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G. WALDES

3,263,238

ART OF PRODUCING TROUSER-FLY CLOSURE UNITS

Filed Oct. 12, 1964

2 Sheets-Sheet 1

Fig. 1B.

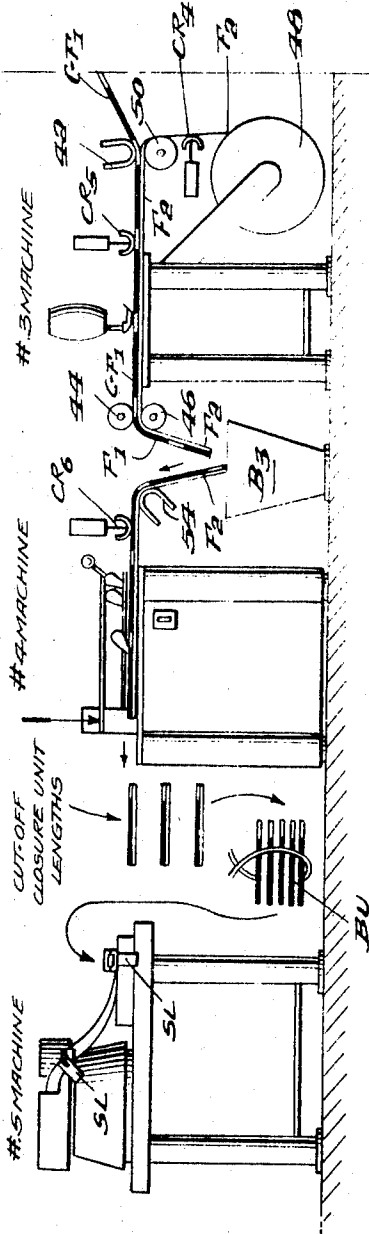


Fig. 2B.

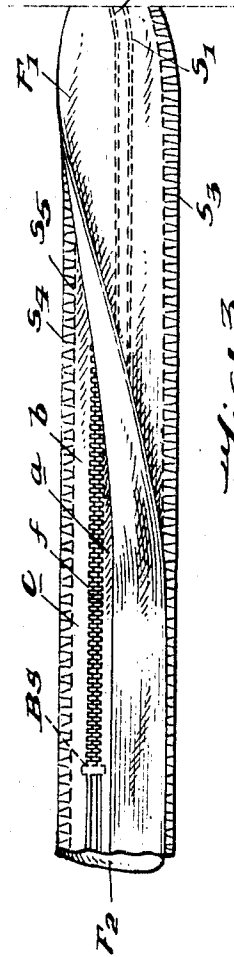


Fig. 3.

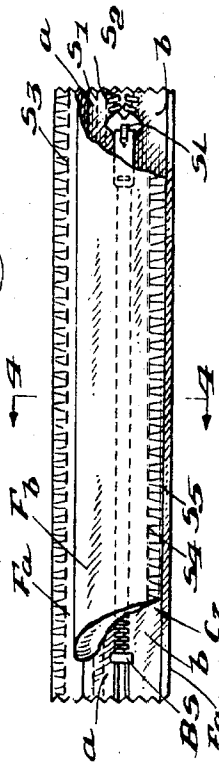
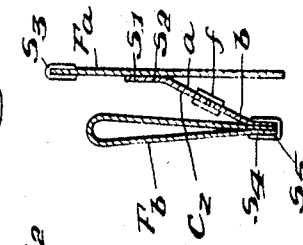


Fig. 4.



