

April 23, 1929.

S. H. GOLDBERG ET AL

1,709,938

METHOD AND MACHINE FOR PRODUCING HAIR GRIPPING FASTENERS

Filed Dec. 31, 1927

7 Sheets-Sheet 1

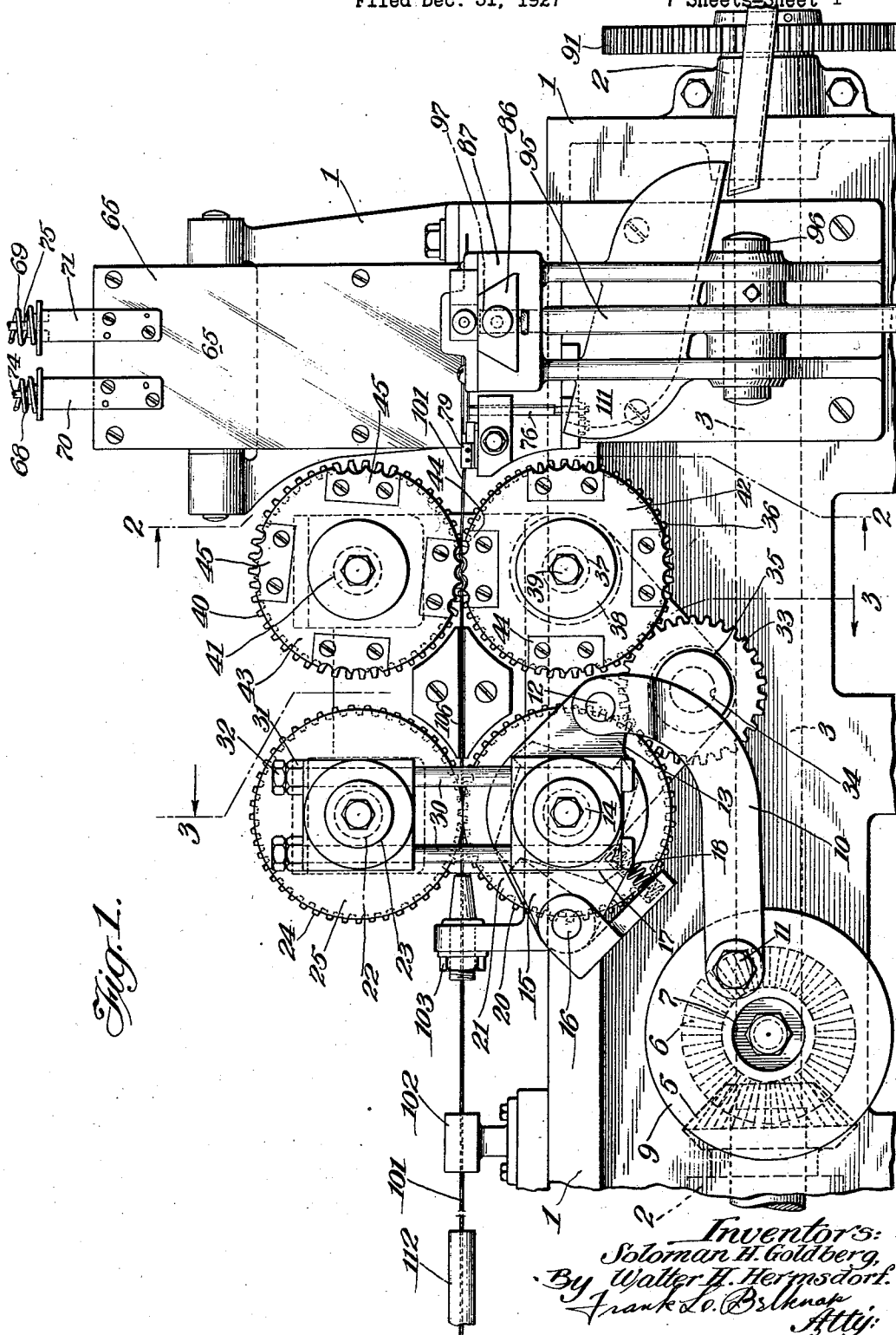


Fig. 1.

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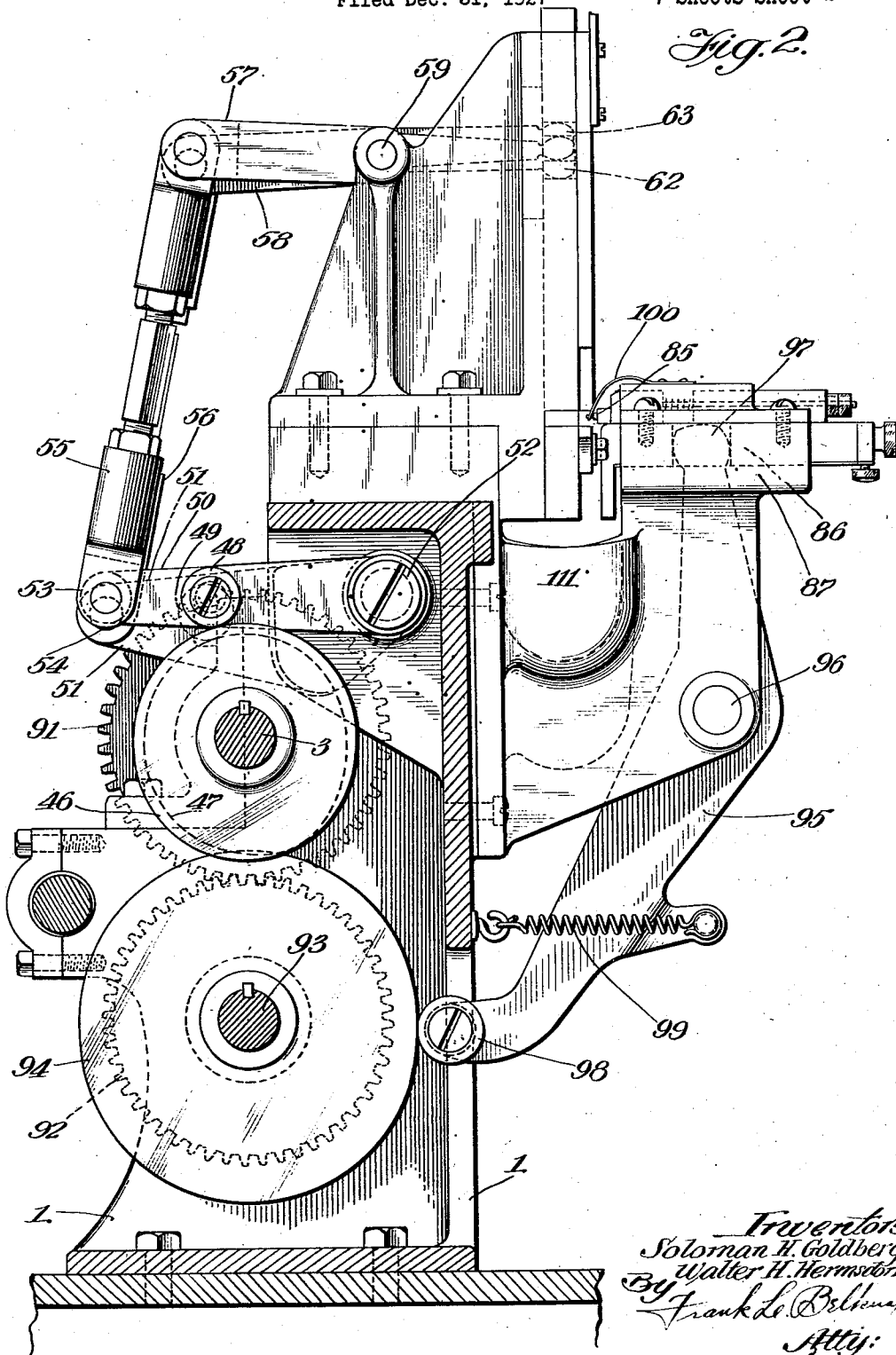
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Fig. 2.



