Oct. 20, 1959 L. STEINMETZ ET AL 2,908,908

STAPLING MACHINE

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Fig. 1.

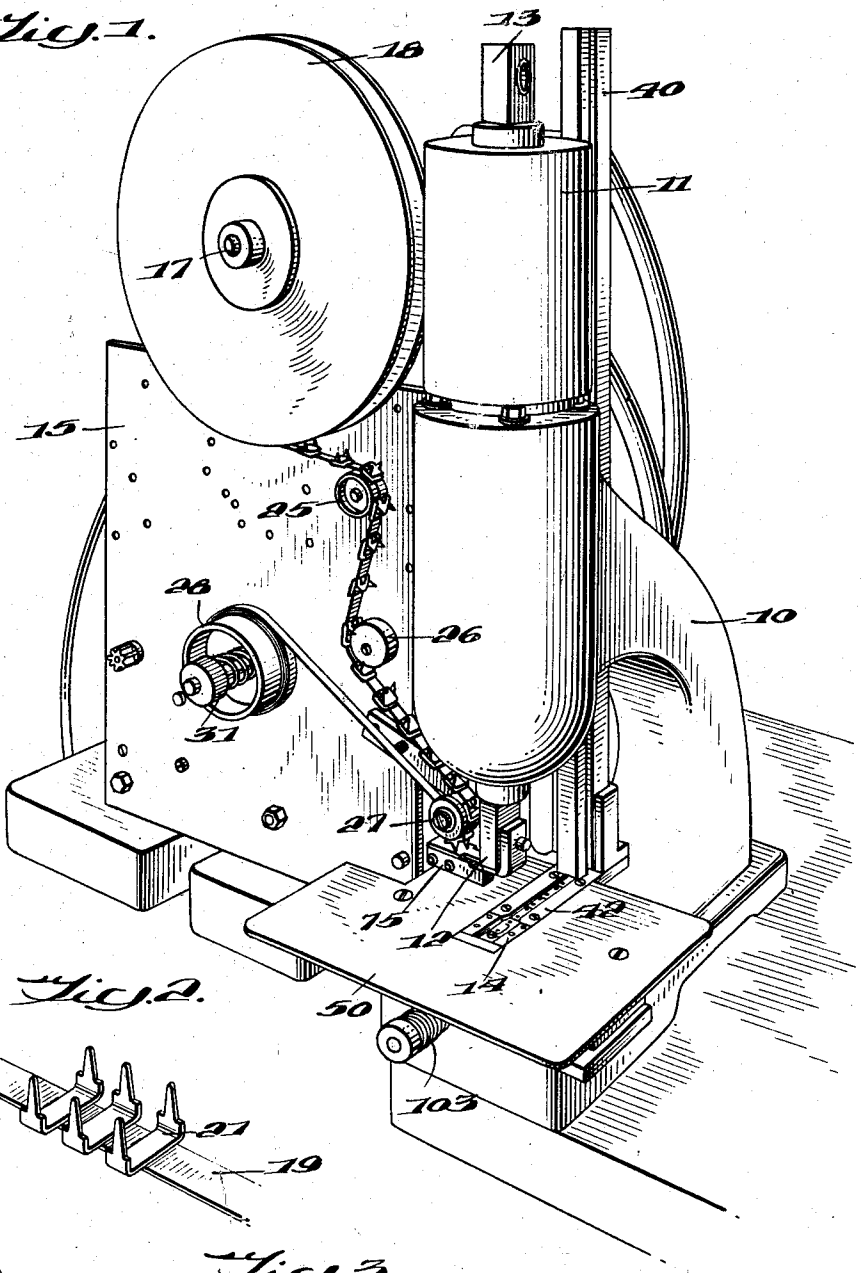
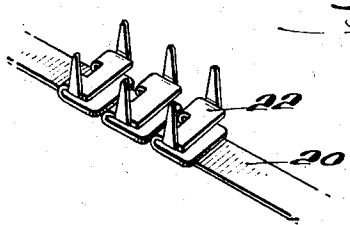


Fig. 2.

Fig. 3.



