# United States Patent [19]

**Perlman**

[11] **3,776,078**

[45] **Dec. 4, 1973**


[54] **APPARATUS FOR CUTTING CONTINUOUS SLIDE FASTENER CHAINS INTO SLIDE FASTENERS OF PREDETERMINED LENGTH**


[75] Inventor: **Morris Perlman**, Brooklyn, N.Y.

[73] Assignee: **Carbide Form Grinding, Inc.**, Brooklyn, N.Y.



[22] Filed: **Aug. 15, 1972**

[21] Appl. No.: **280,900**

[52] **U.S. Cl.** ..... **83/210**, 83/212, 83/221, 83/222, 83/371, 83/921

[51] **Int. Cl.** ..... **B26d 5/38**

[58] **Field of Search** ..... 83/921, 209–212, 83/221, 222, 268, 269, 371



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 3,190,161 | 6/1965 | Runnels et al. | 83/921 X |
| 3,376,772 | 4/1968 | Langwell | 83/921 X |



*Primary Examiner*—J. M. Meister
*Attorney*—Michael S. Striker



[57] **ABSTRACT**

Apparatus for cutting a continuous slide fastener chain in transverse direction at successive portions of the chain which are not provided with coupling elements and in which a gap is formed between inner edges of the two stringers forming the chain to thereby produce individual fasteners from the chain. The apparatus comprises means for moving the chain in longitudinal direction and a stop finger arranged to ride on the engaged coupling elements and to drop into a gap between the edges of the stringers to thereby engage a bottom stop connecting the two stringers at the end of each gap. The stop finger is temporarily maintained in the dropped position to thereby stop further feeding of the chain and to initiate movement of a cutting blade to cut the chain downstream of the finger in transverse direction, whereafter the finger is released and the cycle repeated at the next gap.


