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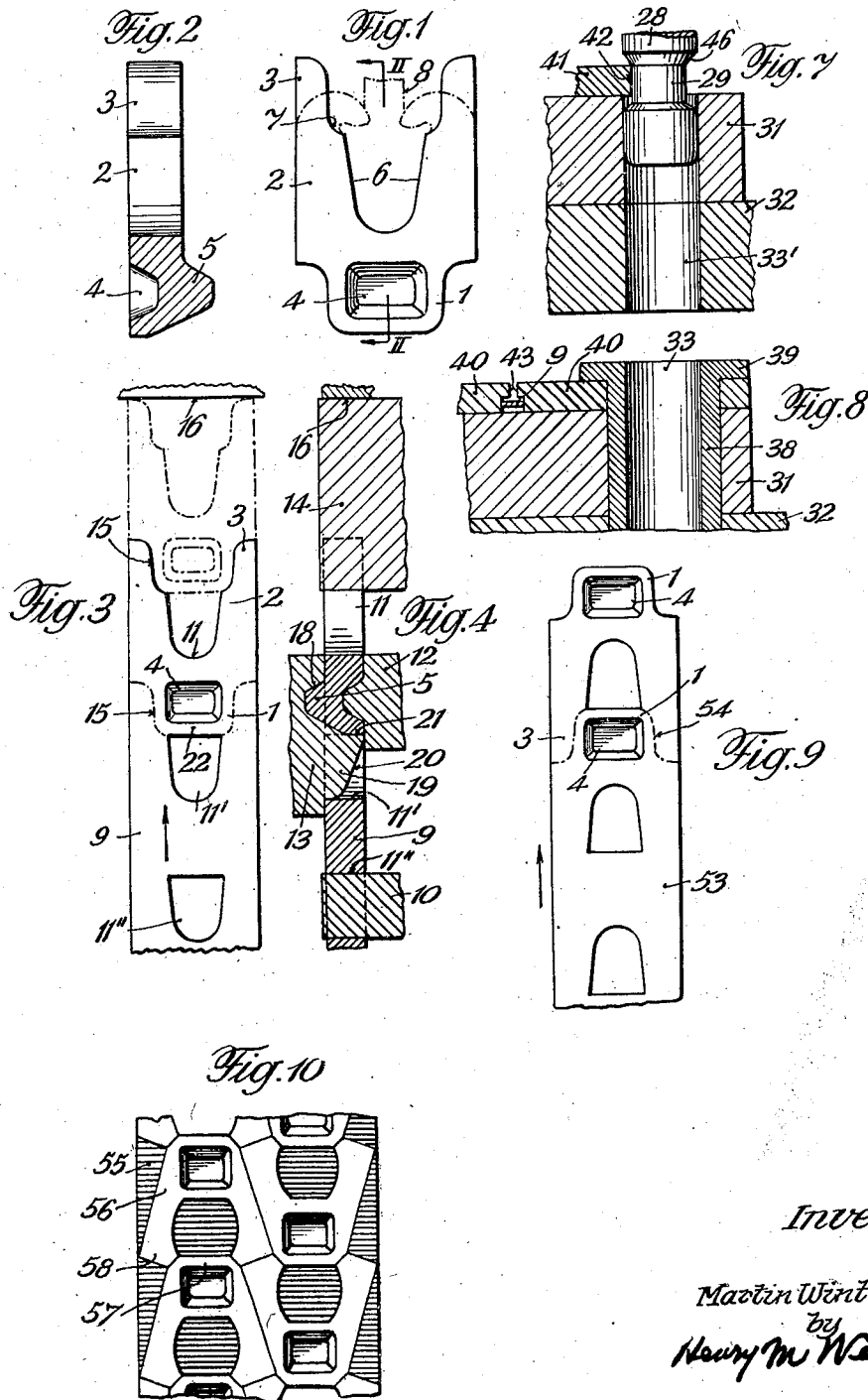
M. WINTERHALTER

2,366,948

METHOD FOR PRODUCING SLIDE FASTENER ELEMENTS

Filed Feb. 17, 1942

2 Sheets-Sheet 1



Inventor:

Martin Winterhalter
by
Henry M. Weidner
Att'y.