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STAPLING MACHINE

Filed June 30, 1958 6 Sheets-Sheet 2

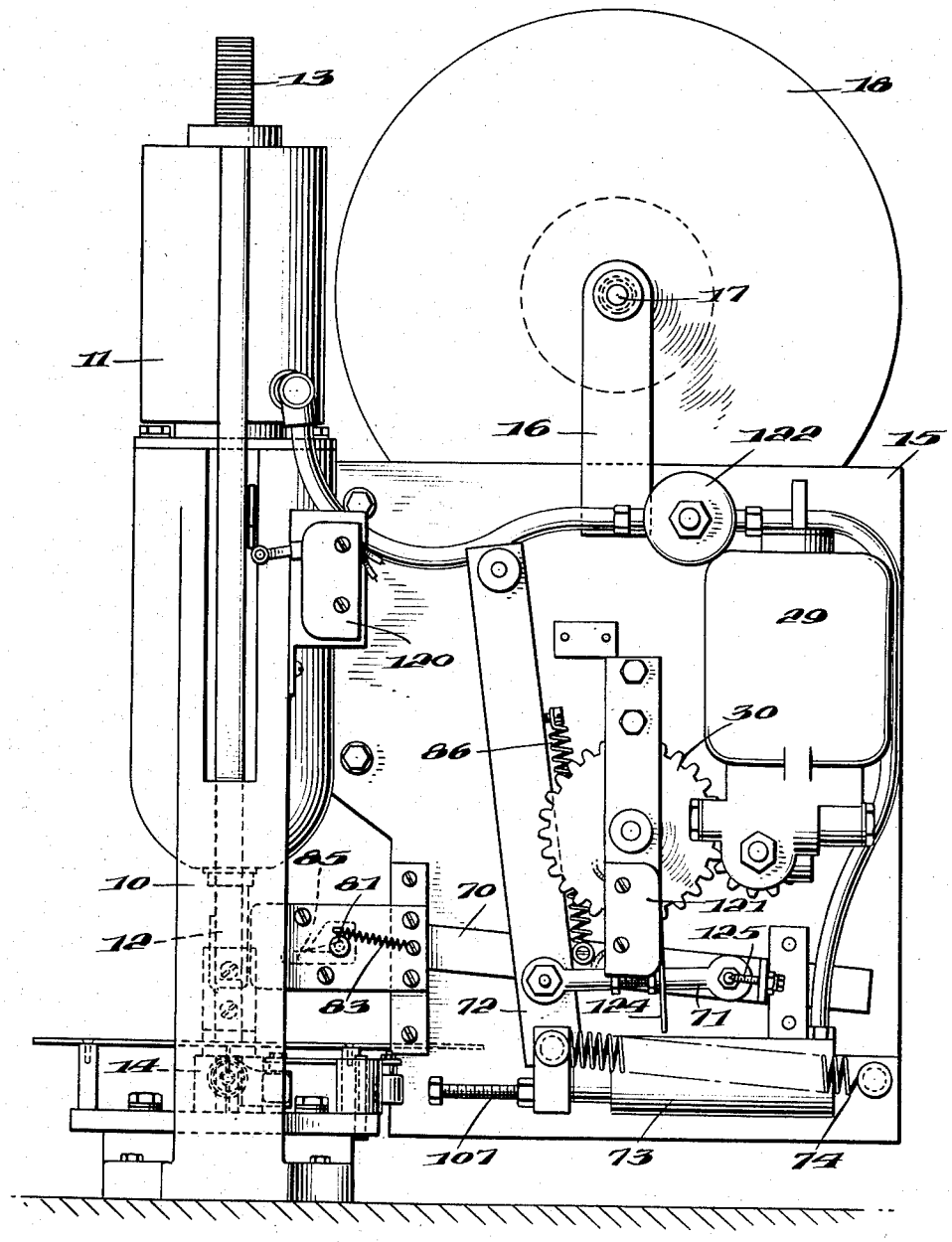


Fig. 4.

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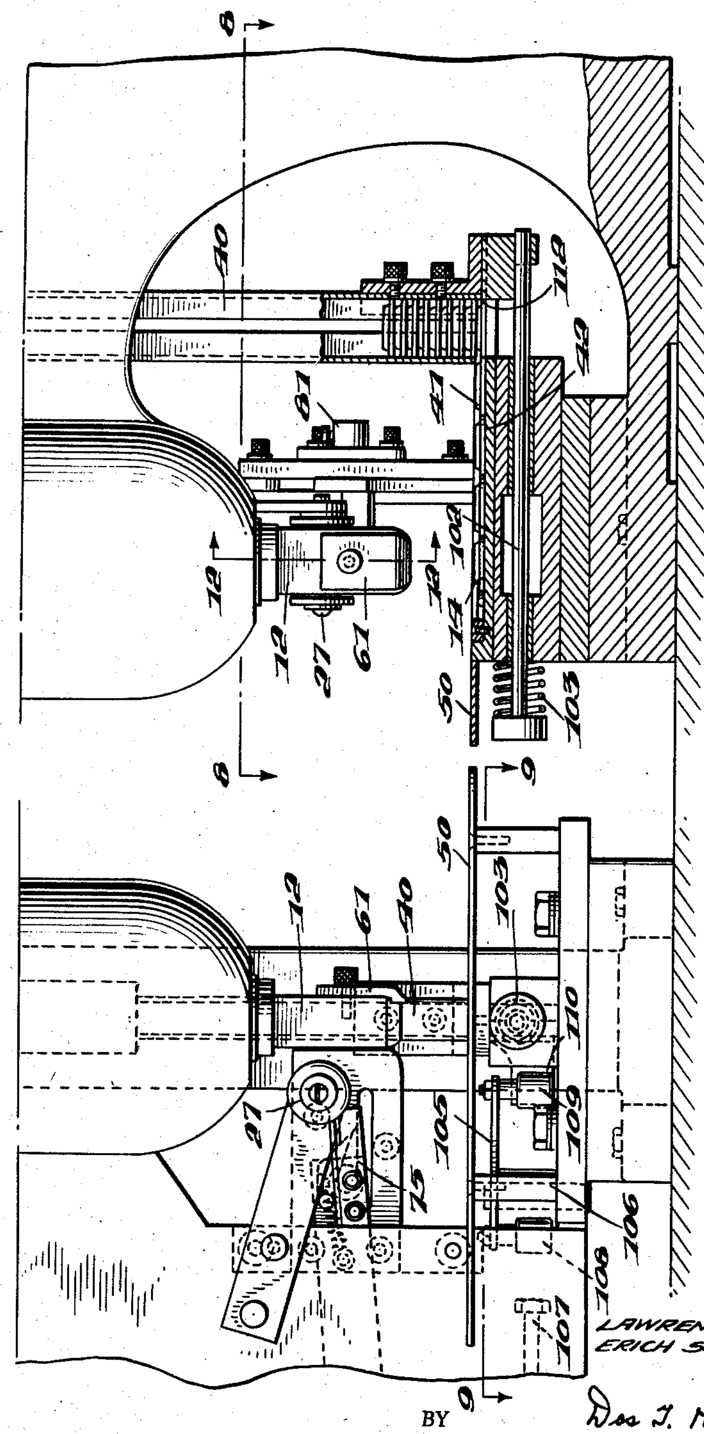
STAPLING MACHINE

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6 Sheets-Sheet 3

Fig. 6.

