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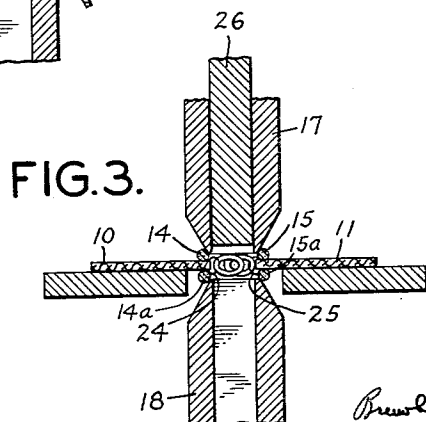
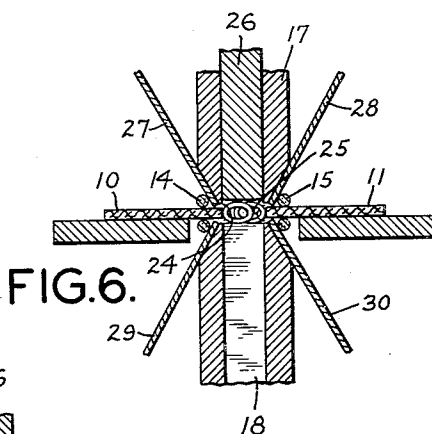
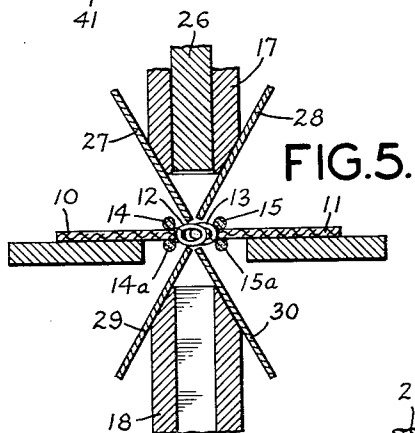
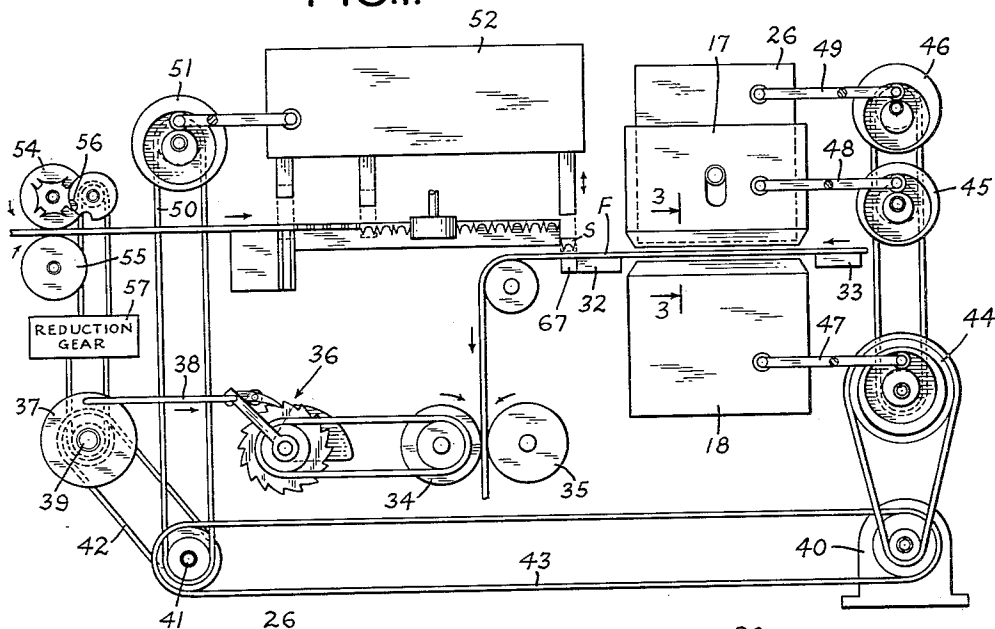
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METHOD OF GAPPING STRINGER FOR SLIDE FASTENERS

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2 Sheets-Sheet 1

FIG. 1.



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1

## METHOD OF GAPPING STRINGER FOR SLIDE FASTENERS

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This invention relates to methods for gapping or removing portions of rows of slide fastener elements secured to a tape or other material and it relates particularly to a method by means of which sections of coil-type slide fasteners can be detached from the tapes or other material to which the coils are secured to enable a plurality of slide fasteners of desired length to be made from longer stringers of slide fastener elements.

Methods and apparatus for gapping slide fasteners have been proposed heretofore. The prior gapping mechanisms and methods usually involve cutting spaced apart sections of the fastener element into a plurality of pieces and then detaching the cut pieces from the tape.

