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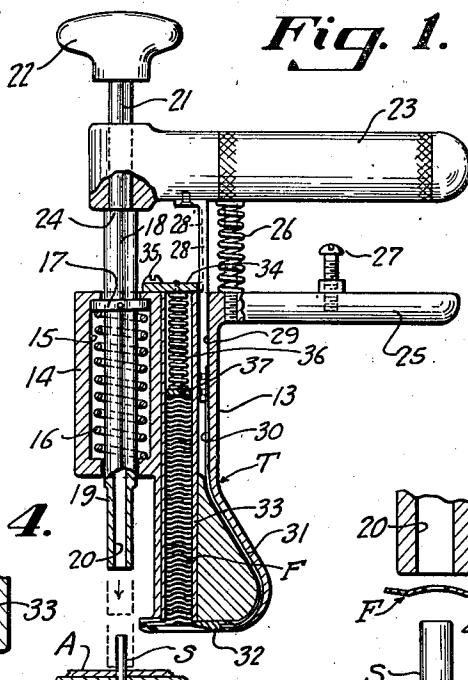
H. W. KOST

2,315,209

FASTENER APPLYING TOOL

Filed Feb. 24, 1940

3 Sheets-Sheet 1



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FASTENER APPLYING TOOL

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3 Sheets-Sheet 2

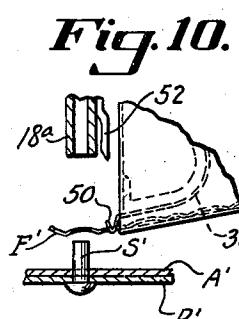
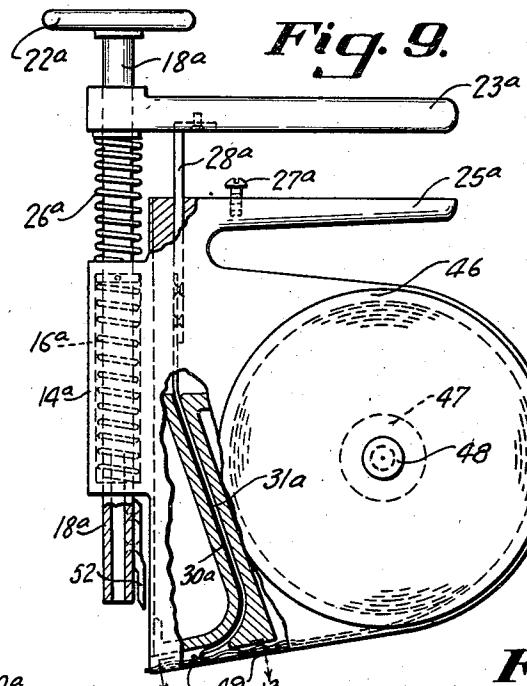


Fig. 11.



Fig. 12.

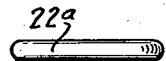
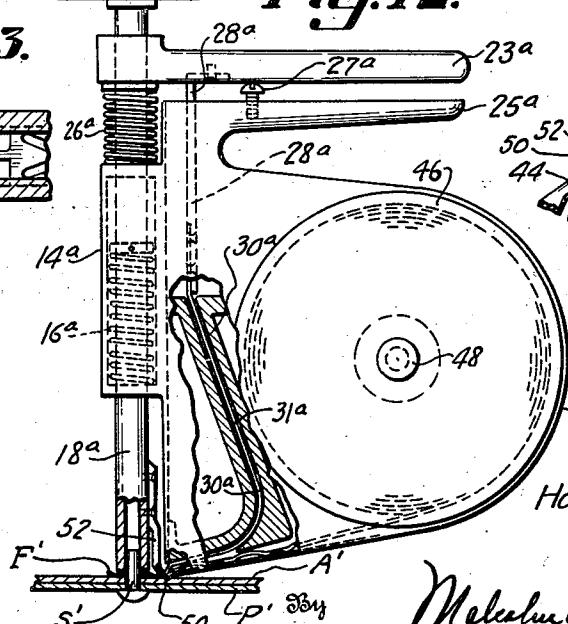
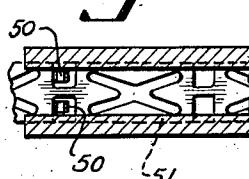


Fig. 13.