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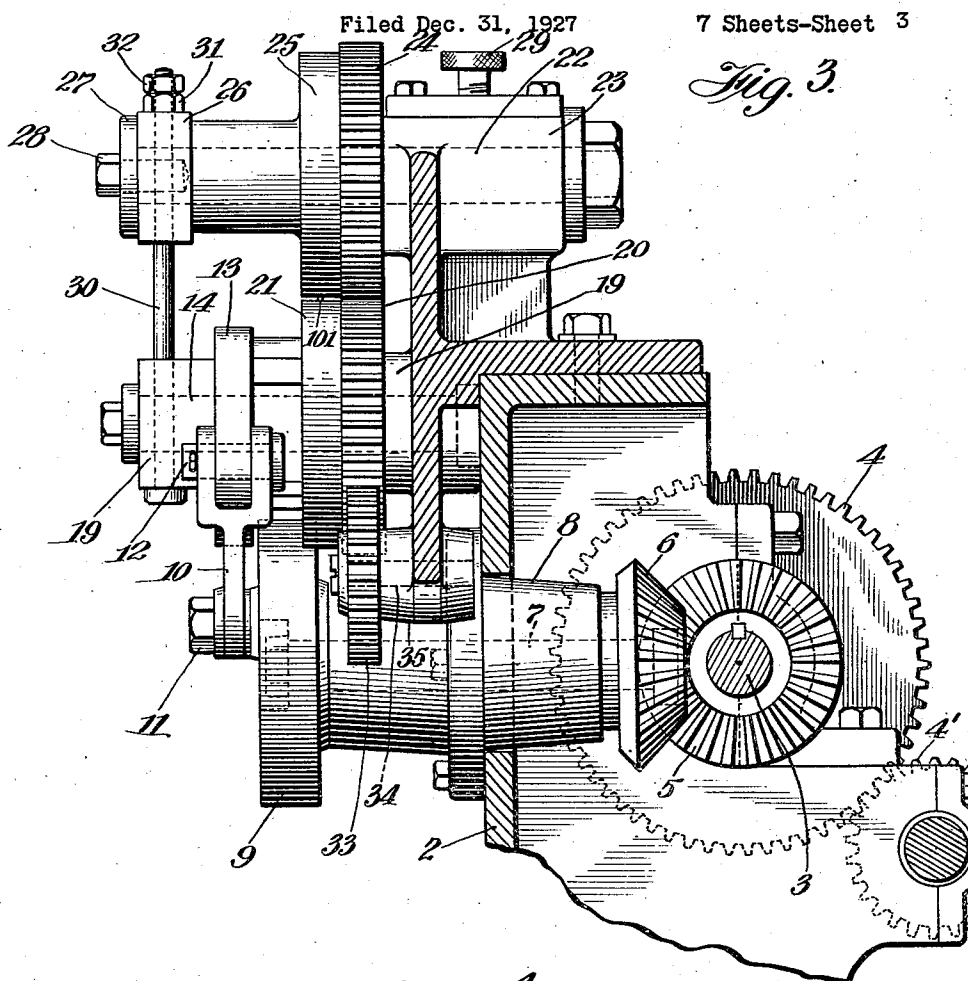
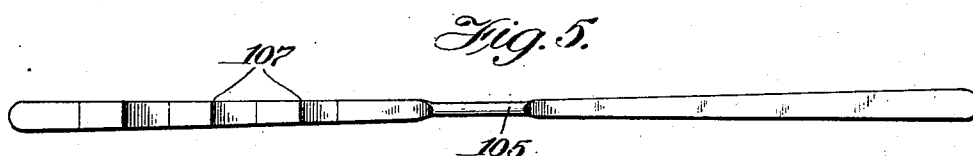
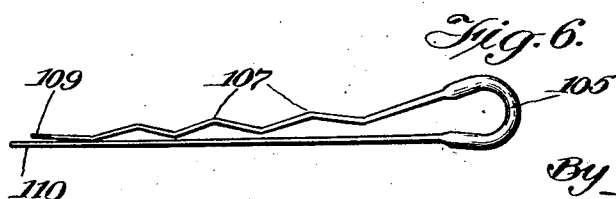
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7 Sheets-Sheet 3



