 141 and into clamping engagement with articles to be clamped together thereby, by a single, continuous forward movement of the plunger 64.

Figs. 14 and 15 illustrate a modified form and arrangement of the clip spreading elements, providing a displaceable mounting thereof for facilitating a ready and easy passage of a clip thereby. In the modification, each spreader element 150 is substantially identical to the element 140 in respect to the clip-engaging portion 141, here designated by the same numeral of reference. Each element 150 is provided with a slot 151 rearwardly adjacent the end 141, and seated in the slot is a shouldered portion 152 of a securing screw 153 which threadedly engages the housing plate 16. By reason of the shouldered screw and slot 151, the element 150 is adapted for longitudinal displacement, the extent of such displacement being limited preferably by a pin 154 carried by an adjustable member 155 and seating in a slot 156 formed in the outer end portion of element 150. The member is adjustably secured to the housing plate 16 by screws 157 extending through a slot 158 formed in the member.

The elements 150 are each provided with an additional slot 159 located intermediate the slots 151 and 156, for the reception of the upper end 160 of a biasing lever 161. The lever extends through a slot 162 formed therefor in the plate 16, and inwardly of the housing for pivotal connection as at 163, to a frame 164 secured as by screws 165 to the underside of plate 16. One end 166 of a suitable tension spring 167 is secured to one of the levers, while the opposite end 168 of the spring is connected to the other lever through an adjustable element or screw 169. Thus the levers are pivotally urged toward each other by the spring, and this serves through the lever ends 160 in the slots 159 of the spreader elements, to effect a displacement bias of the elements toward each other, being adjustably limited in this respect by the pins 154. The clip-engaging ends 141 of the elements 150 are normally related as heretofore described, this in the present instance being effected through adjustment of the pin-carrying members 155 such that the pins engage the rear ends of the slots 156 when the desired relative spacing of the ends 141 is attained.

The spring 167 serves to maintain such relation of the elements 150 until they are urged apart against the spring tension, by a clip displaced past the spreader ends 141. During displacement of a clip past the ends 141 and into clamping engagement with the objects to be held together, the rear end 10 of the clip will engage the ends 141 and in passing thereby, will urge the spreader elements apart, thus facilitating an easy passage of the clip end 10 past the spreader ends 141.

From the foregoing description of the improved clip appliance, it will be observed that the device presents a compact and positively acting mechanism for applying clips in an automatic manner, to objects to be held together thereby. Moreover, damage to the operating mechanism which might result from jamming of an abnormally formed or bent clip in the bore 28, or in its displacement past the clip spreader elements, is effectively precluded by reason of the magneti-

cally actuated, plunger type motor utilized to operate the mechanism, this providing a cushioned drive as will be readily understood.

The preferred embodiments of the invention herein illustrated and described are not to be taken as limiting the invention thereto, but it is to be understood that alterations or modifications in the parts or arrangement thereof may be made within the spirit and intended scope of the invention as defined by the appended claims.

I claim:

1. In a machine of the type described for application of spring clips, the combination of a magazine for holding a supply of said clips, clip receiving means, means serving to bias the clips in said magazine toward said receiving means, and clip applying means including elements operable in sequence, one thereof adapted to effect displacement of a clip in said receiving means and into clamping engagement with articles to be held thereby, and another adapted for biasing or loading parts of the clip during its displacement, in a manner to facilitate its engagement with said articles.

2. In an attaching device for clips of a type characterized by resilient, self clamping arms, means forming a clip channel, a reciprocable clip-impelling member operable to move a clip to be attached, through said channel, actuating means of electromagnetic type for operating said member, and arm-deflecting means engaged by the clip when impelled to a predetermined position in said channel.

3. In an attaching device for clips of types characterized by resilient arms, means forming a clip channel, a clip application station associated with said channel, a plunger operable in the channel in impelling relation to a clip therein, actuating means of electromagnetic type for operating said plunger, an energizing circuit for said actuating means, a circuit control switch means therefor, located in the zone of said clip application station, arm deflecting means engaged by the clip when impelled by the plunger to a predetermined position in the zone of said application station, and means locating sheet elements or the like, in a position to extend between the arms of the clip when the clip is in said predetermined position in the zone of said application station.

4. In an attaching device for clips of types characterized by resilient arms, means for impelling a clip to a position to be attached, means for spreading the clip as it approaches a position of attachment, means for feeding the clips, one at a time, to a position of engagement by the impelling means, said feeding means being operable in timed relation to said clip impelling means.

