

Nov. 11, 1952

A. LENART ET AL

2,617,098

CLIP FORMING AND APPLYING MACHINE

Filed April 17, 1950

8 Sheets-Sheet 1

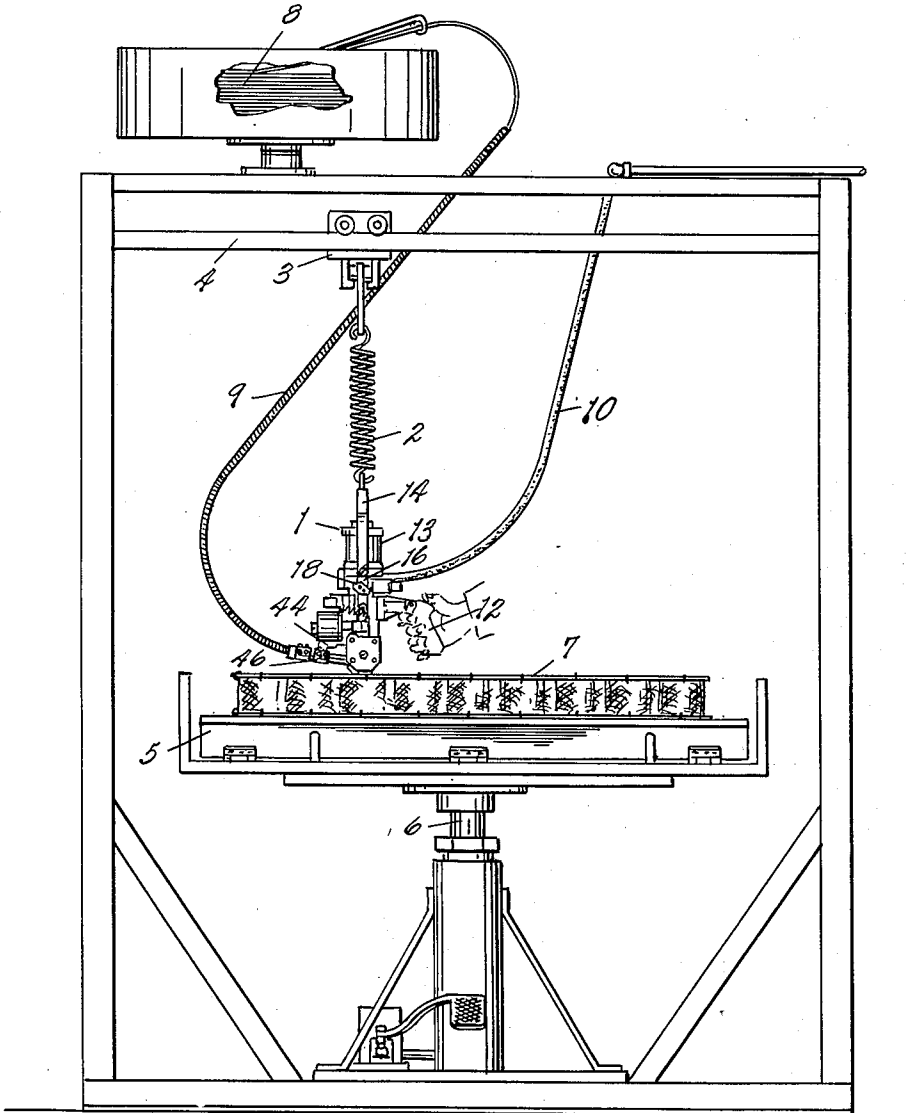


FIG. 1

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8 Sheets-Sheet 2

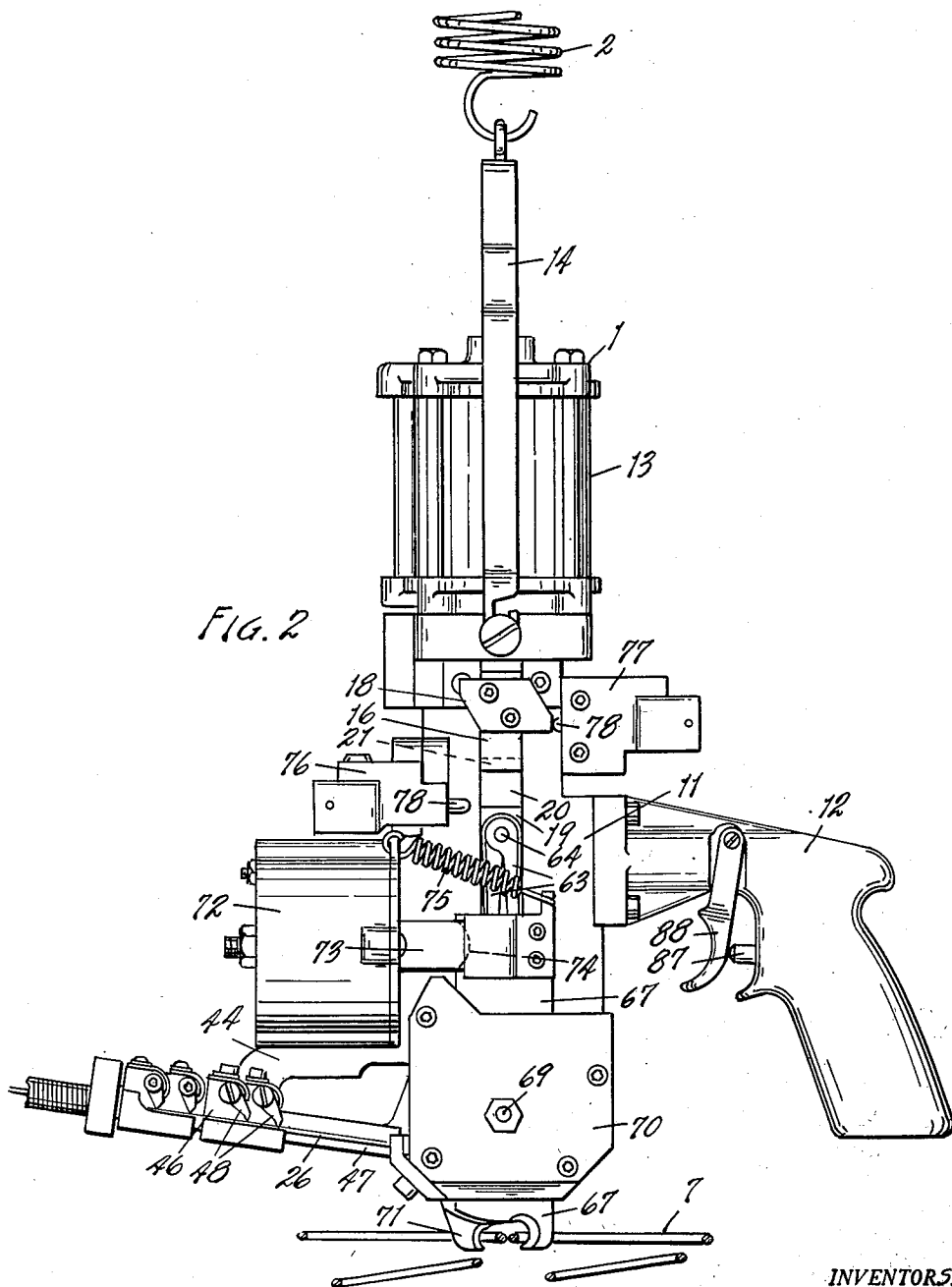


FIG. 2

