Dec. 31, 1940. J. T. WRIGHT 2,226,598

WIRE STITCHING MACHINE

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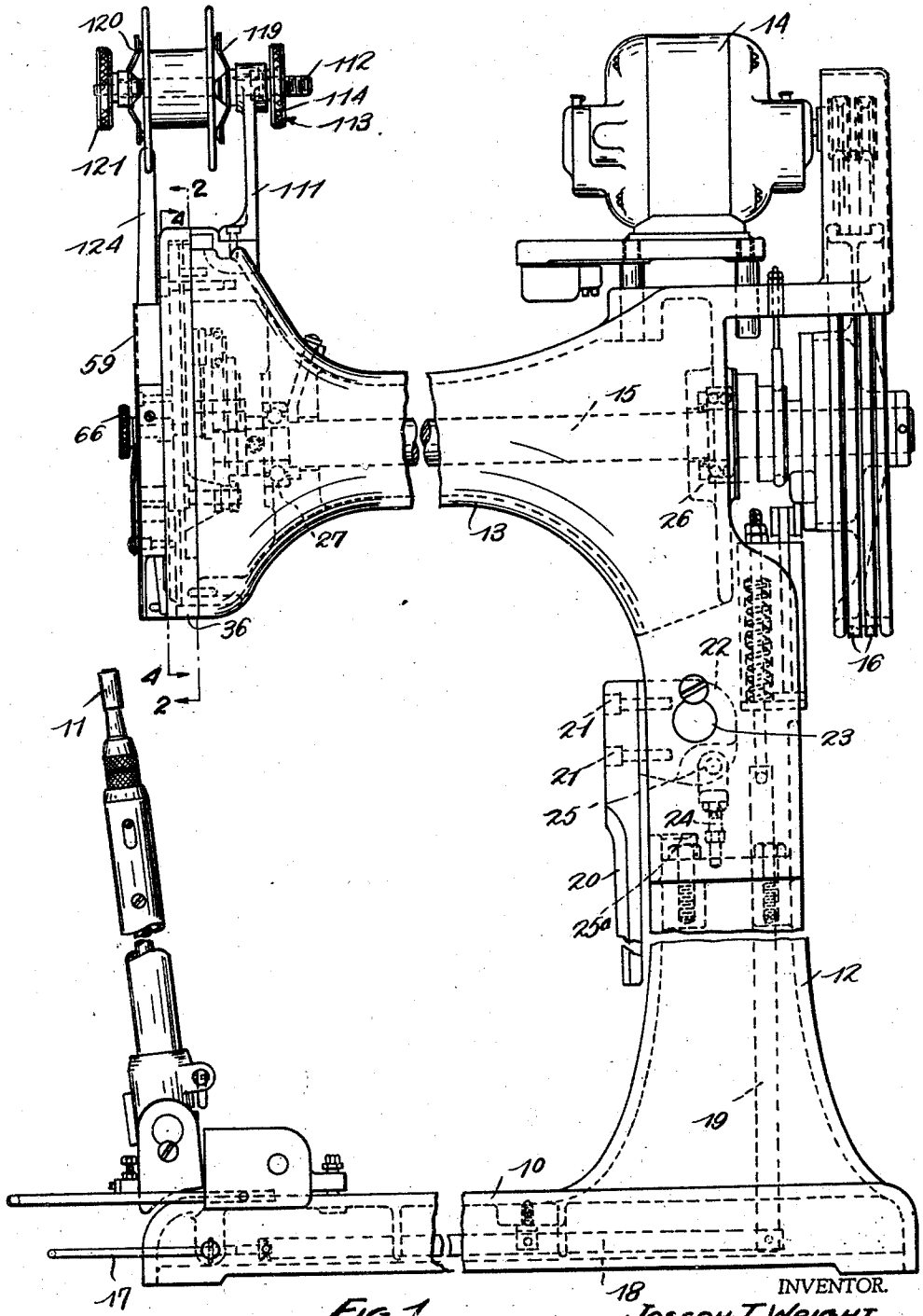


FIG. 1.

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WIRE STITCHING MACHINE

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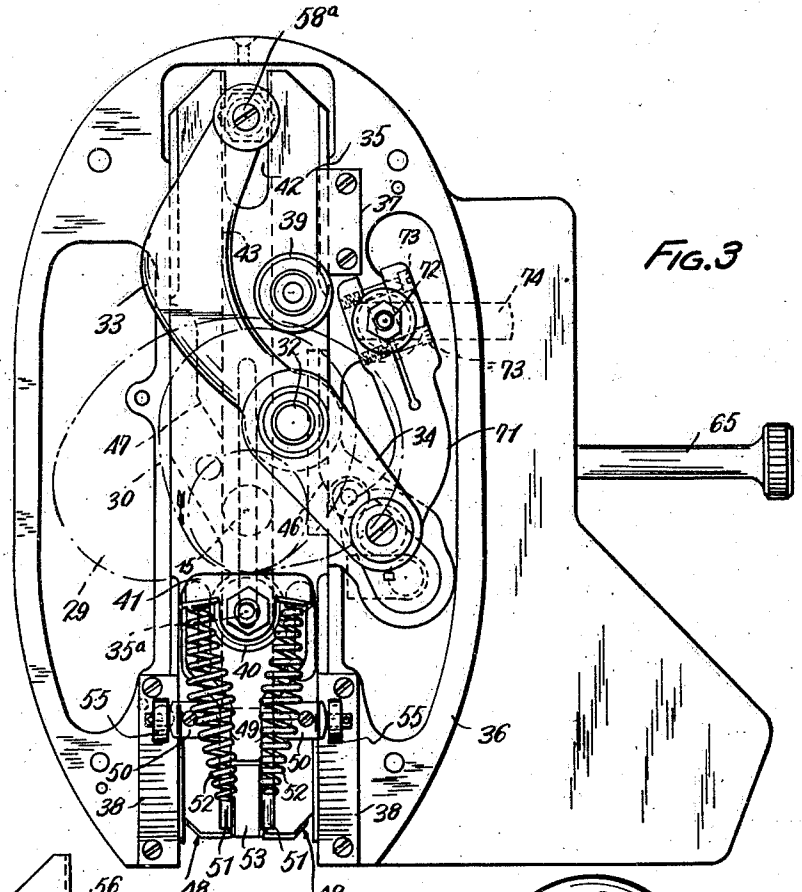