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M. WINTERHALTER

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2 Sheets-Sheet 2

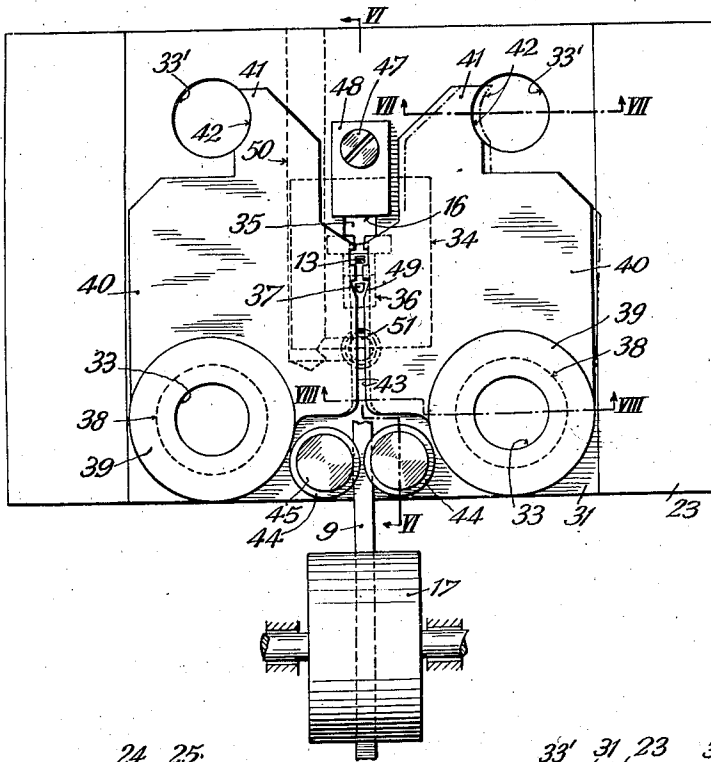


Fig. 5

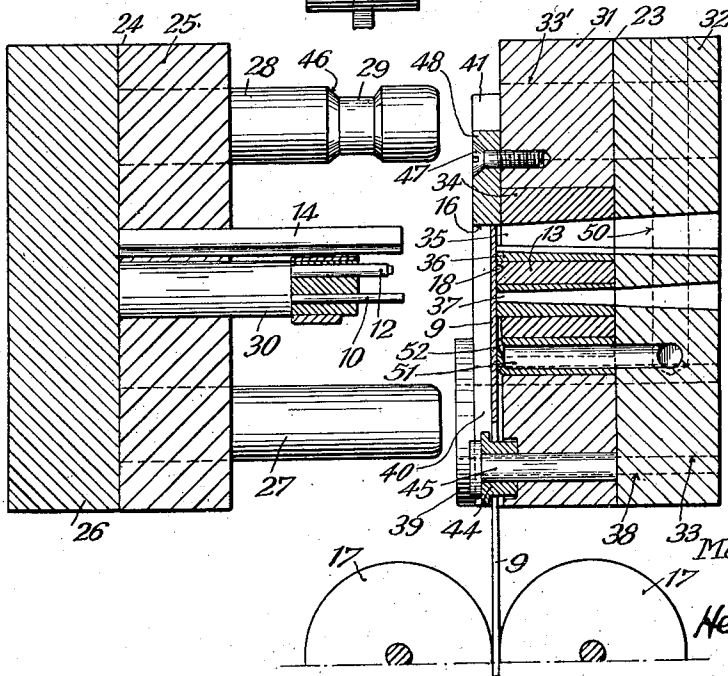


Fig. 6

Inventor:

Martin Winterhalter

by Henry M. Weidner

Att'y.

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METHOD FOR PRODUCING SLIDE
FASTENER ELEMENTSMartin Winterhalter, Morcote, near Lugano,
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This invention relates to a method for producing slide fastener elements of the type comprising an interlocking head portion at one end and two tape gripping jaws at the other end for attaching the element to the edge of a tape.

For producing fastener elements of this type it is known, for example, to punch them in successive end to end relation out of a strip of sheet material, by providing V-shaped diverging jaws. At the free ends of these jaws there are provided inwardly directed projections. For attaching these elements to a tape they are placed astride the reinforced edge of the tape and then the V-shaped jaws are squeezed together so that the projections at the end of the jaws are brought in clamping relation with the tape at the rear of the reinforced edge thereof. Owing to the V-shaped diverging jaws of the elements, a relatively high percentage of waste of strip material is obtained with this method of punching out the elements since the material cut out between the diverging jaws and between the outer edges of the jaws and the strip edges is lost.