Fig. 5.



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STAPLING MACHINE

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Fig. 7.

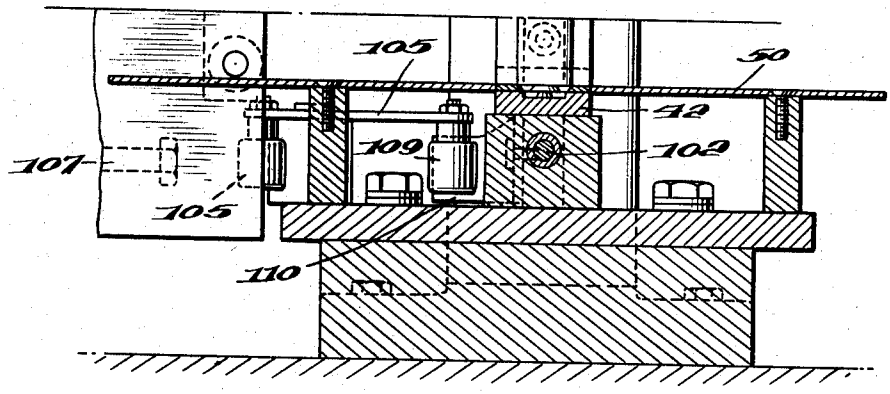
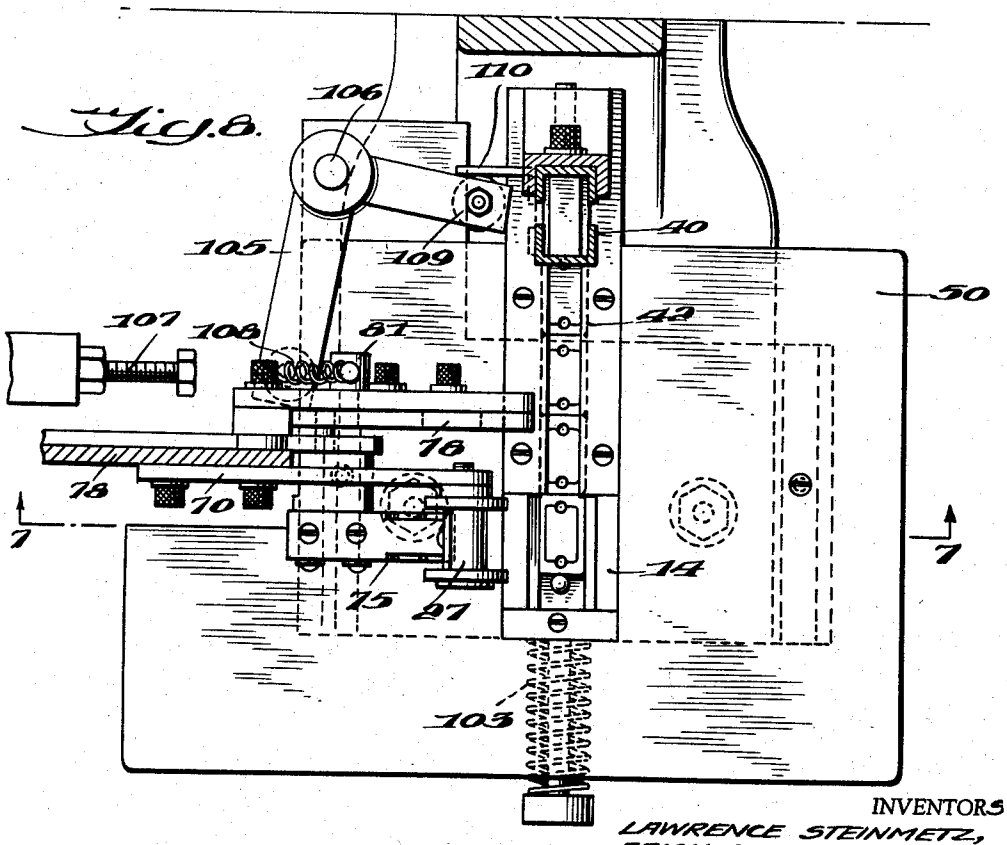


Fig. 8.



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STAPLING MACHINE

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Fig. 9.