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8 Sheets-Sheet 3

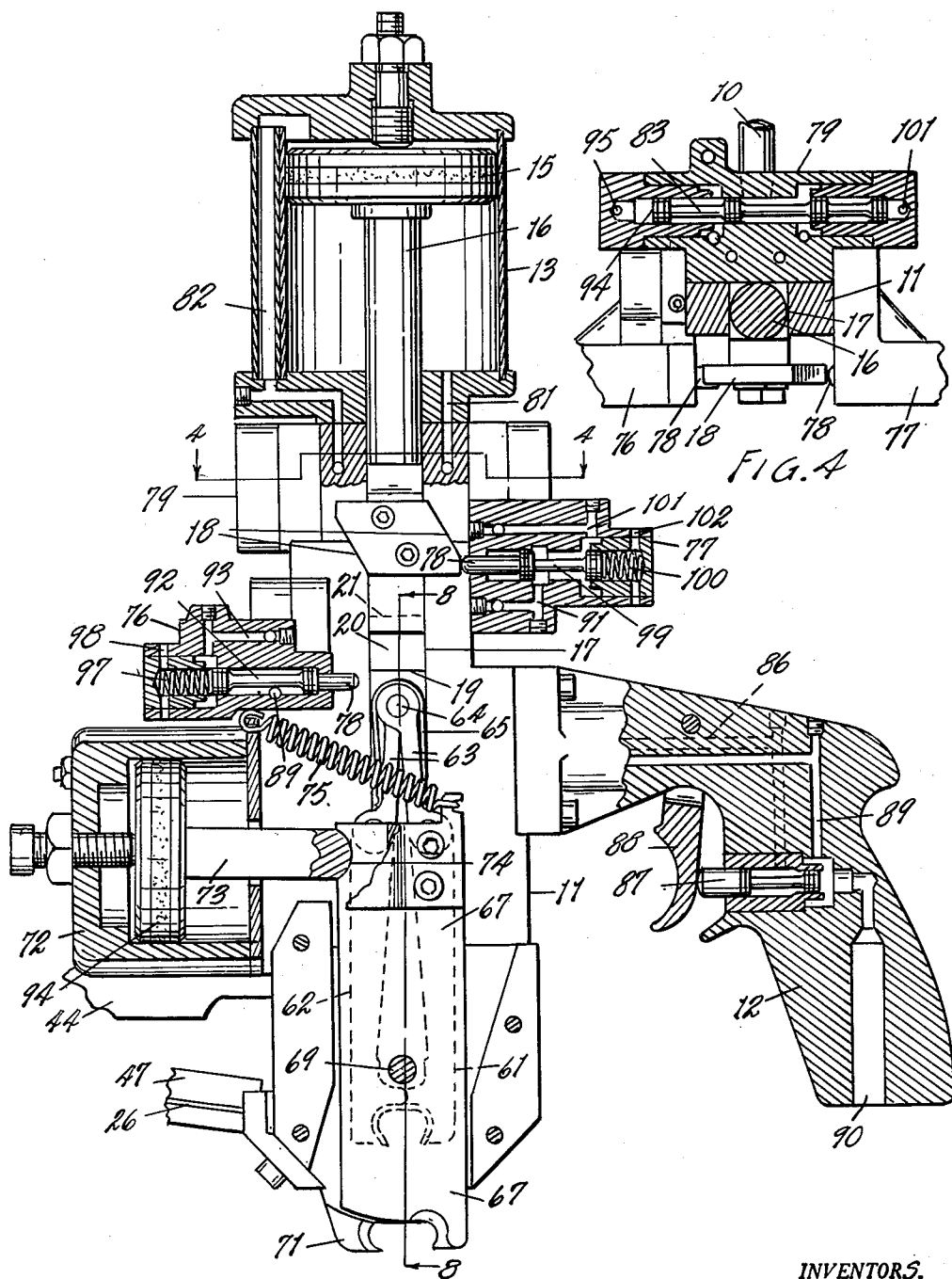


FIG. 3

FIG. 4

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8 Sheets-Sheet 4

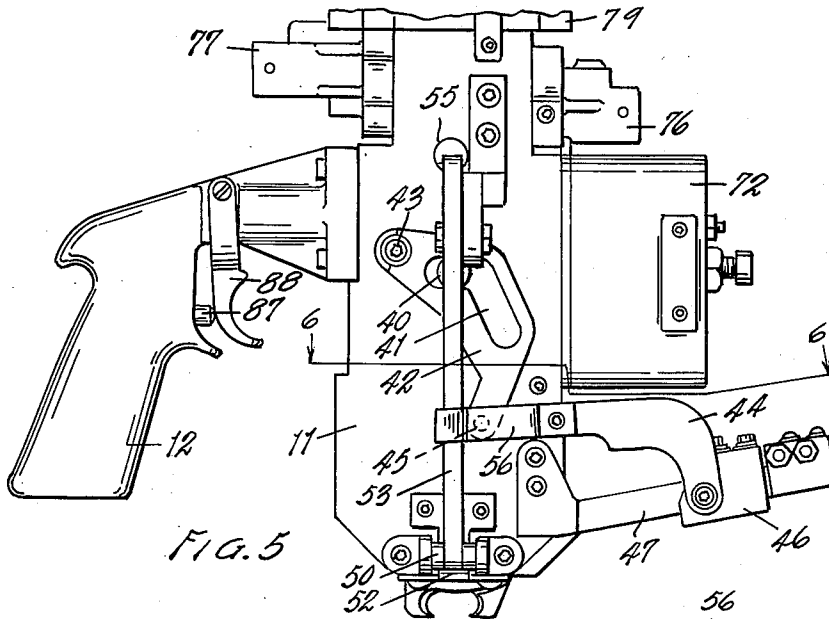


FIG. 5

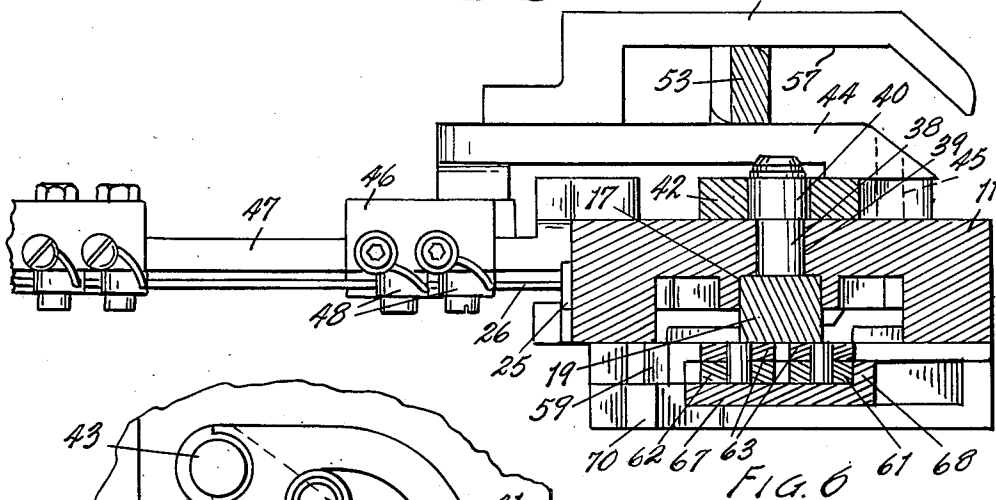