**17 Claims, 12 Drawing Figures**

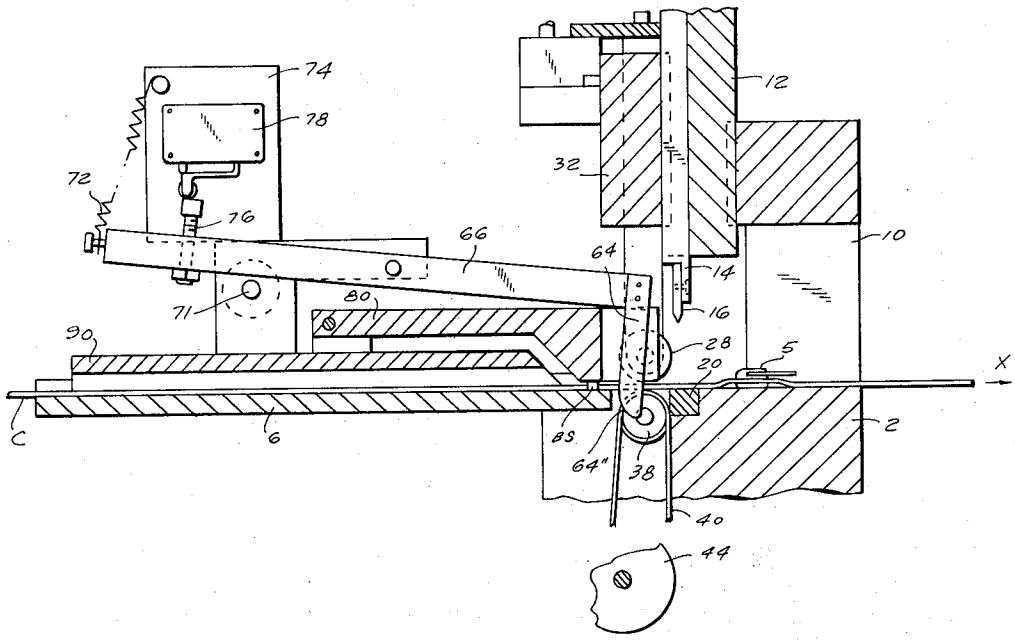


FIG. 1

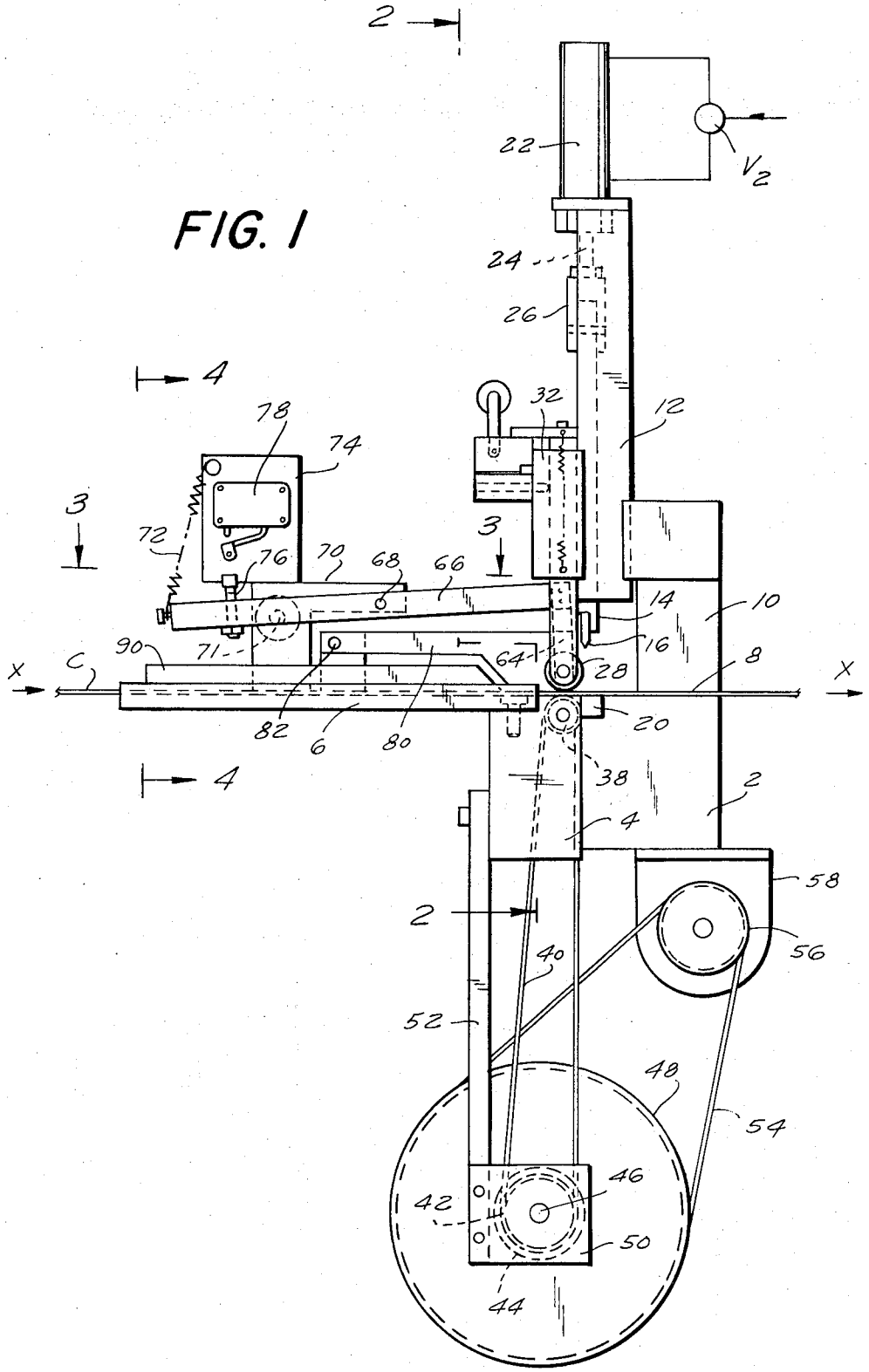

2
22
$V_2$
24
26
4
78
74
32
12
3
72
76
70
68
66
3
14
10
16
90
71
64
28
8
X
C
X
82
6
80
20
38
4
2
4
2
58
56