5. In an attaching device for clips of types characterized by resilient arms, means for impelling a clip to a position to be attached, means for spreading the clip as it approaches a position of attachment, and means for feeding the clips one at a time, said feeding means being operable by said clip-impelling means.

6. In an attaching device for clips of types characterized by resilient arms, means for impelling a clip to a position to be attached, means for spreading the clip as it approaches a position of attachment, means for feeding the clips, one at a time, to a position for movement by the impelling means, said feeding means being operable in timed relation to said clip-impelling means, and means locating sheet elements or the like in a position to extend between the arms of

the clip when the clip is impelled to a predetermined position.

7. In an attaching device for clips of a type characterized by resilient arms, means forming a channel for a clip to be attached, a plunger operable to impel the clip through the channel, actuating means of electromagnetic type for operating said plunger, an energizing circuit for said actuating means, including a control device therein, means for deflecting the arms of the clip responsively to movement of the clip to a predetermined position with respect to the channel, the clip channel having an open portion, and means providing a zone of deposit of sheet elements or the like intended for clip application, said zone of deposit overlying the open portion of the channel.

8. In an attaching device for wire clips of self-clamping type characterized by resilient arms adapted to engage opposite sides of a group of sheet elements or the like, means forming a clip channel, means for feeding the clips, one at a time, to said channel, a plunger reciprocally operable in the channel in impelling relation to a clip therein, clip-arm-deflecting means positioned to be engaged by the clip when impelled to a predetermined zone of the channel, means forming a plane surface constituting a zone of deposit of the materials to be clipped, and said channel having a portion underlying the said zone of deposit, and formed for guiding relation of one of the clip arms beneath the plane of said deposit surface.

9. In a machine of the type described for application of clips of resilient, self-clamping type, comprising a clip supplying magazine, a clip application station at which are arranged articles to be engaged by a clip, and clip applying mechanism operable automatically to effect uninterrupted displacement of a clip from said magazine to said station and into engagement with said articles, said mechanism including an electromagnetically actuated clip displacing element and means arranged near said station, adapted temporarily to deform said clip in a manner to facilitate its engagement with the articles to be clamped thereby.

10. In a machine of the type described, the combination of a clip-supplying magazine, clip receiving means, a clip application station associated with said receiving means and at which are arranged articles to be engaged by a clip, and clip applying means operable in sequence, to effect displacement of a clip in said receiving means and into clamping engagement with said articles, and a separation of a clip from said magazine for delivery to said receiving means.

11. In a machine of the type described, the combination of a clip-supplying magazine, clip receiving means, a clip application station associated with said receiving means and at which are arranged articles to be engaged by a clip, clip applying means adapted for effecting displacement of a clip in said receiving means and into

clamping engagement with said articles, and mechanism actuated by said clip applying means, cooperating with said applying means in the separation of a clip from the magazine and delivery thereof to said receiving means.

12. In a machine for the purpose noted, comprising a clip supplying magazine, a clip application station at which are arranged articles to be clamped together, clip receiving means interconnecting said magazine and station, means associated with said magazine for effecting delivery of one clip at a time to said receiving means, and clip applying mechanism including a plunger operable to effect displacement movement of a clip in said receiving means, to said station and into clamping engagement with said articles, and clip spreading means disposed in the path of clip movement, adapted for spreading a clip, prior to its engagement with said articles.

13. In a machine of the type described, the combination of a clip-supplying magazine, clip receiving means, a clip application station associated with said receiving means and at which are arranged articles to be engaged by a clip, means operatively associated with said magazine for controlling delivery of but one clip at a time to said receiving means, a member operable in said receiving means, adapted for displacing a clip therein to said station and into clamping engagement with said articles, and operating means for said member including an electromagnetically actuated element.

14. In a machine of the type described, the combination of a clip-supplying magazine, clip receiving means, a clip application station associated with said receiving means and at which are arranged articles to be engaged by a clip, means operatively associated with said magazine for controlling delivery of but one clip at a time to said receiving means, a member operable in said receiving means, adapted for displacing a clip therein to said station and into clamping engagement with said articles, operating means for said member including an electromagnetically actuated element, and control means for said operating means, operable from said station.

15. In a machine of the type described, the combination of a clip-supply magazine, a clip receiving means including an application station at which are arranged articles to be engaged by a clip, a clip-separator functionally associated with said magazine, adapted for controlling delivery of but one clip at a time to said receiving means, a member operable in said receiving means for effecting displacement of a clip therein to said station and into clamping engagement with said articles, operating means for said member including an electromagnetically actuated element, and means actuated in response to operation of said operating means, for operating said clip-separator.

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