FIG. 6

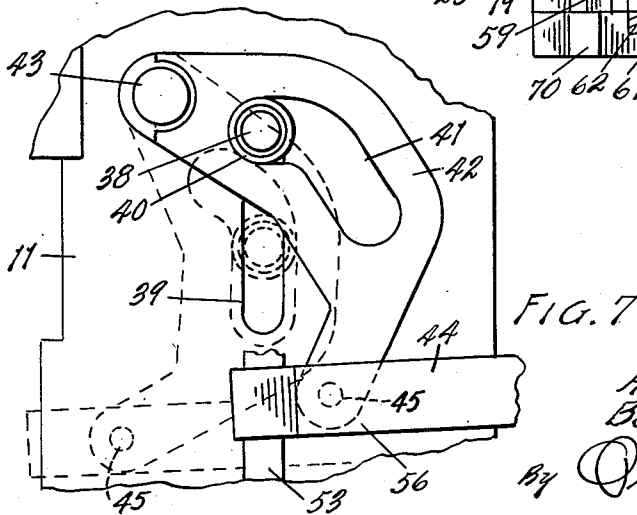


FIG. 7

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8 Sheets-Sheet 5

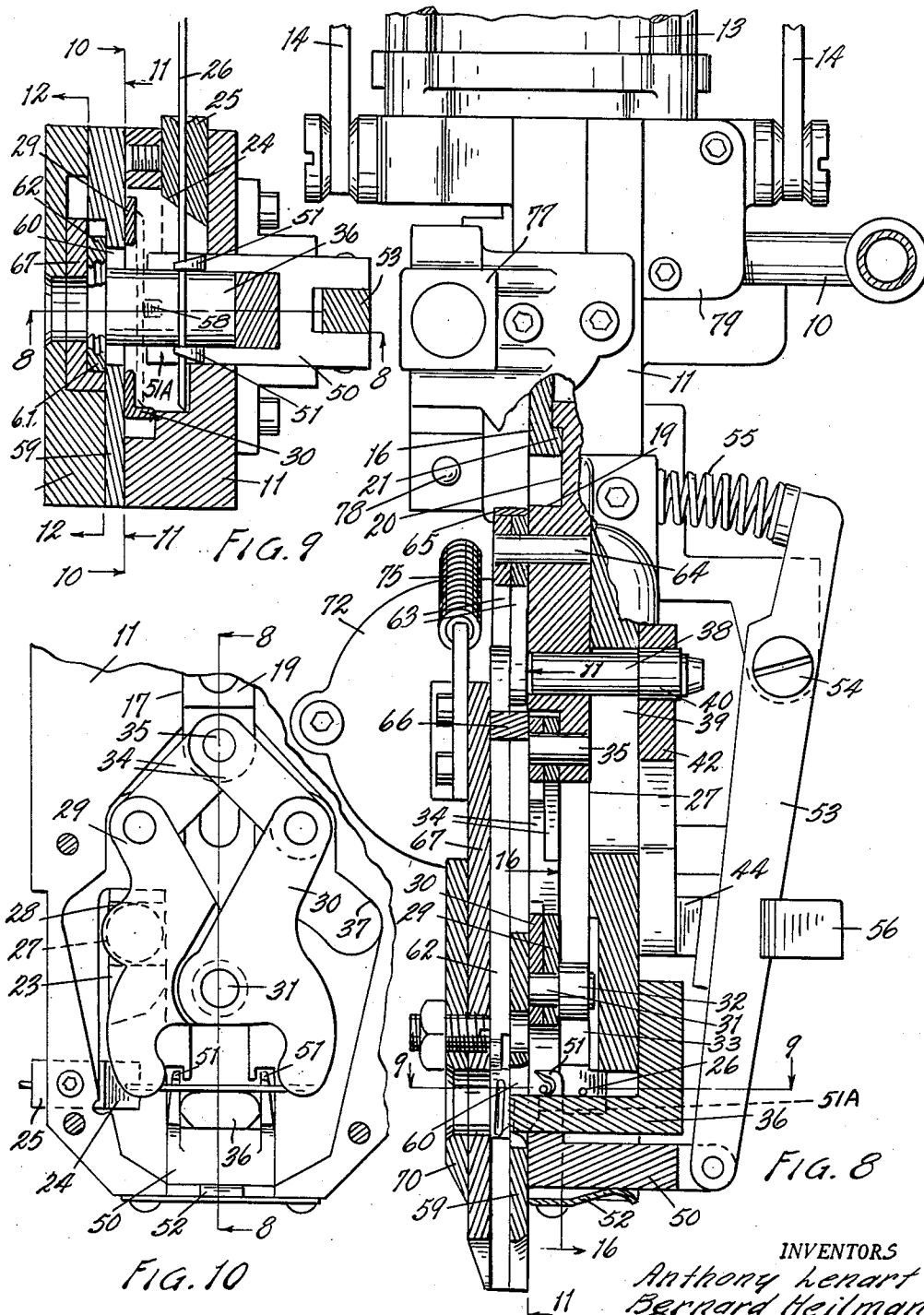


FIG. 10

FIG. 8

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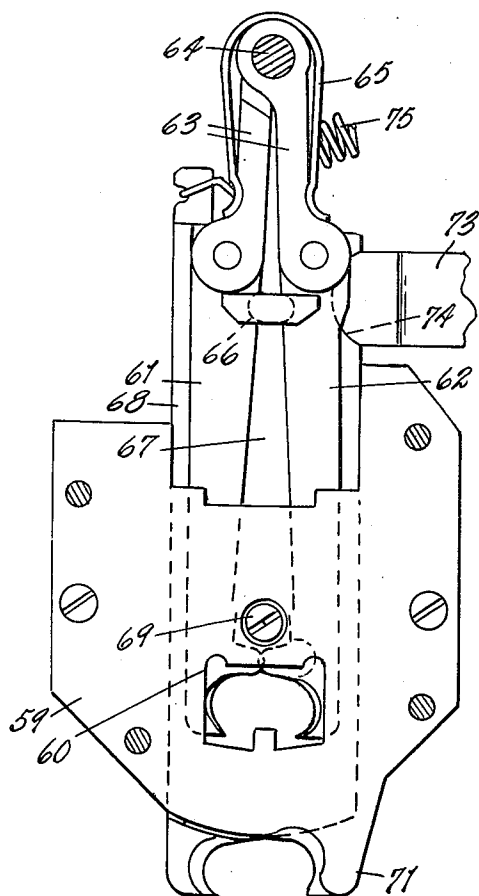