40
52
48
54
46
42
50
44

FIG. 2

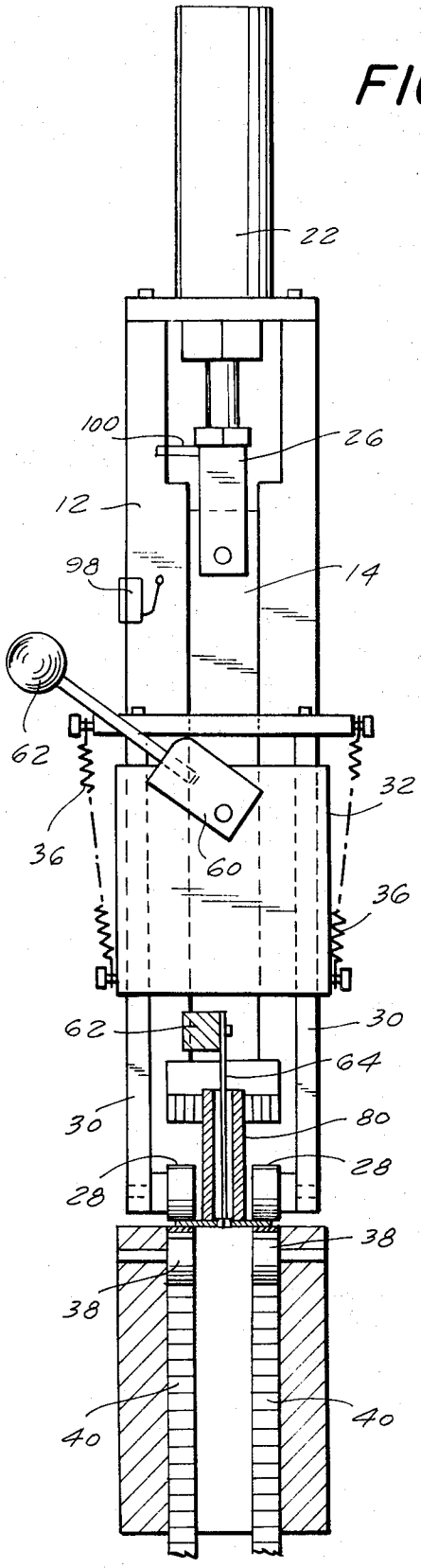

22
100
26
12
98
14
62
32
36
60
36
62
30
64
30
80
28
28
38
38
40
40

FIG. 4

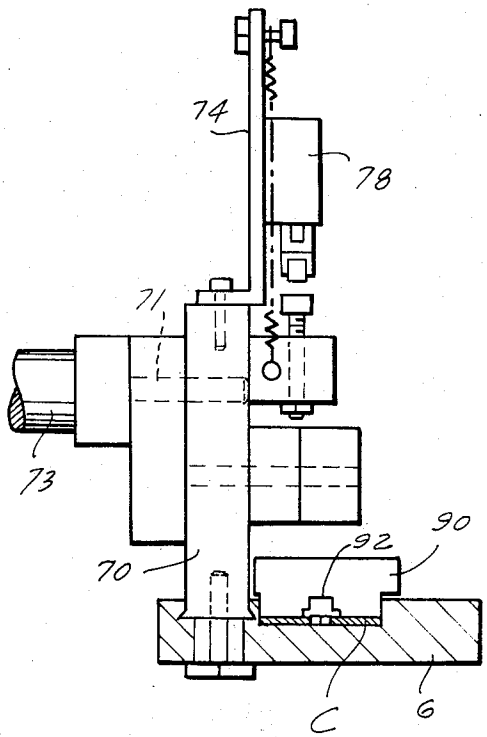
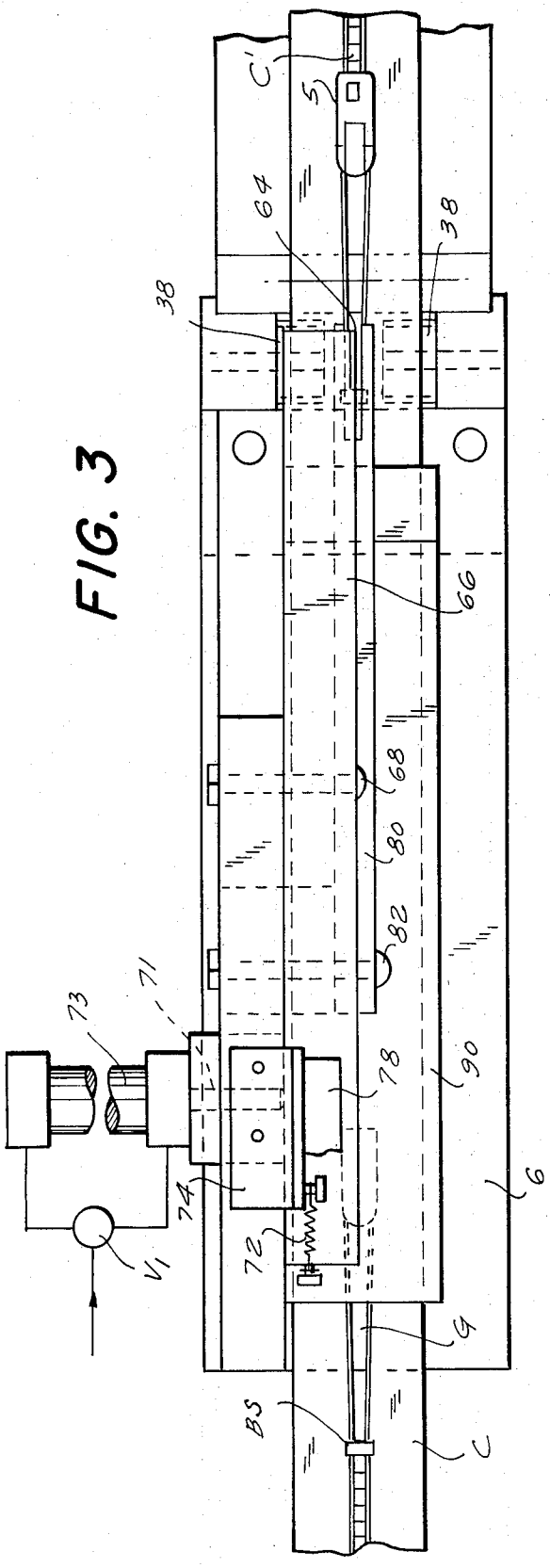