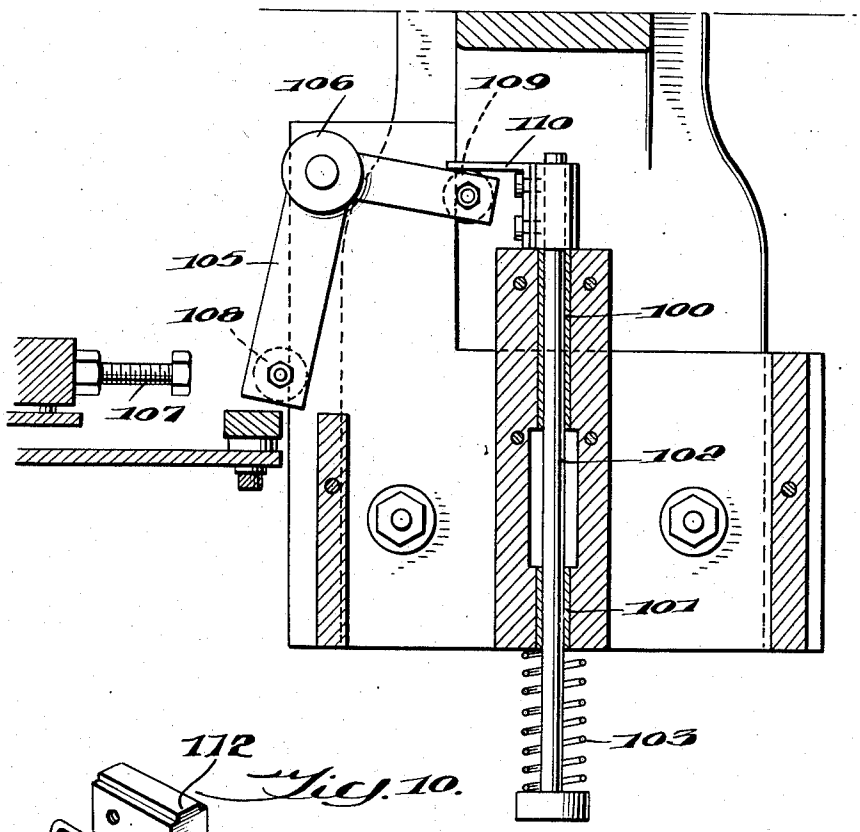


Fig. 10.

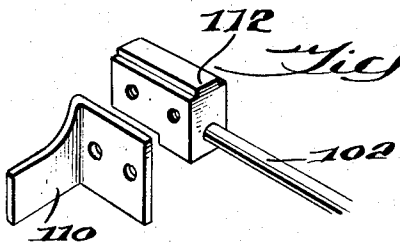
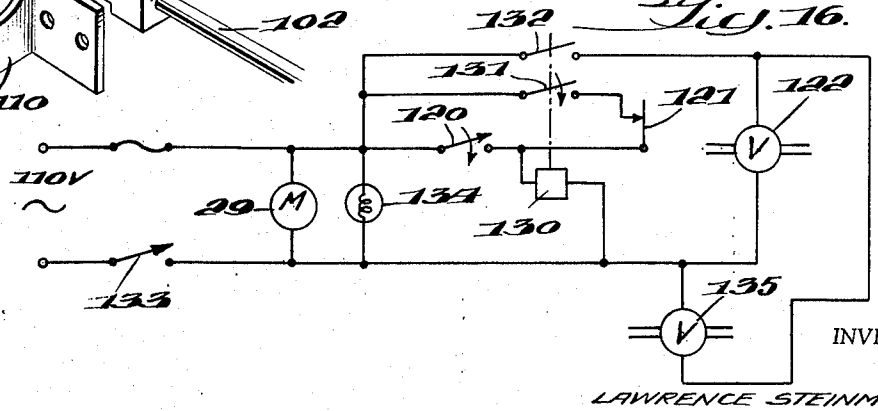


Fig. 16.



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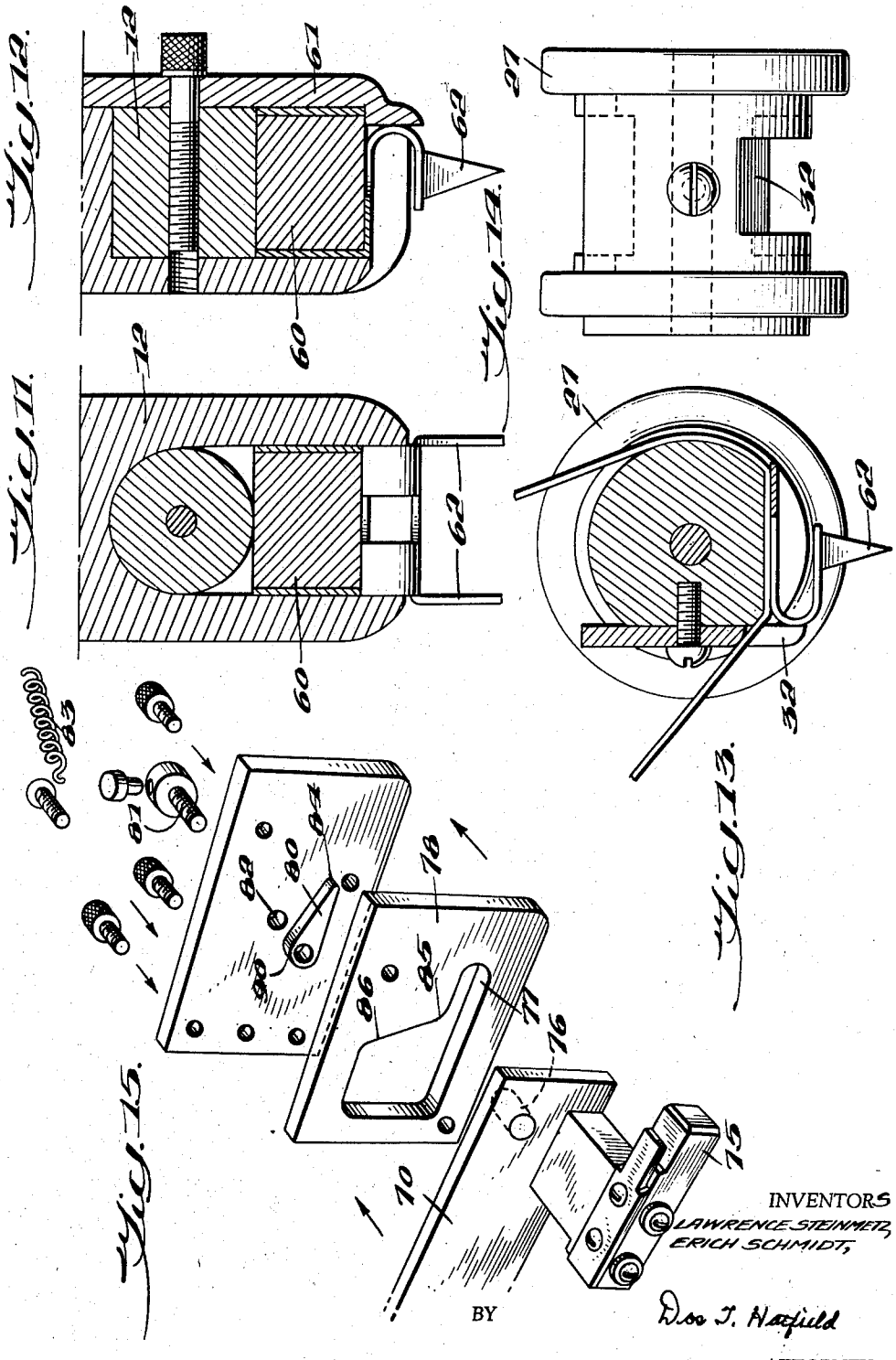
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STAPLING MACHINE

