

July 27, 1954

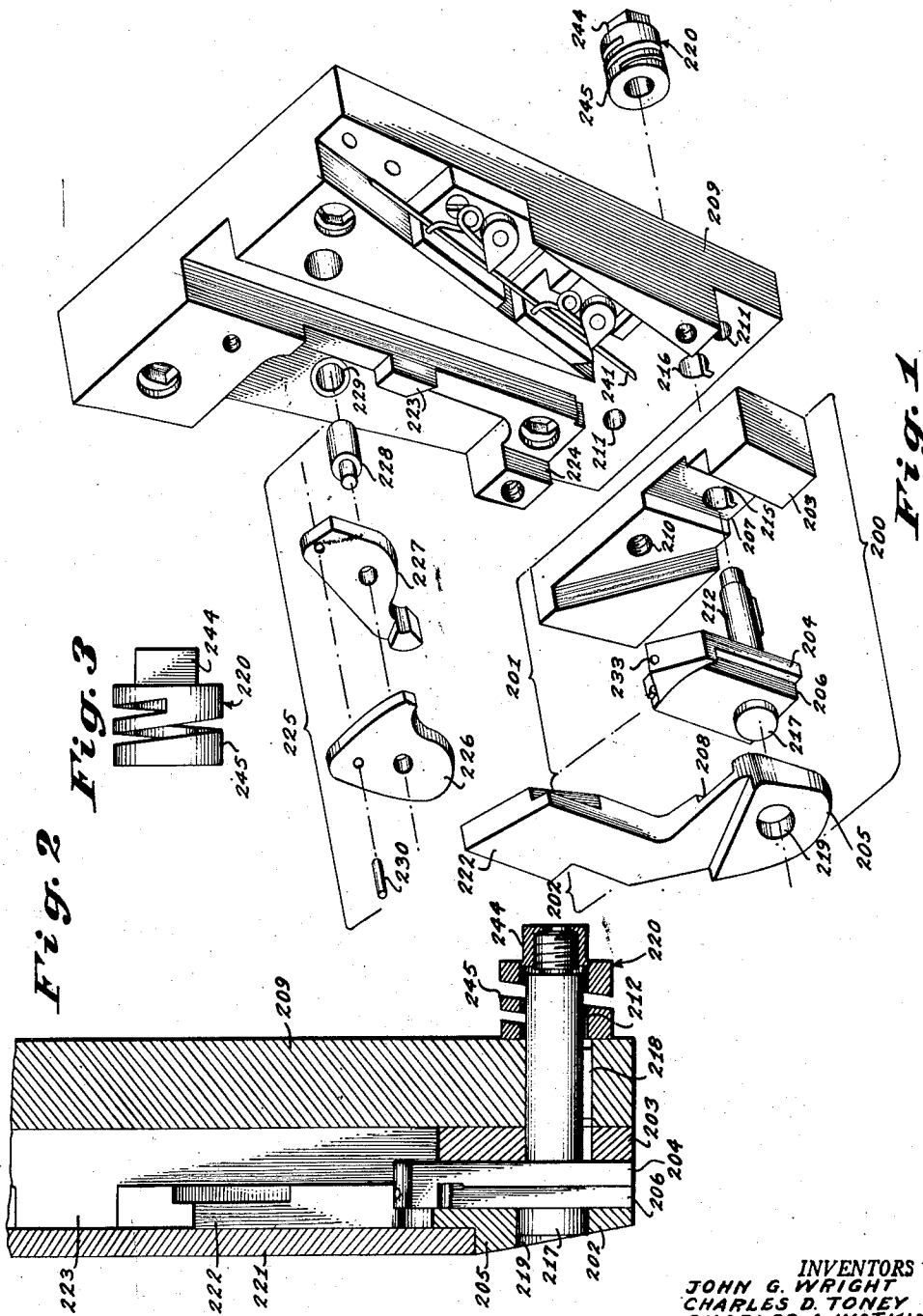
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2,684,490