74
78
71
73
70
92
90
C
6

FIG. 3


C'
5
64
38
38
66
68
80
82
71
73
78
90
74
72
V1
6
G
BS
C

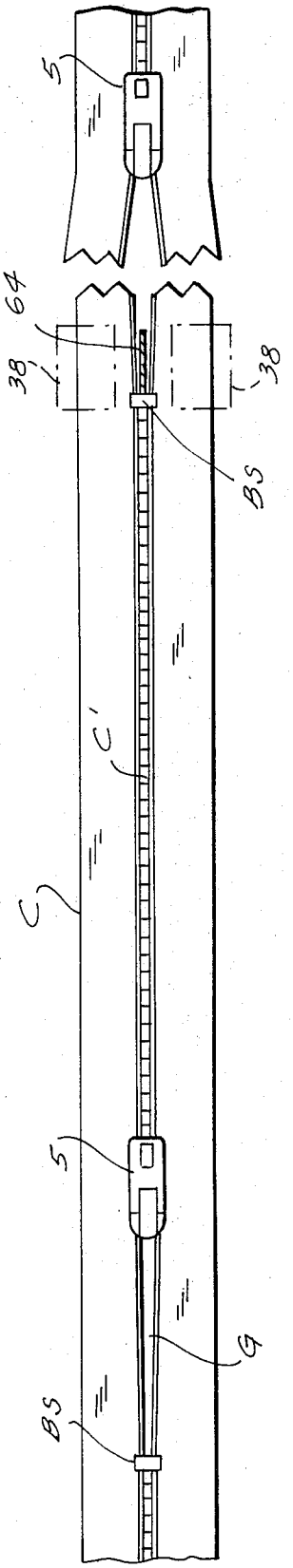

5
64
38
38
BS
C'
C
5
G
BS

FIG. 5

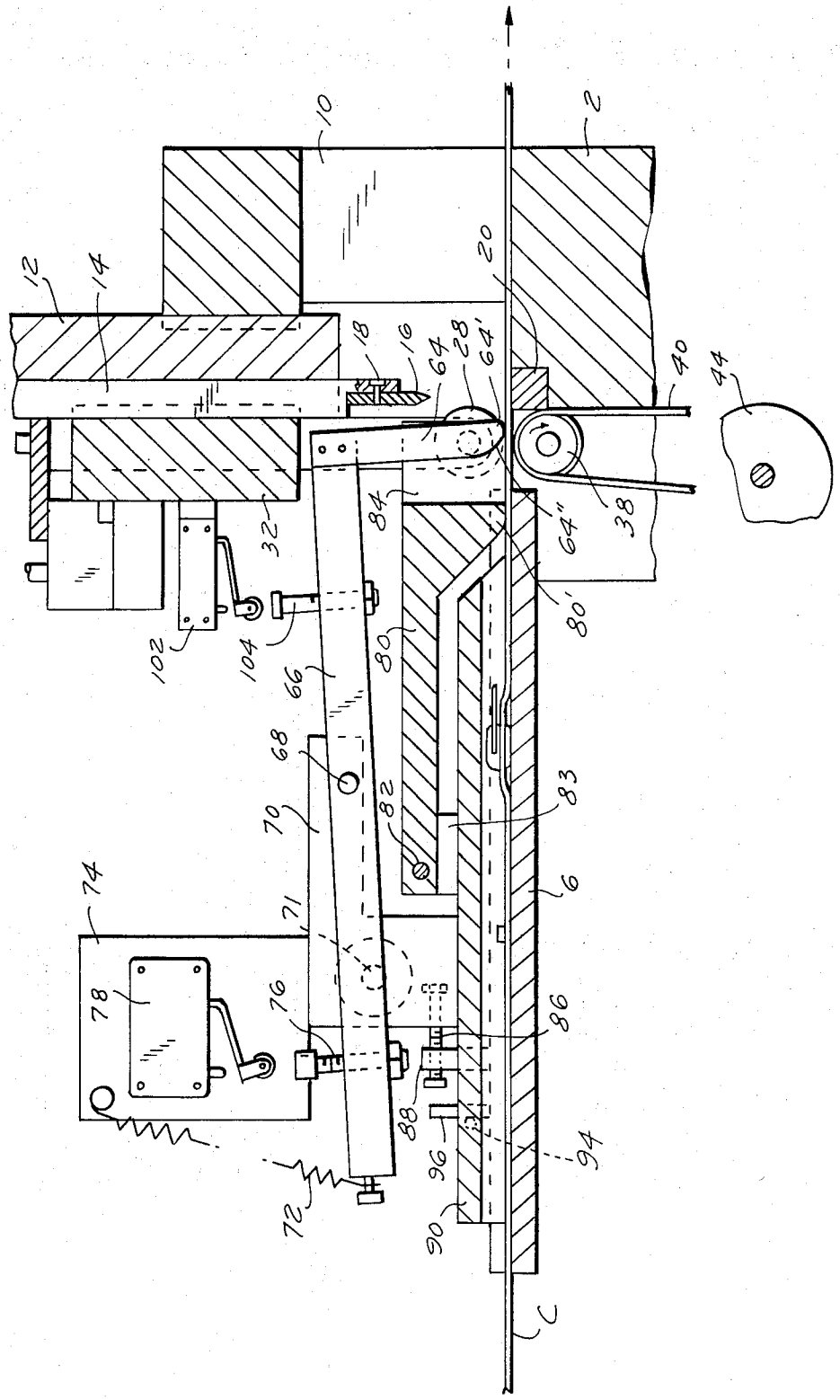

10
2
12
14
20
18
16
64
28'
64'
40
44
38
64"
84
32
80'
102
104
80
66
68
70
82
83
6
74
71
78
76
86
88
96
94
72
90
C

FIG. 6

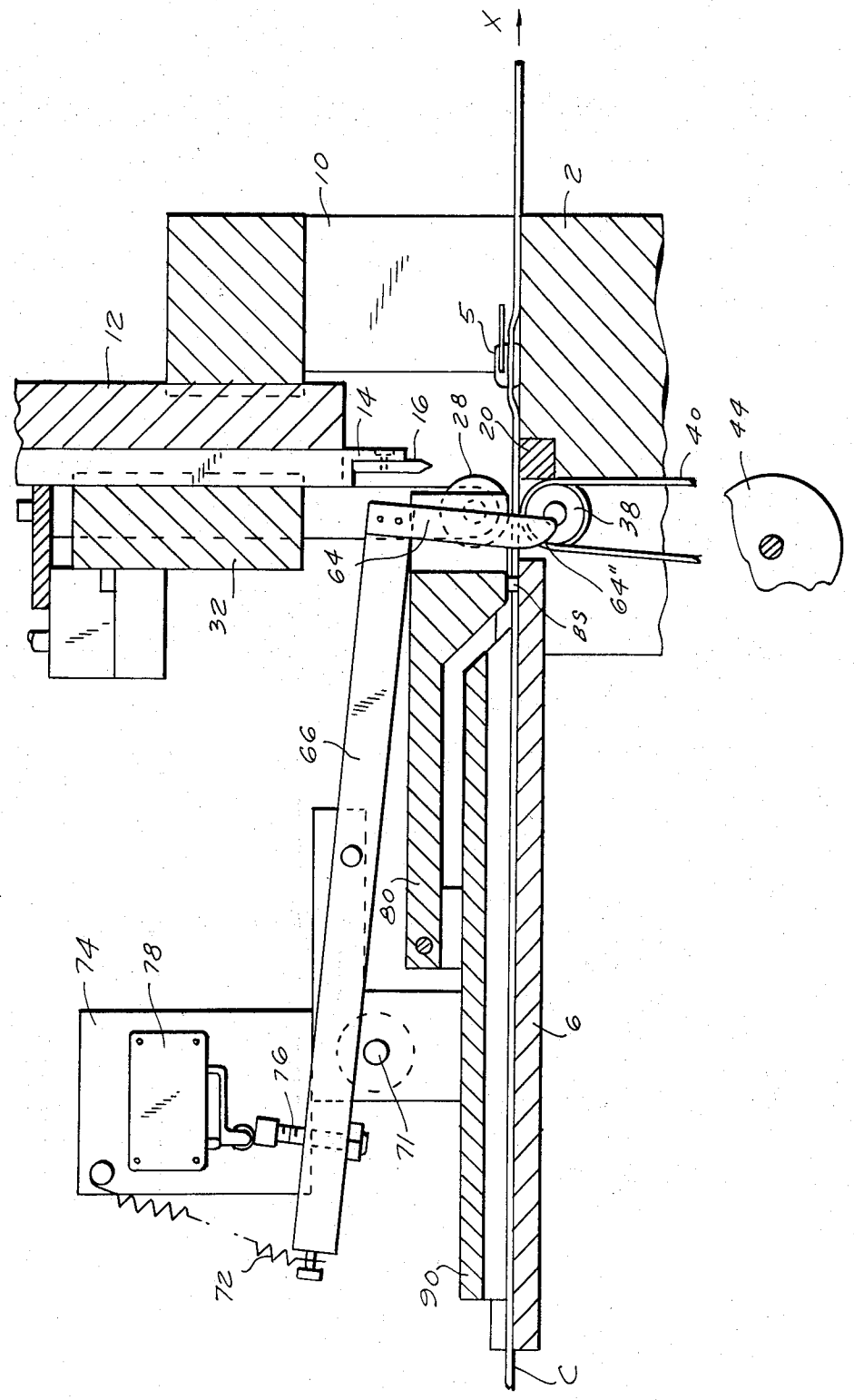