Filed June 30, 1958 6 Sheets-Sheet 6



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United States Patent Office 2,908,908
Patented Oct. 20, 1959

2,908,908

STAPLING MACHINE

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Application June 30, 1958, Serial No. 745,468

12 Claims. (Cl. 1—3)

The present invention relates to a stapling machine and more particularly to a machine for stapling a garment fastener element and backing plate to a garment.

In recent years the waist buttons on trousers and skirts have commonly been replaced with metal fastener hook and eye elements which may be secured to the garment by riveting or stapling through the garment to suitable backing plates.

It is a principal object of the present invention to provide a new, improved and simplified form of stapling machine for securing a garment fastener hook or eye to a garment and associated backing plate.

Stapling machines for securing fastener elements and backing plates to a garment are known and, for example, one such machine is shown in Patent No. 2,718,004. However, the previous types of stapling machines, such as the type shown in the aforementioned patent, were comparatively complex and occasionally presented difficulties in their operation in feeding the fastener elements and backing plates to the stapling anvils.

Therefore, another important object of the invention is to provide an improved stapling machine having simplified and reliable means to feed the elements to be stapled onto the respective anvil members of the machine.

A feature of the invention as used in a stapling machine having a reciprocable anvil movable to and from a stationary anvil, is the provision of a supply reel of tape having secured thereon a plurality of fastener elements with depending staple prongs. Friction drive means is provided to continuously pull said tape towards a stop element with a fastener engaging the stop element which may be adjacent one of the stapling anvils in its rest position. First reciprocating means is provided to strip the fastener element on the tape as positioned at the stop element and transfer the element to one of the stapling anvils. In addition, a container of backing plates is provided together with second reciprocable means to transfer a backing plate to the other anvil in a position with the apertures in the backing plate aligned with the prongs of the fastener element on the one anvil. Thereafter, the movable anvil may be reciprocated to and from the stationary anvil with a garment therebetween to thereby staple and secure the fastener to the garment and backing plate.

Further objects, features and the attending advantages of the invention will be apparent with reference to the following specification and drawings, in which:

Fig. 1 is a perspective elevational view of the machine;

Fig. 2 is a fragmentary view of a supply tape with eye fastener elements secured thereon;

Fig. 3 is a fragmentary view of a supply tape with hook fastener elements secured thereon;

Fig. 4 is a rear view of the machine;

Fig. 5 is a fragmentary front view of the lower portion of the machine;

Fig. 6 is a fragmentary view to the right of Fig. 5;

Fig. 7 is a sectional view on the line 7—7 of Fig. 8;

Fig. 8 is a fragmentary sectional view on the line 8—8 of Fig. 6 with the upper reciprocating anvil omitted;

Fig. 9 is a sectional view on the line 9—9 of Fig. 5;

Fig. 10 is an exploded view of a detail shown in Fig. 9;

Fig. 11 is a sectional view through the head of the reciprocable anvil;

Fig. 12 is a sectional view through the head of the reciprocable anvil taken at right angles to the section of Fig. 11 and on the line 12—12 of Fig. 6;

Fig. 13 is a detail sectional view through the supply tape guide and stop members;

Fig. 14 is a view of the supply tape guide and stop member as seen to the right of Fig. 13;

Fig. 15 is an exploded detail of the reciprocating transfer means for the element on the supply tape and showing the motion guide cam for the reciprocating means; and

Fig. 16 is a wiring diagram for the control circuit of the machine.

Referring first to Figures 1–4 of the drawings, the stapling machine is generally comprised of a bench-mounted yoke **10** supporting an air cylinder **11** for a reciprocating anvil **12**. The air cylinder piston rod **13** which is connected to the anvil **12** is spring loaded to a rest position with the anvil **12** raised above the lower stationary anvil **14** that is supported on the base of the yoke **10**.