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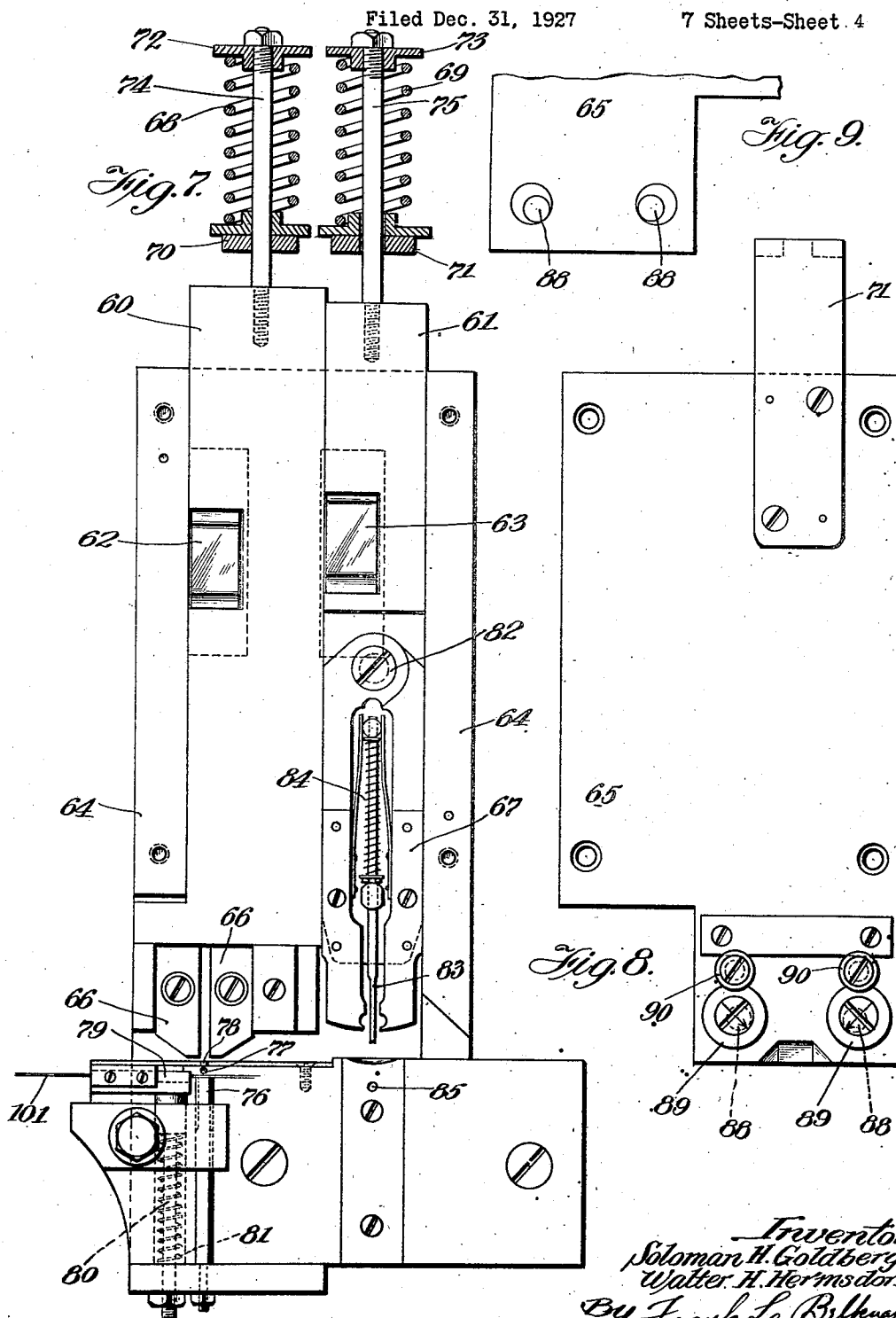
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7 Sheets-Sheet 4



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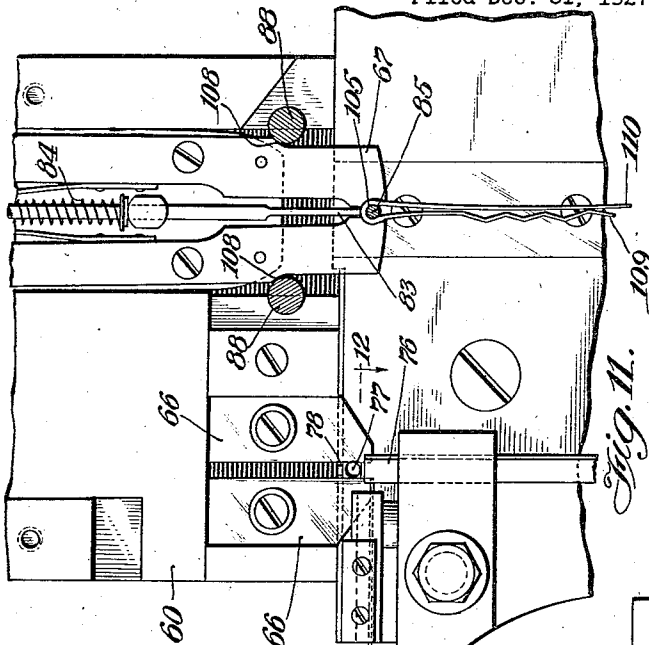
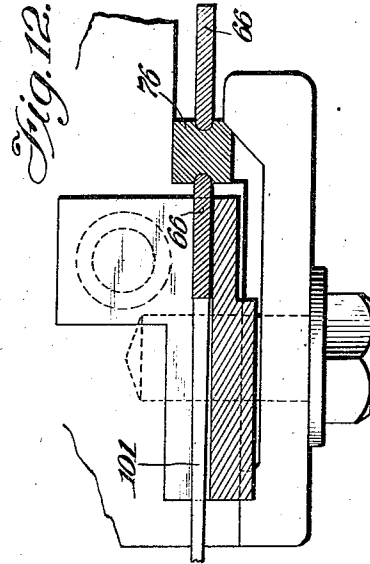
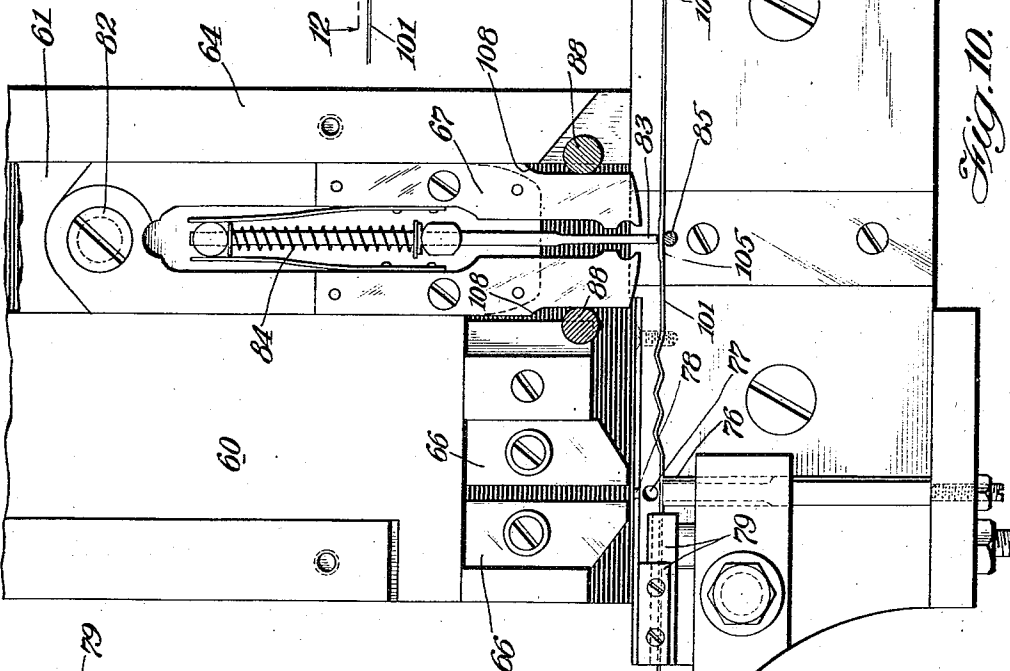
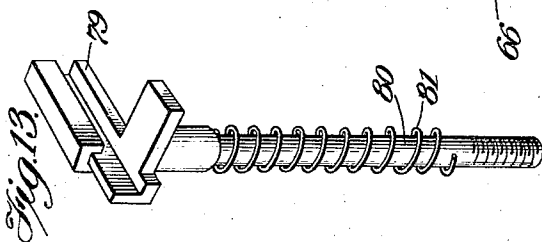
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7 Sheets-Sheet 5