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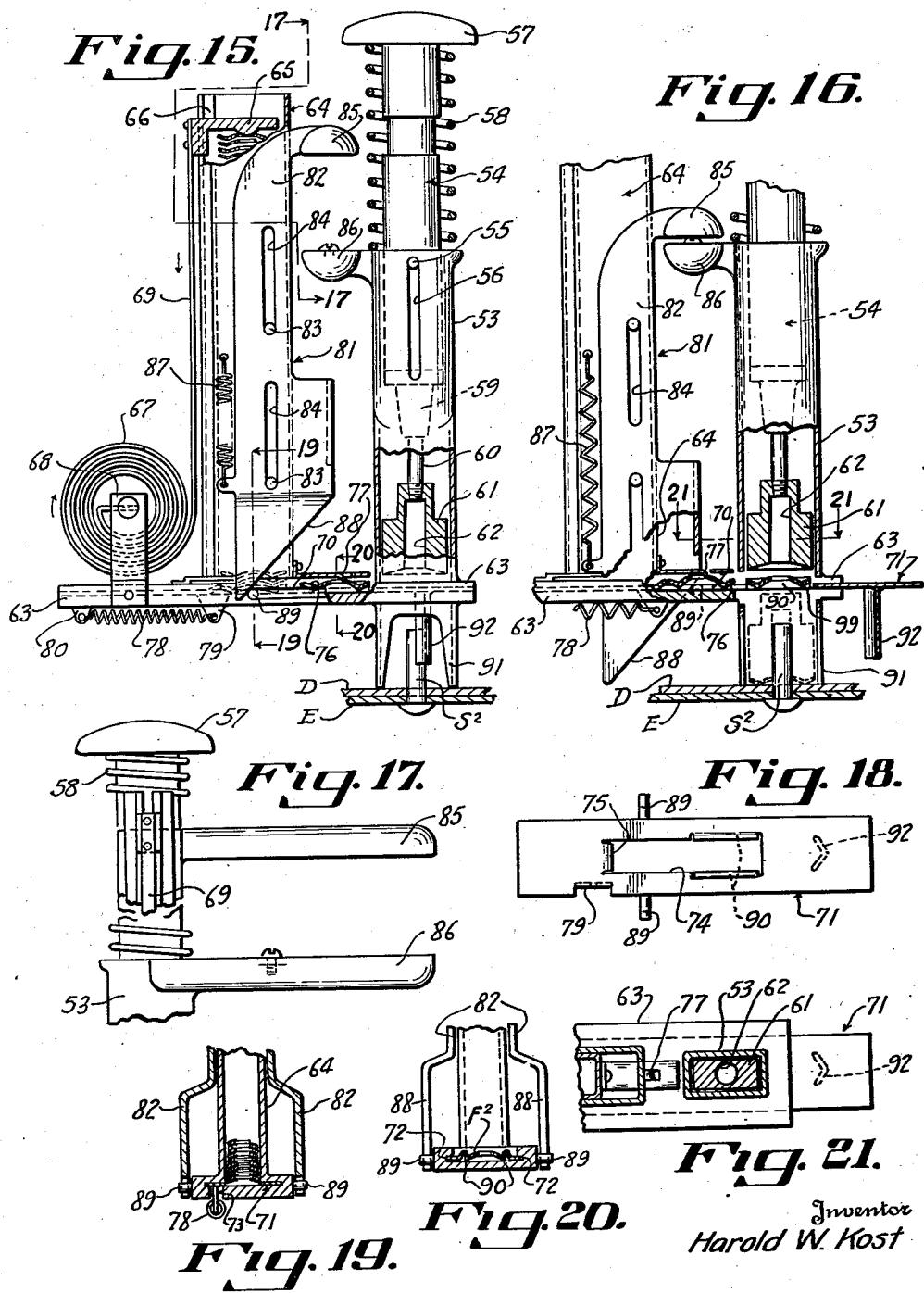
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## FASTENER APPLYING TOOL