A vertically positioned plate member **15** is provided with an arm **16** to which may be removably and rotatably journalled at **17** a supply reel **18** of tape **19** or **20** having secured thereon either fastener eyes **21** or fastener hooks **22**, respectively. The supply tape is threaded over guide members **25**, **26**, and **27** to a take-up reel **28**. The take-up reel **28** is driven by the electric motor **29** through the gear **30** and friction clutch **31** in a manner to tend to continuously pull the tape from the supply reel **18** until a fastener element thereon abuts a stop member **32** (see Figs. 13 and 14) on the tape guide **27**. The guide member **27** is positioned adjacent the anvil **12** in its normal rest position and each time a fastener element on the tape abutting the stop member **32** is stripped from the tape and transferred to the anvil **12** in a manner to be described, the take-up reel **28** is driven by the friction clutch **31** to pull the supply tape and advance the next successive fastener element into position abutting the stop member **32**. As most clearly shown in Fig. 1 of the drawings, the fastener elements on the supply tape are secured thereon in a position with their staple prongs depending towards the stationary anvil **14** when positioned on the guide **27** against the stop member **32**.

Extending vertically in a position to the rear of the yoke **10** is a container **40** (see particularly Figs. 1 and 6 of the drawings) for backing plates such as shown at **41**. The backing plates are advanced and transferred from the container **40** through a guide channel **42** to the stationary anvil **14** by means of spring loaded reciprocating transfer means to be later described in detail. Obviously, the position of the backing plate **41** on the stationary anvil **14** is aligned with the position of a hook or eye fastener element on the movable anvil **12** so that the depending prongs will pass through the perforations of the backing plate when the movable anvil is moved towards the stationary anvil by the piston of the air cylinder **11**. A garment support plate **50** is provided and when a garment is placed thereon, the prongs of the fastener element will pass through both the garment and the perforations of the backing plate to be clinched and stapled thereto by the stationary anvil configuration as is well known.

The upper reciprocating anvil **12** is shown in detail in Figs. 11 and 12 of the drawings and is provided with a permanent magnet **60** and a stop member **61** for securing a fastener element such as shown at **62** in the required

position with its staple prongs depending towards the stationary anvil. The fastener element **62** is shown in Fig. 13 in the position on the supply tape before its transfer to the reciprocating anvil **12** as shown by Figs. 11 and 12, and the fastener elements are customarily made of ferrous material. Therefore, the permanent magnet **60** will retain the transferred fastener in position on the reciprocating anvil **12** until it is stapled to the garment and backing plate as should be well understood.

In order to strip and transfer a fastener element from the supply tape at the guide **27** and stop member **32** to the reciprocating anvil **12**, a reciprocating transfer arm **70** is linked at **71** to a reciprocating drive arm **72** driven by a reciprocating servo mechanism such as an air cylinder or electric solenoid **73**. A tension coil spring **74** normally urges the linkage to a rest position with the transfer arm **70** and its transfer element **75** at the end thereof resting adjacent supply tape guide **27** above and to the left of the end of the movable anvil **12**. The transfer element **75** is suitably shaped to engage and strip a fastener element of either the hook or eye type from the supply tape and is moved in a path both downward and towards the end of the anvil **12** to deposit the fastener element in position under the permanent magnet **60** as shown in Figs. 11 and 12 of the drawings.

As the transfer arm **70** is reciprocated to and from the anvil **12**, it is guided in its movement as described above by a cam and roller guide mechanism shown in exploded detail in Fig. 15 of the drawings. The reciprocating transfer arm **70** is provided near its transfer element **75** with a guide roller **76** that is engaged within the cut-out portion **77** of the cam plate **78**. Also positioned within the cam cut-out **77** is a pivoted cam tongue **80** fixed to the shaft **81** journalled at **82** and constrained to an upper position as shown by the tension coil spring **83** with the end **84** of the tongue **80** engaging the surface **85** of the cut-out **77**. It will be noted that the coil spring **86** (see Fig. 4) tends to pull the reciprocating transfer arm **70** upwards and, therefore, the guide arrangement described above is effective to permit the arm **70** to rise upwardly at the return end of its reciprocating stroke into a position to engage and strip a fastener element from the supply tape upon the initiation of the next fastener feeding reciprocation of the transfer arm **70**. Each time the arm **70** is reciprocated to feed a fastener element to the movable anvil **12**, it is first moved downward by the cam cut-out surface **86** and the guide roller **76** then passes past the tongue **80** which pivots against its spring **83** to permit such passage. As the arm **70** returns, however, the switch tongue **80** keeps the arm **70** in its lower position until the arm reaches the end of its return stroke, at which time the guide roller **76** passes the end **90** of the tongue **80** and the spring **86** causes the arm **70** to rise with its transfer element behind and adjacent the next fastener element on the supply tape at the guide stop member **32**.