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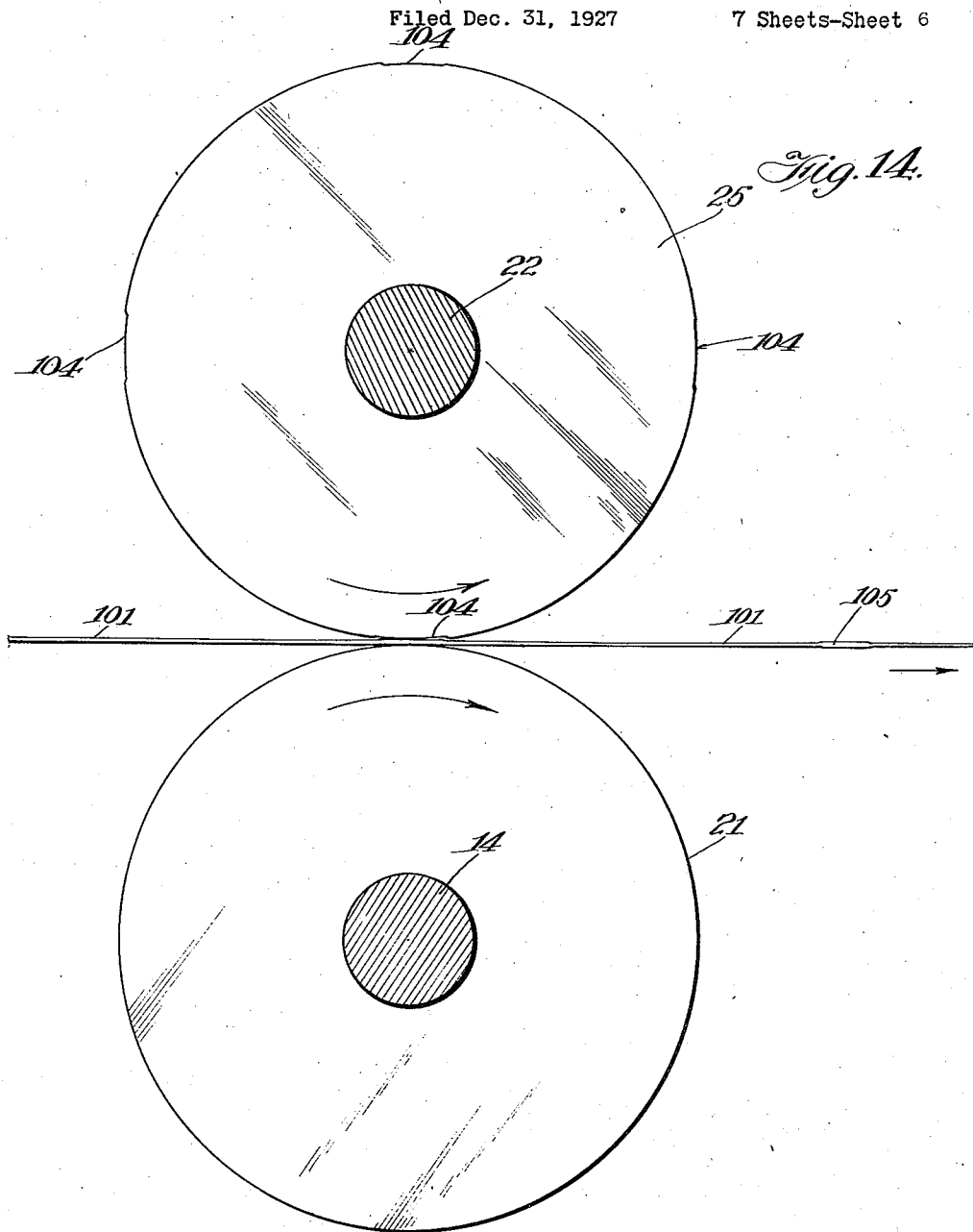
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7 Sheets-Sheet 6



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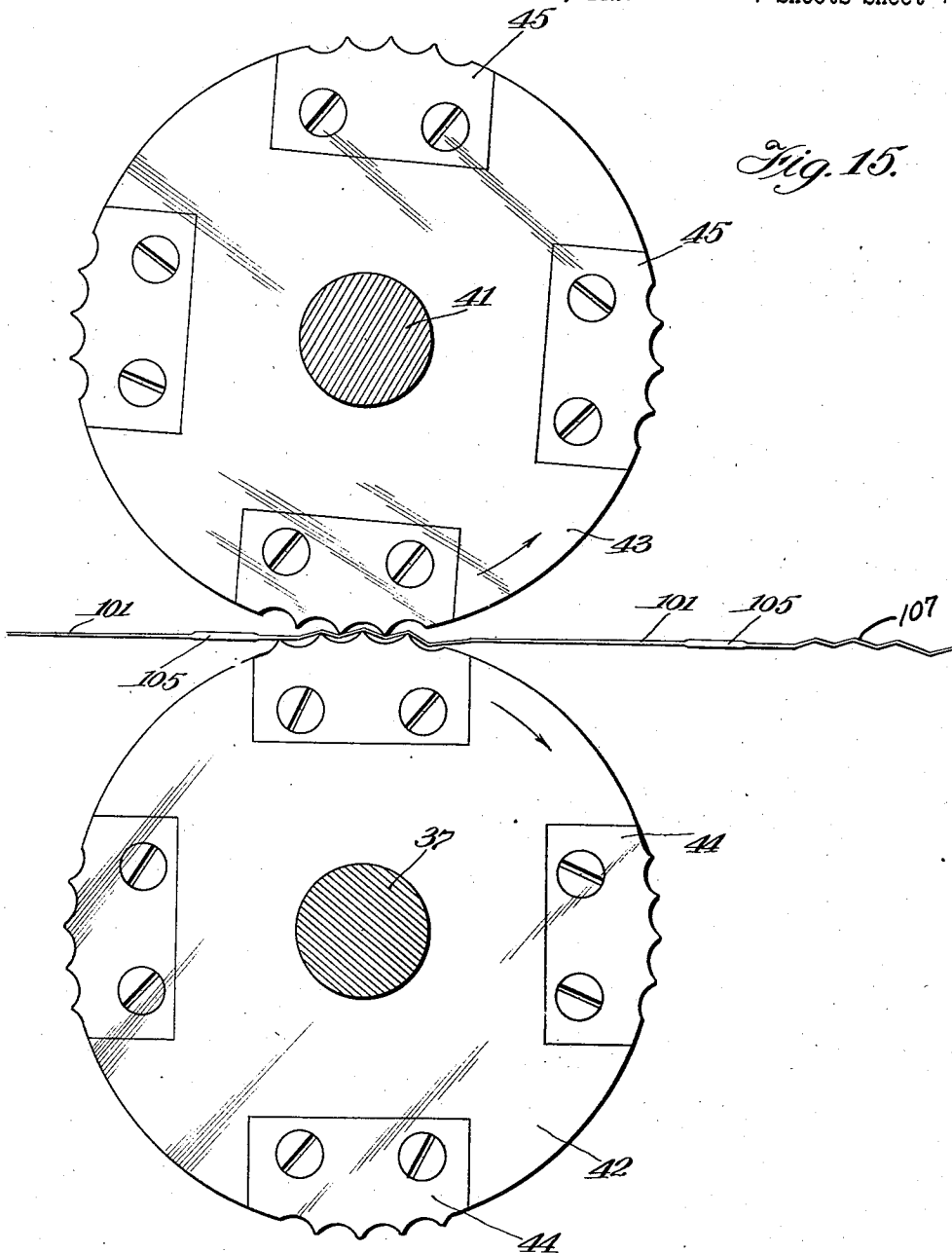
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METHOD AND MACHINE FOR PRODUCING HAIR GRIPPING FASTENERS