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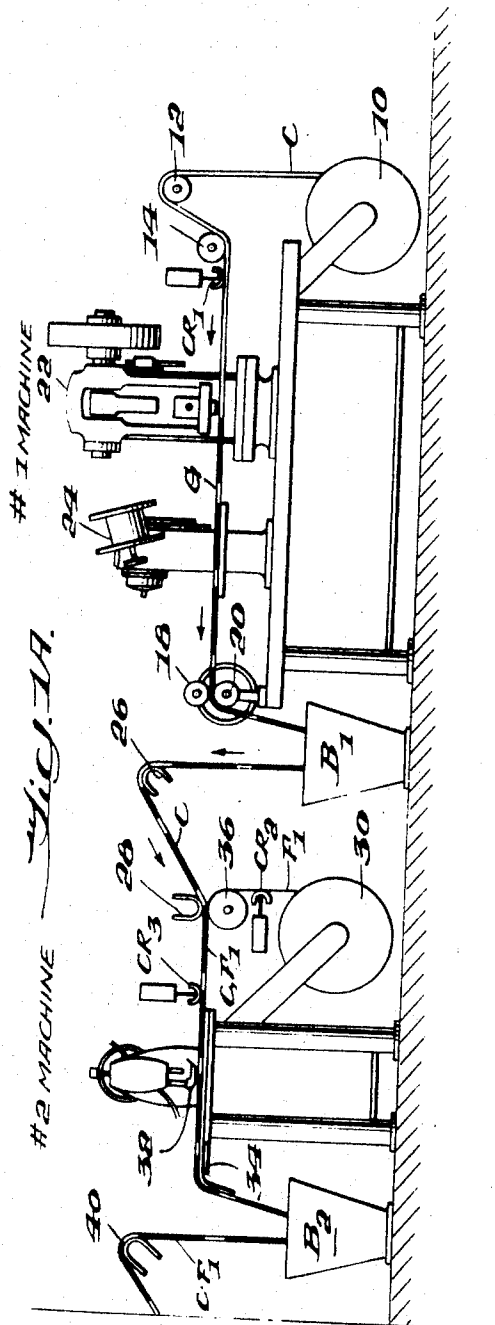
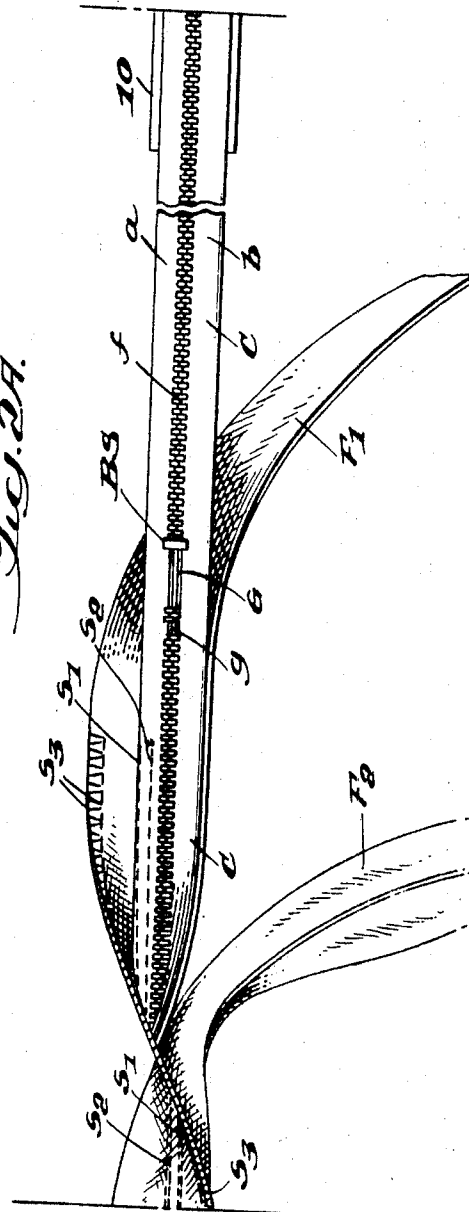
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2 Sheets-Sheet 2



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**ART OF PRODUCING TROUSER-FLY
CLOSURE UNITS**

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This invention relates to improvements in the art of producing trouser-fly closure units, and more particularly to a method of producing zipper and attached fly-strip type trouser-fly closure units from a continuous slide fastener or zipper chain and two continuous tapes of fly-strip material, in a continuous flow operation.