FIG. 7

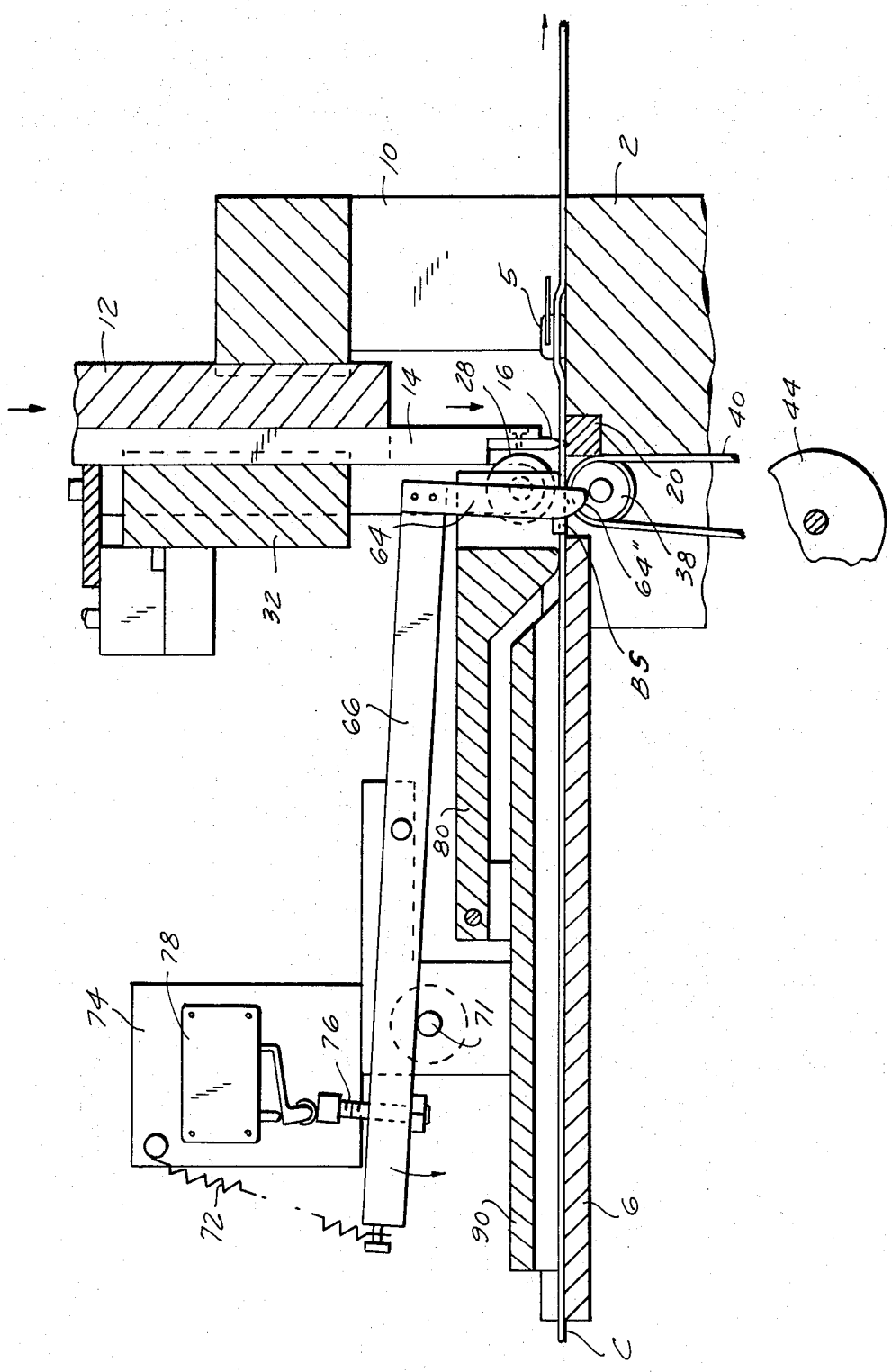



FIG. 8

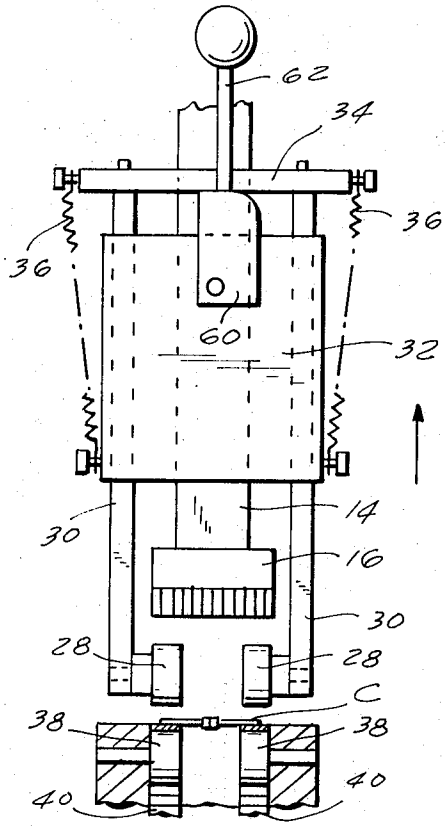

62
34
36
36
60
32
14
30
16
30
28
28
C
38
38
40
40

FIG. 9

FIG. 10

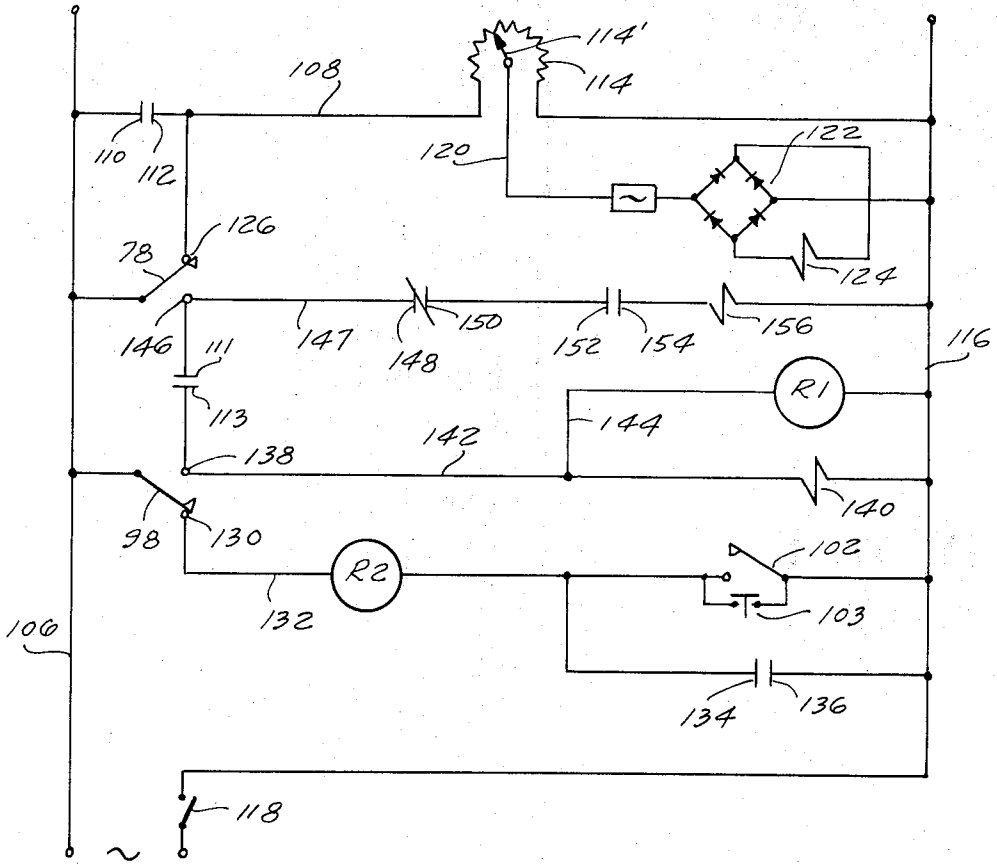

114'
114
108
110
112
120
122
124
126
78
146
147
148
150
152
154
156
111
113
116
R1
144
142
138
140
98
130
R2
102
103
132
106
134
136
118