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE.

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METHOD AND MACHINE FOR PRODUCING HAIR-GRIPPING FASTENERS.

Application filed December 31, 1927. Serial No. 243,828.

The present improvements relate to a method and machine particularly designed to operate on a continuously advancing length of wire to automatically and economically produce hair gripping fasteners of the "snap" type.

The essence of the present invention resides in a method and machine, completely automatic in operation, by which there is produced a new type of hair fastener of unique characteristics and high serviceability as part of a continuous operation, resulting in increased output at high efficiency.

The hair fastener produced by the method and machine of the present invention belongs to that class in which the fastener is constructed of metal having qualities of springiness. Hair fasteners of this type are generally made from material having a greater width than thickness, both width and thickness being substantially uniform throughout the length and width of the stock, said hair fasteners being identified as the "flat" or "snap" type of fastener. Such fasteners have a distinct advantage over the old style of hair pin made of springless round wire, in that they exert a substantial gripping force upon the hair to hold it firmly in place, which function the old springless round type of hairpins does not perform, the latter being merely forced into the hair.

The particular hair fastener produced by the method and apparatus of the present invention has many advantages over those of the prior art. Fasteners of the prior art of the "snap" type comprise a length of flat strip material of greater width than thickness, bent to provide an open loop and two legs, which may or may not be crimped; said width and thickness being uniform throughout the entire length and width of the fastener. The legs are so arranged as to contact each other at predetermined points.

The fastener produced by the method and apparatus of the present invention comprises two legs of spring material of greater width than thickness, integrally connected in a unitary structure by means of a loop substantially round in cross section. The thickness of each leg is substantially less at its extremity than adjacent its connection to said loop, the change in thickness pref-

erably being merely throughout the length of each leg. Each leg is substantially greater in width at its extremity than adjacent its connection to said loop, said change in width being merely throughout the length of the leg. One, or both, of the legs may have one or more crimps to cause the fastener to more firmly grip the hair. The substantially round connecting loop provides a greater spring tension upon the legs than does the loop made from flat spring material, which tension causes the legs to more firmly grip the hair.

By decreasing the thickness of each leg toward its extremity, these legs will tend to bow and spread further apart at their extremities than fasteners having legs of uniform thickness throughout their length, thus making their application to the hair easier than with the latter type. The increased width of each leg toward its extremity gives the legs more gripping surface upon the hair relative to the "snap" type of fasteners of the prior art.

It is one of the purposes and objects of the present invention to provide a method for making fasteners as above described from round or substantially round wire stock. The method comprises as a single continuous operation feeding a continuous strip of substantially round wire raw stock and acting on said strip to produce flattened portions with intermediate spaced substantially unflattened portions, this strip being characterized by flattening the flattened portions to a varying degree of thickness and width for the purposes heretofore specified, said substantially unflattened portions being left to subsequently provide the unflattened connecting loop heretofore referred to; then making crimps at predetermined points throughout the length of each unflattened portion to provide one or more crimps in one, or both, of the legs of the resulting pin; then cutting said continuously advancing strip of wire into predetermined lengths intermediate and substantially centrally of the flattened portion, this step being characterized by producing a substantially rounded severed extremity on each opposite length of severed wire, the small waste pieces between opposed points of severance being automatically removed; thereafter bending the severed lengths of wire intermediate

and substantially centrally of the substantially unflattened portions thereof to form a fastener having two legs integrally connected into a unitary structure by means of a loop of substantially round or unflattened cross section. As a final step in the process, if desired, said fasteners may be subjected to a tempering process under heat to increase their spring tensional qualities.

It is a further purpose and object of the present invention to provide an automatic apparatus for carrying out the above described method. The apparatus, or machine, briefly described, comprises in combination means for feeding a continuous length of substantially round or unflattened wire stock to a flattening means comprising, for instance, rolls adapted to act on said continuously advancing strip of wire to produce flattened portions therein while leaving spaced unflattened portions intermediate said flattened portions, said rolls being so designed as to roll out the flattened portions to a gradual and varying degree of thickness and width. The continuously advancing strip of wire is then fed to a crimping means, for instance, comprising opposed rolls acting on said strip to form crimps at predetermined points in the flattened portions of the wire. The continuously advancing wire is then severed at the proper point by a severing means, characterized by producing a substantially round severed extremity, the waste pieces between opposed points of severance being removed, for instance, by a blast of air. Each length of severed wire is then bent by a bending means acting intermediate and substantially centrally of its unflattened portion to form a fastener having two opposed legs and an integrally connected loop, said fastener being then ready for use. If desired, means are provided for tempering said fastener under heat to increase its spring tension qualities.

Many other important objects and advantages of the present invention will be more particularly apparent from the following detailed description.

Fig. 1 is a fragmentary side elevational view of the machine of the present invention.

Fig. 2 is a cross sectional view taken on line 2—2 of Fig. 1, illustrating the mechanism for actuating the cutting and forming dies.

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 1, illustrating the flattening mechanism.

Fig. 4 is a fragmentary view of the wire after it has passed through the flattening means.

Fig. 5 is a view of the wire after it has passed through the crimping and cutting means.

Fig. 6 is a view of the completed fastener after being bent to final form.

Fig. 7 is a view partly in section of the cutting and bending mechanism with the cover plate removed.

Fig. 8 is a view of the cover plate for the cutting and bending mechanism.