It is of course well known to produce trouser-fly closure units from a continuous slide fastener chain and pre-cut fly strips, as by sewing a succession of the pre-cut fly strips first to one of the tapes of the two stringers making up said chain, and then sewing the companion or opposite pre-cut fly strips to the tape of the other stringer, but only after individual zipper lengths have been cut from the continuous slide fastener chain on transverse lines extending between each two adjacent of the first sewn fly strips and unmeshing of the fastener elements holding the two stringers of each zipper length together as effects separation of said two stringers. In this prior method of trouser-fly closure unit production, it was of course usual to remove a small number of the fastener elements from one or both ends of the zipper lengths thereby to provide the zipper tapes with element-free ends, but here again such element removal was effected only during or following severance of the individual zipper lengths from the continuous slide fastener chain.

While according to another known method of producing trouser-fly closure units, for which reference is had to my Patent No. 2,731,643, dated January 24, 1956, the fly-strip components of such units were fashioned from continuous fly-strip tape rather than pre-cut lengths thereof, this patented method required that the stringers making up the continuous chain to which the continuous fly-strip tape was applied be completely separated one from the other, not only when sewing the individual fly-strip tapes to the tapes of the separated continuous stringers but also during severance of the closure-unit lengths of the zipper stringer from the separated chain stringers.

A major object of the present invention is the provision of a practical and fast method of producing trouser-fly closure units, particularly of the type used in dungarees, levis, work pants, overalls, etc., as well as such a method which is exceedingly simple in its practice as compared to the prior methods described in the foregoing.

Another object of the invention is the provision of a substantially fully mechanized method of producing trouser-fly closure units from a continuous slide fastener chain and continuous fly-strip tapes in a continuous flow operation.

Still another important object of the invention is the provision of a mechanized method of producing trouser-fly closure units from a continuous slide fastener chain and continuous fly-strip tapes as aforesaid, characterized in that a continuous fastener chain consisting of two continuous stringers whose respective fastener elements or scoops are maintained fully engaged, is moved along a predetermined path of movement, during the course of which movement continuous fabric tapes subsequently to form the fly strips are assembled and thereupon secured thereto in proper position and sequence, without any requirement of or need for the fastener elements of the stringers making up the continuous slide fastener chain being disengaged or

unmeshed prior to the securement of either one or both of said fly-strip tapes.

A still further object of the invention is the provision of a continuous flow method for producing trouser-fly closure units as last above, wherein the continuous slide fastener chain acts as a traveling carrier for the continuous fly-strip tapes following assembly of the latter on or to said chain and up to the time that final severance of the trouser-fly closure units from said continuous chain is effected.

The above and other objects of the improved method of producing trouser-fly closure units from continuous slide fastener or zipper chain and continuous cloth tapes as herein contemplated will appear from the following detailed description thereof, in which reference is had to the accompanying drawing, wherein:

FIGS. 1A and 1B together constitute a diagrammatic view in side elevation illustrating the major steps of and the substantially fully mechanized and continuous flow nature of said method;

FIG. 2A and 2B together are intended to depict the manner and order of the assembly of the continuous fabric tapes which ultimately provide the fly strips of the trouser-fly closure units being produced to a continuous fastener chain which is to provide a multiplicity of the slide fastener or zipper components of said units;

FIG. 3 is a broken-away view in plan illustrating the final trouser-fly closure unit produced by the practice of the method of the present invention;

FIG. 4 is an enlarged section taken along line 4—4 of FIG. 3.

Referring to the drawings, with the aid of which the herein method of producing trouser-fly closure units will be explained, reference numeral 10 designates a reel or spool carrying a roll of continuous slide fastener or zipper chain C consisting of a pair of stringers *a* and *b* carrying rows of uniformly spaced, interengaged interlocking fastener elements *f* along their adjacent edges for the full length thereof. The reel 10 is shown to be mounted for rotation in suitable brackets affixed to the "feed in" side of the table of the first or #1 machine of a complex of machines to be generally described which operate on the continuous slide fastener chain moving in a predetermined path along which said machines are arranged at intervals and on two oppositely disposed continuous fly-strip tapes which are assembled thereto, in manner as eventually to produce the trouser-fly closure units constituting the end product of the herein method. Said continuous chain C is progressively drawn from the reel 10, thence over and under the spaced idler rolls 12, 14, respectively, thence under a machine-stop control means CR, which senses when the supply of continuous chain C has run out, and finally through the operating components of the first or #1 machine, by a set of powered feed or draw-off rollers 18, 20 mounted on the discharge side of the machine.