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,315,209

## FASTENER APPLYING TOOL

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Application February 24, 1940, Serial No. 320,525

14 Claims. (Cl. 81—3)

This invention relates to a tool for applying sheet metal fasteners to a stud, shank or the like, and an object is to produce a new and improved tool of this character which is supplied with a sizable number of such fasteners which can be readily and conveniently advanced or fed into position of use so that the individual fasteners can be speedily mounted as desired, thereby greatly reducing the time required for assembly operations as well as facilitating their application.

Another object is to produce a tool for applying fasteners of the above character which is equipped with a magazine to contain a sizable number of fasteners, the tool having an actuator for conveniently feeding fasteners successively into the line of travel of a plunger which operates to force the fastener upon the stud or the like.

A further object is to produce a tool of the above character which is adapted to receive a roll of fasteners in ribbon form, the ribbon being intermittently advanced to position the foremost fastener in position of use and sever it from the supply in a predetermined or desired manner.

Other objects and advantages of the invention will hereinafter appear and for purposes of illustration but not of limitation, embodiments of the invention are shown on the accompanying drawings in which

Figure 1 is a side elevation partly in section of a tool for applying apertured sheet metal fasteners to a stud or the like and which is equipped with a magazine for containing a stack of fasteners;

Figure 2 is a top plan view of one of the apertured sheet metal fasteners;

Figure 3 is an enlarged fragmentary sectional view of the lower portion of the magazine showing the actuator for advancing or feeding fasteners and the spring for holding the fastener in position for engagement by the plunger;

Figure 4 is a sectional view substantially on the line 4—4 of Figure 3;

Figure 5 is an enlarged fragmentary sectional view showing the position of the parts assumed when the actuator has advanced a fastener to a useful position;

Figure 6 is a transverse sectional view on the line 6—6 of Figure 5;

Figure 7 is a side elevation partly in section of the tool showing the position assumed by the parts when a fastener has been applied to a stud;

Figure 8 is an enlarged fragmentary sectional view showing the plunger forcing a fastener upon a stud;

Figure 9 is a side elevation partly in section of an alternate form of tool employing a supply roll made up of a continuous ribbon of individual fasteners connected to each other by a relatively thin connecting piece;

Figure 10 is a fragmentary sectional view showing the position of the parts when the foremost fastener of the ribbon has been advanced to position of use;

10 Figure 11 is a plan view of a portion of the ribbon formed from a series of fasteners;

Figure 12 is a view of the tool similar to Figure 9 but showing the position of the parts after a fastener has been forced upon the stud;

Figure 13 is an enlarged transverse sectional view on the line 13—13 in Figure 9;

Figure 14 is a fragmentary perspective view showing the manner in which the foremost fastener is severed from the supply ribbon;

15 Figure 15 is a vertical sectional elevation of another alternate form of tool employing a cam element for advancing fasteners laterally to position of use;

Figure 16 is a fragmentary sectional view of the lower end portion of the tool shown in Figure 15 showing the cam depressed and the fastener advanced to position beneath the plunger and joined by dotted lines, the plunger having applied the fastener to a stud;

20 Figure 17 is a view substantially on the line 17—17 of Figure 15;

Figure 18 is a plan view of the fastener actuating slide;