FASTENER FORMING KNIFE ASSEMBLY

Original Filed Jan. 18, 1947

3 Sheets-Sheet 1



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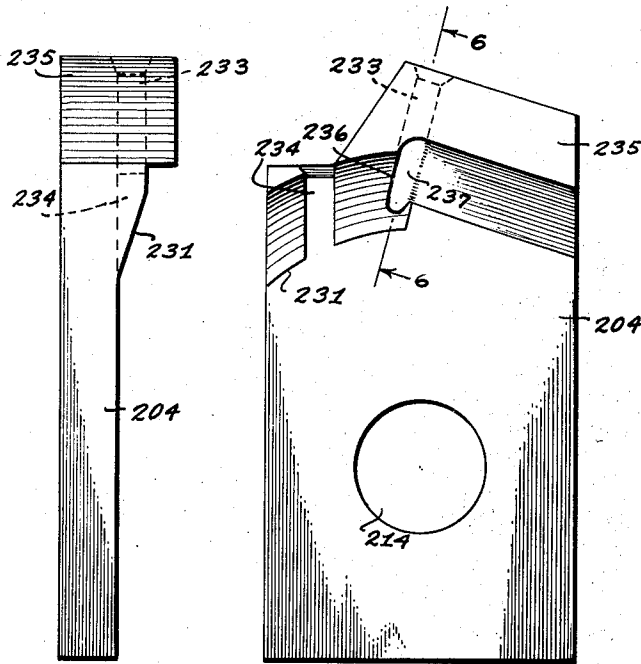


Fig. 4

Fig. 5

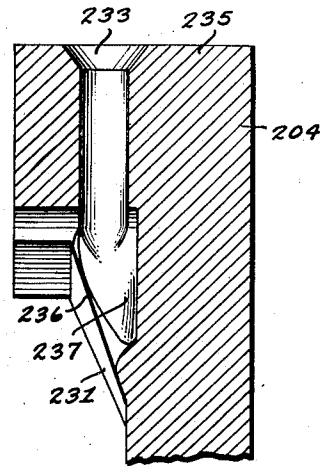


Fig. 6

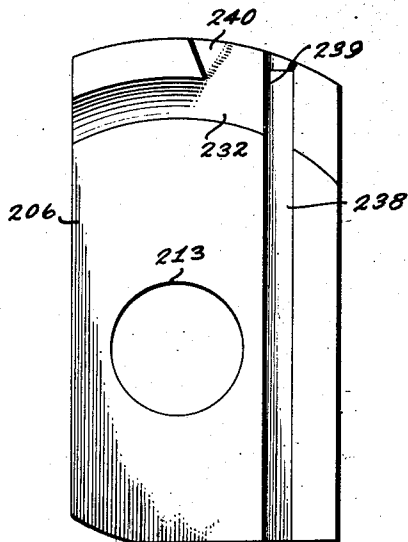
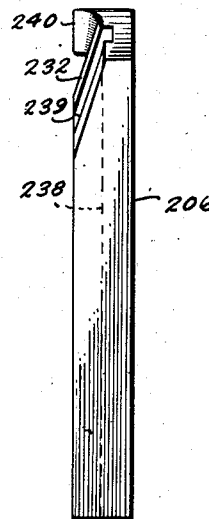


Fig. 7

Fig. 8



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Fig. 12

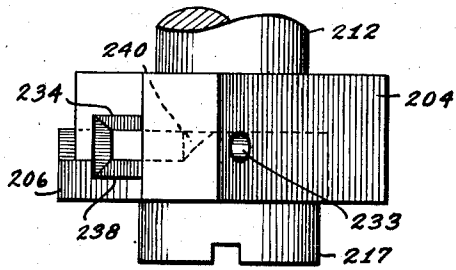


Fig. 10

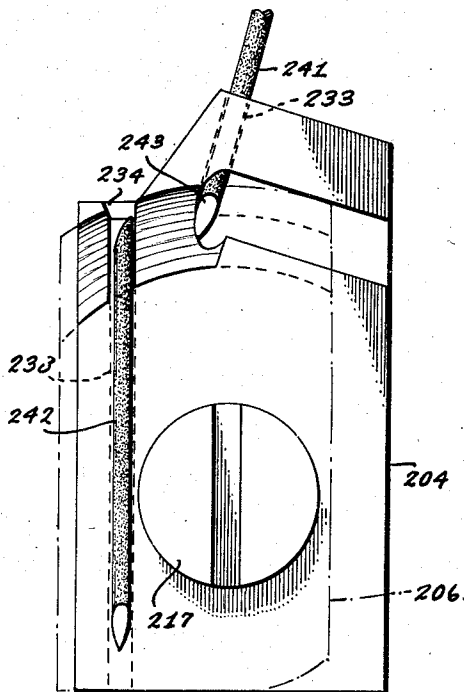
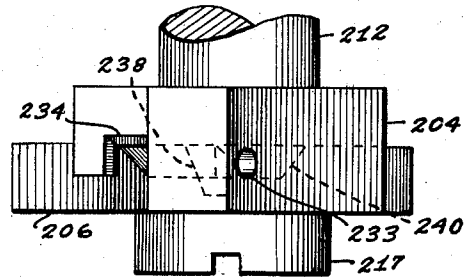