Said #1 machine, which is a commercial machine manufactured and sold by Semiautomatic Machines Co., Brooklyn, New York, combines a so-called chain chopper generally designated 22 and a bottom-stop applying means designated 24. Preferably, the chain chopper 22 is in the nature of a reciprocating punch which operates on the chain in well known manner as to remove, with each stroke thereof, two groups of the interengaged fastener elements thereof, thereby to form a short gap *g* and a closely following long gap *G* in the rows of said fastener elements. As explained in the patent to Soave No. 2,804,669, dated September 3, 1957, which with the present application is commonly owned, the short gap *g* provides a so-called needle gap near the upper end of the zipper components of the final trouser-fly closure

units, and the long gap G provides element-free tape extensions at the other or bottom end of said zipper components, which facilitates sewing said end into the crotch portion of the trousers. The aforesaid bottom-stop applying means 24 affixes to the now gapped slide fastener chain moving to same a succession of bottom stops generally designated BS, with which zipper components of trouser-fly closure units are conventionally provided for the purpose of preventing the zipper-operating slider from running off the lower end of the zipper.

It will of course be understood that the rate of feed of the continuous chain C through the first or #1 machine is timed to the operation of each of the chain chopper and bottom-stop applying means components thereof, to the end that the location of both the gaps and applied bottom stops bear the desired predetermined relationship to the length of the zipper components of the trouser-fly units being produced.

The now gapped chain C having bottom stops applied thereto as aforesaid leaving the aforesaid first of #1 machine is directed to a storage bin B₁, wherein it is preferably permitted to accumulate until a reserve supply of the chain is built up in said bin.

From bin B₁, the continuous chain is drawn through the second or #2 machine of the complex, known as a "safety stitch" machine, such being essentially a commercial 4-needle sewing machine of a type which is manufactured and sold by Union Special Machine Co., Chicago, Illinois. Just prior to the continuous gapped chain C moving onto the table of said #2 machine, to which it is guided by guide shoes 26, 28, a continuous fabric fly-strip tape F₁ is associated therewith. More particularly, said continuous fly-strip tape is drawn from a roll supply thereof wound on a reel or spool 30 supported in brackets affixed to the under side of said machine table by built-in tape feed means 32, 34 disposed on the opposite side of the machine from said reel 30, and which also draw the continuous chain from the bin B₁ and thence through the machine. The continuous fly-strip tape passes over guide roll 36 disposed just below the aforesaid chain guide shoe 28 and hence assumes a position in which it underlies the continuous chain C as both are drawn across the machine table.

By reference to FIG. 2A, it will be seen that the continuous fly-strip tape F₁ is substantially wider than the combined width of the two stringers *a* and *b* making up the continuous chain C, and also that said fly-strip tape is assembled to said continuous chain in laterally offset relation thereto, by an amount such that the longitudinal center line of the fly-strip tape coincides or substantially coincides with the longitudinal center line of the tape *a* of said continuous chain C, with the result that one longitudinal side-edge portion of the continuous fly-strip tape extends a substantial distance beyond or laterally of the free edge of the aforesaid stringer tape *a*.

In passing through the aforesaid #2 machine, manifold operations are performed by said machine on the continuous chain C and the continuous fly-strip tape F₁ now associated therewith. Firstly, said machine using two of its needles sews the continuous fly-strip tape to the tape of stringer *a* with a double line of stitches *s*₁, *s*₂ passing through both said tapes. Secondly, said machine trims the longitudinal side edge of the continuous fly-strip tape which extends beyond the free longitudinal side edge of the tape of said stringer *a*, to provide thereon a straight edge. Finally, the said #2 machine, through the use of the other two of its four needles, sews an overedge stitch *s*₃ on the laterally offset, now straight edge of the continuous fly-strip tape, which prevents unraveling of said edge.