25 Figure 19 is a sectional view on the line 19—19 of Figure 15;

Figure 20 is a sectional view on the line 20—20 of Figure 15; and

30 Figure 21 is a sectional view on the line 21—21 of Figure 16.

40 The illustrated embodiment of the invention shown on Figures 1 to 8 comprises a tool T for applying fasteners such as F, to a plain shank rivet or stud S. For example, the stud S is formed with a head H at one end which abuts against a supporting panel P, passing through an opening in such panel and also through an opening in a panel A which it is desired to attach or secure to the panel P. For this purpose, the fastener F is forced upon the stud S on the outer side of the panel A and into engagement with it (Figure 7), so that the two panels A and P are securely held together in assembled relation. The fastener F in this instance is of sheet metal and provided with a longitudinal camber with opposite end portions thereof formed with upturned

flanges. The fastener is provided with a pair of inwardly extending tongues 11 and has a central aperture 12 somewhat smaller than the perimeter of the stud S so that when the fastener is forced longitudinally of the stud, the tongues bite into the surface and militate against retrograde movement. It is to be understood that other forms of fasteners may be used to advantage with the tool T and the above description is given merely by way of example. Fasteners of this general character are well-known to those skilled in this art and more detail description or illustration thereof is not considered necessary.

The tool consists of a body portion 13 formed with an enlargement 14 at one side which extends a portion of the length thereof and has a cavity 15 to receive a helical spring 16, one end of which bears against the bottom wall of the cavity 15, the opposite end bearing against a collar 17 which is mounted on a plunger 18 for longitudinal adjusting movements. The plunger 18 is mounted for longitudinal sliding movements relative to the cavity 15 and is urged to its normal or raised position by the coil spring 16. The lower end 19 of the plunger below the enlargement 14 is reduced and is formed with a hollow bore 20 of a size to have a nice sliding fit over the pin or stud S. The upper end portion of the plunger 18 has a reduced extension 21 and mounted on the extreme upper end of the extension 21 is a knob or handle 22.

Mounted for sliding movements on the plunger extension 21 is a handle 23, which normally rests against a shoulder 24 formed between the plunger 18 and extension 21. Integral with the body portion 13 and extending outwardly therefrom beneath and in substantially parallel relation to the handle 23 is an arm 25 and interposed between the arm 25 and handle 23 is a coil spring 26. The movement of the handle 23 toward the arm 25 is limited by a set screw 27 carried by the arm 25 which provides an adjustable stop for the downward movement of the handle 23.

Secured to the underside of the handle 23 is a depending arm 28 which is reciprocable in a guideway 29 formed in the body portion 13 of the tool. Fixed to the lower end portion of the arm 28 is a flexible metal tape or ribbon 30 which slides in a slot 31 which inclines downwardly and outwardly and then gradually curves downwardly and inwardly. To the lower end of the tape 30 and disposed in a plane at substantially right angles to the plane of movement of the plunger is an actuating element 32 which as will herein-after appear, is adapted to move toward and away from the line of travel of the plunger 18. It will be manifest that the operator by gripping the handle 23 and arm 25 may move the handle toward the arm, thereby forcing the actuating element 32 by means of the arm 28 and tape 30 to the left of Figure 1 or to a position substantially as shown in Figure 5. When the pressure on the handle 23 is released, the coil spring 26 returns the handle to its normal position.

Disposed intermediate the enlargement 14 and the guideway 29 is a magazine consisting of a tube 33 the inside of which is shaped to accommodate a stack of fastener F. The upper end of the tube 33 is closed by a plate 34 which is detachably secured to the body portion by a screw 35. The plate 34 has an integral extension which engages in a groove 28' in the arm 28 for assisting in guiding the reciprocating movement of the arm. The plate 34 not only closes the upper end

of the tube but also provides a mounting for a follower spring 36 which carries a follower plate 37 at its lower end, the plate exerting pressure against the upper end of the stack of fasteners F.

As shown on Figure 4, the side edges of the lowermost fastener of the stack rests upon ledges 38 which are so positioned that the tapered end portion 39 of the actuating element 32 may bear against one of the flanges 10 of the lowermost fastener. In this manner when the actuating element 32 is moved to the left of Figure 3, the lowermost fastener is shoved from the stack. It will be observed that a lateral extension 40 is provided along which the actuating element 32 forces the lowermost fastener F, the ledges 38 being continued along the extension 40 in order suitably to support the fastener. It is also to be understood that the side edge portions of the actuating element 32 are likewise guided along the ledges 38.