Fig. 11

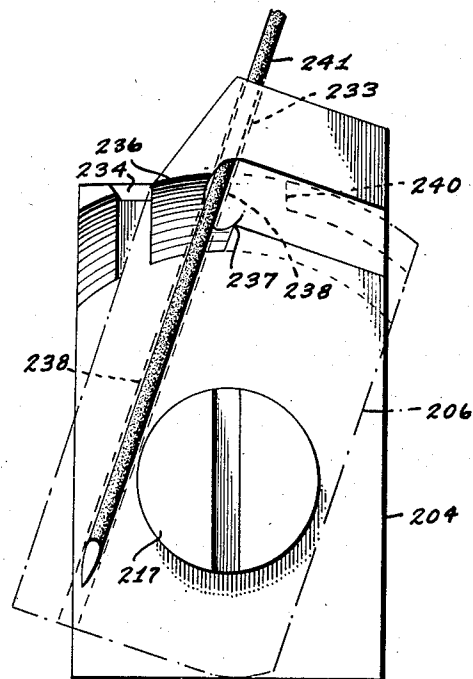


Fig. 9

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2,684,490

FASTENER FORMING KNIFE ASSEMBLY

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Original application January 18, 1947, Serial No. 722,806. Divided and this application December 13, 1950, Serial No. 207,888

3 Claims. (Cl. 10-43)

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This invention relates to fastener forming and inserting machines, and more especially to a nailing machine which is adapted particularly for woodworking operations, and by which fasteners are formed from a continuous length of wire or the like and inserted in material to be secured. This is a division of our copending application Serial No. 722,806, filed January 18, 1947.

In the copending application of Wright et al., Ser. No. 595,776, filed May 25, 1945, now U. S. Patent No. 2,520,521, a machine of the same general type adapted for soling shoes is disclosed. The present invention represents an improvement over the machine disclosed in the above application and incorporates modified and novel features adapting the present machine for heavy duty service in woodworking operations as described more in detail below.

An important feature of the present invention is an improved fastener forming knife assembly which provides positive means for conditioning the fasteners formed so that consistent straight driving of the fasteners is obtained. In the above copending application, a knife assembly is described in which stationary and movable blade members are adapted to cut the continuous length of wire from which the fasteners are formed diagonally to provide a driving point, and the stationary blade member is formed with an arcuate cutting edge adapted to displace the diagonal point on the fasteners formed to a position substantially coincident with the longitudinal axis of the fasteners. Displacement of the fastener point according to this arrangement is effected during the cutting operation, and while good results are obtained with the relatively small wire sizes characteristically used in soling shoes, difficulty is encountered in handling the larger wire sizes.

This difficulty is obviated according to the present invention by a fastener forming knife assembly in which the stationary blade member is formed with a recess adjacent its shearing edge and the movable blade member is formed with a shoulder projection adapted to cooperate with this recess and thereby positively effect displacement of the fastener points after the cutting action has been completed. The improved fastener forming knife assembly of this invention together with the other modified and novel features referred to above are illustrated in the accompanying drawing showing an embodiment of the invention.

In the drawing:

Fig. 1 is a blown-apart assembly view illus-

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trating the arrangement of the fastener forming knife assembly;

Fig. 2 is a fragmentary vertical section showing the fastener forming knife assembly in assembled position;

Fig. 3 is a detail of the fastening means used in assembling the fastener forming knife assembly;

Figs. 4 and 5 are respective side and face views of the stationary blade member of the fastener forming knife assembly;

Fig. 6 is a fragmentary sectional detail on the line 6-6 in Fig. 5;

Figs. 7 and 8 are respective face and side views of the movable blade member of the fastener forming knife assembly;

Fig. 9 is a face view showing the assembled arrangement of the movable and stationary blades in fastener forming position, with the movable blade indicated in broken lines to allow illustration of the position of the wire from which the fasteners are formed;

Fig. 10 is a plan view of the assembled movable and stationary blade members in fastener forming position;

Fig. 11 is a face view showing the assembled arrangement of the movable and stationary blades in fastener inserting position, with the movable blade indicated in broken lines to allow illustration of the position of the fastener and the wire from which the fasteners are formed; and

Fig. 12 is a plan view of the assembled movable and stationary blade members in fastener inserting position.