FIG. 3

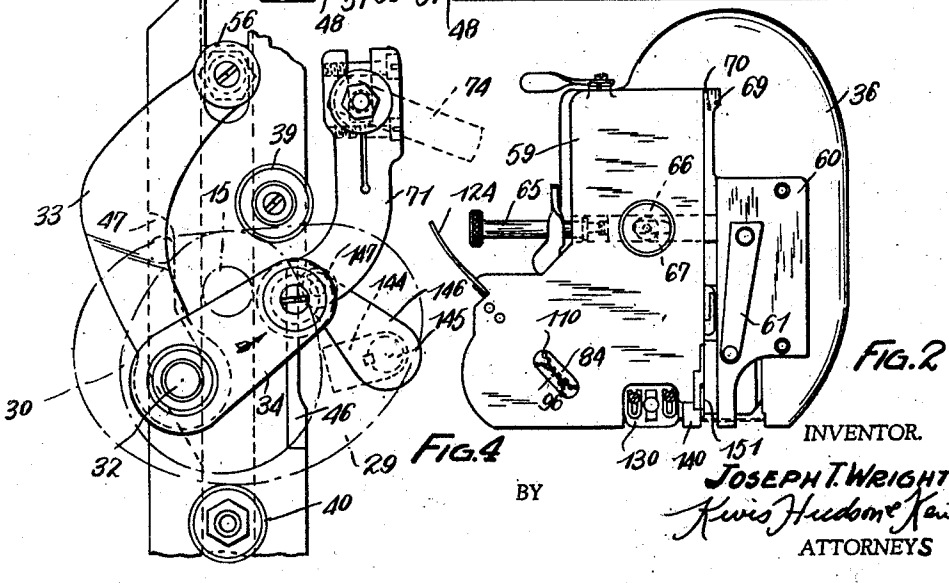


FIG. 4

FIG. 2

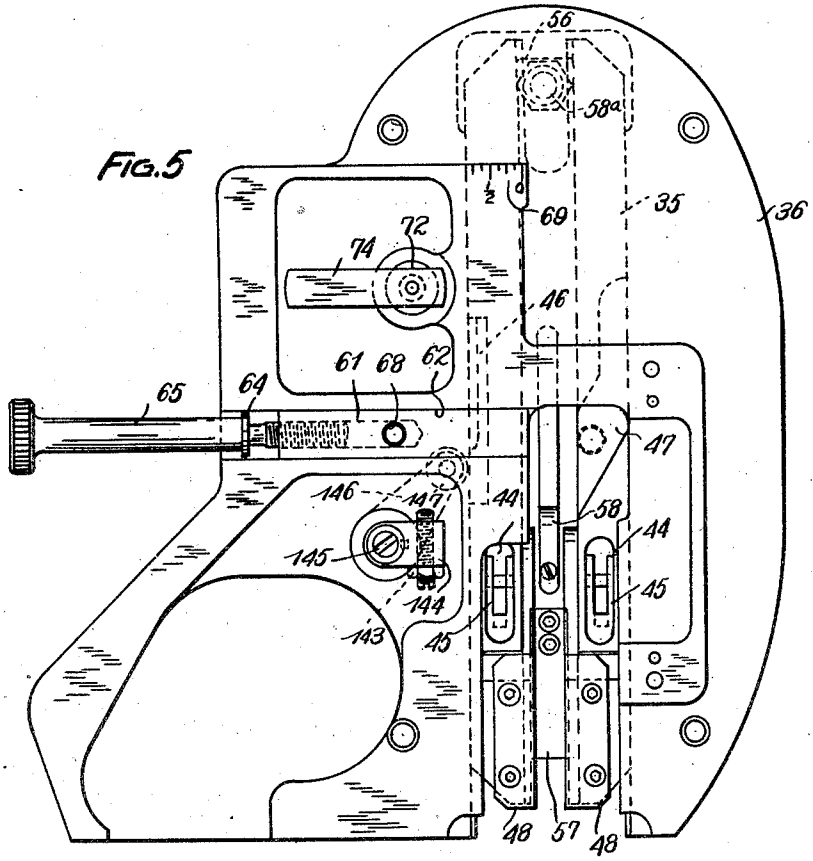
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WIRE STITCHING MACHINE

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FIG. 5



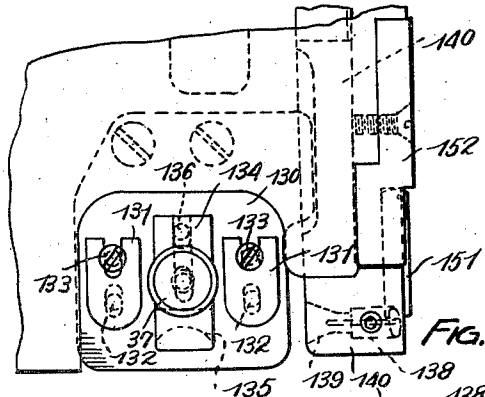


FIG. 11

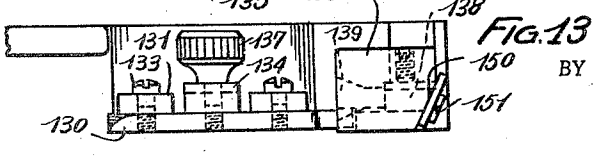


FIG. 13

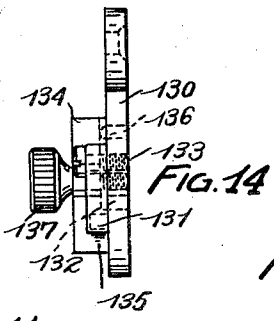


FIG. 14

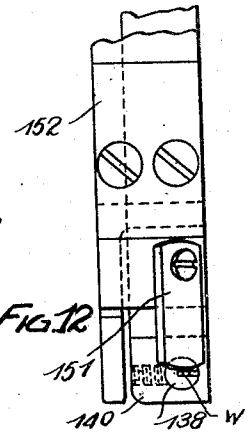


FIG. 12

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WIRE STITCHING MACHINE

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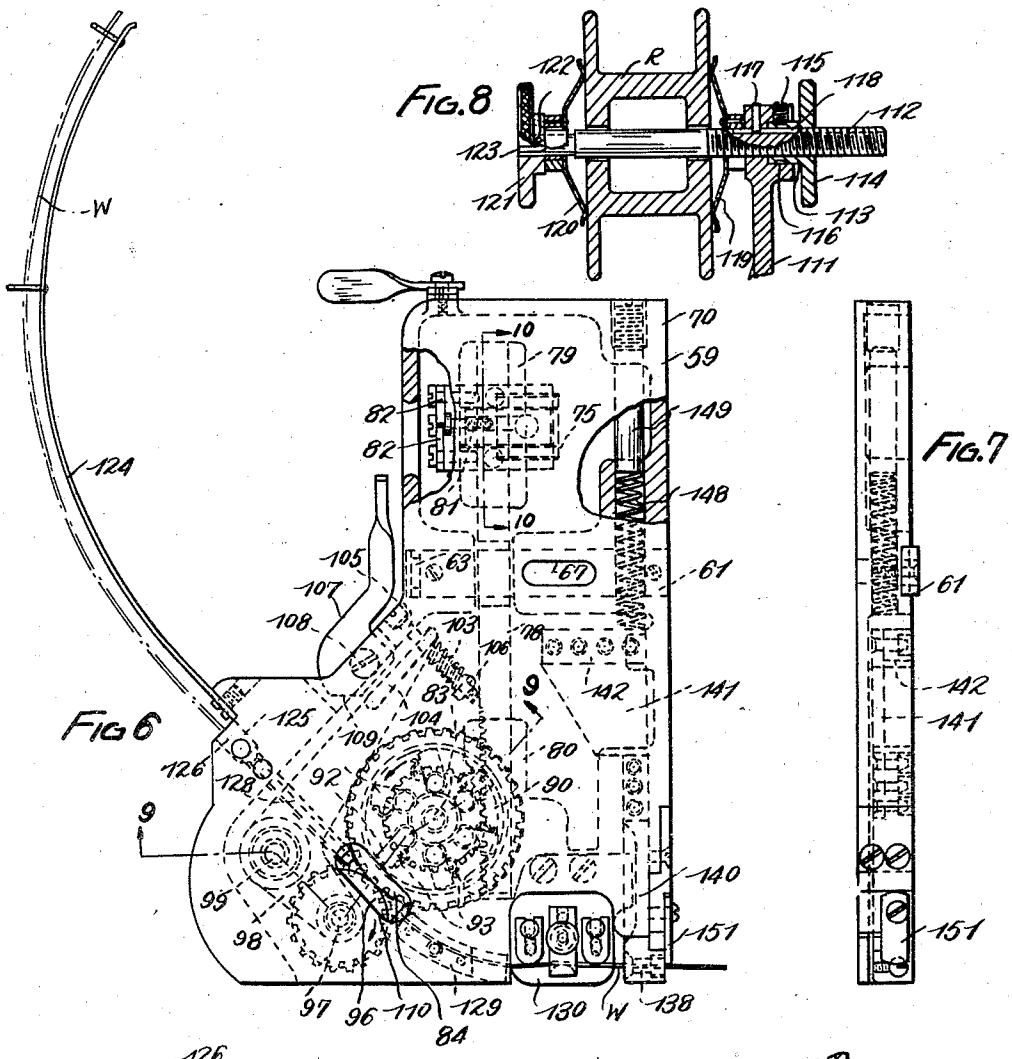