The present invention differs from prior methods for gapping slide fasteners in that the gapping operation is accomplished by severing the threads or other elements by means of which the row or string of fastener elements is secured to the tape or other material and pinching off the slide fastener section at the opposite ends of the section to be removed from the stringer. No effort is made to cut the slide fastener element into small pieces or to sever the tape. As a result, the edge of the tape is left undamaged by the gapping operation. Moreover, inasmuch as the stitches which secure the row or stringer of the fastener elements are cut at short intervals, the remaining fragments of the thread can be removed readily to leave the edge of the tape clean and unmarred thereby greatly enhancing the appearance of the completed slide fastener.

Apparatus for gapping the fastener elements may be provided with means which also applies an end stop to the row of slide fastener elements adjacent to the gap formed therein. The stop prevents detachment or loosening of the row of slide fastener elements.

For a better understanding of the present invention reference may be had to the accompanying drawing in which:

FIGURE 1 is a schematic view in side elevation of an apparatus for gapping slide fasteners in accordance with the present invention;

FIGURE 2 is a schematic perspective view of the apparatus of FIGURE 1;

FIGURE 3 is a sectional view taken on line 3-3 of FIGURE 1 illustrating initiation of a gapping operation on a coil-type slide fastener;

FIGURE 4 is a perspective view of a slide fastener from which a section of the slide fastener coil has been detached;

FIGURE 5 is a view in vertical section of the blades of a gapping apparatus and showing a mechanism for spreading the beads of the slide fastener apart; and

FIGURE 6 is a vertical sectional view of the gapping apparatus in a position in which the threads are about to be severed to release the sections of the coils.

The invention will be described with reference to the gapping of a coil-type slide fastener similar to the fasteners disclosed in the Schwartz U.S. Patent No. 2,858,592, dated November 4, 1958, in which the coils forming fastener elements are secured to tapes or strips of material by means of threads passing between the convolutions of the coils and secured to the tape or material by stitching passing through the material and also, if desired, through beads or guide cords disposed on opposite sides

2

of the tapes. A typical section of a fastener of this type is shown in FIGURES 2 and 4 in which the fastener F includes two stringers F<sup>1</sup> and F<sup>2</sup> including two tapes 10 and 11 to which are secured interlocking coils 12 and 13 and having guide cords or beads 14, 14a and 15, 15a secured adjacent to the tapes. The beads on one or both sides of the tapes can be omitted, if desired.

Single stringers, or meshed stringers can be gapped in accordance with the invention but operating economies can be obtained by gapping the stringers while the coils thereon are in a meshed relation as shown in FIGURE 2. The apparatus for gapping single stringers or meshed stringers can be essentially the same and may include a pair of knives 17 and 18 having cutting edges 20 and 21 about equal in length to the gap to be formed in the coil or coils, joined by laterally extending curved end portions 22 and 23. It will be understood that a single stringer F<sup>1</sup> as shown in FIGURE 4, can be gapped with a pair of knife blades each of which has only one long edge and curved sections at each end. The knives 17 and 18 do not have sharp edges for the reason that such sharp edges would cling to and perhaps cut or mar the coils, the bead cords or the tapes and thus produce unpredictable results. The edges 20, 21, 22 and 23 of each blade are somewhat blunt and are generally of chisel shape so that they will slide over the outer edges of the coils 12 and 13 and will tend to force the beads 14, 14a and 15, 15a apart so that the threads 24 and 25 which secure the coils with the tapes are stretched, pinched and severed by engagement of the edges of the blades 17 and 18 as they are brought together. At the same time, the curved edges 22 and 23 on the ends of the blades 17 and 18 pinch through the coils and sever the section to be detached from the stringer or stringers. The severed sections of the coils are cleared by means of a plunger or ejector 26 which is movable through the open blade 17 into the open blade 18 thereby dislodging and discharging the severed section of the coil downwardly and out of the machine.

In some cases, the beads 14, 14a, 15, 15a may be secured so closely to the coils or teeth of the fastener that difficulty is encountered cutting the threads without pinching the coils or the beads. For that reason and as shown in FIGURES 5 and 6, thin flexible blades 27, 28, 29 and 30 may be mounted adjacent to the blades 17 and 18 converging toward the coils 12 and 13. Inasmuch as the metal strips 27 to 30 are flexible, movement of the blades 17 and 18 toward the coils will spread the strips apart as shown in FIGURE 6 thereby pushing the beads 14, 14a and 15, 15a apart and exposing the threads 24 and 25 so that the blades 17 and 18 can sever the threads without cutting or damaging the beads or the tapes. If any of the threads are not completely severed, the downward movement of the plunger 26 will break or cut them and completely detach the severed section or sections of the coils 12 and 13. The ejecting plunger 26 has right angularly related end and side faces forming edges that cooperate with the blade 18 to act as shears.

Inasmuch as severing of connecting threads loosens the ends of the coil adjacent the gap formed in the coil, it is desirable to provide an end stop at least adjacent the one end of the coil to avoid shifting of the fastening coils on the tapes.