Fig. 9 is an enlarged fragmentary view of the lower portion of the cover plate for the cutting and bending mechanism.

Fig. 10 is a fragmentary view, partly in section, of the cutting and bending mechanism in a different stage of operation.

Fig. 11 is a fragmentary view, partly in section, of the cutting and bending mechanism in a still different stage of operation.

Fig. 12 is a view taken on line 12—12 of Fig. 11 showing an enlarged detailed view of the cutting dies.

Fig. 13 is a view illustrating the wire guide which guides the wire to the cutting dies.

Fig. 14 is an enlarged view illustrating the wire flattening rolls, and

Fig. 15 is an enlarged view illustrating the crimping rolls.

Referring more in detail to the drawings, 1 designates a suitable frame in which may be journaled in the bearings 2 a shaft 3 adapted to be rotated by means of a suitable source of power which may drive the gear 4' which meshes with the gear 4 carried by shaft 3. A miter gear 5 may be keyed to the shaft 3, meshing with another miter gear 6, which may be keyed to one end of shaft 7, (shown more clearly in Fig. 3), shaft 7 being journaled in a bearing 8 and having keyed to the other end a crank wheel 9. Arm 10 at one end may be eccentrically and pivotally connected to crank wheel 9 by means of a pin 11, and on the other end may be pivotally connected by means of a pin 12 to rocking lever 13 which may be loosely journaled to pivot on shaft 14. Rocking lever 13 may carry a ratchet dog 15 which may be pivotally attached thereto by means of a pin 16. A ratchet collar 17 may be mounted upon and suitably keyed to shaft 14, being adapted to engage the ratchet dog 15. A compression spring 18 may bear against dog 15 to insure its engagement with the ratchet collar 17. Shaft 14 may be suitably journaled in bearings 19 and may have mounted upon and keyed thereto a gear 20 having a wire flattening roll 21 screwed, or otherwise attached, to it. A shaft 22 journaled in bearings 23 may be mounted over shaft 14 and may have keyed to it a gear 24 of the same diameter as gear 20. Gear 24 may mesh with gear 20 and in turn have attached to it by suitable means, such as screws, for instance, a flattening roll 25 of the same size as roll 21. A block 26 may be journaled on shaft 22, being retained by a washer 27 secured

by means of a bolt 28. A thumb screw 29 may be provided to raise or lower bearing 23 to regulate the clearance between the rolls 21 and 25. Bolts 30 may connect block 26 and the casing for bearing 19 to support the free ends of shaft 22 and shaft 14, while the wire is being flattened. A nut 31 and locknut 32 may be provided for adjustment purposes.

10 An intermediate gear 33 may be mounted upon shaft 34 journaled in bearing 35 and may mesh with gears 20 and 36, so that gear 36 will be driven by gear 20 and be rotated in the same direction as gear 20. Gear 36 is 15 keyed to shaft 37 and retained thereon by a washer 38 secured by bolt 39. A similar gear 40 may be similarly mounted on a similar shaft 41 directly over shaft 37 to mesh with gear 36, said shaft 37 being properly journaled in bearings (not shown). 20 Gears 36 and 40 may each carry crimping rolls 42 and 43, respectively, said rolls having removable forming dies 44 and 45, respectively.

25 Referring now to Fig. 2, cams 46 and 47 may be keyed to shaft 3 contacting rollers 48 and 49 mounted upon rocker arms 50 and 51, respectively, which arms may be pivotally mounted at 52 and pivotally connected at 53 and 54 to push rods 55 and 56, respectively. Rocker arms 57 and 58 may be 30 pivotally mounted at 59 and pivotally connected to push rods 55 and 56, respectively. The rocker arms 57 and 58 may engage the cutting and die carrying blocks 60 and 61 (Fig. 7) at 62 and 63, which blocks may be 35 slidably mounted in the housing 64 having a removable cover 65. Cutting die 66 may be suitably attached, for instance, by means of screws, to block 60, and forming die 67 may 40 be pivotally attached at 82 to block 61. Dies 66 and 67 may be maintained at the top of their stroke (in normal position) by means of compression springs 68 and 69 which may 45 bear on suitable extensions 70 and 71 of housing 64 and washers 72 and 73 fastened to rods 74 and 75 which may be in turn screwed into blocks 60 and 61.

50 A die pin 76 may be suitably mounted below the die 66, having, as will be more apparent in Fig. 12, channels or grooves which may conform with the die 66, allowing said die to slide over it in a close fit in all points. Immediately above die pin 76 may be provided an opening 77 connected to a suitable 55 supply of compressed air. Directly above opening 77 may be provided a stripping pin 78 to remove from the die 66, as it travels upward, any of the waste portion resulting from severing the wire. Adjacent die pin 76, and 60 between it and the crimping rolls 42 and 43, may be provided a suitable guide 79 for the flattened crimped wire to properly guide said wire between cutting die 66 and pin 76. 65 Guide 79 may be slidably mounted on a pin

80 and adapted to move downwardly when engaged with die 66 on its downward cutting stroke. A compression spring 81 may be employed to raise the guide 79 to its normal raised position after die 66 has completed its downward cutting stroke. 70

Forming die 67 may be divided into two parts which may be pivotally connected at 82. Between the two pivoted jaws may be 75 slidably mounted a pin 83, the end of which may be kept in an extending position below the jaws of the die 67 by means of a compression spring 84. An anvil pin 85 may be positioned below the jaws 67 and may be 80 mounted on a horizontal reciprocating block 86 (Fig. 2) properly journaled at 87. Pins 88 (Fig. 8) having enlarged heads 89 adapted to be locked in position by screws 90 may be eccentrically mounted in the housing 85 cover 65 to engage the jaws of the hinged forming die 67 (Figs. 10 and 11).

Block 86 which carries anvil pin 85 may be reciprocated by the following means: A gear 91 may be keyed to shaft 3. A gear 92 90 may be properly keyed to a camshaft 93 meshing with gear 91, said camshaft 93 being properly journaled in bearings positioned in the frame of the machine. A cam 94 may be properly keyed to said camshaft 93. A rocker arm 95 pivotally mounted at 96 may have one end adapted to engage block 86 at 97, and the other end adapted to carry 95 a roller 98 which may contact cam 94, said roller 98 being kept in such contact by means of a constant tension exerted by a spring 99. A spring 100, the function of which will be hereinafter more particularly described, may be mounted on the frame portion 87, so that its free end will contact the side of anvil 100 pin 85. 105