FIG. 6

FIG. 7

FIG. 8

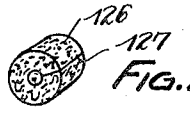


FIG. 20

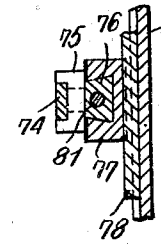


FIG. 10

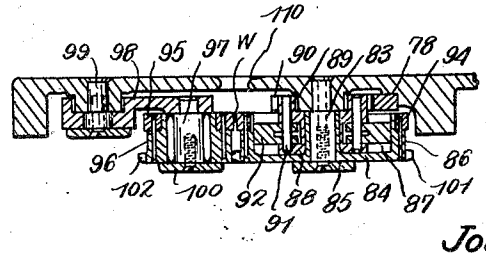


FIG. 9

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WIRE STITCHING MACHINE

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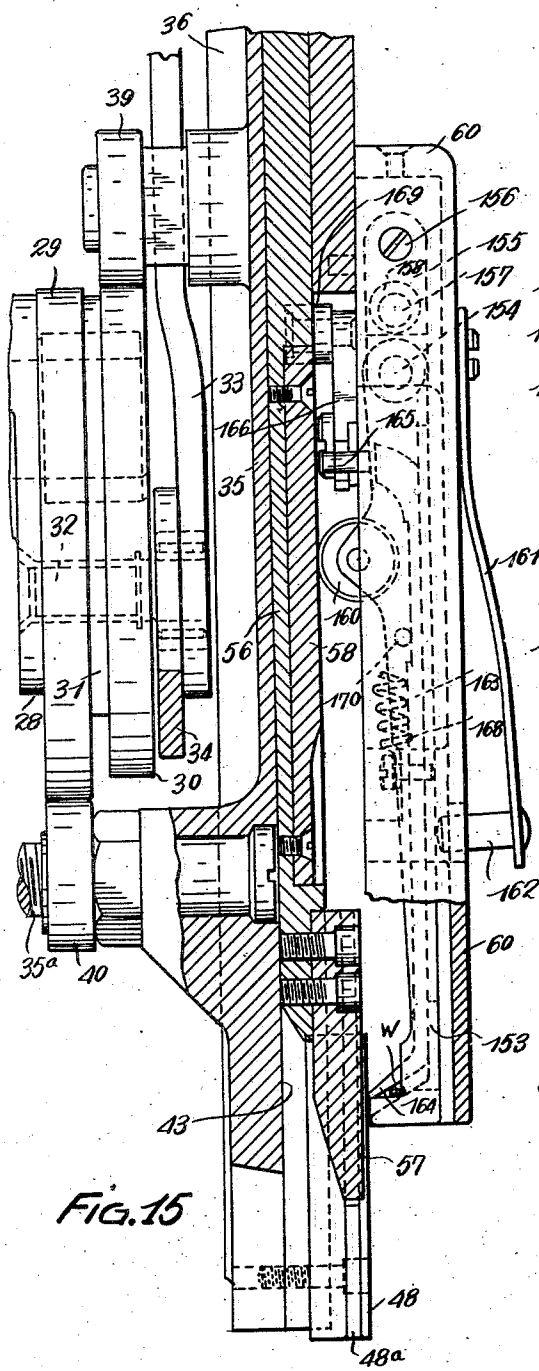


FIG. 15

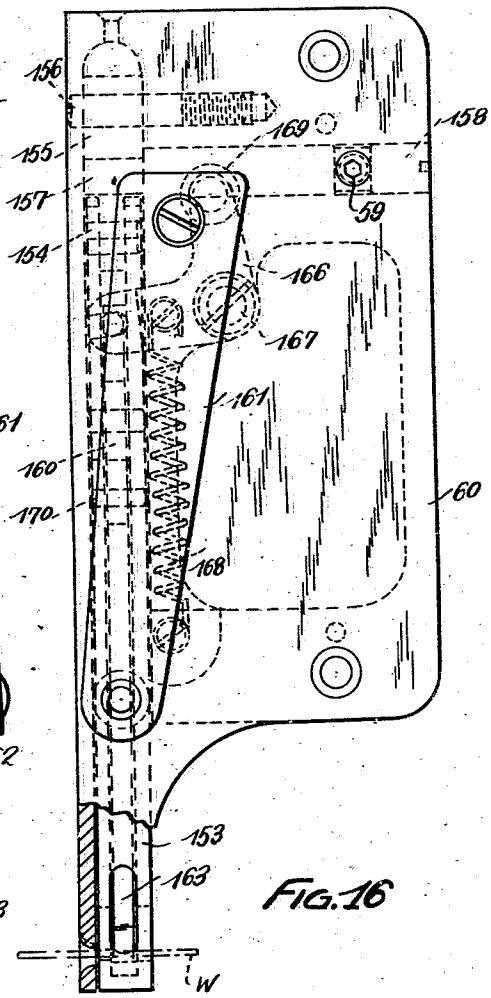


FIG. 16

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WIRE STITCHING MACHINE

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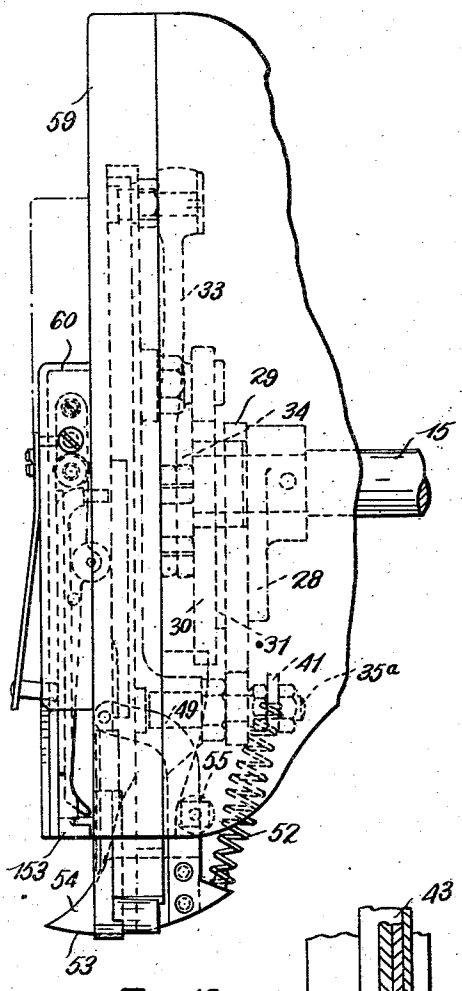