The fastener forming knife assembly of the present invention is indicated generally by the reference numeral 200 in the drawing. Generally described, this assembly comprises a stationary blade member 201 and a matched movable blade member 202 adapted for assembly with the stationary blade member 201 for movement between fastener forming and fastener inserting positions.

The various elements of knife assembly 200 are shown in Fig. 1 in exploded relation indicating their operating association in assembled relation. The stationary blade member 201 is composed of a holder 203 and a blade insert 204. Likewise, the movable blade member 202 includes a holder 205 and a blade insert 206. Holder 203 of the stationary blade member is recessed as at 207 to receive the blade insert 204, and holder 205 of the movable blade member as shown at 208 to receive blade insert 206.

The knife assembly 200 is assembled for oper-

ation in relation to an operating head 209. The holder 203 of the stationary blade member 201 is secured directly on operating head 209, tapped holes (one of which is shown in Fig. 1 at 210) being provided for this purpose to receive fastening screws (not shown) extended through openings as at 211 in the operating head 209.

Assembly of the movable blade member 202 with stationary blade member 201 for movement between fastener forming and fastener inserting positions is effected by means of a stud member 212. Aligned apertures 213 in movable blade insert 206 (see Fig. 7), 214 in stationary blade insert 204 (see Fig. 5), 215 in holder 203 of stationary blade member 201, and 216 in operating head 209, are provided to receive stud member 212 and define a pivot axis for movable blade member 202 with respect to stationary blade member 201.

Stud member 212 is formed with a head portion 217 arranged to seat on movable blade insert 206 as shown, and is fitted with a key 218 which is pressed in place so that the stationary and movable blade insert 204 and 206 are retained on stud member 212 for mounting and removal as a unit. Holder 205 of the movable blade member 202 is formed with a further aperture 219 to provide clearance for the head portion 217 of stud member 212 in assembled position. When knife assembly 200 is mounted, the key 218 on stud member 212 is positioned in operating head 209 (see Fig. 2), and stud member 212 is secured in place by a fastening means 220 which is described more in detail below. The holder 205 of movable blade member 202 is pivotably positioned by the head portion 217 of stud member 212, and is retained against lateral movement by a face plate 221 mounted on operating head 209 (see Fig. 5).

This method of assembly provides a secure mounting for stationary blade member 201 on operating head 209 while allowing free movement of movable blade member 202 on stud member 212 between fastener forming and fastener inserting positions. This movement of movable blade member 202 is actuated through a cam arm portion 222 of holder 205 which is disposed for shifting between a fastener forming position stop 223 and a fastener inserting position stop 224 on operating head 209.

Shifting of movable blade member 202 between stops 223 and 224 is effected by operation of a fastener inserting plunger mechanism (not shown) and a cam follower assembly 225 pivoted on operating head 209, as described in the above noted parent application Serial No. 722,806. The cam follower assembly 225, as best shown in Fig. 1, comprises an upper lever segment 226 and a lower lever segment 227 assembled on a pivot pin 228 which is carried in a bushed opening 229 in operating head 209. The upper and lower lever segments 226 and 227 are doweled in proper assembled relation by a shear pin 230, which is provided to allow the operating mechanism to give at this point in the event of jamming of knife assembly 200 and thus avoid damage to more important and expensive parts of the mechanism. The upper lever segment 226 is formed to follow the action of the plunger mechanism, and lower lever segment 227 to follow the cam arm portion 222 on holder 205 of movable blade member 202, and thus relate these elements for operation of the knife assembly

200 in accordance with the cyclic actuation of fastener forming and fastener inserting operations as described more in detail below.

With more particular reference to the blade inserts 204 and 206 of knife assembly 200, the features of these inserts are illustrated in detail in Figs. 4 to 8, inclusive. These blade inserts have matched inner faces formed with complementary conical portions developed in relation to the stud apertures 213 and 214, which as previously mentioned define the pivot axis for these members. The conical portion of stationary blade insert 204 is shown at 231 in Figs. 4, 5 and 6, and the corresponding portion of movable blade insert 206 at 232 in Figs. 7 and 8. These conical portions 231 and 232 adapt the knife assembly 200 to make a diagonal cut and thus form a fastener point during fastener forming operations as will appear in greater detail presently.