FIG. 11

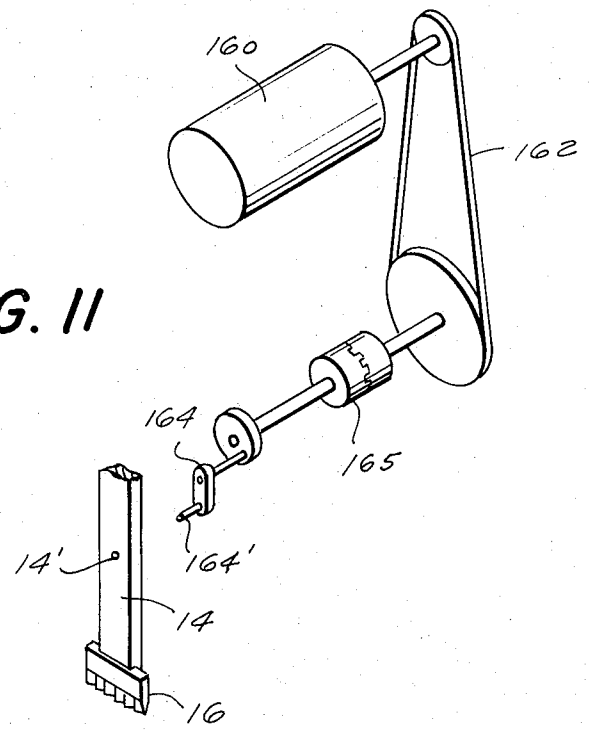
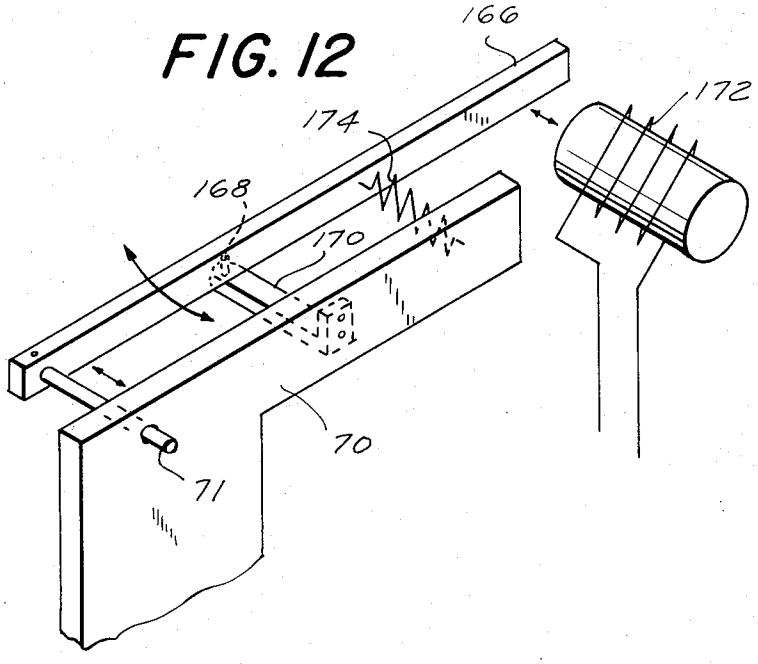



FIG. 12



# APPARATUS FOR CUTTING CONTINUOUS SLIDE FASTENER CHAINS INTO SLIDE FASTENERS OF PREDETERMINED LENGTH

## BACKGROUND OF THE INVENTION

In producing slide fasteners it is known in the art to produce first a more or less continuous chain comprising a pair of stringers or tapes to the inner edges of which coupling elements are attached which are engaged with each other and in which successive portions of the two stringers which are provided with interengaged coupling elements are separated by portions of the stringers free of coupling elements so as to form between the inner edges of the two stringers elongated gaps of predetermined length. At one end of each gap the two stringers are connected to each other by a bottom stop for the slider cooperating with the coupling elements in a known manner to disengage the same when the slider is moved toward the bottom stop and to reengage the coupling elements when the slider is moved in the opposite direction. From this continuous chain, individual slide fasteners are produced by cutting the chain transversely in the region of each longitidinal gap. Such cutting is preferably produced by a pinking blade so as to prevent fraying of the tapes at the cut ends thereof. Before cutting the chain into individual fasteners, a plurality of sliders may also be applied to the chain and top stops may be applied to the stringers at the end of each gap opposite to the end to which the bottom stop is fastened.

In this way individual slide fasteners are produced from a continouus chain in which the individual slide fasteners have opposite ends free of coupling elements, which facilitates attaching, for instance by sewing, the individual slide fasteners to a garment or the like.

To carry out the aforementioned process in a fully automatic manner and at high speed, is, however, connected with considerable difficulties.

Apparatus is known in the art in which a stop finger is arranged to automatically move, during feeding of the chain in longitudinal direction, into each of the successive gaps so that the bottom stop at the end of each gap will engage the finger to thereby stop further movement of the chain and to initiate subsequently thereto actuation of the cutting blade or blades to cut the continuous slide fastener chain in transverse direction substantially midway in each gap. Depending on the desired length of the portions free of coupling elements at the ends of the finished slide fastener, the length of the gaps in the chain is relatively short, that is in the order of 1 to 1-½ inches. The chain is usually fed in longitudinal direction by roller means engaging the upper and the lower faces of the chain, respectively, the two stringers and, in order to avoid buckling of the chain at the moment a finger moving in the gap engages the bottom stop, the roller means have to be arranged in such a position so as to pull the bottom stop against the stop finger. Since the distance between a bottom stop stopped by the stop finger and the reciprocating cutting blade is for the abovementioned reason a relatively short one, in apparatus according to the prior art two pairs of roller means for feeding the chain are provided in which one pair is arranged downstream, as considered in the feeding direction, of the cutting blade, and a second pair upstream of the stop finger. In such a construction it is evidently necessary to maintain the circumferential speeds of the two pairs of feeding rollers exactly alike, and to stop both of them exactly at the same time at which the stop finger engages a bottom stop or preferably to stop the upstream feeding rollers a short instant before the downstream feeding rollers are stopped so as to positively prevent buckling of the tapes between the two pairs of feeding rollers, which wpuld deterimentally affect proper cutting of the tapes. This necessarily leads to a complicated construction which has to be maintained in perfect order to assure trouble-free working of the apparatus. Difficulties arise also in such an apparatus if the wear of the upstream feeding rollers should differ from the wear of the downstream feeding rollers, since in this case even if the pairs of feeding rollers are driven with the same speed, the circumferential speed of the feeding rollers will change and lead to difficulties.



## SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus of the aforementioned kind which is simpler in construction than apparatus known in the art so that the apparatus of the present invention may be built at considerably smaller cost than apparatus known in the art and stand up also under extended use better than known apparatus.

Broadly, the present invention relates to an apparatus for producing individual slide fasteners from a continuous slide fastener chain having two stringers the inner edges of which are provided along first portions of the chain with interengaged coupling elements and having second portions alternating with the first portions and being free of coupling elements to define gaps between the inner edges of the second portions, in which the two stringers are connected to each other at one end of each gap by a bottom stop, and in which the two stringers of the chain are cut transversely in the region of each gap.