FIG. 18

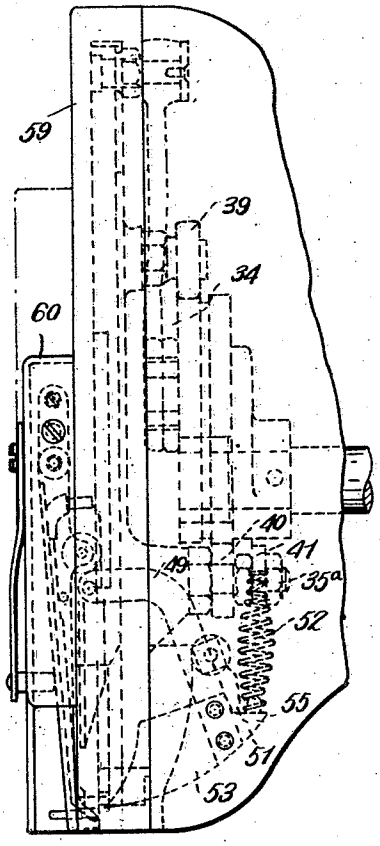


FIG. 17

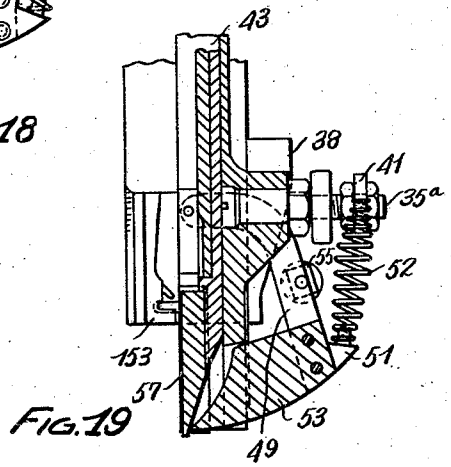


FIG. 19

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Patented Dec. 31, 1940 2,226,598

UNITED STATES PATENT OFFICE

2,226,598

WIRE STITCHING MACHINE

Joseph T. Wright, Cincinnati, Ohio, assignor to Harris-Seybold-Potter Company, Cleveland, Ohio, a corporation of Delaware

Application July 6, 1939, Serial No. 283,021

17 Claims. (Cl. 1—2)

This invention relates to improvements in wire stitching machines, that is to say machines for cutting predetermined lengths of wire from a coil, forming the wire into staples, driving the staples and clinching them. The machine of the present invention is a machine of this type designed particularly for stitching together the parts of cardboard boxes, and in some cases, metal parts.

One of the objects of the invention is the provision of a machine of this character wherein the adjustments for staple length are effected quickly and easily simultaneously with an adjustment which maintains the cut-off wire centrally positioned with respect to the former slide regardless of the length of the wire.

Another object of the invention is the provision of a wire feed embodying improved operating mechanism.

A further object is the provision of simple and effective mandrel and wire gripping means capable of quick and easy adjustment.

Another object is the provision of an improved wire cutting means adapted for oblique as well as square cutting of the wire.

Still another object of the invention is the provision of an improved operating mechanism for the former and driver slides.

Another object is the provision of an improved mounting for the shoe over which the staple is supported while being driven.

Other objects and features of novelty will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which—

Fig. 1 is a side elevational view of a complete box stitcher embodying the present invention.

Fig. 2 is a front view of the head of the machine.

Fig. 3 is a rear view on a larger scale of the face plate of the head with the former slide at the top of its stroke.

Fig. 4 is a fragmental view showing the operating mechanism for the former and driver slides advanced through an angle of 180°.

Fig. 5 is a front view of the face plate.

Fig. 6 is a front view of the wire feed block with certain parts broken away and others shown in section.

Fig. 7 is an edge view of the same.

Fig. 8 is a central vertical sectional view of the wire reel and its mounting.

Fig. 9 is a sectional view taken substantially on the line 9—9 of Fig. 6.

Fig. 10 is a vertical sectional view taken substantially on the line 10—10 of Fig. 6.

Fig. 11 is a detail elevational view of the lower part of the wire feed block with the die block in its uppermost position of travel.

Figs. 12 and 13 are side and bottom views respectively of the same, with the die block in its lower position.

Fig. 14 is an edge view of the wire straightening unit shown in Figs. 11 and 13.

Fig. 15 is a large scale vertical sectional view taken through the driver and driver slide, showing the mandrel swung out of the way of the former and driver slides.

Fig. 16 is a front view of the mandrel block.

Fig. 17 is a side view of the head showing the mandrel swung backwardly into position to hold a length of wire in the path of the former, with the shoe withdrawn to inoperative position.

Fig. 18 is a similar view showing the mandrel withdrawn and the shoe advanced, the parts being in a position which they assume when the driving of the staple is beginning.

Fig. 19 is a similar view showing the parts at the end of the driving stroke, the shoe being cammed away by the driver.

Fig. 20 is a detail perspective view of a felt plug used for lubricating the wire preparatory to its being fed, straightened and cut off.

In the drawings I have illustrated at 10 the base of a wire stitching machine, upon which may be supported a post anvil 11 that swings into or out of operative position in a manner well known in the art. From the rear end of the base a column 12 extends upwardly for the support of a forwardly projecting arm 13. A motor 14 drives a shaft 15 through the intermediacy of pulleys and V-belts 16 and a clutch of the type which is automatically thrown out after the shaft 15 has turned through 360°. The operation of this clutch may be controlled in a more or less conventional manner by a foot pedal 17 operating through a lever 18 and a link 19.

For some purposes a blade anvil rather than a post anvil is preferred. My machine provides means for using a post or a blade interchangeably. The post 11 may be removed and the blade 20 used instead. The latter is secured, as by screws 21, to a bracket 22 which turns with trunnions 23 journalled in the side walls of the column 12. A prop 24 is pivotally connected at 25 to bracket 22, and has a free outer end which hangs down as shown when the blade anvil 20 is in inoperative position. When the blade anvil is swung upwardly a slight distance beyond horizon-

tal position and then lowered to horizontal position the prop 24 may be guided into recess 25a in which it is retained. By a reverse procedure the prop may be released and the anvil swung down to the inoperative position illustrated.