The blade inserts 204 and 206 are further formed so as to adapt them to receive and position wire for fastener forming and fastener inserting operations. In the stationary blade insert 204, a passageway 233 is provided in fastener forming position and a slot 234 in fastener inserting position. The passageway 233 in fastener forming position extends through a head portion 235 of stationary blade insert 204, and is of generally tubular or cylindrical form and of suitable diameter to receive wire fed for fastener forming operations. This passageway 233 opens into the conical portion 231 of stationary blade insert 204 so as to form a shearing edge 236, and adjacent the shearing edge 236 a recess is formed as indicated in Figs. 5 and 6 at 237. The slot 234 in fastener inserting position is disposed to relieve the conical portion 231 sufficiently to provide clearance for operation of the fastener inserting plunger mechanism.

The conical portion 232 of movable blade insert 206 is also relieved by a slot 238 (see Figs. 7 and 8) which extends entirely across the inner face of movable blade insert 206 and is oriented in relation to slot 234 in stationary blade insert 204 to complete a passageway for the plunger mechanism 500 in fastener inserting position. Similarly, the passageway 233 of stationary blade member 204 and slot 238 in movable blade insert 206 are positioned for alignment in fastener forming position so that wire for forming fasteners may be fed into the assembled blade members (compare Fig. 9).

The manner in which slot 238 extends through the conical portion 232 of movable blade member 206 provides a complementary shearing edge 239 for fastener forming action with the shearing edge 236 of stationary blade insert 204. As these shearing edges 236 and 239 are located at the respective conical portions formed on the inner faces of blade inserts 204 and 206, the wire fed for forming fasteners is cut diagonally to form a fastener point as noted above.

Spaced from the shearing edge 239 of movable blade insert 206 is a shoulder projection 240 which is adapted to cooperate with the recess 237 formed adjacent the shearing edge 236 on stationary blade insert 204 to effect displacement of the point on fasteners formed to a position substantially coincident with the longitudinal axis of the fasteners and thus condition the fasteners for consistent straight driving as previously mentioned. The spacing of shoulder 240 on movable blade insert 206 is such that in

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fastener inserting position it is shifted to press into recess 237 the leading end of the wire fed for forming fasteners, which remains after fastener forming action of the shearing edges 236 and 239, and thereby displace the point on fasteners formed as described above (compare Fig. 11). For this purpose the recess 237 is formed with a concavity corresponding to the displacement desired, and as the leading end of the wire remaining after fastener forming action will have a tapered point as a result of having been cut diagonally, this point may be positively shaped in conformance with the concavity of recess 237 by the action of shoulder 240.

The operation of blade inserts 204 and 206 in the manner described above is further illustrated in Figs. 9 to 12, inclusive. In Fig. 9, the disposition of the assembled blade inserts in fastener forming position is shown, the movable blade insert 206 being indicated in dotted lines to allow illustration of the position of wire fed for forming fasteners. As mentioned above, the passageway 233 in stationary blade insert 204 and slot 238 in movable blade insert 206 are aligned in fastener forming position, and wire 241 is represented in Fig. 9 fed into the passageway thus formed for a fastener forming operation. With the wire 241 positioned in this manner, shifting of the movable blade insert 206 to fastener inserting position will result in cutting of wire 241 by the complementary shearing edges 236 and 239 to form a fastener 242 which will be transferred to fastener inserting position in the slot 238 of movable blade insert 206 as indicated in Fig. 11. Also, with the shifting of the movable blade insert 206 to fastener inserting position, the shoulder projection 240 will be moved as previously mentioned to press the leading end 243 of wire 241 remaining after the fastener forming action into the recess 237 formed in stationary blade insert 204 and thus condition the driving point for the next fastener to be formed. Succeeding fastener forming and fastener inserting operations are effected by repeated shifting of the movable blade insert 206 between fastener forming and fastener inserting positions as is described further below.

Repeated shifting of the movable blade insert 206 in this manner requires an assembly means for the blade inserts which will resist the turning movement induced by this shifting and which will also remain secure under the repeated shock of the fastener forming operations. If the assembly of blade inserts 204 and 206 is not properly provided for in these respects, it is not possible to maintain the adjustment between the blade inserts necessary for satisfactory fastener forming action. The shock of the fastener forming operation is particularly troublesome in this connection because it imposes a tension load on stud member 212 used for assembling the blade inserts 204 and 206. And this tension load is suddenly applied and rapidly repeated during operation of the machine. Under these conditions a conventional type of fastening nut would back off so that the blade inserts would be loosened beyond permissible limits.