According to the invention and in order to accomplish the above objects, the apparatus comprises mainly support means, cutting means on the support means and including a blade movable between a rest position and a cutting position, moving means for moving the blade between the aforementioned positions, feeding means mounted on the support means for moving the chain in longitudinal direction, in which this feeding means is arranged adjacent the blade and upstream of the latter, as considered in the direction of movement of the chain, a stop finger mounted on the support means movable between an inactive position in which an end of the finger rides on the engaging coupling elements on the first stringer portions and a stopping position in which the end of the finger has moved into a gap formed between the inner edges of the second stringer portions to thereby engage with a curved front edge thereof a bottom stop at the end of the respective gap. The stop finger is arranged with respect to the feeding means so that the latter pulls the respective bottom stop against the curved front edge of the finger so that the latter tends to move back to its inactive position. To prevent this moving back of the stop finger, under the pull imparted to the chain, locking means are provided which are mounted on the support means movable between an inactive position and a locking position to cooperate in the latter position with the stop finger to maintain the stop finger, after its end has moved into a gap, in the stopping position. The apparatus includes further control means cooperating with the feeding

means, the locking means and the moving means for stopping operation of the feeding means after the end of the stop finger has moved into a gap and engages the bottom stop at the end of this gap, while the locking means is in its locking position, for then moving the cutting blade from its rest to its cutting position and back to its rest position to thereby cut the chain in transverse direction and thereafter moving the locking means to its inactive position and simultaneously restarting the feeding means so that the curved edge of the stop finger will cause the latter to move to its inactive position due to the camming action imparted to the curved edge by the bottom stop, whereafter the cycle is repeated.

The stop finger preferably projects downwardly from one end of a double armed lever which in turn is pivotally mounted intermediate its ends and the locking means preferably comprise a pin adapted to engage a lower edge of this lever on the side of its pivot axis which is distant from the one end at which the finger is mounted.

The feeding means preferably comprise a first pair of transversely spaced rotatable means and a second pair of transversely spaced rotatable means arranged to engage the stringers of the chain at opposite faces laterally of the interengaged coupling elements, and one of the pairs of transversely spaced rotatable means are driven. The end of the stop finger is arranged in the inactive position between the other pair of rotatable means and in the stopping position between the one pair of rotatable means. The first pair of rotatable means preferably comprises a pair of transversely spaced rollers, adapted to engage upper faces of the two stringers, whereas the second pair of rotatable means preferably comprise a pair of transversely spaced rollers and a pair of endless belts respectively extending in elongated loops over part of the circumference of the rollers of the second pair so as to engage the stringers at the lower faces thereof, and these belts are driven by drive means located distant from the second pair of rollers. The first pair of rollers are biased by springs toward the second pair of rollers and manually ooperable means are provided for moving this first pair of rollers against the force of the springs away from the second pair so that at the start of the operation, the leading end of the chain may be threaded between the two pairs of rollers.

The locking pin may be moved between its inactive and its locking position by pneumatic cylinder and piston means controlled by the aforementioned control means, but other means may also be provided to move the locking means, for instance, the locking pin may be moved by magnet means or solenoid means likewise controlled by the aforementioned control means.

The cutting blade may be moved between its rest and its cutting position likewise by pneumatic cylinder and piston means or from an electric motor over a crank drive whereby a single revolution clutch is provided between the motor and the crank, and the aforementioned cylinder and piston means or the one revolution clutch may be controlled by the aforementioned control means.

As mentioned before, the continuous slide fastener chain to be cut in the apparatus of the present invention into individual slide fasteners, may not only be provided with bottom stops at the end of each gap, but also with sliders applied to each of the first chain portions, that is the portions of the chain at which the two stringers are provided at the inner edges thereof with engaged coupling elements, and top stops may be formed at the end of each gap which is opposite from the end to which the bottom stop is applied. The aforementioned elements may be applied to the chain in an automatic manner by apparatus known in the art and it can happen that one or the other chain portion between successive gaps is not provided with the necessary slider. A slide fastener not provided with a slider cut from such a chain is evidently defective and in order to eliminate such a defective slide fastener from the slide fasteners cut in rapid succession from the chain, the control means of the apparatus according to the present invention preferably include also sensing means for sensing the presence or absence of a slider on each first chain portions and for stopping the machine if the aforementioned sensing means senses the absence of a slider so that the defective slide fastener may be eliminated from the other slid fasteners produced.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an overall side view of the apparatus;

FIG. 2 is a cross-section taken along line II—II of FIG. 1;

FIG. 3 is a cross-section taken along the line III—III of FIG. 1;

FIG. 4 is a cross-section taken along the line IV—IV of FIG. 1;

FIG. 5 is a top view of part of a continuous chain to be cut into individual slide fasteners;

FIGS. 6–8 are longitudinal cross-sections through the apparatus showing successive positions of the stop finger and the cutting blade;

FIG. 9 is a partial cross-section similar to that shown in FIG. 2, and showing the upper rollers of the feeding means in raised position;

FIG. 10 is a wiring diagram of the control means;

FIG. 11 is a schematic perspective view showing a modification of the moving means for moving the cutting blade between the positions thereof; and

FIG. 12 is a schematic perspective view showing a modification of the means for moving the locking pin.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing and more specifically to FIG. 1 of the same it will be seen that the apparatus of the invention comprises support means including a pair of blocks 2 and 4 connected to each other in any convenient manner and a base or guide member 6 projecting in lateral direction to the left, as viewed in FIG. 1, from the block 4 and connected thereto by screws or the like. The upper faces of the blocks 2 and 4 and the bottom face of the longitudinal groove formed in the guide member 6 form together a guide face 8 on which the endless slide fastener chain C to be cut into individual slide fasteners is fed in the manner, as will be described later on, in the direction as indicated by the ar-

rows X. A block **10** projecting upwardly from the block **2** and connected thereto by screws or the like, supports an upright guide member **12** formed in its left face, as viewed in FIG. **1**, with a vertically extending guide groove in which a slide member **14** is guided for reciprocation in vertical direction. The slide member **14** carries in a cutout at its lower end a blade **16** removably connected thereto by screws **18** (FIG. **6**). The blade **16** is preferably a pinking blade, i.e., the front and the rear face of the blade are provided with grooves of substantially traingular configuration so as to form a zig-zag shaped horizontally extending lower cutting edge. Arranged opposite the cutting edge of the pinking blade **16**, is a stationary anvil **20**, formed from hardened steel, and fixed in any convenient manner in an appropriate cutout of the block **2**. For moving the slide member **14** and the pinking blade **16** connected thereto between its upper rest position as shown in FIG. **1**, and a downwardly displaced cutting position in which the cutting edge of the blade **16** cooperates with the stationary anvil **20** to cut the slide fastener chain in transverse direction, a pneumatic cylinder **22** is mounted in stationary position on the upper end of the guide member **12** and the piston rod **24** of the piston, not shown in FIG. **1**, and reciprocably arranged in the cylinder **22**, is connected by yoke **26** to the upper end of the slide member **14**.