The shaft 15 is mounted in two anti-friction bearings 26 and 27 carried by the hollow head 13. Forward of the bearing 27 there is pinned to the shaft a plate 28 which serves as a brace and anchor for two cams 29 and 30 with a separator plate 31 therebetween. The plates 29, 30 and 31 are preferably attached to the plate 28 by two screws or bolts, one of which carries a forwardly projecting pivot 32 upon which are oscillatably supported a link 33 and a link 34.

The former slide is illustrated at 35. It is guided in rabbets formed in the rear side of a face plate 36 attached to the arm 13, and is held within said rabbets by a small guard plate 37 near the top of the face plate and two plates 38 at the bottom thereof which serve also as cams for a purpose which will presently appear. The former slide is caused to travel up and down by means of a cam follower 39 rotatably mounted on the slide and bearing on cam 30, and by means of a second follower 40 carried by former slide post 35a which also supports a bracket 41, follower 40 bearing upon the periphery of cam 29. These cams are so made as to cause the former slide to have a movement downwardly through approximately a quarter of a revolution of shaft 15, to remain at the bottom of its stroke until the shaft has completed somewhat more than half a revolution, and then to return to the top of its stroke during the balance of the cycle.

The former slide is provided with a clearance slot 42 at its upper end, a central vertical groove 43 in its forward side, a pair of apertures 44 in which are mounted pivot blocks 45, an insert cam plate 46, a cam groove 47, and suitable mounting holes for rigidly carrying the two former blocks 48 having grooves 48a (Fig. 15). The pivot blocks 45 constitute mounting means for a bifurcated lever 49 which carries roller blocks 50 and a pair of rearward extensions 51 adapted to receive the lower ends of double conical compression springs 52, the upper ends of which fit over projections at the ends of bracket 41, see Figs. 3, 17 and 19. The lower end of lever 49 is rigidly affixed to a shoe 53, the front curvilinear surface 54 of which is designed to support the center and its flat sides the legs of the descending wire staple substantially throughout the driving portion of the stroke. Rollers 55 mounted upon the blocks 50 and running upon the cam plates 38 serve to retract the shoe on the up stroke into a non-interfering position.

Slidably mounted in the groove 43 is a driver slide 56 rigidly carrying driver 57. This slide has a cam insert 58 and a post 58a by which it is actuated from the pivot pin 32 and link 33 previously mentioned. Its motion is sinusoidal in character, but its peak occurs somewhat after that of the former slide, that is to say when the former slide starts downward the driver slide at first moves upward a short distance and then later follows the former slide downward. The motion of the driver slide differs from that of the former slide however in that it has no dwell at the bottom or top of its stroke. The function of the cam insert 58 is to withdraw the mandrel at the proper time so that it will be in position to receive the wire advanced by the next feeding stroke and incidentally not interfere with the driving operation.

On the forward side of the face plate, that is the side shown in Fig. 2, a wire feed block 59 is mounted to have a small horizontal adjustment, and beside the wire feed block a mandrel block 60 is rigidly mounted. The block 59 is provided on its rear side with a horizontal tongue 61 that is slidable in a transverse groove 62 in the forward side of the face plate. At one end of the tongue 61 there is a vertical slot 63 which receives one edge of a collar 64 that is carried by an adjusting rod 65 which has a reduced inner end that is threadably mounted in the face plate. A thumb screw 66 extends through a slot 67 in block 59 and is threadably mounted in a hole 68 in the face plate. When this screw is tightened down it fixes the position of the wire feed block. When an adjustment of the block is to be made the screw 66 is first loosened, after which the rod 65 is turned to move the block horizontally a desired amount, and then the screw 66 is again tightened. The setting of the wire feed block may be determined and duplicated when desired by reference to a scale 69 engraved on the face plate cooperating with the edge 70 of feed block 59, the scale indicating directly the thickness of work to be stitched.

The feed of the wire is effected by the movement of the link 34 previously referred to and a second link 71 pivotally connected with link 34 and rigidly connected with a short shaft 72 that is journalled on the face plate. The effective length of link 71 may be varied to some extent, as indicated in Fig. 3 where the link is shown bifurcated with the bifurcation straddling a flatted portion of shaft 72. Clamping screws 73 hold the link in different positions of adjustment upon this flatted portion. On the forward side of the face plate shaft 72 carries a crank 74. It will be apparent that as the pivot pin 32 travels in its circular path around the axis of shaft 15 the outer end of the crank 74 is caused to swing upwardly and downwardly. Varying the length of arm 71 by the adjustment just above described affects somewhat the extent of the swinging motion of crank 74.

In Fig. 3, crank 74 is at the beginning of the cycle. As the pivot pin 32 is turned anti-clockwise 180° about the axis of the shaft 15, the path of any point on arm 74 describes an arc descending approximately 30° to the position shown in Fig. 4. Continued rotation of shaft 15 then causes arm 74 to travel upward through an arc of about 60° at which point it reverses and returns to its starting position.

Referring now to Figs. 6 and 10, it will be noted that crank 74 fits slidably within a groove in a swivel block 75 carried by a dovetail slide 76 that is mounted in a dovetail block 77 which is secured to a rack 78 that is vertically movable in grooves in the pads 79 and 80. The swinging movement of the crank 74 therefore imparts up and down movement to the rack 78. Dovetail slide 76 is adjustable in block 77 by means of a shouldered screw 81 retained and locked by twin plates 82—82 fixed to dovetail block 77, the plates being mutually offset a slight amount to accomplish the locking action. The length of stroke of the rack 78 may therefore be changed in two ways, first by the bodily movement of the block 59 through operation of the adjusting rod 65, and second by movement of the swivel block 75 with respect to block 77 through manipulation of the screw 81.

In the lower part of the block 59 there is a stub shaft 83 upon which is journalled the hub

of a wheel 84, which is prevented from moving axially in one direction by a disk 85 attached to the end of the shaft, and in the other direction by a wall of the block itself. The wheel 84 has a rim 86, and between the hub and this rim there is an annular pocket 87. The wheel hub has a smooth machined outer surface upon which is journalled the inner element 88 of a one-way or ratcheting clutch. This element has an annular extension 89 provided with gear teeth 90 that mesh with the teeth of rack 78. In the clutch element 88 there are a series of pins 91 upon which are pivotally mounted dogs 92 that are adapted when the clutch element 88 is rotated counterclockwise, as viewed in Fig. 6, to grip the internal wall of rim 86 and impart motion thereto. Soft springs 93 tend to hold the dogs 92 in operative position. On the other hand, when the clutch element 88 is rotated in the clockwise direction the springs 93 yield and the dogs merely slide on the surface of the rim. Hence when rack 78 travels upwardly the wheel 84 is rotated anticlockwise, while downward movement of the rack merely rotates the inner element of the ratcheting clutch and conveys no movement to the rim of the wheel. In an annular recess in the periphery of rim 86 there is mounted a hardened ring 94, between which and another similar but smaller ring 95 the wire W is fed. Ring 95 is carried by a small wheel 96 that is journalled on a stub shaft 97 which is carried by the short arm of a bell crank lever 98 pivotally mounted at 99 in the front wall of the feed block 59. Wheel 96 is held against axial movement by a guard disk 100 secured to the end of shaft 97. The wheels 84 and 96 have intermeshing gear teeth 101 and 102 respectively, so that all rotation of wheel 84 is positively imparted to wheel 96.