FIG. 11

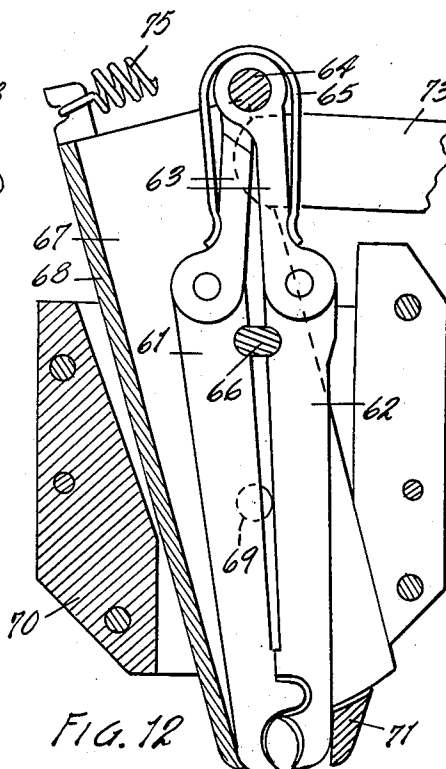


FIG. 12

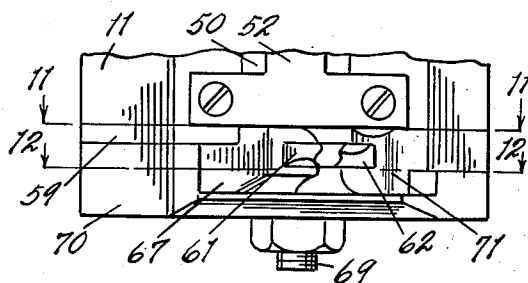


FIG. 13

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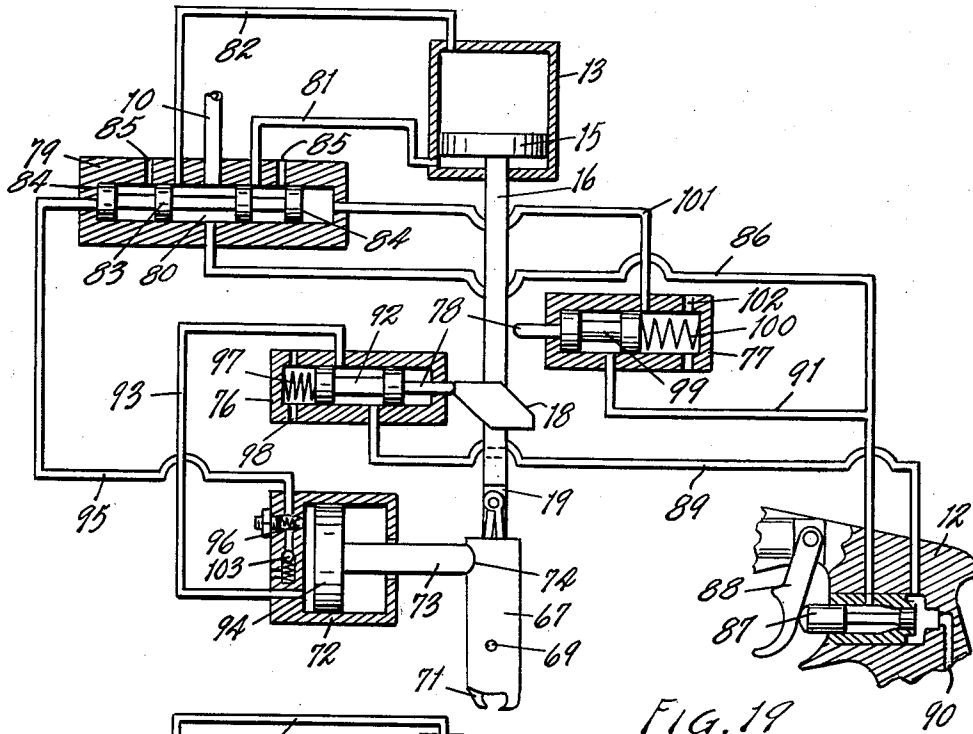


FIG. 19

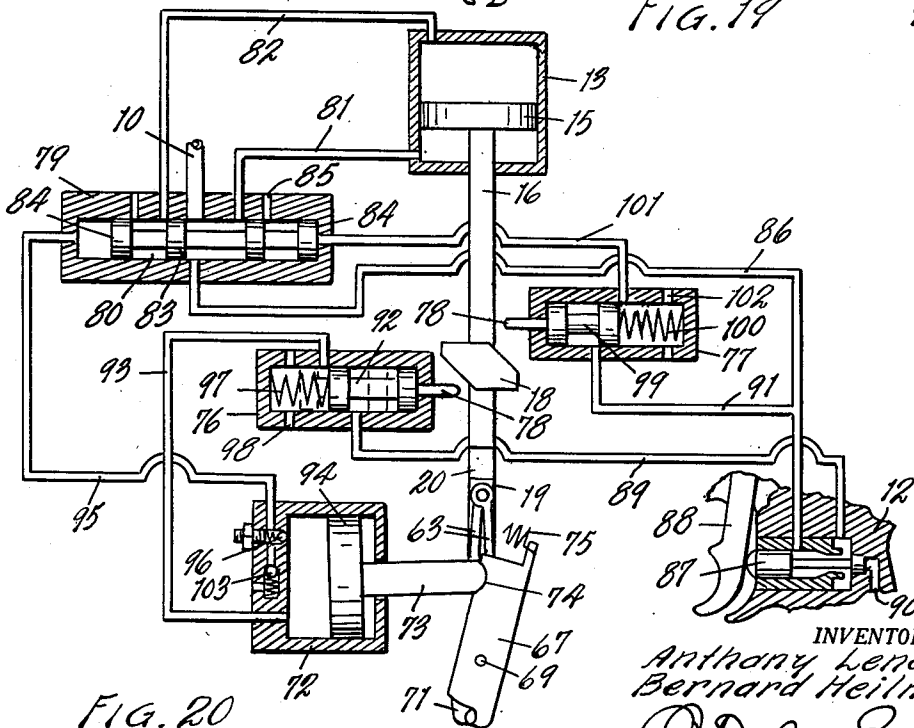


FIG. 20

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UNITED STATES PATENT OFFICE

2,617,098

CLIP FORMING AND APPLYING MACHINE

Anthony Lenart and Bernard Heilman, Detroit, Mich., assignors to L. A. Young Spring & Wire Corporation, Detroit, Mich.

Application April 17, 1950, Serial No. 156,444

17 Claims. (Cl. 1—177)

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This invention relates to improvements in clip forming and applying machine. The improvements set forth and claimed in this application constitute improvements of the machine described and claimed in our copending application for Clip Forming and Applying Machine, Serial No. 732,524 filed March 5, 1947.

The principal objects of this invention are:

First, to provide an improved form of machine for severing wire stock into short blanks and forming the blanks into clips which are then applied to a work piece by closing the clips around adjacent elements of the work piece.

Second, to provide a clip forming and applying machine which is operated by compressed air and in which the energy for closing the clips is directly supplied by compressed air whereby the final closing force on the clips may be adjusted to any desired value.

Third, to provide pneumatic operating mechanism including work performing cylinders and control valves for automatically advancing and retracting the forming and closing jaws of a clip forming and applying machine and for moving the closing jaws to clip applying position.

Fourth, to provide a clip forming and applying machine in which the closing pressure of the clip applying jaws is as strong or stronger at the end of the closing motion of the jaws than it is at the beginning of the closing motion of the jaws.

Fifth, to provide a clip forming and applying machine which is easily maneuverable and operable over a work piece and in which the operator is required to merely guide and control the operation of the machine by means of a trigger.

Other objects and advantages relating to details of our machine will be apparent from a consideration of the following description and claims and the attached drawings, of which there are eight sheets.

Fig. 1 is a side elevational view of the machine operatively mounted over a work support for joining elements of the work piece.

Fig. 2 is an enlarged side elevational view of the clip forming and applying mechanism operatively associated with a work piece.

Fig. 3 is a side elevational view of the machine with portions thereof broken away in vertical cross section.

Fig. 4 is a fragmentary horizontal cross sectional view taken along the plane of the line 4—4 in Fig. 3 and looking downwardly in the direction of the arrows.

Fig. 5 is a fragmentary elevational view of the opposite side of the forming and closing mechanism from that shown in Figs. 1 to 3.

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Fig. 6 is a fragmentary horizontal cross sectional view taken along the plane of the line 6—6 in Fig. 5 and looking downwardly in the direction of the arrows to the stock feeding elements of the machine.

Fig. 7 is an enlarged fragmentary side elevational view of the stock feeding cam shown in Fig. 5 and illustrates the range of movement of the feeding mechanism.

Fig. 8 is a fragmentary transverse vertical cross sectional view through the forming and applying mechanism taken along the plane of the line 8—8 in Figs. 3, 9 and 10.

Fig. 9 is a fragmentary horizontal cross sectional view taken along the plane of the line 9—9 in Fig. 8 and looking downwardly in the direction of the arrows.

Fig. 10 is a fragmentary side elevational view of the clip forming jaws taken along the plane of the line 10—10 in Fig. 9.