Adjacent the outer end of the extension 40 is a leaf spring 41 which is secured at 42 to the underside of the extension 40. The free end of the spring 41 is curved downwardly as is also the lip 43 at the outer end of the extension. The spring 41 cooperates with the lip 43 to grip the rearmost flange 10 of the fastener F when the latter has been advanced to the position shown on Figure 5. In this position the fastener is in position directly beneath the plunger 19 so that the latter may force the fastener upon the subjacent stud S.

From the above description, it will be apparent that when the handle 23 is grasped and forced toward the arm 25, not only will the lowermost fastener from the stack be moved laterally to the position shown on Figure 5 but also the plunger 18 will be moved to a position close to the advanced fastener. Thereafter, the fastener may be readily forced upon the stud S by pushing against the knob 22 and impart further movement to the plunger, such movement being accomplished independently of the handle 23. Upon release of the knob 22 the spring 16 cooperating with the spring 26 returns the handle 23 and plunger 18 to its normal or raised position. The return movement of the handle 23 operates to move the actuating element 32 to the right or laterally away from the plunger so that it is in position to engage the next succeeding fastener F. The spring pressed follower plate 37 continually urges the stack downwardly so that the lowermost fastener is always in the proper position to be engaged by the actuating element 32 upon its next feeding or fastener advancing movement.

In the form of the invention shown on Figures 9 to 14, a supply roll of fasteners is employed instead of a stack of separate fasteners. As indicated on Figure 11, the fasteners F' are in ribbon form arranged in endwise relation with adjacent fasteners connected by a relatively narrow centrally disposed integral connecting part 44. The spirally wound ribbon is mounted in a holder or magazine composed of a lateral extension 45 of the frame over which a cover 46 fits to retain the roll in position. The roll is provided with a core 47 which is rotatably mounted on a pin 48. The free end of the ribbon passes along a downwardly inclined channel 49 and is engaged in the region between the foremost fastener F' and the next succeeding one by a pair of substantially V-shaped spring fingers 50 which straddle the respective connecting piece 44, as indicated on Figure 14.

The fingers 50 are integral with the end por-

tion of the metal tape 30a which is longitudinally movable in a guideway 31a shaped somewhat similarly to the guideway 31 above described. The upper end of the tape is connected to a vertical reciprocable arm 28a which is connected to a laterally extending handle 23a. The handle 23a is slidably mounted on the plunger 18a which is provided with a knob 22a. The plunger 18a is reciprocable in a lateral extension 14a of the body portion and a coil spring 16a urges the plunger upwardly in a manner similar to the spring 16 above described. Interposed between the top of the extension 14a and the handle 23a is a coil spring 26a, which normally holds the handle 23a in its raised position. An adjustable screw 27a provides a stop for limiting the movement of the handle 23a toward the lateral extending arm 25a.

It will be manifest that upon downward movement of the handle 23a relatively to the arm 25a, the depending arm 28a is moved downwardly thereby imparting a downward movement to the metal tape 31a, the lower end portion of which is caused to move laterally in a direction toward the plunger 18a. The spring fingers 50 engage on opposite sides of the connecting piece 44 in rear of the foremost fastener and impart movement to the ribbon, thereby causing the foremost fastener to move forwardly, substantially to the position indicated on Figure 10. As indicated on Figure 13, the longitudinal edge portions of the ribbon engage in guideways 51 thereby causing the fasteners to move forwardly in the desired manner.

In order to sever the foremost fastener F' from the next succeeding one, a knife 52 is fixed to the lower end portion of the plunger 18a and extends a slight distance beyond the lower end of the plunger. The severing operation does not take place until after the fastener F' has been applied to the stud S'.