In order that the feed wheels 84 and 96 may grip the wire W with the proper tractive force even though different wires of varying thickness may be used, a coil spring 103 is caused to press against a plate 104 in the longer arm of bell crank lever 98. The compression of spring 103 may be regulated by suitable means. As illustrated herein this means consists of an elongated bolt 105 set into a counterbored hole in the block and provided with a nut 106 which is held by any suitable means against turning in the block. Spring 103 surrounds this bolt 105 between the nut 106 and the plate 104. When the operator desires to adjust the pressure of spring 103 he inserts a screw-driver in the slot at the outer end of the bolt and turns the latter in one direction or the other. When the machine is being threaded the wire feed rolls may be separated by means of a lever 107 which is pivoted at 108 and provided with a surface 109 for engagement with the plate 104 when the lever 107 is swung downwardly and outwardly. For the convenience of the operator the point where the wheels 84 and 96 grip the wire is exposed to view by a window 110 in the front wall of the block.

The wire reel is carried by a bracket 111 which is attached to the head of the machine. This bracket has a smooth opening therethrough in which is carried a spindle 112 threaded at its rear end to receive a nut 113 provided with a knurled flange 114. This nut has a cylindrical outer surface which extends into a counterbore in the bracket 111 and is held against longitudinal movement with respect to the bracket by set screw 115 extending into a groove 116 in the external surface of the nut. The spindle 112 is held from turning in the bracket because of the fact that a pin 117 carried by the bracket extends into a keyway 118 in the spindle. Obviously, therefore, when the nut 113 is turned one way or the other the spindle 112 is moved longitudinally in the bracket. The reel R surrounds spindle 112 in front of bracket 111 and is positioned between two identical spring spiders 119 and 120 which are sufficiently stressed to exert the desired amount of friction upon the side walls of the reel. The hub of spider 119 rests directly upon the spindle, while the hub of spider 120 rests preferably upon a reduced portion of a knob 121 which is adapted to slip onto or off of the spindle readily and is provided with a pin 122 which cooperates with a hook-shaped slot 123 in the spindle, whereby the knob may be quickly put in place or removed therefrom when it becomes necessary to change reels. It will be apparent that the degree of friction to be exerted upon the reel is determined by the adjustment of nut 113 and that this adjustment is in no way disturbed when one reel is removed and another one of the identical dimensions placed in position.

Wire from the reel is directed downwardly over a flexible guide arm 124 mounted at its lower end in the wire feed block. The wire enters the feed block through a pocket 125 in which is mounted a felt plug 126, see Fig. 20, having a slit 127 therein to receive the wire. This plug is impregnated with a thin oil so that the wire is covered with a thin film of lubricant when it enters the block. This lubrication of the wire has been found to be quite beneficial, particularly as to reduction in wear upon the wire straightening and staple forming tools and the wire guides 128 and 129. After passing through the plug 126 the wire, which may be either round or flat, enters a tube 128 which guides it into the bight of the feed wheels 84 and 96. After leaving these wheels it passes through a curved guide 129 which directs it into the wire straightening unit.

The latter unit comprises plate 130 removably attached to the feed block, see Figs. 11, 13 and 14. It carries three straightening elements. The outer ones 131 are identical substantially U-shaped elements with rounded heads at their lower ends. These elements are guided by pins 132 and are held in adjusted position by headed screws 133. The middle element 134 has an upwardly extending rounded head 135 on its rear side, the element being open from side to side for a distance above this head. A pin 136 assists in guiding element 134 and a thumb screw 137 holds it in adjusted position. The wire in passing beneath the rounded heads of elements 131 and over the head 135 is straightened. On previous machines of this class which include a straightening device, only one of the three elements is adjustable. By providing adjustability for all three elements the wire can be kept centralized in the desired path of travel, whereas with only the middle element adjustable the wire cannot be so centralized for all diameters or sizes of wire which may be used in the machine.

The wire then enters through a bell mouth opening 139 in the die holder 140 and thence passes through the cylindrical die 138 which is secured in holder 140 by a set screw. The die holder is slidable vertically within suitable guide surfaces in the wire feed block 59. The upper end of this carrier is riveted to a plate 141 to which is riveted a cross head 142, Fig. 6. The under surface of this cross head bears upon the

upper end of an adjusting screw 143, in a short crank 144 that is keyed to a stub shaft 145, the latter being journalled in face plate 36, see Fig. 5. At the rear end of shaft 145 there is an operating arm 146 which carries a roller 147 that is arranged to run upon cam plate 46, previously mentioned. This cam plate is mounted in the former slide. Its high spot encounters the roller 147 when the former slide nears its upper position on the up stroke, that is to say near the end of the cycle. Normally the carrier 140 is held in its lowermost position by a coil spring 148 which bears upon the top of cross head 142. This spring may be regulated as to pressure by means of a screw 149, shown in Fig. 6. The die block 138 is made removable and interchangeable. It may have an exit end with a surface square to the direction of travel of the wire as in Figs. 6 and 7, or it may have an oblique surface as shown at 150 in Fig. 13. A knife blade 151 bears against the exit surface of the die block. Blade 151 is mounted in a removable and replaceable block 152. Interchangeable blade mounting blocks may be used having provision for supporting the knife blade either square with the direction of travel of the wire or obliquely thereto in order to cooperate with the square or oblique die blocks. The blade mounting block 152 is fixed in the wire feed block 59, and as the die block rises it carries the wire past the cutting edge of the blade 151 and causes the latter to sever the wire. At this time the length of wire which extends beyond the die block is held in the mandrel, as will be presently explained, and its position is nearly in line with the lower end of the knife blade. Hence that part of the wire which is to be severed is only slightly moved by the cutting action. On the other hand in machines where the cutting is done by a moving knife blade the cutting action tends strongly to displace or bend down one end of the severed wire and places considerable strain upon the gripping means of the mandrel. Where an oblique cut is made I prefer to use a small angle, even as low as 10° or 15°.

The fixed mandrel block 60 is suitably recessed on its rear surface to receive the mandrel 153 which is U-shaped in cross section with its open side to the rear. At its upper end the mandrel is hung upon a pin 154 which is carried at the lower end of a vertical lever 155 that is supported upon a pivot 156. The lower end of the lever and therefore the pin 154 may be adjusted forwardly and backwardly by suitable means which in this instance takes the form of an eccentric 157 on one end of a shaft 158 provided with a screw-driver slot in its outer end which is exposed at the edge of the block, whereby it may be readily turned. A locking screw 159 may be provided to hold shaft 158 in any desired position of adjustment. The adjustment of the mandrel pivot 154 is for the purpose of setting the limit of rearward swing of the mandrel 153 so that the wire being carried thereby is exactly centralized under the vertical grooves 48a in the former blocks before they begin their downward movement.