In order to save strip material, it has already been proposed to punch the elements from the strip with jaws extending longitudinally of the strip instead of diverging jaws. In this case the outer edges of the jaws can be formed by the edges of the strip of sheet material and the distance between these longitudinally extending jaws is smaller so that less material is wasted when punching out such elements from the strip. But for attaching such elements to the edge of the tape, the jaws have to be spread apart before the reinforced edge of the tape can be introduced between them and afterwards the jaws are squeezed again into clamping relation with the tape. The repeated bending operation to which these jaws are subjected owing to being spread open and successively squeezed together again, results in weakening of the material of the jaws at the place where they are subjected to deformation, and finished fasteners made with such elements are not very resistant against a traction effort tending to pull the elements off the tape, because the jaws yield at the weakened place and fall off the tape.

It is an object of the present invention to provide an improved method for producing fastener elements of the type referred to and to stamp the fastener elements from a strip of sheet material with a minimum waste of strip material. According to the invention the fastener elements are successively punched out from a strip of sheet material with the end portions of successive ele-

ments in overlapping relation, so that a part only of the material situated between the two jaws is wasted, and that a greater number of fastener elements can be punched out from a given length of strip than when the successive elements are cut out in end to end relation.

According to a preferred embodiment of the invention the ends of the tape gripping jaws are formed without inwardly directed projections destined to be squeezed into clamping engagement with the tape, but the jaws are provided with end portions of relatively weak cross section, so that after placing the elements astride the edge of the tape, the end portions can be bent inwardly and clamped on the tape without requiring any squeezing or bending of the inner jaw portions. In this case no V-shaped diverging jaws are required and no spreading apart of the jaws is necessary, but the outer edges of the jaws can be formed by the longitudinal edges of the strip of material from which the elements are cut out.

The accompanying drawings show various examples of fastener elements made in accordance with the present invention, and a preferred form of embodiment of a punching apparatus for carrying out the method according to the invention.

Fig. 1 is a plan view of a finished fastener element produced according to my improved method.

Fig. 2 is a section along the line II—II of Fig. 1.

Fig. 3 is a plan view and Fig. 4 a longitudinal section of a strip of material, showing diagrammatically the manner of producing the fastener elements.

Fig. 5 is a plan view of the lower or die carrying part of a punching tool.

Fig. 6 is a vertical section through the two parts of the punching tool, the lower part being shown in section along the line VI—VI of Fig. 5.

Fig. 7 is a section along the line VII—VII of Fig. 5, showing the two parts of the punching tool in operating position.

Fig. 8 is a section along the line VIII—VIII of Fig. 5.

Fig. 9 shows a strip of material from which fastener elements are cut out in reversed position with respect to that of Fig. 3.

Fig. 10 shows a further example of manner of producing fastener elements in accordance with the present invention.

The fastener element represented in Figs. 1 and 2 comprises an interlocking head portion and two tape gripping jaws formed each of a

jaw portion 2 joining the head portion and having a relatively stronger cross section, and an end portion 3 of relatively weaker cross section. The head portion 1 is provided with the usual recess 4 in one face and projection 5 in the other face. An opening 6 is provided between the two jaw portions 2 to receive the reinforced edge of a band-shaped carrier or tape 8. The inner edge of the jaws following the edge of the opening 6 is provided with a shoulder 7 so that the end portions 3 are of less width and have a weaker cross section than the jaw portions 2. These end portions 3 are adapted to be bent inwardly as shown in dash and dot lines in Fig. 1, for attaching the element to the edge of the tape 8.

Figs. 3 and 4 diagrammatically represent the manner of producing the described fastener element. A sheet metal strip 9 having a width corresponding to the width of the finished fastener element is fed in a step by step motion in the direction of the arrow between upper and lower parts of a punching tool. This tool comprises a perforating punch 10 which, after each feeding step of the strip 9, cuts a hole 11, 11', 11'' into the strip, this hole having the shape of the opening 6 between the jaw portions 2 of the element. A die punch 12 cooperates with a die 13 disposed on the other side of the strip and produces an impression into the strip after each feeding step of the strip to form a socket 4 and corresponding projection 5. This impression is formed between two successive holes 11 and 11' which have been cut out after previous feeding steps of the strip. A further punch 14 is provided with a cutting edge the shape of which corresponds to the dash and dot line 15 in Fig. 3 extending at the end of the opening 11' from opposed sides thereof to both edges of the strip 9. After each feeding step of the strip, a finished fastener element is severed from the end of the strip along the line 15 by means of the punch 14. The line of separation 15 has such a shape that inside of this line the head portion 1 of the severed element is formed, while outside of this line the end portions 3 of the following element are formed which will be severed from the strip after the next feeding step.