The sequence of operations is as follows: the handle 23a is first gripped and forced toward the arm 25a whereupon the ribbon formed by the fasteners F' is advanced as above described. The foremost fastener, which is then in the position indicated in Figure 10, is located directly over the stud S' and the plunger 18a is then forced downwardly to force the fastener upon the stud as hereinbefore described. When the plunger has nearly completed its operation, the knife 52 moves between the spring fingers 50, as indicated on Figure 14, and employing the panel A' which is to be attached to the supporting structure P', as a backing, effects a cutting or shearing of the connecting piece 44. Thereupon the plunger 18a is released and moves upwardly under the action of the coil spring 16a. Upon the release of the handle 23a the spring 26a causes it to move upwardly and the spring fingers ride over the next succeeding fastener F' and come to rest in position to engage the rear edge of the next succeeding fastener preparatory to the next advancing movement of the fastener ribbon. It will be understood that sufficient space is afforded above the fastener ribbon to enable the spring fingers 50 to ride rearwardly thereover, such movement being made possible by the inclination of the V-shaped fingers substantially as shown on the drawings.

In the form of the invention shown on Figures 15 to 21, a cylinder 53 receives a reciprocatorially mounted instrument 54 which is provided with a laterally extending pin 55 and rides in a vertically elongate slot 56 in the cylinder 53. The instru-

ment 54 is formed with a knob 57 and interposed between the knob and the cylinder 53 is a coil spring 58 which holds the instrument normally in its raised position. The instrument 54 has a tapered extension 59 at its lower end from which projects a pin 60 the lower end of which is secured to a fastener engaging slide 61 formed with an axial bore 62.

The instrument 54 is substantially a pin punch 10 of the type available on the market and well-known to those skilled in the art of punching holes in sheet metal and other similar materials. In the operation of this instrument, the knob 57 is pushed down and after a predetermined pressure is imparted to the pin 60, a spring pressed plunger is automatically released and delivers a sharp blow against the pin 60. Each time that pressure is imparted against the pin 60, a blow of predetermined force is imparted thereto. 15 Since instruments of this character are well-known in the trade, and inasmuch as the construction thereof forms no part of the present invention, further description and illustration is not considered necessary.

As indicated in Figure 21 the lower end of the cylinder 53 is rectangular in shape and the slide 61 has a nice sliding fit therein. The lower end of the cylinder 53 is fixed to a laterally extending support 63. Carried by the support 63 in spaced relation to the cylinder 53 is a vertically disposed tube or fastener magazine 64 which receives a stack of sheet metal fasteners F' similar to the fasteners hereinbefore described. Engaging the uppermost fastener of the stack is a follower plate 65 which rides in a vertical slot 66 in the side of the magazine 64. For imparting a spring pressure against the follower plate 65 to urge the stack of fasteners downwardly, a spiral spring 67 is carried by a bracket 68 on the support 63 and has an extension 69 which is fastened to the outer side of the follower plate 65.

The lower end of the magazine 64 opens into a horizontally disposed guideway 70 formed in the support 63. Slidable in the guideway 70 is a fastener actuating slide 71, side edge portions of which ride in oppositely disposed grooves 72 in the guideway 70, and an elongate slot 73 extends throughout the lower portion of the guideway 70. The actuating slide is formed with a horizontally elongate slot 74 and at one end of the slot is an upwardly offset lip 75. The lip 75, as indicated on Figures 15 and 16, is adapted to engage the rear edge of the lowermost fastener F' of the stack and advance such fastener to the right of these figures to a station indicated by the reference number 76. In such position, a lug 77 which inclines downwardly and to the right (Figure 16) enters the opening in the top of the fastener and holds it in place during the retracting or retrograde movement of the actuating slide 71. The slide 71 is moved to the left by a coil spring 78 which is anchored at one end to a bracket 79 which depends from the slide into the slot 73 and at the opposite end to a bracket 80 which is secured to the underside of the support 63.

Feeding movement is imparted to the actuating slide 71 by a vertically reciprocatory cam yoke 81 having a pair of yoke arms 82 which straddle the fastener magazine 64. Movement of the yoke 81 is guided by pins 83 which project outwardly from the sides of the magazine 64 into vertically elongate slots 84 in the yoke arms 82. Projecting laterally from the upper end of the yoke 81 is a handle 85 which is nor-

mally spaced above a cooperating grip arm 86 which is fixed to the cylinder 53. The yoke 81 is yieldingly held in its raised position by a coil spring 87 which is connected respectively to the magazine 64 and yoke 81.