A follower roller 160 is mounted between rearwardly extending projections on the mandrel and bears upon the cam plate 58 carried in the driver slide as previously mentioned. A leaf spring 161 with an elongated button 162 riveted thereto, projecting through a hole in the front of the block and bearing upon the mandrel, serves to hold the follower 160 against cam plate 58. After the driver slide 56 has driven one staple and rises again to its upper normal position follower 160 rides onto the low spot of the cam plate and permits the mandrel to swing rearwardly to carry a length of wire into position beneath the former slide, where it remains until on the next succeeding stroke the formers have descended well toward the bottom of their travel.

Within the cavity of the U-shaped mandrel there is a vertically slidable gripper bar 163 which at its lower end carries a gripper foot 164 that is inclined downwardly and rearwardly as shown in Fig. 15. It is accordingly adapted to grip securely a length of wire W supported upon the rearwardly extending part of the lower end of the mandrel 153 regardless of the size or cross sectional shape of the wire. At the upper end of the gripper bar there is a rearwardly projecting pin 165 which is received between bifurcations in the lower arm of a bell crank lever 166 that is pivotally supported at 167 in the mandrel block. A tension spring 168 acts to pull downwardly on this arm of the bell crank and to exert downward pressure on the gripper foot. The raising of the gripper bar in order to release a wire held in the mandrel is accomplished by a follower 169 carried in the upper arm of the bell crank 166 and cooperating with cam groove 47 in the former slide. This releasing of the wire by the gripper foot takes place shortly before the mandrel begins its forward swing. It will be observed that the actuation of the gripper bar by the operating means just described in no way interferes with the swinging movement of the mandrel. A transverse pin 170 mounted in the side of the mandrel affords a slide bearing for the gripper bar and serves to maintain the latter in place in the U-shaped guide provided in the rear of the mandrel.

Operation.—The operations of wire feeding, gripping, cutting off, transferring to a position beneath the former, forming the staple, driving and clinching are performed successively within the course of a single revolution of the drive shaft 15, starting and stopping at a point coincident to the highest rise of the former slide. Assuming that in the previous cycle a length of wire has been fed and cut off and is held by the mandrel 153 and gripper 163, 164 in the position of the parts illustrated in Figs. 3, 5, 6 and 17, where the mandrel is swung backward into the path of the former blocks, and that the operator has depressed the foot lever 17 to start the revolution of shaft 15, the former slide then starts downward. After it has descended a short distance the formers contact the wire held by the mandrel and bend down the ends thereof forming the legs of a staple, the point of actual engagement of the wire being at the lower ends of the grooves 48a. Therefore, the staple legs lie in these grooves which at this instant continue downward while the staple crown is still being held by the mandrel and gripper. The gripper 163, 164 then rises to release the wire, due to the action of cam groove 47 upon follower 169, and shortly thereafter the mandrel swings forwardly out of the way of the formers and driver, due to the action of cam plate 58 upon follower 160. As the mandrel moves forward the shoe 53 begins its forward movement due to the action of cam plates 38 on followers 55. Directly after the staple is formed the driver starts to move downward. The staple is forced down into contact with the curvilinear surface 54 of the shoe, and then as the driving operation continues the staple itself cams back the shoe whilst being supported

and held aga ıst distortion by the shoe. The former which at this time is standing still also assists in guiding the staple and maintaining it vertical. Thus, at the time when the descending driver has propelled the stitch to the point where its legs are ready to pierce the work, the staple is supported laterally from all directions; the front, back and outside of its legs by the grooves in the formers, the inside of the legs by the shoe sides. As the driver bears against the upper part of the staple crown the shoe supports the lower part of the staple crown until practically the end of the stitch. When the staple legs have fully pierced the work they impinge on the clincher block whose upper hardened surface is usually so shaped as to turn the staple ends inward. The stitch is completed as the driver reaches its lowermost position, when the staple ends nearly touch each other on the under side of the work, the stitch and work being squeezed somewhat between the driver and clincher block at the very end of the stroke. While this is occurring the feeding of another length of wire is beginning, that is when the cycle has progressed approximately one-third of a revolution, it being understood that at this time the mandrel is swung forward, as indicated in Figs. 18 and 19, and is in line with the wire emerging from the die block 138 which is then in its lowered position. During the latter part of the driving stroke and during the first part of the upward travel of the former and driver slides, the feeding of wire continues. At about the time it ends the gripper bar 163 is permitted to descend in response to the action of spring 168. Then while the wire is thus gripped the die block 138 rises and the wire is severed. Some time before the feed of wire was completed the shoe 53 was retracted, and now the mandrel again moves rearwardly with its new length of wire and positions the latter in the path of the former ready to be acted upon in the next cycle.

The width of the staple is determined by the spacing of the formers and the width of the supporting shoe and the mandrel. In most cases this width will not be changed when different jobs are to be performed, but if changes are desired they must be accomplished by substituting different formers, drivers, mandrel and shoe. Frequently however changes in the length of the staple legs are desired. These changes may be effected with my machine by the simple expedient of adjusting the wire feed block 59 horizontally upon the face plate by the means previously described. The proportions of the parts are such that as the feed block 59 is moved away from the path of travel of the former and driver a given distance, the additional length of wire fed is exactly double that distance. Hence any increase in the length of wire fed is divided equally between the two legs of the staple.

The feed adjustment effected by the manipulation of screw 81 changes the length of wire fed independently of the position of the feed block 59. This adjustment may be used to alter the relative length of the legs of a staple in case one leg longer than the other is desired. Ordinarily however its chief use is as a means of correcting any inequality in the length of staple legs.

The adjustment of the effective length of link 71 is essentially a means to establish the correct travel of the crank 74, which is a prerequisite for the use of uniform spacings of the engraved scale 69.

These two adjustments taken in combination afford a means of causing the staple to have legs equal in length and of the values for work thicknesses as indicated by the setting of witness line 70 on the scale 69, regardless of depth of stitch, variations in fabrication of parts or dissimilarity in assembly procedure from one machine to another. They furthermore provide effective means of compensation adjustment for normal backlash and wear in service.

It is to be noted that the scale graduations 69 are true fractions of an inch, that is not reduced or enlarged from the standard U. S. calibration for rules and scales. This is a valuable aid to the operator who if he wishes may employ a pocket rule to measure the distance between the right hand edge 70 of the feed block and the left hand edge of mandrel block 60 which coincides with the zero mark on scale 69. The measurement of this space between blocks is a true representation of the actual thickness of work to be stitched for any particular setting.

Having thus described my invention, I claim:

1. In a wire stitcher, a mandrel adapted to receive and hold a length of wire, said mandrel being mounted to swing about a pivot at its upper end for moving said length of wire into position to be formed into a staple, actuating means arranged to operate upon the mandrel below its pivot, and means for moving the pivot laterally to change the location of the arc through which the lower end of the mandrel swings.

2. In a wire stitcher, a mandrel adapted to receive and hold a length of wire, said mandrel being mounted to swing about a pivot at its upper end for moving said length of wire into position to be formed into a staple, cam means operatively associated with the mandrel below said pivot for swinging the mandrel about the pivot, and means for moving the pivot laterally toward or away from said cam means to change the location of the arc through which the lower end of the mandrel swings.