Owing to this overlapping relation between the head of one fastener element and the jaws of the next following element, the waste of strip material produced when cutting out the element, is reduced to a minimum, only the material forming the openings 11, 11', 11'' being lost, and this opening only extends through substantially one half of the length of the gripping jaws. The distance between successive holes 11, 11', 11'', and the distance between the successive interlocking sockets 4 is less than the length of a finished fastener element, because successive elements have overlapping portions, namely the jaw portions 3 and head portion 1, and the feed motion corresponding to each feed step is also smaller than the length of a fastener element.

The step by step feeding motion of the strip 9 can be produced by any convenient means, for instance by advancing the strip by means of two intermittently rotating feeding rollers 17 (Figs. 5 and 6) towards a fixed abutment 16. As soon as the end of the strip arrives at the abutment and the further advancing motion ceases, the three punches 10, 12 and 14 are simultaneously pressed downwardly, and in moving downwards the punch 14 severs a finished fastener element from the strip 9 while simultaneously it cuts out the end portions 3 of a further element which will be sev-

ered from the strip at the next following stroke of the punch 14. The punch 12 produces the socket 4 and projection 5 of the head of this further element, while the punch 10 cuts a hole 11' producing the jaw portions 2 in a more backwardly situated part of the strip 9.

In the position of the strip 9 shown in Figs. 3 and 4 a finished fastener element represented in dash and dot lines has just been severed from the strip and simultaneously the jaw end portions 3 of a further element have been formed. The punch 12 has formed the socket 4 and projection 5 between the holes 11 and 11' and the punch 10 has cut the hole 11''. The punches are now retracted and the strip 9 is advanced until the jaw ends 3 of the partly formed, next following fastener element arrive against the abutment surface 16 and then the three punches 10, 12 and 14 are lowered again and sever the next following element from the strip in the manner above described, produce the recess 4 and projection 5 between the holes 11' and 11'' and cut out a further hole 11 in a rearward portion of the strip 9.

The die 13 is provided with a cavity 18 into which the punch 12 presses the material of the strip for forming the projection 5. Immediately at the rear of the cavity 18 the die is formed with a projecting part 19 having a rearwardly extending inclined face 20. This projecting part 19 penetrates into the hole 11' of the strip during the punching operation and forms by means of its face 21 an abutment for the relatively weak transverse portion 22 in the strip between the recess 4 and the hole 11', in order to prevent the material of this transverse strip from being deformed as a result of the pressure exerted by the punch 12.

Figs. 5 to 8 represent a punching tool used in producing the described fastener element. This tool is formed of a lower die carrier 23 and of an upper punch carrier 24. The part 24 comprises a supporting plate 25 and a cover plate 26. The supporting plate carries two cylindrical guide bolts 27 and two further cylindrical guide bolts 28 which latter are provided with an annular groove 29. The plate 25 further carries the cutting punch 14 and a supporting bolt 30 in which the punches 10 and 12 are removably inserted.

The lower portion 23 of the punching tool also comprises a supporting plate 31 and a cover plate 32. These plates are provided with holes 33 and 33' traversing both plates and adapted to receive the guide bolts 27 and 28 of the upper tool portion 24. A die piece 34 is forced into the plate 31 and provided with an opening 35 extending through the entire height of the part 23 and the upper edge of which cooperates with the punch 14 for severing a fastener element from the strip 9. The severed element can fall down the opening 35 to be carried away from the punching tool. A sleeve 36 inserted into the die piece 34 carries the die 13 cooperating with the punch 12 and is provided with an opening extending through the entire member 23. The upper edge of this opening cooperates with the punch 10 for punching out the holes 11, 11', 11'' from the strip 9. The cut out material can fall through the opening 37 and be removed from the punching tool.

Sleeves 38 are inserted into the holes 33 of the die carrier 23 and are provided with a flange 39 at their ends projecting above the top face of the plate 31. Clamping jaws 40 are pivotally mounted on each of these two sleeves 38 between the flange 39 and the top face of the plate 31. Each clamping jaw is provided with an exten-

sion 41 situated in proximity of one of the holes 33' and having a lateral edge 42 formed as an arc of a circle the radius of which corresponds to the radius of the holes 33'. In a certain angular position of the jaw 40, as represented in Fig. 5, the curved edge 42 is exactly in line with the edge of the hole 33'. The two opposed edges 43 of the jaws 40 cooperate with one another to form a guide channel between themselves for guiding the strip 9 which is advanced by the rollers 17 and moreover laterally guided between rollers 44 which are rotatably carried by bolts 45 inserted into the plate 31.