Fig. 11 is a fragmentary vertical cross sectional view taken along the plane of the line 11—11 in Figs. 8 and 9 and looking in the opposite direction from the view in Fig. 10.

Fig. 12 is a fragmentary vertical cross sectional view taken along the plane of the broken line 12—12 in Figs. 9 and 13 and showing the clip applying jaws in closed position.

Fig. 13 is a fragmentary bottom view of the clip applying jaws.

Fig. 14 is a fragmentary vertical cross sectional view similar to Fig. 10 but illustrating the forming jaws in closed position.

Fig. 15 is a fragmentary horizontal cross sectional view similar to Fig. 9 but illustrating the forming and closing jaws in closed position.

Fig. 16 is a fragmentary vertical cross sectional view taken along the plane of the line 16—16 in Figs. 8 and 15 and illustrating the action of the blank severing jaws.

Fig. 17 is an enlarged fragmentary elevational view illustrating the action of the closing jaws in applying a clip to elements of a work piece.

Fig. 18 is an enlarged fragmentary plan view showing a clip as applied to the work piece by our machine.

Fig. 19 is a schematic diagram illustrating the pneumatic controls and operating mechanism for our machine, the elements of the controls being illustrated conventionally and in an at rest position.

Fig. 20 is a schematic view similar to Fig. 19 but illustrating the controls and mechanism in an actuated retracting position.

Fig. 1 illustrates generally a desirable operating installation of our machine in which the

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forming and applying mechanism 1 is suspended by a coil spring 2 from a carriage 3 mounted on the rail 4. The rail is supported by a suitable framework over an adjustable work support 5. The work support 5 is vertically adjustable on the hydraulic pedestal 6 and adapted to support a work piece in the form of a cushion assembly 7 for connection of the elements of the assembly by the machine 1. Blank wire stock for the machine 1 is supplied in a continuous manner from the coil 8 through a flexible guide tube 9, and compressed air for operating the machine is supplied through the flexible conduit 19 from a suitable source.

The forming and applying mechanism 1 operates in much the same manner and contains many of the same parts as the machine disclosed in our above mentioned copending application. In general the machine consists of a vertically disposed body or base plate 11 having the operating handle 12 bolted to the front edge thereof. The upper end of the body is enlarged and has the pneumatic cylinder 13 bolted to the top thereof. A yoke 14 swingably supports the body 11 from the spring 2 and desirably the lower portion of the mechanism is approximately balanced on the yoke 14 by the weight of the pneumatic cylinder.

As is most clearly illustrated in Figs. 3 and 4, the cylinder 13 contains a piston 15 having a piston rod 16 extending downwardly into a slot 17 in the left side of the body 11 as viewed from the front or handle edge of the machine. The lower end of the piston rod 16 is squared to be guided in the slot 17 and has a double sided cam 18 secured thereto in overlapping relationship with the sides of the slot. Also slidably mounted in the slot 17 is a generally rectangular elongated ram 19, and as is most clearly illustrated in Figs. 3 and 8, the ram 19 has a transversely extending notch 20 formed therein. The lower end of the piston rod 16 overlaps the upper end of the ram 19 and has a laterally projecting finger or flange 21 slidably positioned in the notch 20 to form a lost motion connection between the ram and the piston rod. Thus downward movement of the piston rod 16 will not affect the ram 19 until the flange 21 strikes the bottom of the groove 20. Similarly, upward movement of the piston rod will not affect the ram until the flange 21 engages the upper side of the groove 20.

The stock feeding and severing mechanism of the machine is most clearly illustrated in Figs. 5 to 9 and 16. It will be noted that the left face of the body 11 is vertically recessed or grooved adjacent to the groove 17 as at 22 (see Fig. 16) to form a slideway for the shear block 23. The shear block 23 has an oblique vertical face co-operative with a complementary face 24 on the feed block 25 fitted into the rear edge of the body 11. Blank wire stock entering the recessed body through a hole in the feed block as at 26 is engaged and sheared off by the descending shear block 23. Movement of the shear block 23 is accomplished by means of a roller 27 riding in a transverse slot 28 in the shear block. The roller 27 is carried on the rear forming jaw 29.

Cooperative with the rear forming jaw 29 is a front forming jaw 30, and the two are pivotally connected by a pin 31 and vertically guided by a roller 32 on the pin movable in a slot 33 in the body 11. The upper ends of the jaws 29 and 30 are connected by the links 34 to a pin 35 carried on the lower end of the ram 19.

The forming jaws 29 and 30 are moved into

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closed forming position about a transversely extending mandrel 36 by reason of downward movement of the pin 35 forcing the links 34 and the upper ends of the forming jaws apart into the diverging guide recesses 37 formed in the face of the body 11.

The lower end of the ram 19 carries a pin 38 which projects to the right side of the body 11 through a vertical slot 39 (see Figs. 6, 7 and 8). The outer end of the pin 38 carries a roller 40 engaged in the angle shaped cam slot 41 formed in a feed cam 42. The feed cam is pivotally supported on the right side of the body by the screw 43. The lower end of the feed cam 42 is pivoted to the rearwardly extending feed arm 44 as at 45. As is most clearly illustrated in Figs. 5 to 7, upward movement of the pin 38 with the ram 19 will result in the roller 40 moving in the cam slot 41 and causing the feed arm 44 to be moved rearwardly of the machine. The rear end of the feed arm 44 is connected to a feed jaw 46 slidably mounted on the rail 47 and provided with spring pressed feed pawls 48. Upon lowering motion of the ram and pin 38, the feed arm 44 and jaw 46 will be drawn forwardly and the pawls 48 will feed a predetermined length of the wire stock through the shear block 25. The length of the stock fed into the body of the machine and across the mandrel 36 can be adjusted by positioning the stop screw 49 in the front side of the body opposite the feed block as is most clearly illustrated in Fig. 16.

In order to advance the severed blank of relatively straight stock transversely to the forming jaws 29 and 30, we have provided a transverse feed shoe 50 shaving upstanding hooked fingers 51 positioned on each side of the mandrel 36. The feed shoe 50 is springably retained along the bottom of the mandrel by a spring clip 52 and is pivotally connected at its outer end to a vertically extending lever 53. The lever 53 has a fixed pivotal connection to the body 11 as at 54 and is spring biased to move inwardly or to the left toward the forming jaws by the coil spring 55. The lower arm of the lever 53 extends along side of the feed arm 44, and the arm 44 is provided with a bracket 56 embracing the outside of the lever 53 to form a cam slot 57, the edges of which are operative to move the lever 53 transversely as the feed arm 44 is moved to the front or rear. As is most clearly illustrated in Fig. 6, rearward motion of the feed arm 44 will permit the lever 53 and feed shoe 50 to move inwardly of the body under the influence of the spring 55 at the end of the retracting motion of the arm 44, ram 19, and the forming and closing jaws as will be described. As the arm 44 is moved forwardly to advance a new blank of wire, the lever 53 is immediately drawn outwardly to reposition the hooked fingers 51 to receive the incoming stock.

The forming jaws 29 and 30 which descend and close with downward movement of the ram 19 will thus engage and bend each successive blank about the mandrel 36. It will be noted that a small raised tooth 58 on the top of the mandrel prevents the unformed blank stock from being drawn rearwardly by the retracting hooked fingers 51. On the next succeeding advancing motion of the feed shoe 50, the inner or leading edges 51A of the hooked fingers 51 will engage and advance the formed clip along the mandrel and into the closing jaws, as will now be described.