Like the #1 machine, the aforesaid #2 machine is provided with machine-stop control means designated CR₂ and CR₃, the former sensing any running-out of the continuous fly-strip tape F₁ being drawn from the spool or reel 30, and the latter sensing any running out of the

continuous chain C feeding to the #2 machine from the bin B₁.

From the #2 machine the continuous gapped chain C with the continuous fly-strip tape F₁ sewn thereto is directed to a second storage hopper or bin B₂, wherein a reserve supply of chain and tape is built up for withdrawal as needed.

From bin B₂ the continuous gapped slide fastener chain C and continuous fly-strip tape F₁ assembled thereto as aforesaid, after passing over and under the guide shoes 40, 42, is drawn by the powered feed rollers 44, 46 through the third or #3 machine of the complex wherein, among other things, an opposite continuous fly-strip tape F₂, also drawn from a roll supply thereof carried by a reel or spool 48 by said feed rollers, is assembled to the tape of the other or opposite stringer *b* of said continuous chain upon being guided thereto by a guide roll 50. This #3 machine, which is known in the trade as a "high-speed serger," is basically a commercial machine manufactured by Union Special Machine Co., Chicago, Illinois, modified by the addition of a folder attachment which effects folding of said opposite continuous fly-strip tape F₂ along its longitudinal center line, prior to its being sewn to the continuous stringer-tape *b*, as will be described.

However, prior to the continuous chain and continuous fly-strip tapes F₁ and F₂ being acted upon by said #3 machine, said continuous chain and the continuous fly-strip tape F₁ already sewn thereto are together turned 180° on a longitudinal line extending through same. Preferably, this turning over of chain and tape F₁ may be accomplished simply by applying a half twist to the assembly thereof prior to the same feeding to the table of the #3 machine.

In passing through the #3 machine, said continuous opposite fly-strip tape F₂, after being longitudinally folded by the folder attachment with which the machine is provided, is first disposed against the under face of the stringer *b* of the continuous chain being drawn there-through in lateral position with respect thereto such that the free longitudinal edges of said folded fly-strip tape underlie and substantially register with the free longitudinal edge of said tape of the chain stringer *b*. Thereupon, the machine trims off the so-related free edges of the longitudinally folded, opposite continuous fly-strip tape F₂ and said stringer tape. Finally, said machine sews the continuous fly-strip tape F₂ to the stringer tape *b* by lines of over-edge stitches designated *s*₄, *s*₅ passing through said related edges. In addition to securing said tape F₂ to said stringer tape *b*, said stitches serve to prevent unraveling of the plural edge of the tapes secured thereby.

As with the #2 machine, the #3 machine is also provided with machine-stop control means CR₄ and CR₅ which sense any running out of the supply of the slide fastener chain and/or tape F₂ feeding to the machine.

During the course of its movement through the #3 machine and prior to the sewing of the opposite fly-strip tape F₂ to the tape of the continuous chain stringer *b* as aforesaid, the first applied fly-strip tape F₁ is folded back on itself by an amount sufficient to permit the needles of said machine to sew through the registered free edges of said opposite tape F₂ and said tape of stringer *b* without at the same time sewing through said tape F₁. Such folding of the tape F₁ is shown to an exaggerated degree at the left end of FIG. 2B, which view is designed to show the lines of stitches *s*₄, *s*₅ sewn by the needles of the #3 machine and which secure the continuous fly-strip tape F₂ to the continuous chain C. FIG. 2B also shows that at this stage of the process the normally under side of said chain C is facing upwardly. Prior to the finally sewn assembly of chain C and fly-strips F₁, F₂ moving from the #3 machine, said tape F₁ will be return-folded to its prior position in which it completely overlies the continuous chain C and underlying tape F₂, and in this con-

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dition the assembly passes from said #3 machine to a bin B₃, wherein an accumulation thereof is permitted to build up.