3. In a machine of the class described, a mandrel mounted to swing about a pivot at its upper end, actuating means arranged to operate upon the mandrel below its pivot, a gripper mounted to slide up and down in said mandrel, means for moving the pivot to change the location of the arc through which the lower end of the mandrel swings, and means for reciprocating said gripper arranged to function independently of the position of said pivot.

4. In a wire stitcher, a mandrel adapted to receive and hold a length of wire, said mandrel being mounted to swing about a pivot at its upper end for moving said length of wire into position to be formed into a staple, actuating means arranged to operate upon the mandrel below its pivot, a vertical lever in the lower end of which said pivot is mounted, a fulcrum for said lever above said pivot, and means for turning said lever on its fulcrum to adjust said pivot and thereby change the location of the arc through which the lower end of the mandrel swings.

5. In a stitching machine, a mandrel, a former slide, former legs thereon adapted to bend down the ends of a length of wire carried by the mandrel, a driver slide mounted to reciprocate between the legs of the former, a shoe movable into and out of the space between said legs for supporting the staple during the driving operation, and a bifurcated support for said shoe pivotally hung in said former slide on opposite sides of the path of said driver slide.

6. In a stitching machine, a mandrel, a former

slide, former legs thereon adapted to bend down the ends of a length of wire carried by the mandrel, a driver slide mounted to reciprocate between the legs of the former, a shoe movable into and out of the space between said legs for supporting the staple during the driving operation, a bifurcated support for said shoe pivotally hung in said former slide on opposite sides of the path of said driver slide, spring means for urging said shoe forward toward operative position, and cam means for withdrawing said shoe as the former slide rises on its up stroke.

7. In a stitching machine, a mandrel, a former slide, former legs thereon adapted to bend down the ends of a length of wire carried by the mandrel, a driver slide mounted to reciprocate between the legs of the former, a shoe movable into and out of the space between said legs for supporting the staple during the driving operation, a bifurcated support for said shoe pivotally hung in said former slide on opposite sides of the path of said driver slide, spring means for urging said shoe forward toward operative position, a pair of fixed cams at the sides of the former path, and cam followers carried by the said bifurcated support for engagement with said cams, whereby the shoe is swung out of the way as the former slide rises on its up stroke.

8. In a machine of the class described, a face plate, a wire feed block adjustable on said face plate, staple forming and driving means in said face plate, an oscillatable crank mounted in said face plate and operatively associated with said forming and driving means, and wire feeding means in said wire feed block having a slide connection with said crank, whereby the effective radius of the crank is varied as the wire feed block is adjusted in a straight line toward or away from the center of oscillation of said crank, thereby producing a variable feed of the wire.

9. In a machine of the class described, a face plate, a wire feed block adjustable on said face plate, staple forming and driving means in said face plate, an oscillatable crank mounted in said face plate and operatively associated with said forming and driving means, and wire feeding means in said wire feed block having a slide connection with said crank, whereby the effective radius of the crank is varied as the wire feed block is adjusted in a straight line toward or away from the center of oscillation of said crank, thereby producing a variable feed of the wire.

10. In a machine of the class described, a face plate, a wire feed block bodily adjustable on said face plate, staple forming and driving means vertically reciprocable in said face plate, an oscillatable crank mounted in said face plate, means associated with said staple forming and driving mechanism for oscillating said crank, wire feeding means in said wire feed block having a sliding connection with said crank whereby the effective radius of the crank is varied as the wire feed block is adjusted bodily toward or away from the path of travel of said staple forming means, and whereby the position of cut with respect to the center line of the staple driving means is changed in proportion to the length of wire fed and cut off.

11. In a machine of the class described, a face plate, a wire feed block adjustable on said face plate, staple forming and driving means in said face plate, an oscillatable crank mounted in said face plate, means associated with said staple forming and driving mechanism for oscillating said crank, wire feeding means in said wire feed block having a sliding connection with said crank whereby the effective radius of the crank is varied as the wire feed block is adjusted toward or away from the center of oscillation of the crank, and means accessible from the exterior of the block for changing the effective radius of the crank independently of the adjustment of said wire feed block.

12. In a machine of the class described, a wire feed comprising an oscillating crank, a drive shaft rotatable once for each cycle of the machine, a link eccentrically connected with said drive shaft and connected at its free end with a second link, the opposite end of the second link being fixed to said crank at its axis of oscillation, and adjustable means for varying the length of said second link and the angle through which said crank oscillates.

13. In a machine of the class described, a face plate, a wire feed block adjustable on said face plate, staple forming and driving means in said face plate, an oscillatable crank mounted in said face plate, wire feeding means in said wire feed block having a slide connection with said crank, whereby the effective radius of the crank is varied as the wire feed block is adjusted toward or away from the center of oscillation of said crank, thereby producing a variable feed of the wire, and gauge marks on the face plate when in register with a witness on said wire feed block to show the thickness of work accommodated for a given adjustment of the feed block

14. In a machine of the class described, a face plate, a wire feed block bodily adjustable on said face plate, staple forming and driving means in said face plate, an oscillatable crank mounted in said face plate, wire feeding means in said wire feed block having a slide connection with said crank, whereby the effective radius of the crank is varied as the wire feed block is adjusted toward or away from the center of oscillation of said crank, thereby producing a variable feed of the wire, and gauge marks on the face plate when in register with a witness on said wire feed block to show the thickness of work accommodated for a given adjustment of the feed block, the parts being so proportioned and designed that the movement of the feed block equals the change in thickness of the work.

15. In a machine of the class described, a wire feed comprising a reciprocable rack, feed rolls, a pinion meshing with said rack, means operatively associated with said pinion for ratcheting said rolls forward in a wire feeding direction only as the pinion oscillates in response to the reciprocating movements of the rack, and means for reciprocating the rack comprising a guide mounted upon the rack transversely thereof, a slide in said guide, a swivel mounted in said slide, an oscillating crank having a slidable connection with said swivel, and means for adjusting said slide to different positions within said guide for regulating the length of throw of said rack.

16. In a machine of the class described, a wire feed comprising an oscillating crank, a drive shaft rotatable once for each cycle of the machine, a link eccentrically connected with said drive shaft and connected at its free end with a second link, the opposite end of the second link being fixed to said crank at its axis of oscillation, and adjustable means for varying the length of said second link and the angle through which said crank oscillates, a reciprocable rack, a pinion meshing with said rack, means operatively associated with said pinion for ratcheting said rolls

forward in a wire feeding direction only as the pinion oscillates in response to the reciprocating movement of the rack, and means for reciprocating the rack from said oscillating crank comprising a guide mounted upon the rack transversely thereof, a slide in said guide, a swivel mounted in said slide having a sliding connection with said oscillating crank, and means for adjusting said slide to different positions within said guide for regulating the length of throw of said rack.

17. In a stitching machine, a mandrel, a former slide, former legs thereon adapted to bend down the ends of a length of wire carried by the mandrel, a driver head and driver slide mounted to reciprocate between the legs of the former, a shoe movable into and out of the space between said legs for supporting the staple during the driving operation, and a bifurcated support for said shoe pivotally hung in said former slide and approximately in the line of the path of said driver head.

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