The closing jaws are separated from the forming jaws 29 and 30 by a plate 59 which closes the recessed side of the body 11. The plate 59 has

a hole formed therethrough as at 60, through which the end of the mandrel projects, and the rear closing jaw 61 and front closing jaw 62 are lapped upon the side of the plate 59. The upper ends of the closing jaws are connected by means of the separate links 63 to a driving pin 64 connected to the lower end of the ram 19. Thus the closing jaws are reciprocated upwardly and downwardly concurrently with the ram and the forming jaws. The closing jaws are normally held with their lower ends in open position by means of the U-shaped spring 65 which presses inwardly on the links 63 to pivot the upper ends of the forming jaws about a spacer pin 66 (see Fig. 12). After the formed clip has been received in the open lower ends of the closing jaws it is retained in place by reason of the concave shape of the jaws as is more particularly described in our before mentioned co-pending application. After the closing jaws have been advanced downwardly below the bottom of the plate 59 and body 11, the jaws are in a position to be closed, and this motion is accomplished by a closing plate 67 lapped upon the left or outer sides of the closing jaws and having an inwardly extending flange 68 along its front edge engageable with the front edge of the front closing jaw. The closing plate 67 is pivotally supported by the bolt 69 on a cover plate 70, and the rear closing jaw is restrained against displacement by a depending finger 71 on the bottom of the plate 59.

Closing motion of the plate 67 is accomplished by a pneumatic cylinder 72 having a piston rod 73 which engages the bracket 74 secured to the upper end of the closing plate. The closing plate is returned to open position by the coil spring 75. The mechanism for regulating the actions of the clip forming and advancing cylinder 13 and the clip closing cylinder 72 consists generally of a lower valve 76 and an upper valve 77 secured to the rear and front edges respectively of the body 11. The valves have actuating pins 78 which project toward the ram 19 and are in a position to be alternately actuated by the double sided cam plate 18 as the piston 16 reciprocates in the cylinder 13. A reversing valve 79 secured to the top of the body reverses the supply of air top and bottom of cylinder 13.

The several communicating passages and valves for interconnecting and operating the pneumatic system are most clearly understandable from a consideration of the diagrammatic views in Figs. 19 and 20. It will be understood that the necessary passages and chambers corresponding to the conduits shown conventionally in these figures are provided in the body of the machine 1, but it is believed unnecessary to a complete understanding of our machine to point out in detail where these passages are provided within the body 11. The passages could take the form of external pipes or conduits connecting the several valves and cylinders if this was desired. Where the several passages appear in the drawings of the machine, they have been given reference numerals corresponding to the numerals of the conventionally illustrated conduits and pneumatic system, which will now be described.

The reversing valve 79 positioned at the top of the body has an elongated valve chamber 80 into the center of which the air supply conduit 10 continually opens. Opening to the chamber 80 on opposite sides of the conduit 10 are a retracting conduit 81 and an advancing conduit 82 which extend respectively to the bottom and top of the pneumatic cylinder 13. A double ended

valve element 83 reciprocable in the chamber 80 alternately connects the supply conduit 10 with the retracting and advancing conduits 81 and 82. Piston faces 84 on the ends of the valve element 83 function to move the valve element under the influence of air pressure admitted to the ends of the chamber 80, as will be described presently, and vent passages 85 are positioned to vent the conduits 81 and 82 to the atmosphere whenever either of these conduits are inoperative.

Air pressure is continually supplied from the conduit 10 and chamber 80 through a control conduit 86 which extends downwardly to a trigger valve 87 positioned in the handle 12 of the machine. A trigger 88 on the grip is operative when depressed to open the conduit 86 to the conduit 89. When the valve 87 is closed, the conduit 89 is vented to the atmosphere through a port 90 in the handle. The control conduit 86 also has a branch passage 91 extending to the upper valve 77, the purpose of which will be described presently.

The conduit 89 opens to the lower valve 76, and when the piston rod 16 and double sided cam 18 are in lowered position as shown in Fig. 19, the valve element 92 of the lower valve will be retracted by the cam in the position illustrated to permit the flow of air through the lower valve and conduit 93 to the clip closing cylinder 72. The flow of compressed air into the cylinder 72 will build up a pressure in the cylinder tending to move the piston 94 and piston rod 73 outwardly to close the clip forming jaws. A conduit 95 also opens to the face of the piston 94, but an adjustable pressure relief valve 96 positioned in the cylinder 72 prevents the admission of air to the conduit 95 until the desired operating pressure has been built up in the cylinder 72 and the piston rod 73 has moved to close the clip closing jaws.

Turning now to the conditions that will exist in the system after the trigger 88 has been actuated as shown in Fig. 20, it will be noted that the predetermined pressure in the cylinder 72 will have moved the jaw closing plate 67 to closing position, and the pressure within the cylinder 72 having been built up sufficiently to open the valve 96, air will have been admitted to the left end of the reversing valve 79 to move the valve element 83 to the right. The supply of compressed air to the advancing conduit 82 is shut off, and air is admitted to the retracting conduit 81 and the bottom of the cylinder 13 to start upward movement of the piston 15 and piston rod 16. The first upward movement of the piston rod 16 will have moved the double sided cam 18 away from the tappet on the lower valve 92, permitting the spring 97 to move the lower valve to close off the conduit 89 and vent the conduit 93 and cylinder 72 to the atmosphere through the vent 98. Due to the lost motion connection between the piston rod 16 and ram 19, no vertical movement will have been imparted to the closing jaws 61 and 62 or the forming jaws 29 and 30, and the closing plate 67 will have time to move to open position, the return spring 55 functioning to return both the closing plate and the piston 94. The piston 15 will continue its upward motion so that the piston rod 16 picks up and retracts the ram 19 and the forming and closing jaws, as was explained previously. Note also that at this time the shoe 50 and fingers 51 will advance a formed clip to the closing jaws in their retracted position and will advance a clip

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blank along the mandrel to underneath the forming jaws. Near the upper limit of travel of the piston rod 16, the double-sided cam 18 will engage and depress the tappet of the valve element 99 in the upper valve 77. The upper valve 77 is biased by the spring 100 to close the conduit 91 from the conduit 101. In closed position, the valve 77 vents the conduit 101 through the vent 102. On inward movement of the valve element, air pressure from the branch conduit 91 is admitted through the conduit 101 to the right end of the reversing valve 79. The valve element 83 is thus moved to the left to the position shown in Fig. 19, cutting off the supply of compressed air to the bottom of the cylinder 13 and stopping the upward movement of the piston and ram. The downward movement of the piston and ram follows immediately and automatically since the valve element 83 automatically opens the reversing valve 79 to the conduit 82. The initial downward movement of the ram actuates the pin 38 and the cam link 42 to drive the feed arm 40 in stock feeding motion and to retract the shoe 50.