Describing now the operation of the device, the shaft 3 may be rotated from a suitable source of power which drives gear 4 which in turn drives gear 4 keyed to said shaft 3. A continuously advancing length 110 of substantially round wire 101 of suitable size and temper may be led through guides 102 and 103 from which it may be passed between the flattening rolls 21 and 25, one or both of said rolls being indented, as at 104 (Fig. 14), so as not to substantially flatten a 115 predetermined portion 105 of the wire, said indentures being spaced substantially 90° apart. Either, or both, of the rolls 21 and 25 may not be perfectly round, being of a 120 slightly greater diameter midway between said indentures 105 than adjacent the indentures, said variation in diameter being gradual between the point of greater diameter and the point of lesser diameter. The 125 flattening rolls 21 and 25 are intermittently driven by means of the crank wheel 9 which causes arm 10 to reciprocate rocking the ratchet dog carrying lever 13 to a sufficient degree to permit the dog 15 to engage in turn 130

each ratchet upon the coupling 17. The ratchets on ratchet coupling 17 may be so positioned as to cause the rolls 21 and 25 to turn one quarter of a revolution to each engagement of the ratchet, or each revolution of the crank wheel 9. Thus, as the wire 101 is passed between rolls 21 and 25 the portion adjacent the unflattened portion 105 is thicker than it is midway between said unflattened portions, the thickness variation being gradual between said points of greatest and least thickness. It is also obvious that the wire is of a greater width where it is rolled thinnest, as will be apparent from Fig. 4.

The flattened wire may then be drawn through the guide 106 and through the crimping rolls 42 and 43 having crimping dies 44 and 45, respectively, spaced substantially 90° apart, which dies will form one or more crimps 107 in a predetermined portion of the flattened portions of the wire. The crimping rolls, being driven by gears 20, 33 and 36, rotate in unison with the flattening rolls 21 and 25. Thus, each time the rolls 21, 25, 42 and 43 make a quarter of a turn (90°) sufficient wire is flattened and crimped to form one fastener.

The flattened and crimped wire is then led through guide 79 over the cutting die pin 76 and over the anvil pin 85. When the rounded unflattened portion of the wire moves to a position over the anvil pin 85 preferably substantially centrally thereof, the ratchet assembly may be so timed to have caused the flattening and crimping rolls to have completed their quarter turn, thus interrupting the movement of the wire. The cam 46 may be so timed that at the moment the flattening and crimping rolls cease turning (and the wire comes to rest), it will begin to push rod 55 upwardly to cause the end 62 of rocker 57 to push die block 60 downwardly, thus causing cutting die 66 to engage the wire and cut it at a predetermined point.

Cam 47 may be so timed to lift push rod 56 to cause the end 63 of rocker 58 to push die block 61 downwardly and cause the end of pin 83 to contact and hold the wire 101 against the anvil pin 85 just before cutting die 66 engages the wire to cut it (Fig. 10). The cam 46 then causes the cutter die 66 to sever the wire the moment pin 83 engages the wire. As will be more apparent from Fig. 12, the cutting die 66 and the pin 76 may be so shaped as to sever the wire in such a manner as to form rounded ends on the wire when severing it. The moment die 66 severs the wire, cam 47 causes the die 67 to move downwardly and bend the round unflattened portion 105 of the wire around the anvil pin 85. As the die 67 moves downwardly to bend the wire the pins 88 engage the shoulders 108 (Fig. 11) to squeeze the two pivoted sections of die 67 together, which

in turn causes the wire to be sufficiently bent, at 105, to cause the legs 109 and 110 of the pin to firmly press against each other when the hairpin now formed is released from the die 67. As die 67 begins to bend the wire over pin 85 the pin 83 compresses spring 84 and slides upwardly into the jaws of the die 67. Cam 47 then permits die 67 to be lifted to its former position by spring 69, the pin 83 being pushed to its normal extended position by the spring 84. When the cutting die 66 has completed its cutting of the wire, cam 46 permits spring 68 to return the die to its former position. The small portion of waste resulting from the cutting of the wire is stripped from the die upon its upward travel by pin 78 where it is blown into a chute (not shown) by a blast of air issuing from opening 77. The wire guide 79 which was depressed when die 66 engaged it is returned to its former position by spring 81.

Upon die 67 releasing the completed fastener, cam 94 may be so timed as to permit the spring 99 to draw the lower end of rocker arm 95 inwardly, causing in turn the upper end 97 to move outwardly, which end 97 causes block 86 to slide outwardly carrying with it anvil pin 85. As pin 85 moves outwardly the spring 100 (Fig. 2) will brush the fastener off the pin 85, causing it to drop into the chute 111 from which it may pass into a suitable tempering or finishing means, as may be desired. Then the completed fastener is removed from anvil pin 85, the cam 94 will cause the pin 85 to move to its former position under the jaws of die 67 by bearing against the lower end of rocker 95 and pushing it outwardly to cause the end 97 to move inwardly, carrying with it the block 86 and pin 85.

The moment pin 85 is in position crank wheel 9 has caused the ratchet mechanism to engage the next ratchet upon ratchet coupling 17 and the above described cycle is repeated. It is obvious, of course, that once the device is threaded with the wire 101 the flattening rolls 21 and 25 will draw the wire from any suitable source of supply. The rolls 21, 25, 43 and 44, of course, exert enough force upon the wire to feed it to the cutting and forming mechanism.

In the practical construction the cut away portion 104 of the flattening roll 25 is not sufficient to prevent the portion 105 from being slightly flattened. This is necessary, as will be readily apparent to those skilled in the art to prevent the wire 101 from moving from one side to the other of the face of the rolls.

It is to be understood that in returning the dies to their normal position a tracked or grooved cam may be employed, thus eliminating the necessity of springs to accomplish this function. Although we

have illustrated and described a device adapted to form one fastener during each cycle, it is to be understood that two or more pins may be formed during each operating cycle. Also the cams may all be mounted upon one shaft instead of two or more. A wire straightening device illustrated diagrammatically at 112 may be employed to remove the curl from the wire. It will be also apparent that a square instead of round wire may be used with equal results.

From the foregoing it will be apparent that we have perfected a very novel machine of high utility, capable of producing hair fasteners of a superior type and quality continuously, resulting in a maximum yield per time unit of operation, since the machine is completely automatic in its operation. Due to the simplicity and arrangement of the various mechanism, the liability of interruption of operation due to mechanical difficulties has been reduced to a minimum.

We claim as our invention:

1. A machine comprising in combination, means acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by intermediate substantially unflattened portions means for severing said advancing strip of wire stock intermediate each flattened portion to produce severed blanks having flattened extremities and an intermediate substantially unflattened connecting portion, means for then engaging the substantially unflattened portion of each severed blank and bending same to bring the flattened extremities into opposed relationship to form a fastener, and means for imparting an intermittent movement to said various means.

2. A machine comprising in combination, means acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by intermediate substantially unflattened portions, means acting on the flattened portions of said advancing strip of wire stock to produce spaced crimps therein, means for severing said advancing strip of wire stock intermediate each flattened portion to produce severed blanks having flattened extremities and an intermediate substantially unflattened connecting portion, means for then engaging the substantially unflattened portion of each severed blank and bending same to bring the flattened extremities into opposed relationship to form a fastener, and means for imparting an intermittent movement to said various means.