When the two parts 23 and 24 of the punching tool are situated in operating position the guide bolts 27 and 28 penetrate into the corresponding holes 33 and 33' of the part 23. As represented in Fig. 7, the annular groove 29 of the bolt 28 is then situated on the level of the extension 41 of the clamping jaws 40. The annular groove is limited on its upper side by a conical or inclined surface 46 which is arranged to cooperate with the circular arc-shaped edge 42 of the extension 41 of the clamping jaw. When during the punching operation the punch carrier 24 is urged towards the die carrier 23, the guide bolts 28 penetrate further into the holes 33' and the inclined surface 46 of each bolt acts against the corresponding edge 42 to push the extension 41 of the jaw 40 towards the left in Fig. 7. Accordingly both clamping jaws 40 are pivoted about the axis of the holes 33 towards each other and the curved edge 42 is maintained by the cylindrical surface of the bolt 28 above the groove 29 in the position in which it is in line with the edge of the hole 33'. In the position of the clamping jaws 40 corresponding to the position in which the edges 42 are maintained by the cylindrical surface of the bolts 28, the edges 43 of the jaws 40 are applied laterally against the strip 9 and maintain the strip immobile while the three punches 10, 12 and 14 effect the punching operations. When the punch carrier 24 is again raised or moved away from the die carrier 23, the bolts 28 are moving outwardly in the holes 33' into the position represented in Fig. 7, so that the groove 29 arrives again on the level of the extension 41 of the clamping jaws 40 and both jaws are released, the edges 42 being no more maintained by the cylindrical surface of the bolts 28, but are free to penetrate into the grooves 29, as represented in dash and dot lines in Fig. 5. The edges 43 of the jaws release the strip 9 and this latter can now be advanced through one step by the feed rollers 17, until the free end of the strip, from which a fastener element has been severed during the punching operation abuts against the abutment surface 16 which is provided on a piece 48 secured by means of a screw 47 to the supporting plate 31 of the die carrier 23. The opposed edges 43 of the clamping jaws 40 are suitably cut out at 49 to allow free passage of the punches 10 and 12.

The cover plate 32 of the die carrier 23 is provided with a duct 50 connected to a passage 51 traversing the supporting plate 31 and ending in a nozzle 52 communicating with the space above the top face of the die carrier underneath the advancing strip 9. The duct 50 is destined to be connected to an air supply to feed air under pressure to the nozzle 52 which thus directs a stream of air towards the place of operation of the punches for the purpose of removing adhering metal particles and dust or dirt from the

punches and to secure clean punching edges and surfaces and according exactly punched contours of the fastener elements. The sleeve 36 inserted in the supporting plate 31 and carrying the dies slightly projects above the upper surface of the supporting plate 31 so that an empty space is formed between the strip 9 and the surface of the plate 31 allowing discharge of the air from the nozzle 52.

Fig. 9 shows a strip 53 from which fastener elements of the type represented in Figs. 1 and 2 are punched out, but in this case the elements are cut out in inversed position relatively to Fig. 3 with respect to the direction of feeding of the strip. The punch which is used to sever an element from the end of the strip along the line 54 is positioned in such manner that exteriorly of the line 54, the jaw end portions 3 of the severed element are formed, while interiorly of the line 54 the head portion 1 of the element to be severed with the next following punching operation is formed.

It is obviously possible to use a strip of material of such a width that simultaneously two or more fastener elements according to Figs. 1 and 2 can be cut out side by side after each advancing step of the strip, without producing any supplementary waste of material, since adjacent elements would have a common cutting line along the outer edges of the jaw portions 2 and 3. The width of the strip in this case would be equal to the sum of the width of the finished fastener elements punched out side by side from the strip.

In the example according to Fig. 10 fastener elements 56 having V-shaped diverging jaws are punched out from a strip 55 in such position that the head portion 56 of one element is partly engaged between the jaw ends 58 of another element.

It is known to use aluminium or aluminium alloys for the production of fastener elements of separable fasteners, and to color such elements by previously subjecting them to anodic oxidation in an electrolytic bath. For this purpose the finished fastener elements are placed in rows on electrically conducting rods, and these rods carrying the elements are then used as electrodes. When making fastener elements according to described process, in which the elements are cut out from a strip corresponding in width to the width of the finished elements so that the lateral edges of the element are formed by the lateral edges of the strip, the process of oxidation and coloring can be simplified because the strip itself, before punching out the elements, can be oxidised and colored by electrolytic treatment. The outer lateral edges of the fastener elements are formed by the colored edges of the strip from which the elements are punched, and the coloring is not lost by the punching operation. By oxidising and coloring of the strip of material before punching out the elements much time and expense is saved by avoiding the necessity of placing the elements on the electrode rods and the difficulty of producing a good electrical connection between the elements and the rods.