Formed on the lower end of each yoke arm 82 is a downwardly and rearwardly inclined cam surface 88 against which pins 89 projecting laterally from the slide 71, are held by the spring 78. It is apparent that upon depression of the handle 85 toward the grip handle 86, the cam surfaces 88 impart an advancing movement to the left of Figure 15 to the slide 71, thereby advancing a fastener from the magazine to the station 76. As above explained, the fastener is held at the station 76 when the slide 71 retracts by the lug 71, but upon the next advancing movement of the slide 71 the fastener at the station 76 will be advanced to the position indicated at 99 by the frictional engagement between the slide and fastener, the latter being gripped by downturned spring fingers 90 on the slide (Figure 20).

Depending from the support 63 beneath the cylinder 53 are legs 91 which are adapted to rest upon the panel D which is to be joined to a supporting panel E by the stud S<sup>2</sup>. For locating the tool with respect to the stud S<sup>2</sup>, a bent strip 92 depends from the underside of the slide 71. The locator strip is first brought into contact with the stud S<sup>2</sup> as indicated on Figure 15 and then the actuating slide 71 is operated to feed a fastener to station 99, and then while the handle 85 is held down, the knob 57 is forced downwardly to cause the plunger slide 51 to push the fastener upon the stud S<sup>2</sup> as indicated by dotted lines on Figure 16. The handle 85 is then released and the actuating slide 71 returns to its normal position preparatory to the next advancing movement. Likewise the instrument 54 is spring returned to its normal position.

From the above description, it will be apparent that I have provided an exceedingly simple and compact tool for applying sheet metal fasteners to studs or the like. Since these fasteners are frequently very small and difficult and time-consuming to handle and apply to the studs, it will be realized that by the use of this tool, the cost of assembling operations is materially reduced, enabling an operator rapidly and efficiently to apply fasteners of the character described above with considerably less time consumed and without the necessity of carrying a number of individual fasteners loosely and with the consequent loss of many of them. It will be realized that slight changes in the contour of the actuating element and associated parts may be necessary to accommodate similar fasteners of slightly different configuration.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What I claim is:

1. A tool for applying fasteners including a frame, a reciprocal plunger element having means for applying the fasteners carried by the frame, a magazine for the fasteners, an ejector operating in a plane at substantially right angles to the plane of movement of the plunger element for ejecting the fasteners from the magazine into the path of movement of the plunger element, means to return the plunger element to inoperative position following operation thereof, a

handle element having slidable connection with the plunger element to provide for movement of the plunger element, in applying a fastener, independently of movement of the handle element, means carried by said plunger element and engageable by the handle element whereby to move the plunger element to cause its fastener applying means to lie adjacent to the ejected fastener, a metal tape connected to the handle element for operation thereby and connected to the ejector to operate the latter, and means to guide the movement of the tape whereby movement of the handle element effects said movement of the ejector at substantially right angles to the plane in which the plunger element operates.

5 2. A tool in accordance with claim 1, wherein the handle element is formed with an opening which slidably receives the plunger element therethrough, and wherein the means to move the plunger element to lie adjacent to the ejected fastener consists of an abutment on the plunger element engageable with the handle element.

10 3. A tool in accordance with claim 1, wherein the handle is disposed at substantially right angles to the plunger and the slidable connection is in the form of an opening in the handle and which slidably receives the plunger therethrough, and wherein there is an arm rigidly connected to the frame and disposed parallel to and spaced from the handle.

15 4. A tool in accordance with claim 1, wherein there is a member rigidly connected to and depending from the handle element and which is slidable within the guide means and to which the upper end of the tape is connected.

20 5. A tool in accordance with claim 1, wherein the handle element is disposed at substantially right angles to the plunger element and is formed with an opening which slidably receives the plunger element therethrough; wherein there is an arm rigidly connected to the frame and disposed parallel to and spaced from the handle element, and wherein there is a coil spring interposed between the arm and handle element to restore the latter to normal position following operation thereof.