3. A machine comprising in combination, means acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by intermittent substantially unflattened portions, means for severing said advancing strip of wire stock intermediate and substantially centrally of each

flattened portion to produce severed blanks having flattened extremities and an intermediate substantially unflattened connecting portion, means for then engaging the substantially unflattened portion of each severed blank and bending same to bring the flattened extremities into opposed relationship to form a fastener, and means for imparting an intermittent movement to said various means.

4. A machine comprising in combination, means comprising opposed rolls, acting on an advancing strip of wire stock to produce spaced flattened portion therein separated by intermediate substantially unflattened portions, means for severing said advancing strip of wire intermediate each flattened portion to produce severed blanks having flattened extremities and an intermediate substantially unflattened connecting portion, means for engaging the substantially unflattened portion of each severed blank and bending same to bring the flattened portions into opposed relationship to form a fastener, and means for imparting an intermittent movement to said various means.

5. A machine comprising in combination, means comprising opposed rolls, acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by intermediate substantially unflattened portions, said flattened portions gradually varying in width and thickness from each end inwardly toward the center thereof, means for severing said advancing strip of wire intermediate each flattened portion to produce severed blanks having flattened extremities and an intermediate substantially unflattened connecting portion, means for engaging the substantially unflattened portion of each severed blank and bending same to bring the flattened portions into opposed relationship to form a fastener, and means for imparting an intermittent movement to said various means.

6. A machine comprising in combination, means acting on a continuous strip of advancing wire stock to produce spaced flattened portions therein, means acting on said flattened portions to produce crimps therein, means for severing said advancing strip of wire at a point intermediate each flattened portion to produce severed lengths of wire, means engaging the substantially unflattened portion of each severed length cooperatively associated with means for bending the flattened portions and bringing same into opposed relationship to produce a fastener having opposed legs and an integral connecting unflattened bend, and means for imparting intermittent movement to said various means.

7. A machine comprising in combination, means acting on a continuous strip of advancing wire stock to produce spaced flat-

tened portions therein, means for severing said advancing strip of wire at a point intermediate each flattened portion to produce severed lengths of wire, means, comprising 5 reciprocal forming dies, engaging the substantially unflattened portion of each severed length cooperatively associated with means for bending the flattened portions and bringing same into opposed relationship to produce a fastener having opposed legs and an 10 integral connecting unflattened bend, and means for imparting intermittent movement to the various means.

8. A machine comprising in combination, 15 means acting on a continuous strip of advancing wire stock to produce spaced flattened portions therein, means comprising reciprocal cutting dies for severing said advancing strip of wire at a point intermediate each flattened portion to produce severed lengths of wire, means engaging the 20 substantially unflattened portion of each severed length cooperatively associated with means for bending the flattened portions and bringing same into opposed relationship to produce a fastener having opposed flat 25 legs and an integral connecting unflattened bend, and means for imparting intermittent movement to said various means.

9. A machine comprising in combination, 30 means acting on a continuous strip of advancing wire stock to produce spaced flattened portions therein, means acting on said flattened portions to produce crimps in said flattened portions, means for severing said 35 advancing strip of wire at a point intermediate each flattened portion to produce severed lengths of wire, means comprising reciprocal forming dies engaging the substantially unflattened portion of each severed 40 length cooperatively associated with means for bending the flattened portions and bringing same into opposed relationship to produce a fastener having opposed flat legs and an integral connecting unflattened bend, 45 said forming dies being hinged to cause same to bend said unflattened portion to such an extent that the legs of the bent fastener will contact each other, and means for imparting intermittent movement to said various 50 means.

10. A machine comprising in combination, means acting on a continuous strip of 55 advancing wire stock to produce spaced flattened portions therein, means acting on said flattened portions to produce crimps in said flattened portions, means comprising reciprocal cutting dies for severing said advancing strip of wire at a point intermediate 60 each flattened portion to produce severed lengths of wire, means engaging the substantially unflattened portion of each severed length cooperatively associated with means for bending the flattened portions and 65 bringing same into opposed relationship to

produce a fastener having opposed flat legs and an integral connecting unflattened bend, said severing means producing a substantially rounded end on each end of the severed blank, means comprising an automatically operated mechanism to produce an air 70 blast for removing the waste pieces between two opposed severed ends, and means for imparting intermittent movement to said various means. 75

11. A method which comprises acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by substantially unflattened portions, thereafter severing said wire intermediate each 80 flattened portion to produce severed wire lengths, each having an intermediate unflattened portion integrally connected to opposite flattened portions, then bending each length of wire intermediate said substantially unflattened portion to bring the opposite 85 flattened portions into opposed relationship.

12. A method which comprises acting on an advancing strip of wire stock to produce 90 spaced flattened portions therein separated by substantially unflattened portions, controlling said flattening operation to gradually vary the thickness and width of said flattened portions inwardly from both ends 95 thereof, thereafter severing said wire intermediate each flattened portion to produce severed wire lengths, each having an intermediate unflattened portion integrally connected to opposite flattened portions, and 100 then bending each length of wire intermediate said substantially unflattened portion to bring the opposite flattened portions into opposed relationship.

13. A method which comprises acting on 105 an advancing strip of wire stock to produce spaced flattened portions therein separated by substantially unflattened portions, controlling said flattening operation to gradually vary the thickness and width of said flattened portions inwardly from both ends 110 thereof, thereafter severing said wire intermediate and substantially centrally of each flattened portion to produce severed wire lengths, each having an intermediate unflattened 115 portion integrally connected to opposite flattened portions, and then bending each length of wire intermediate said substantially unflattened portion to bring the opposite flattened portions into opposed relationship. 120

14. A method which comprises acting on a continuous strip of wire stock to produce spaced flattened portions therein separated by substantially unflattened portions, controlling said flattening operation to gradually vary the thickness and width of said 125 flattened portions inwardly from both ends thereof, then acting on the flattened portions of said wire to crimp same, thereafter sev- 130

erling said wire intermediate each flattened portion to produce severed wire lengths, each having an intermediate unflattened portion integrally connected to opposite flattened portions, then bending each length of wire intermediate said substantially unflattened portion to bring the opposite flattened portions into opposed relationship.

15. A method which comprises acting on an advancing strip of wire stock to produce spaced flattened portions therein separated by substantially unflattened portions, controlling said flattening operation to gradually vary the thickness and width of said flattened portions inwardly from both ends thereof, thereafter severing said wire intermediate each flattened portion at the point of greatest width and least thickness to produce severed wire lengths, each having an intermediate unflattened portion integrally connected to opposite flattened portions, and thereafter bending each length of wire intermediate said substantially unflattened portion to bring the opposite flattened portions into opposed relationship.

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