Although I have shown and described particular embodiments of my improved method and means for producing slide fastener elements, I do not desire the invention to be limited to the particular steps and arrangements disclosed, and I intend in the appended claims to cover all mod-

ifications which do not depart from the spirit and scope of my invention.

I claim:

1. The method of forming a slide fastener element having at one end spaced opposed tape gripping jaws and at the opposite end an interlocking head provided with a recess in one face and a corresponding projection at the opposite face, which comprises advancing a strip step by step a distance less than the length of a fastener element; and, after each step, effecting a single punching operation on the faces of the strip simultaneously to (a) pierce an aperture in the strip to form walls which constitute part only of the inner opposite opposed lateral edges of the jaws of a fastener element extending from adjacent the head of that element to points intermediate the lengths of those jaws, and also constitute part only of the lateral edges of the head of another fastener element, which fastener elements are to be subsequently successively severed from the end of the strip, and (b) sever a completed fastener element from the end of the strip along lines of severance which intersect a like aperture pierced at the end of a prior step and form a remaining part of the lateral edges of the head of a fastener element including opposite lateral edges of such head, and also form a complementary remaining part of the inner opposite opposed lateral edges of the jaws of another fastener element, whereby such head is severed from such jaws in complementary overlapping relation therewith with the head embraced by the jaws; the shape of said aperture and the contour of said lines of severance being such as to space said inner opposite opposed lateral edges of the jaws the distance desired in the completed fastener element; and prior to so severing the fastener element from the end of the strip forming therein the recess and interlocking projection thereof so that a complete fastener element will be severed.

2. The method according to claim 1 in which the recess and corresponding projections of the fastener elements are as units successively formed by the same single punching operations as perform the other operations on the strip.

3. The method according to claim 1 in which the completed fastener element is severed from the end of the strip along lines of severance which form the remaining part of the lateral edges of the head of the fastener element so severed, and also form the remaining part of the inner opposite opposed lateral edges of the jaws of the fastener element to be severed from the strip at the end of the next successive step of advance of the strip.

4. The method according to claim 1 in which the completed fastener element is severed from the end of the strip along lines of severance which form the remaining part of the inner opposite opposed lateral edges of the jaws of the fastener element so severed and also form the

remaining part of the lateral edges of the head of the fastener element to be severed from the strip at the end of the next successive step of advance of the strip.

5. The method according to claim 1 in which the same single punching operation as performs the other operations on the strip also forms the recess and corresponding projection of the head of the fastener element to be severed from the strip at the end of the next successive step of advance of the strip.

6. The method according to claim 1 in which the same single punching operation as performs the other operations on the strip also forms, adjacent an aperture pierced at the end of a prior step, the recess and corresponding projection of a fastener element, and there is entered into such aperture an abutment for preventing deformation of that wall of said aperture which is adjacent said recess and projection.

7. The method according to claim 1 in which the width of the strip selected is that of the completed fastener element, the lines of severance of the fastener elements from the strip intersecting the edges of the latter, so that said edges form the outer lateral edges of the completed fastener element.

8. The method according to claim 1 in which the strip selected is wide enough to permit the forming therefrom by the successive punching operations of at least two contacting rows of fastener elements, each punching operation severing from the end of the strip a fastener element from the end of each row along lines of severance which separate from each other the several fastener elements so severed from the end of the strip.

9. The method according to claim 1 in which the strip selected is wide enough to permit the forming therefrom by the successive punching operations of at least two contacting rows of fastener elements having outer sides which converge toward the fastener head, with the heads of the fastener elements of one row facing in the opposite direction from those of the other row, a side of each fastener element of each row contacting with a side of the opposite fastener element of the other row, and the inner lateral edge of a jaw of each fastener element of each row at the end portion of that jaw contacting with the lateral edge of the head of an adjacent fastener element of the same row in overlapping relation therewith, with the end of such jaw contacting with the jaw end of the fastener element of the other row opposite the fastener element having such head, each punching operation severing from the end of the strip a fastener element from the end of each row along lines of severance which separate from each other the several fastener elements so severed from the end of the strip.

MARTIN WINTERHALTER.