The gapping apparatus can be modified to include elements for applying end stops to the fastener adjacent gap formed therein during gapping of the fastener. A typical apparatus embodying both gapping and end stop applying mechanisms is illustrated in FIGURES 1 and 2. As shown therein, the gapping knives 17 and 18 and the ejecting plunger 26 are mounted above and below guide elements 32 and 33 over which a slide fastener element is drawn by means of feed rollers 34 and 35. One or both of the feed rollers 34, 35 which engage the opposite sides

of the fastener may be driven by means of intermittent or adjustable throw ratchet member 36 which is driven by means of a crank 37 and a connecting rod 38 a drive shaft 39. The shaft 39 is driven by means of a motor 40 through the medium of a counter shaft 41 and suitable belt and pulley or equivalent drive mechanisms 42 and 43. The motor 40 also drives a series of interconnected cams 44, 45 and 46 which rock the levers 47, 48 and 49 move the knives 17 and 18 and the ejector 26 up and down in timed relation to gap the fasteners. It will be evident that the intermittent drive mechanism 36 allows the gapping operation to take place while the slide fastener material is stationary and advances the slide fastener material a predetermined distance while the cutting knives and ejector are retracted. A belt 50 connects the shaft 41 to a cam member 51 which drives a punch press head 52 to form and insert end stops S in the slide fastener adjacent one end of the gap cut therein. As shown in FIGURE 2, a strip of metal or deformable plastic material S' is advanced intermittently by means of the rollers 54 and 55 which are rotated intermittently by means of a Geneva drive 56. A reduction gear 57 transmits power from the drive shaft 39 to the Geneva drive 56 so that the strip S' is advanced step by step at relatively low speed. As the strip S' advances, it passes over a die block 60 which cooperates with a reciprocating punch 61 to enable the punch to cut teeth S'' in the edges of the strip. The teeth S'' are then bent downwardly by means of the reciprocating punch 62 to form the strip generally into a series of connected end stops. As the strip is advanced, the teeth S'' are rolled against a supporting guide bar 63 by means of idler rollers 64 and 65. A reciprocating stamping punch 66 shears off the leading stop S and drives the teeth of the stop S through the slide fastener tapes and into engagement with a clinch block 67 below the supporting and below the fastener where the ends or the teeth S'' are clinched to secure the stop S firmly to the tape. Proper timing of the cam 51 with respect to the cams 44, 45 and 46 enables the stops to be punched, bent and inserted while the slide fastener is not moving.

It will be understood that the strip S' may be formed of any suitable material and if desired, nylon or other thermoplastic material may be molded around the ends of the fastener coils and bonded to the fabric to render the ends of the fastener elements strong, neat and smooth.

From the preceding description of a typical apparatus and typical methods for gapping fasteners, it will be apparent that I have provided methods and means whereby the gapping of slide fasteners and the application of slide stops to the tapes and the fastener elements are greatly facilitated.

It will be understood that the length of the gap is determined by the overall size or length of the cutting edges 21, 22 on the cutting knives and that longer or shorter knives may be used as desired. Moreover, as indicated above, either single stringers or meshed stringers can be gapped with a similar apparatus.

Therefore, it will be apparent from the preceding description that the invention is susceptible to considerable modification and that the method of the invention described above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A method of gapping slide fasteners in which a row of fastener elements is attached to a piece of material by threads extending between the fastener elements and the piece, comprising, moving a portion of said row and an adjacent portion of said piece of material relatively to each other to stretch the threads between said fastener elements and piece of material, severing the threads to disconnect a section of said row from said piece of material, and severing the row of fastener elements at the opposite ends of said section to free said section from said piece of material.

2. The method set forth in claim 1 comprising dislodging the freed section from the row to form a gap therein and attaching a slider stop to said piece of material to the row of fastener elements in engagement with the end thereof adjacent to one end of said gap to secure said end to said piece of material.

3. A method of gapping slide fasteners having a row of fastener elements secured to a piece of material by threads extending between said fastener elements and said piece of material, and a slider guide bead secured to said piece of material adjacent to said row, comprising pushing a section of said row of fastener elements and said guide bead apart to stretch said threads and expose them between said row and said bead, severing said threads to disconnect a section of said row from said piece of material and severing said row at opposite ends of said section to free said section from said piece of material.

4. The method set forth in claim 3 comprising dislodging the freed section from the row to form a gap therein and attaching a slide stop to said piece of material to the row of fastener elements in engagement with the end thereof adjacent to one end of said gap to secure said end to said piece of material.

5. A method of gapping slide fasteners having meshable rows of fastener elements, each row being secured to a piece of material by threads extending between said fastener elements and the corresponding piece of material, comprising moving portions of said rows of fastener elements and said pieces of material relatively to stretch the threads between meshed sections of the rows of fastener elements and the pieces of material, severing said threads to disconnect said meshed sections from said pieces of material, and severing said rows of fastener elements simultaneously at opposite ends of said sections to free them from said pieces of material and dislodging the freed meshed sections from said rows to form a gap in said rows.

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