The reciprocating transfer mechanism for transferring the backing plates from the container **40** to the anvil **14** is most clearly shown in Figs. 4–10 of the drawings. The guide channel **42** is positioned beneath the garment support plate **50** and extends from the stationary anvil **14** to a position beneath open lower end of the container **40**. Reciprocably journalled beneath the guide channel **42** at **100** and **101** is a transfer rod **102** that is spring loaded by compression spring **103** to advance a backing plate through the guide channel **42** to the stationary anvil each time a backing plate is stapled to a garment and removed. In order to move the transfer rod **102** to the loading position against the force of the compression spring **103** as shown by Fig. 6 of the drawings, one end **108** of a bell crank **105**, pivotally journalled at **106** is engaged by an end **107** of the reciprocation element of the servo mechanism **73**. The other end **109** of the bell crank **105** engages an angle abutment **110** on the end of the transfer rod **102**. Thus, as the reciprocating element of the servo mechanism initiates a reciprocation of the transfer arm **70** to strip and transfer a fastener element from the supply tape, the servo mechanism end **107** engages the bell crank **105** to initiate a reciprocation of the transfer rod **102** and move it to the cocked loading position shown by Fig. 6 of the drawing with the transfer shoulder **112** engaging the lowermost backing plate in the container **40** and moving it towards the rest of the backing plates in the guide channel **42**. Thus when the backing plate at the stationary anvil **14** is removed upon completion of the stapling operation which is also after the arm **70**, servo cylinder **73** and servo mechanism end **107** have completed a reciprocation, the coil spring **103** is effective to complete the reciprocation of the transfer rod **102** by returning the rod to the position shown in Figs. 8 and 9 of the drawings thereby advancing the next successive backing plate in the guide channel **42** into position on the stationary anvil **14**.

It should now be understood that the initiation of each reciprocation of the transfer means for both the fastener elements and the backing plates should be timed to occur before the initiation of each reciprocation of the stapling anvil. A control circuit to simply provide such timed operation in connection with certain manual controls is shown in Fig. 16 of the drawings. In the first place it should be understood that the air cylinder **11** for reciprocating the movable anvil **12** towards the stationary anvil **14** is controlled by a manual air control valve, not shown, which may be positioned at any suitable location for operation by the machine operator. Each time the manual control valve (not shown) is manipulated to admit air to the air cylinder **11**, the anvil **12** is moved downward towards the anvil **14** and at the end of the stroke the air is discharged from the cylinder and the piston within the cylinder is automatically returned by an interior spring to again raise the anvil **12** to the normal resting position above the anvil **14** as shown in Fig. 4 of the drawings. Each time that the movable anvil **12** returns to its normally raised position above the stationary anvil **14**, the microswitch **120** is momentarily closed to complete a circuit shown in Fig. 16 of the drawings to the relay coil **130**, which closes its contacts **131** to establish a holding circuit for the relay coil **130** through the normally closed microswitch contacts **121**. Also, the operation of the relay **130** closes its contacts **132** to complete a circuit to the solenoid air control valve **122** which admits air to the transfer cylinder **73** causing the linkage including the arms **72**, link **71** and reciprocating transfer arm **70** to engage a fastener element and transfer the element to the movable anvil **12**. At the end of the stroke of the transfer arm **70** towards the anvil **12**, the contact arm **124** of the microswitch **121** is engaged by the projection **125** (see Fig. 4) to momentarily open the normally closed microswitch contact **121** thus breaking the holding circuit for the relay circuit **130** which thereupon restores. The restoration of the relay **130** de-energizes the solenoid valve **122** which thereupon releases the air in the cylinder **73**, allowing the spring **74** to return the transfer arm **70** to its normal resting position as previously described. Again referring to the circuit diagram of Fig. 16, the control circuit is connected to the 110-volt source of current through a manual control switch **133** and the electric motor **29** and panel light **134** are energized upon the closing of the manually-operated main switch **133**. Of course, with the main switch **133** closed, the remainder of the control may operate in the manner described above.

It will now be seen that the timing of the initiation of the reciprocation of the transfer arm **70** and the transfer rod **102** for the fastener element and backing plate, respectively, is timed to occur after the return of the air-operated anvil to its normal resting position above the stationary anvil upon the momentary closing of the microswitch **120** as the anvil returns to its resting position. Thus, the operation of the transfer cylinder **73** and

associated transfer mechanisms for both the fastener element and the backing plate is prevented from occurring except when the movable anvil is resting in the normal position above the stationary anvil.

As a safety feature in order to prevent the inadvertent operation of the air cylinder **11** at a time when the transfer arm **70** may be moving towards the movable anvil **12**, a second solenoid valve **135** may be electrically connected in parallel with the solenoid **122** and this valve may be interposed in the air line to the cylinder **11** in such manner as to prevent the passage of air to the air cylinder **11** so long as the solenoid valve **135** is energized, even though the manual control valve referred to may be operated to normally admit air to the air cylinder **11**. The solenoid valve **135** is not shown structurally on the drawings, although it is indicated in the circuit diagram of Fig. 16 and it should be obvious how this valve may be arranged in the air supply line between the manual control valve and the air cylinder **11**.

Various modifications will occur to those skilled in the art within the spirit of the invention and the scope of the appended claims. For example, although the invention has been specifically described in connection with the transfer of a hook or eye fastener element from a supply tape to a movable anvil, it should be apparent that the transfer of the hook or eye fastener element from the supply tape could be effected towards the stationary anvil without departing from the spirit of the invention. Similarly, the supply tape may be provided with both hook and eye fastener elements alternately secured thereon.

What is claimed is:

1. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, means movable to strip and transfer a fastener from said tape to said reciprocating anvil, means movable to transfer backing plates from said container to said stationary anvil, and means to move said reciprocating anvil towards said stationary anvil with a fastener and a backing plate aligned in their respective positions on the respective anvils.

2. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, means movable to strip and transfer a fastener from said tape to one of said anvils, means movable to transfer backing plates from said container to the other of said anvils, and means to move said reciprocating anvil towards said stationary anvil with a fastener and a backing plate aligned in their respective positions on the respective anvils.

3. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stop element, friction drive means to tend to continuously pull said tape from said reel to a position with a fastener abutting said stop element, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, means movable to strip and transfer a fastener from said tape at said stop element to said reciprocating anvil, means movable to transfer backing plates from said container to said stationary anvil, and means to move said reciprocating anvil towards said stationary anvil with a fastener and a backing plate aligned in their respective positions on the respective anvils.

4. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, first reciprocable means movable to and from said reciprocating anvil to strip and transfer a fastener from said tape to said reciprocating anvil, second reciprocable means movable from and to said stationary anvil to transfer backing plates from said container to said stationary anvil, means to initiate a single reciprocation of said first reciprocable means, means to initiate a single reciprocation of said second reciprocable means substantially concurrently with the movement of said first reciprocable means, and means to initiate a reciprocation of said reciprocating anvil towards said stationary anvil when neither said first nor second reciprocating means is moving and with a fastener and a backing plate aligned in their respective positions on the respective anvils.

5. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, first reciprocable means movable to and from one of said anvils to strip and transfer a fastener from said tape to said one anvil, second reciprocable means movable from and to the other of said anvils to transfer backing plates from said container to the other of said anvils, means to initiate a single reciprocation of said first reciprocable means, means to initiate a single reciprocation of said second reciprocable means substantially concurrently with the movement of said first reciprocable means, and means to initiate a reciprocation of said reciprocating anvil towards said stationary anvil when neither said first nor second reciprocating means is moving and with a fastener and a backing plate aligned in their respective positions on the respective anvils.

6. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stop element, friction drive means to tend to continuously pull said tape from said reel to a position with a fastener abutting said stop element, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, first reciprocable means movable to and from said reciprocating anvil to strip and transfer a fastener from said tape at said stop element to said reciprocating anvil, second reciprocable means movable from and to said stationary anvil to transfer backing plates from said container to said stationary anvil, means to initiate a single reciprocation of said first reciprocable means, means to initiate a single reciprocation of said second reciprocable means substantially concurrently with the movement of said first reciprocable means, and means to initiate a reciprocation of said reciprocating anvil towards said stationary anvil when neither said first nor second reciprocating means is moving and with a fastener and a backing plate aligned in their respective positions on the respective anvils.

7. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stop element, friction drive means to tend to continuously pull said tape from said reel to a position with a fastener abutting said stop ele-

ment, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, first reciprocable means movable in a single reciprocation from a rest position adjacent said stop means to and from one of said anvils to strip and transfer a fastener from said tape to the one anvil, second reciprocable means spring loaded at a rest position near the other of said anvils and movable towards said container and back to the other anvil to transfer backing plates from said container to the other anvil, means to initiate a reciprocation of said first reciprocable means, means to initiate a reciprocation of said second reciprocable means substantially concurrently with the movement of said first reciprocable means, and means to initiate a reciprocation of said reciprocating anvil towards said stationary anvil when neither said first nor second reciprocating means is moving and with a fastener and a backing plate aligned in their respective positions on the respective anvils.

8. A stapling machine for stapling a fastener to a backing plate comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stop element, friction drive means to tend to continuously pull said tape from said reel in a position with a fastener abutting said stop element, a container for a plurality of backing plates each having apertures to receive the staple prongs of a respective one of said fasteners, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, first reciprocable means movable in a single reciprocation from a rest position adjacent said stop means to and from said reciprocating anvil to strip and transfer a fastener from said tape to said reciprocating anvil, second reciprocable means spring loaded at a rest position near said stationary anvil and movable towards said container and back to said stationary anvil to transfer backing plates from said container to said stationary anvil, means to initiate a reciprocation of said first reciprocable means, means to initiate a reciprocation of said second reciprocable means substantially concurrently with the movement of said first reciprocable means, and means to initiate a reciprocation of said reciprocating anvil towards said stationary anvil when neither said first nor second reciprocating means is moving and with a fastener and a backing plate aligned in their respective positions on the respective anvils.

9. A stapling machine for stapling a fastener comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stop element, friction drive means to tend to continuously pull said tape from said reel to a position with a fastener abutting said stop element, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, reciprocating means movable forwardly to a position adjacent said tape to strip a fastener from said tape and transfer the fastener to one of said anvils and thereafter movable rearwardly away from said tape, and means to move said reciprocating anvil toward said stationary anvil when said reciprocating means has moved away from said tape.

10. A stapling machine for stapling a fastener comprising, a supply reel of tape having a plurality of fasteners with depending staple prongs secured along the length thereof, a stationary anvil, a reciprocating anvil movable to and from said stationary anvil, reciprocating means movable forwardly to a position adjacent said tape to strip a fastener from said tape and transfer the fastener to one of said anvils and thereafter movable rearwardly away from said tape, and means to move said reciprocating anvil toward said stationary anvil when said reciprocating means has moved away from said tape.

11. A stapling machine as set forth in claim 10, further characterized in that said reciprocating means is guided during its movement by cam means.

12. A stapling machine as set forth in claim 11 further characterized in that said cam means guides said reciprocating means from its starting position downwardly and forwardly toward said tape and thereafter rearwardly and upwardly to its starting position.

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