From the aforesaid bin B₃, the now fully assembled continuous slide-fastener chain and continuous tapes F₁ and F₂ of fly-strip material passes to the #4 machine of the aforesaid complex, which functions to sever from said continuous chain and tape assembly feeding to it predetermined lengths thereof corresponding to the particular length of the run of trouser-fly closure units then being produced. More particularly, said #4 machine severs successive lengths from the continuous chain and fly-strip tape assembly along transverse lines of cut or severance which extend across said assembly about mid-way of the length of each of the aforesaid long gaps G made in the chain by the chain chopper 22 of the #1 machine as previously described. Thus, the action of the cutting-off machine is necessarily timed to the spacing between said chain gaps G.

As will also be evident from a consideration of FIG. 3, the cutting blade employed in the #4 machine is of a type which makes a straight line of cut or severance, thereby to provide square-cut ends on the severed lengths constituting the closure units. Preferably also, the configuration of said blade is such as to pink (serrate) the end edges of both the chain or zipper and the fly strip components of the severed lengths of closure units as they are cut from the continuous chain and tape assembly.

Rather than being a machine currently available on the open market, as are said #1, #2, and #3 machines, the #4 machine is a proprietary machine, being the subject-matter of an application of John Langwell for Letters Patent Serial No. 425,217, filed January 13, 1965, which with the present application is commonly owned. Said machine incorporates specially designed means for intermittently feeding the continuous chain and tape assembly to the cutting blade thereof, which depends on a moving feed finger or pawl engaging against the bottom stop BS of each closure-unit length of the chain C, preferably from the gap side thereof so as to avoid unmeshing of the chain during the cutting-off operation. Accordingly, such requires an end-to-end reversal of the continuous chain and tape assembly feeding to said #4 machine, as respects its previous position. This reversal can be simply achieved by feeding to the #4 machine an end of the continuous chain and tape assembly which was the end thereof last to enter the bin B₃. It will be understood that such end may also be provided by cutting off the accumulation of chain and tape in the bin B from that still running into said bin from the #3 machine. Since a feed of this type also requires that both the chain of fastener elements *f* and the bottom stops BS be disposed bottom-side up and exposed from above, said #4 machine is provided with suitable means to fold back both the free longitudinal edge portion of the upper or first-assembled fly-strip tape F₁ from its normal position in which it overlies said fastener elements, as earlier discussed, and preferably also the doubled-over free edge portion of the second-assembled fly-strip tape F₂ previously secured to the tape of the stringer *b* and which underlies the fastener elements of the chain when the latter is disposed bottom-side up as aforesaid. Further details regarding the construction and operation of said #4 machine will be found in said Langwell application Serial No. 425,217.

In feeding to said #4 machine, the continuous slide fastener chain and fly-strip tape assembly is guided by a guide shoe 54. The feed-in side of said machine also mounts a machine-stop control means CR₄ which senses when the supply of chain and tape assembly feeding to the machine has run out.

The severed lengths of side fastener chain or zipper and fly strips coming from the #4 machine may be immediately run through the #5 machine of the complex which performs the final operation of mounting (applying) the fastener or zipper operating slider SL to the chain fas-

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tener or zipper elements, but preferably said severed lengths are collected and bundled as indicated diagrammatically at BU in FIGURE 1B for later mounting of the sliders, as called for. This #5 machine is a commercial machine known as a Vibratory Slider Mounting Machine which is manufactured and sold by the Semi-automatic Machines Co., Brooklyn, New York, which it will be recalled also manufactures the aforesaid #1 machine, and it operates to mount the individual sliders SL feeding from a vibratory hopper, pull-tab side down, to the zipper component of the aforesaid severed lengths disposed with the under side of the zipper facing upwardly.

The final trouser-fly closure unit produced by the above described method of the invention is shown in plan in FIG. 3, with the understanding that the unit is there shown with its fastener or zipper disposed right-side up. In this position the longitudinally folded fly strip F_b cut from the second-applied continuous fly-strip tape F₂ is shown as disposed forwardly of the zipper component C_z cut from the continuous chain C, but it has been broken away to show the bottom stops BS applied by the #1 machine and the slide SL mounted by the #5 machine, all as described in the foregoing.