The system is thus entirely automatic upon actuation of the trigger 88, and the mechanism will continue to reciprocate and open and close the closing jaws so long as the trigger is held depressed. The rate at which the system will operate may be regulated by adjustment of the valve 96 which determines the pressure which must be built up within the cylinder 72 before the reversing valve is moved to retracting position. A spring biased bleed valve 103 built into the wall of the cylinder 72 and communicating with the conduit 95 is adjustable to determine the rate at which the pressure behind the left end of the valve element 83 is dissipated and overcome by the pressure in the conduit 101 to shift the reversing valve and start the downstroke of the system. The resistance of bleed valve 103 also assures that sufficient pressure will be built up in conduit 95 to shift the valve element 83 in the reversing valve 79.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In combination with a clip forming and applying machine having clip forming and clip closing jaws and a reciprocable ram connected to advance said jaws, a first pneumatic cylinder having a piston rod connected to reciprocate said ram and having a lost motion connection therewith, a cam carried by said piston rod, a second pneumatic cylinder having a piston positioned when extended to act upon and close said closing jaws, upper and lower valves positioned in spaced relationship along and adjacent to said piston rod and spring biased to pressure shut-off position, said valves having tappets arranged to be alternately depressed by said cam to open said valves, a reversing valve having a source of air pressure opening thereto and having a pneumatically shiftable valve element, advancing and retracting conduits opening to said reversing valve and alternatively connectable to said source by said reversing valve, said conduits opening respectively to the top and bottom of said first cylinder, a control conduit continuously opening to said source and having a trigger valve therein, a first branch conduit continuously opening from said control conduit to said upper valve, a first valve shifting conduit extending from said upper valve to said reversing valve and adapted to admit air to move said reversing valve to ram advancing

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vancing position when said upper valve is opened by said cam, a second branch conduit opening from said trigger valve to said lower valve to supply air thereto when said trigger valve is open, a conduit opening between said second cylinder and said lower valve and communicating with said second branch conduit when said lower valve is opened by said cam, a second valve shifting conduit communicating between said second cylinder and the opposite end of said reversing valve from said first shifting conduit, and an adjustable spring biased valve in said second valve shifting conduit opposing the passage of air from said second cylinder to said reversing valve until a predetermined pressure is established in said latter cylinder, said second valve shifting conduit having an adjustable bleed valve opening therefrom, said upper and lower and reversing and trigger valves having vent passages opening to the outlet sides thereof when the shiftable elements thereof are in pressure shut-off position.

2. In combination with a clip forming and applying machine having clip forming and clip closing jaws and a reciprocable ram connected to advance said jaws, a first pneumatic cylinder having a piston rod connected to reciprocate said ram and having a lost motion connection therewith, a cam reciprocable with said piston rod, a second pneumatic cylinder having a piston positioned when extended to act upon and close said closing jaws, first and second valves positioned in spaced relationship along and adjacent to said piston rod and spring biased to pressure shut-off position, said valves having tappets arranged to be alternately depressed by said cam to open said valves, a reversing valve having a source of air pressure opening thereto and having a pneumatically shiftable valve element, advancing and retracting conduits opening to said reversing valve and alternatively connectable to said source by said reversing valve, said conduits opening to opposite ends of said first cylinder, a control conduit opening to said source and having a trigger valve therein, a first branch conduit continuously opening from said control conduit to said first valve, a first valve shifting conduit extending from said first valve to said reversing valve and adapted to admit air to move said reversing valve to ram advancing position when said first valve is opened by said cam, a second branch conduit opening from said trigger valve to said second valve to supply air thereto when said trigger valve is open, a conduit opening between said second cylinder and said second valve and communicating with said second branch conduit when said second valve is opened by said cam, a second valve shifting conduit communicating between said second cylinder and the opposite end of said reversing valve from said first shifting conduit, and an adjustable valve in said second valve shifting conduit opposing the passage of air from said second cylinder to said reversing valve until a predetermined pressure is established in said latter cylinder, said second valve shifting conduit having a bleed valve opening therefrom.

3. In combination with a clip forming and applying machine having clip forming and clip closing jaws and a reciprocable ram connected to advance said jaws, a first pneumatic cylinder having a piston rod connected to reciprocate said ram, a cam reciprocable with said piston rod, a second pneumatic cylinder having a piston positioned when extended to act upon and close said closing jaws, first and second valves posi-

tioned in spaced relationship along and adjacent to said piston rod and biased to pressure shut-off position, said valves having tappets arranged to be alternately depressed by said cam to open said valves, a reversing valve having a source of air pressure opening thereto and having a pneumatically shiftable valve element, an advancing conduit opening to said first cylinder and selectively connectable to said source by said reversing valve, a control conduit opening to said source and having a trigger valve therein, a first branch conduit continuously opening from said control conduit to said first valve, a first valve shifting conduit extending from said first valve to said reversing valve and adapted to admit air to move said reversing valve to ram advancing position when said first valve is opened by said cam, a second branch conduit opening from said trigger valve to said second valve to supply air thereto when said trigger valve is open, a conduit opening between said second cylinder and said second valve and communicating with said second branch conduit when said second valve is opened by said cam, a second valve shifting conduit communicating between said second cylinder and the opposite end of said reversing valve from said first shifting conduit, and an adjustable valve in said second valve shifting conduit opposing the passage of air from said second cylinder to said reversing valve until a predetermined pressure is established in said latter cylinder, said second valve shifting conduit having a bleed valve opening therefrom.

4. In combination with a clip forming and applying machine having clip forming and clip closing jaws and a reciprocable ram connected to advance said jaws, a first pneumatic expansive device having a rod connected to reciprocate said ram and having a lost motion connection therewith, a second pneumatic expansive device operatively connected to and arranged when extended to close said closing jaws, first and second valves positioned in spaced relationship along and adjacent to said rod and spring biased to pressure shut-off position, said valves having tappets arranged to be alternately depressed by a portion of said rod to open said valves, a reversing valve having a source of air pressure opening thereto and having a pneumatically shiftable valve element, an advancing conduit opening to said first device and alternately connected to said source and vented to the atmosphere by said reversing valve, a control conduit opening to said source and having a trigger valve therein, a first branch conduit continuously opening from said control conduit to said first valve, a first valve shifting conduit extending from said first valve to said reversing valve and adapted to admit air to move said reversing valve to ram advancing position when said first valve is opened by said rod, a second branch conduit opening from said trigger valve to said second valve to supply air thereto when said trigger valve is open, a conduit opening between said second device and said second valve and communicating with said second branch conduit when said second valve is opened by said rod, a second valve shifting conduit communicating between said second device and the opposite end of said reversing valve from said first valve shifting conduit, and an adjustable valve in said second valve shifting conduit opposing the passage of air from said second device to said reversing valve until a predetermined pressure is established in said latter device, said second valve shifting conduit having a bleed valve opening therefrom.

5. In combination with a clip forming and applying machine having clip forming and clip closing jaws and a reciprocable ram connected to advance said jaws, a first pneumatic expansive device having a rod connected to reciprocate said ram, a second pneumatic expansive device operatively connected to and arranged when extended to close said closing jaws, first and second valves positioned in spaced relationship along and adjacent to said rod and spring biased to pressure shut-off position, said valves having tappets arranged to be alternately depressed by a portion of said rod to open said valves, a reversing valve having a source of air pressure opening thereto and having a pneumatically shiftable valve element, an advancing conduit opening to said first device and alternately connected to said source and vented to the atmosphere by said reversing valve, a control conduit opening to said source and having a trigger valve therein, a first branch conduit continuously opening from said control conduit to said first valve, a first valve shifting conduit extending from said first valve to said reversing valve and adapted to admit air to move said reversing valve to ram advancing position when said first valve is opened by said rod, a second branch conduit opening from said trigger valve to said second valve to supply air thereto when said trigger valve is open, a conduit opening between said second device and said second valve and communicating with said second branch conduit when said second valve is opened by said rod, a second valve shifting conduit communicating between said second device and the opposite end of said reversing valve from said first valve shifting conduit, and an adjustable valve in said second valve shifting conduit opposing the passage of air from said second device to said reversing valve until a predetermined pressure is established in said latter device.

6. Actuating mechanism for a clip forming and applying machine having reciprocably mounted forming jaws and closing jaws, said mechanism comprising a pneumatically operated piston having a rod connected to advance said jaws and having a lost motion connection therewith, a source of air pressure, a conduit connecting said source to said piston to advance said piston, a valve in said conduit pneumatically movable between open and closed position, a mechanically operable valve spring biased to closed position and arranged to be opened by engagement with a portion of said rod on movement of said piston to retracted position, a second conduit controlled by said last valve and opening between said source and first valve to move said first valve to opened position, a second pneumatically operated piston positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening said source to said second piston, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit between said control valve and said second piston and spring biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a portion of said rod on movement of said first piston to advanced position, a fourth conduit opening between the pressure face of said second piston and the movable element of said first valve in opposition to said second conduit to admit air from said second piston to move said first valve to closed position, a spring pressed valve in said fourth conduit opposing movement of air therethrough until a predeter-

mined pressure is exerted on said second piston, and a spring closed outlet valve from said fourth conduit opposing escape of pressure from said fourth conduit until sufficient pressure is built up therein to shift the movable element of said first valve.

7. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a pneumatically operated piston having a rod connected to advance said jaws, a source of air pressure, a conduit connecting said source to said piston to advance said piston, a valve in said conduit pneumatically movable between open and closed position, a mechanically operable valve spring biased to closed position and arranged to be opened by engagement with a portion of said rod movement of said piston to retracted position, a second conduit controlled by said last valve and opening between said source and first valve to move said first valve to opened position, a second pneumatically operated piston positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening said source to said second piston, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit between said control valve and said second piston and spring biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a portion of said rod on movement of said first piston to advanced position, a fourth conduit opening between the pressure face of said second piston and the movable element of said first valve in opposition to said second conduit to admit air from said second piston to move said first valve to closed position, and a spring pressed valve in said fourth conduit opposing movement of air therethrough until a predetermined pressure is exerted on said second piston.

8. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a fluid pressure operated device connected to translate said jaws and having a lost motion connection therewith, a source of fluid pressure, a conduit connecting said source to said device to advance said jaws, a valve in said conduit movable between open and closed position, a mechanically operable valve biased to closed position and arranged to be opened by engagement with a movable portion of said device and movement of said device to retracted position, a second conduit controlled by said last valve and opening between said source and said first valve to move said first valve to opened position, a second fluid pressure operated device positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening between said source and said second device, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit between said control valve and said second device and biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, a fourth conduit opening between the pressure face of said second device and the movable element of said first valve in opposition to said second conduit to admit fluid from said second

device to move said first valve to closed position, a biased valve in said fourth conduit opposing movement of fluid therethrough until a predetermined pressure is exerted on said second device, and a biased outlet valve from said fourth conduit opposing escape of pressure from said fourth conduit until sufficient pressure is built up therein to shift the movable element of said first valve.

9. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a fluid pressure operated device connected to translate said jaws, a source of fluid pressure, a conduit connecting said source to said device to advance said jaws, a valve in said conduit movable between open and closed position, a mechanically operable valve biased to closed position and arranged to be opened by engagement with a movable portion of said device and movement of said device to retracted position, a second conduit controlled by said last valve and opening between said source and said first valve to move said first valve to opened position, a second fluid pressure operated device positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening between said source and said second device, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit and biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, a fourth conduit opening between the pressure face of said second device and the movable element of said first valve in opposition to said second conduit to admit fluid from said second device to move said first valve to closed position, and a biased valve in said fourth conduit opposing movement of fluid therethrough until a predetermined pressure is exerted on said second device.

10. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a fluid pressure operated device connected to translate said jaws, a source of fluid pressure, a conduit connecting said source to said device to retract said jaws, a valve in said conduit movable between open and closed position, a mechanically operable valve biased to closed position and arranged to be opened by engagement with a movable portion of said device and movement of said device to retracted position, a second conduit controlled by said last valve and opening between said source and said first valve to move said first valve to closed position, a second fluid pressure operated device positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening between said source and said second device, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit between said control valve and said second device and biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, a fourth conduit opening between the pressure face of said second device and the movable element of said first valve in opposition to said second

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conduit to admit fluid from said second device to move said first valve to open position, a biased valve in said fourth conduit opposing movement of fluid therethrough until a predetermined pressure is exerted on said second device, and a biased outlet valve from said fourth conduit opposing escape of pressure from said fourth conduit until sufficient pressure is built up therein to shift the movable element of said first valve.

11. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a fluid pressure operated device connected to translate said jaws, a source of fluid pressure, a conduit connecting said source to said device to retract said jaws, a valve in said conduit movable between open and closed position, a mechanically operable valve biased to closed position and arranged to be opened by engagement with a movable portion of said device and movement of said device to retracted position, a second conduit controlled by said last valve and opening between said source and said first valve to move said first valve to closed position, a second fluid pressure operated device positioned to act upon and close said closing jaws when said jaws are in advanced position, a supply conduit opening between said source and said second device, a manually operative control valve in said supply conduit, a second mechanically operated valve positioned in said supply conduit and biased to closed position, said second mechanically operated valve being positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, a fourth conduit opening between the pressure face of said second device and the movable element of said first valve in opposition to said second conduit to admit fluid from said second device to move said first valve to open position, and a biased valve in said fourth conduit opposing movement of fluid therethrough until a predetermined pressure is exerted on said second device.

12. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a first pneumatically extensible device connected to reciprocate said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of air pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in its opposite positions to oppositely actuate said first device, a first automatically operated valve arranged to admit air to said shiftable valve to move said shiftable valve to jaw advancing position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, a second automatically operated valve connected in series with said manually operated valve and positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, and a conduit having an adjustable minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting air to said shiftable valve to move said shiftable valve to jaw retracting position.

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13. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a first pneumatically extensible device connected to reciprocate said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of air pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in its opposite positions to oppositely actuate said first device, a first automatically operated valve arranged to admit air to said shiftable valve to move said shiftable valve to jaw advancing position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, a second automatically operated valve connected in series with said manually operated valve and positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, and a conduit having a minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting air to said shiftable valve to move said shiftable valve to jaw retracting position.

14. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a first fluid pressure extensible device connected to advance said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of fluid pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in open position to actuate said first device, a first automatically operated valve arranged to admit fluid to said shiftable valve to move said shiftable valve to jaw advancing open position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, a second automatically operated valve connected in series with said manually operated valve and positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, and a conduit having an adjustable minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting fluid to said shiftable valve to move said shiftable valve to closed position.

15. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a first fluid pressure extensible device connected to advance said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of fluid pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in open position to actuate said first device, an automatically oper-

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ated valve arranged to admit fluid to said shiftable valve to move said shiftable valve to jaw advancing open position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, and a conduit having a minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting fluid to said shiftable valve to move said shiftable valve to closed position.

16. Actuating mechanism for a clip forming and applying machine having reciprocally mounted forming jaws and closing jaws, said mechanism comprising a first fluid pressure extensible device connected to retract said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of fluid pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in open position to actuate said first device, a first automatically operated valve arranged to admit fluid to said shiftable valve to move said shiftable valve to closed position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, a second automatically operated valve connected in series with said manually operative valve and positioned to be opened by engagement with a movable portion of said device and movement of said first device to advanced position, and a conduit having an adjustable minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting fluid to said shiftable valve to move said shiftable valve to open position.

17. Actuating mechanism for a clip forming and applying machine having reciprocally

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mounted forming jaws and closing jaws, said mechanism comprising a first fluid pressure extensible device connected to retract said jaws, a second pneumatically extensible device operatively associated with said closing jaws to close said closing jaws, a source of fluid pressure, a supply conduit having a manually operated valve positioned therein and connecting said source with said second device, a pneumatically shiftable valve connected between said source and said first device and operative in open position to actuate said first device, an automatically operated valve arranged to admit fluid to said shiftable valve to move said shiftable valve to closed position and positioned to be opened by engagement with a movable portion of said device and movement of said first device to retracted position, and a conduit having a minimum pressure control valve therein and communicating between said second device and the movable element of said shiftable valve for admitting fluid to said shiftable valve to move said shiftable valve to open position.

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