25 6. A tool in accordance with claim 1, wherein the handle element is disposed at substantially right angles to the plunger element and the slidable connection is in the form of an opening in the handle and which slidably receives the plunger therethrough; wherein there is an arm element rigidly connected to the frame and disposed parallel to and spaced from the handle element; wherein there is a coil spring disposed between the arm element and handle element to restore the latter to normal position following operation thereof, and wherein there is means to limit the movement of the handle element toward the arm element carried by one of said last two elements.

30 7. A tool for applying fasteners including a frame, a reciprocal plunger having means for applying the fasteners carried by the frame, a magazine for the fasteners, means for ejecting the fasteners from the magazine into the path of movement of the plunger, a handle, means on the plunger engageable by the handle upon movement in one operation to move the plunger to cause the fastener applying means thereof to lie adjacent to the ejected fastener, a movable connection between the plunger and handle to permit independent operation of the plunger with respect to the handle in a second operation, means

connected to the handle and to the ejecting means and operable by the handle to actuate the ejecting means, and means to return the plunger to inoperative position following operation thereof.

8. A tool in accordance with claim 7, wherein there is an arm rigidly carried by the frame and disposed substantially parallel to the handle whereby the operator may grip the handle and arm in one hand to actuate the ejecting means, and a spring interposed between the handle and arm to restore the handle to normal position following operation thereof.

9. A tool in accordance with claim 7, wherein there is an arm rigidly carried by the frame and disposed substantially parallel to the handle whereby the operator may grip the handle and arm in one hand to actuate the ejecting means, wherein there is a spring interposed between the handle and arm to restore the handle to normal position following operation thereof, and wherein there is means between the handle and arm to restrict movement of the handle relative to the arm and which is carried by one of the two last named elements.

10. A tool in accordance with claim 7, wherein the means by which the handle moves the plunger includes an abutment on the plunger engageable with the handle whereby upon movement of the handle to operate the ejecting means the plunger will be moved to said position adjacent to the ejected fastener.

11. A tool for applying fasteners including a frame, a reciprocable plunger having means for applying the fasteners carried by the frame, a handle for operating the plunger, a magazine for the fasteners, an ejector operating in a plane at substantially right angles to the plane of movement of the plunger for ejecting the fasteners from the magazine into the path of movement of the plunger, means to return the plunger to inoperative position following operation thereof, a flexible unitary and bodily slidable metal tape connected at one end thereof to the ejector to operate the latter, means having connection with the opposite end of the tape to actuate the tape and thereby the ejector, and means engaging the

5 opposite faces and edges of the tape to guide the movements thereof throughout its length, whereby upon reciprocal movements of the handle to effect said movement of the ejector at substantially right angles to the plane in which the plunger operates.

10 12. A tool in accordance with claim 11, wherein there is means to restore the tape actuating means and therewith the tape to inoperative position following operation thereof.

15 13. A tool for applying fasteners, including a frame, a reciprocal plunger having means for applying the fasteners carried by the frame, a magazine for the fasteners, means for ejecting the fasteners from the magazine into the path of movement of the plunger, an arm rigidly carried by the frame and disposed at substantially right angles to the plunger, a reciprocal handle disposed and movable in a plane substantially parallel to that in which the arm lies, means for mounting the handle for bodily sliding movement in said plane in all positions of the handle and adjacent to the arm so that both can be gripped in one hand of the operator, and means connected to the handle and to the ejecting means to operate the ejecting means.

20 14. A tool for applying fasteners including a frame, a reciprocal plunger having means for applying the fasteners carried by the frame, means for operating the plunger, a holder for the fasteners, means for ejecting the fasteners from the holder into the path of movement of the plunger, means connected to the plunger operating means and connected to the ejecting means for operating the ejecting means, said plunger operating means including means thereon engageable with the plunger for moving the plunger to a position adjacent to the ejected fastener, and means for movably connecting said means for operating the plunger to the latter whereby to provide for further movement of the plunger independent of its operating means thereby to apply the fastener upon completion of the movement of the ejecting means.

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