FIG. 4 illustrates the forward-rearward relationship of the fly-strips F_a and F_b cut from the continuous fly-strip tapes F₁ and F₂, respectively, with respect to the slide fastener or zipper component C_a of the final closure unit.

Without further analysis, it will be appreciated that the herein described invention provides a fast yet highly practical and simplified method for the production of trouser-fly closure units which satisfies the objectives thereof as explained in the early part of this specification. However, it is to be understood that changes in the order of steps and in the individual steps themselves from that or those described in the foregoing, such as would or might occur to persons versed in the particular art and which at the same time are within the scope and spirit of the appended claims are intended to be covered by and embraced within said claims. For example, the chain gapping and bottom-stop applying step may be practiced just prior to the so-called cutting-off step rather than as the first step of the process as disclosed. Similarly, the procedure for assembling the so-called first continuous fly strip tape to a tape of the continuous zipper or slide-fastener chain may be varied from that described, and it follows that types of machines other than the "safety-stitch" machine referred to in the foregoing and which effect the varied form or forms of assembly of fly-strip to zipper chain tape satisfying the purposes and needs of the invention may accordingly be employed. In short, it is intended that all matter in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. The method of producing trouser-fly closure units which comprises the steps of:

causing a continuous slide-fastener chain to move along a predetermined path;

progressively assembling a first continuous tape of fly-strip material to said continuous slide-fastener chain during the course of movement of said tape in a similar but underlying and laterally offset path; then progressively sewing said first tape to the tape of one of the stringers making up the continuous chain, then turning the continuous slide-fastener chain and first tape sewn thereto about substantially the longitudinal center line of said chain so as to dispose its formerly upper side downwardly;

then progressively assembling a second continuous tape of fly-strip material to the now under side of the continuous fastener chain after first folding said second tape about its longitudinal center line and positionally relating said folded tape with respect to said chain so that its folded edge portion underlies said chain and its free longitudinal edges substantially

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underlie the free longitudinal edge of the tape of the other stringer making up said continuous slide fastener chain;

then progressively sewing said second tape to the tape of said other stringer along the so-related free longitudinal edges of said second fly-strip and said other stringer tapes;

and then cutting off from the so-assembled and sewn-together continuous slide-fastener chain and fly-strip tapes a succession of predetermined lengths thereof each corresponding to the length of the individual trouser-fly closure units then being produced.

2. The method according to claim 1, including the step of removing a plurality of the fastener elements from the moving continuous slide-fastener chain at predetermined intervals along the length thereof which are related to the length of the closure units then being produced, all prior to the assembly of the first tape of fly-strip material to said continuous chain.

3. The method according to claim 1, wherein the cutting-off of the predetermined lengths of the slide-fastener chain and the fly-strip tapes assembled thereto is effected along transverse lines of cut which extend across the length portions of the chain from which the fastener elements have been removed.

4. The method according to claim 3, and the further step of applying a slider to the chain of fastener elements component of each severed length of said chain and fly-strips assembled thereto as aforesaid.

5. The method of claim 1, and the final step of applying a slider to the chain of fastener elements component of each severed length of said chain and fly-strips assembled thereto as aforesaid.

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6. The method according to claim 1, including the further step of effecting end-to-end reversal of the assembly of continuous chain and tape of fly-strip material immediately prior to the assembly being subjected to the cutting-off step as aforesaid.

7. The method according to claim 1, including the further steps of, prior to the cutting-off step as aforesaid, providing gaps in the slide fastener chain at predetermined intervals along the length thereof which are related to the length of the closure units being produced, and applying a slider bottom-stop to one end of each of the individual lengths of chain defined by said gaps.

8. The method according to claim 7, including the further step of feeding the assembled and sewn-together continuous slide-fastener chain and fly-strip tapes forwardly for the cutting-off operation through use of said bottom stops.

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