According to the present invention this result is avoided by securing the stud member 212 with a special type of fastening means 220. This fastening means 220 comprises a nut portion 244 adapted for association with the stud member 212 as illustrated in Fig. 1, and a resilient shank portion 245 extending from the nut portion 244 (compare Figs. 1 and 3). The shank portion 245

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is formed to surround the stud member 212 in spaced relation and provide a bearing surface at its extending end for fastening means 220 against operating head 209. As shown in the drawing, the shank portion 245 may suitably have a hollow, cylindrical form, and be rendered resilient by relief according to a spiral pattern. This arrangement provides a spring-like cushion between the nut portion 244 of fastening means 220 and operating head 209 which absorbs the tension shock on stud member 212 resulting from fastener forming action so that shifting of nut portion 244 on stud member 212 is avoided.

An important feature of this fastening means 220 is that it is particularly well adapted for securing the blade inserts 204 and 206 in proper operating adjustment. Because movable blade insert 206 must be free for shifting between fastener forming and fastener inserting positions, the blade inserts cannot be adjusted too tightly. In actual practice, the fastening means 220 is adjusted to a tightness which just allows the movable blade insert 206 to still be shifted by hand. This degree of tightness would not be sufficient for effective use of a lock washer, for example. Fastening means 220, however, may be tightened to effect this adjustment nicely, and will still remain secure under the tension shock imposed on stud member 212.

We claim:

1. A fastener forming knife assembly adapted for forming a plurality of fasteners from a continuous length of wire comprising a stationary blade member and a matched movable blade member having complementary fastener forming shearing edges disposed diagonally of the longitudinal axis of said wire to cut said wire diagonally to form a fastener point, said movable blade member being adapted for assembly with said stationary blade member for movement between fastener forming and fastener inserting positions, means adapting said blade members to receive and position wire in relation to said shearing edges and to transfer fasteners formed to fastener inserting position, said means comprising a support for the tip of said point, a recess formed adjacent said support and extending rearwardly beyond the shearing edge of said stationary blade member, and a shoulder on said movable blade member positioned so that upon movement of said blade member to fastener inserting position the diagonally cut leading end of the wire rearwardly of said tip remaining after fastener forming action of said shearing edges is bent into said recess by said shoulder and the tip of the point formed at said leading wire end by said knife assembly is thereby displaced to a position substantially coincident with the longitudinal axis of the wire and of the next fastener formed therefrom, the length of said support and recess being adapted to displace said tip permanently.

2. In a fastener forming and inserting machine adapted for forming a plurality of fasteners from a continuous length of wire, the combination with an operating mechanism incorporating means for cyclic actuation of fastener forming and fastener inserting operations, of a fastener forming means comprising a stationary blade member and a matched movable blade member, said movable blade member being adapted for assembly with said stationary blade member for movement between fastener forming and fastener inserting positions, a shearing edge formed on said stationary blade member in fastener forming posi-

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tion, a slot in said movable blade member formed with a complementary shearing edge for fastener forming action with the shearing edge of said stationary blade member, said slot being adapted to receive and transfer fasteners formed to fastener inserting position and said shearing edges being disposed diagonally of the longitudinal axis of said wire to cut said wire diagonally to form a fastener point, a support for the tip of said point, a recess formed adjacent said support and extending rearwardly beyond the shearing edge of said stationary blade member, and a shoulder on said movable blade member positioned so that upon movement of said blade member to fastener inserting position the leading end of the wire rearwardly of said tip remaining after fastener forming action of said shearing edges is bent into said recess by said shoulder and the tip of the point formed at said leading wire end by said forming means is thereby displaced to a position substantially coincident with the longitudinal axis of the wire and of the next fastener formed therefrom, the length of said support and recess being adapted to displace said tip permanently.

3. In a fastener forming and inserting machine adapted for forming a plurality of fasteners from a continuous length of wire, a fastener forming

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means as defined in claim 2 and further characterized in that said stationary blade member and matched movable blade member are assembled on a stud member, and a fastening means is associated with said stud member for securing said blade members in assembled relation, the said fastening means comprising a nut portion for engaging said stud member and a shank portion extending from said nut portion and formed to surround said stud member in spaced relation and provide a continuous bearing surface for said fastening means, the intermediate body of said shank portion being relieved according to a spiral pattern to render it resilient.

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