The feeding means for feeding the slide fastener chain C in the direction as indicated by the arrows X in FIG. **1**, comprise a first pair of transversely spaced rotatable means constituted by a pair of rollers **28**, which are transversely spaced from each other (FIG. **2**) and which are freely turnable about shafts having outer ends supported respectively in a pair of vertically arranged bars **30**, which are guided for movement in vertical direction in guide grooves provided in a block **32**, which is fixed by screws or the like to the upright guide member **12** in the position as shown in FIG. **1**. As shown in FIG. **2** the block **32** extends over the guide groove formed in the guide member **12**, so that the rear face of the block **32** provides a further guide face for the slide **14**. The upper ends of the bars **30** are connected by a cross bar **34**, and a pair of tension springs **36** are connected, in the manner as shown in FIG. **2**, at opposite ends to opposite ends of the cross bar **34**, respectively the side faces of the block **32**, so that these tension springs will bias the bars **30** and the rollers **28** mounted thereon in downward direction.

The second pair of rotatable means comprise a pair of transversely spaced rollers **38** freely turnable on shafts supported in appropriate bores formed in the block **4**, and a pair of belts **40** which respectively extend over part of the peripheries of the roller **38**, while the lower portions of the belts extend about a pair of driven pulleys **42** keyed to a shaft **46** supported in a bearing block **50**, which in turn is connected by a plate **52** to the block **4**. The shaft **46** is connected by an electromagnet clutch **44**, schematically indicated in FIG. **1**, to a large diameter pulley **48**, coaxially mounted with the shaft **46** on the bearing block **50** and driven through a belt **54** from a pulley **56** on the output shaft of a drive motor **58** mounted on the bottom face of the block **2**. The belts **40** are preferably so called "timing belts," that is belts which are provided at the inner faces thereof which engage the rollers **38** and the pulleys **42**, with cross ribs spaced in longitudinal direction of the belts from each other and the rollers **38** and as well as the pulleys **32** are preferably provided with corresponding grooves in which the aforementioned cross ribs can engage so as to avoid any slip between the belts, the rollers **38** and the pulleys **42**. The diameters of the rollers **28** and **38** must be held small in the apparatus according to the present invention for reasons which will be explained later on and the diameter of these rollers is preferably about ⅝ inch and at most ¾ inch. Since the fastener chain C has to be fed in longitudinal direction at high speed to assure a great output of the apparatus, the rollers **38** have to be rotated at high speed which would lead with the small diameters of these rollers to a rapid wear of the same. In order to avoid such rapid wear of the high speed rotating rollers, the rollers do not engage the bottom faces of the two stringers of the slide fastener chain, but the bottom faces of the two stringers are engaged by the outer surfaces of the timing belts which have each a considerable length so that any wear resulting from engagement of the belts with the bottom faces of the two stringers is distributed over the whole considerable length of the belts **40**. The belts, which are formed from rubber or the like provide also for a better grip on the bottom faces of the stringers of the slide fastener chain, than could be provided by the metallic circumference of the rollers **38**.

To move the upper rollers **28** against the force of the biasing springs **36** in upward direction to facilitate at the start of the operation of the apparatus threading of the chain beneath the rollers **28**, a cam **60** is pivotally connected to the block **32**, as shown in FIG. **2**, and a manually operable handle **62** fixed to the cam **16** projects laterally therefrom to be movable from the position as shown in FIG. **2**, to the position shown in FIG. **9**, thereby lifting the transverse bar **34** and the vertical bars **30** connected thereto in upward direction so as to raise the rollers **28** from the position shown in FIG. **2** to that shown in FIG. **9**.

To stop the slide fastener chain C fed by the feeding means in longitudinal direction at a position in which the cutting blade **16** is arranged substantially midway of a gap provided in the slide fastener chain, a stop finger **64** is provided fixed to and projecting downwardly from one end of a double armed lever **66** which is pivotally mounted intermediate its ends on a pivot pin **68** projecting laterally from a support block **70**. The lower end portion **64'** (FIG. **6**) of the finger **64** extends through the space between the transversely spaced rollers **28** and is adapted to ride on the engaged coupling elements C' (FIG. **5**) as long as such coupling elements are located beneath the lower end of the finger **64** and to drop into a gap G beneath the inner edges of the two stringers forming the slide fastener chain when such a gap arrives during feeding of the chain beneath the finger.

The arm **66** is biased in clockwise direction by a tension spring **72** connected at one end to the left end of the arm **66**, as viewed in FIG. **1**, and on the other end to a bracket **74** connected to and projecting upwardly from the block **70**. The arm **66** carries imtermediate the pivot pin **68** and its left end an adjustable upwardly projecting set screw **76** adapted to cooperate with a microswitch **78** mounted on the bracket **74**.

The apparatus includes further an elongated guide member **80** arranged beneath the arm **66** and pivotally mounted at the left end thereof, as viewed in FIGS. **1** and **6**, on a pivot pin **82** projecting laterally from a

block 83 mounted on the base 6. The right end of the elongated guide member 80 extends downwardly and its lower end 80' is adapted to ride on the tapes of the slide fastener chain to press the latter against the base. The right end of the arm is formed with a vertical slot 84 therethrough, through which the stop finger 64 extends as best shown in FIGS. 2 and 6. The block 70 on which the arm 66 is pivotally mounted is dovetailed at its lower end in a correspondingly formed slot in the base 6 so as to be movable in the longitudinal direction of the latter. The position of the block 70 in the direction of movement of the slide fastener chain may be adjusted by means of an adjusting screw 86 (FIG. 6) turnably but axially immovably connected at one end to the block 70 and being threadingly connected distant from its connected end in a threaded bore of a member 88 fixed to and projecting upwardly from the base, 6, so that by turning the screw 86 about its axis, the block 70 may be shifted in axial direction to thereby adjust the position of the stop finger 64, with regard to the cutting blade 16.

To maintain the slide fastener chain upstream of the feeding means in taut condition, an elongated floating weight 90 is arranged above the base 6 and beneath the guide member 80 to engage with a bottom face thereof the upper faces of the two stringers forming the chain, as best shown in FIG. 4. The floating weight 90 is provided at its bottom with a central groove 92, for the passage of the coupling elements C' and any slider S provided on the chain. Movement of the floating weight in longitudinal direction during feeding of the slide fastener chain is prevented by a cross pin 94 connected to the floating weight, and adapted to engage an upright pin 96 connected to the base 6.

A second microswitch 98 (FIG. 2) is mounted on the upright guide member 12 and cooperates, during reciprocation of the slide 14 and the pinking blade 16 connected to the lower end thereof, with a pin 100.

To temporarily maintain the arm 66 in the clockwise tilted position in which the lower end portion 62' of the stop finger 64 is moved into gap G of the chain, until the blade 16 has cut the slide fastener chain in transverse direction, locking means are provided to temporarily lock the arm 66 in the tilted position. These locking means comprise, in the embodiment disclosed, a locking pin 71, which is slidably mounted in a transverse bore through the block 70 between a withdrawn inactive position as shown in FIG. 3 in which the end of the stop pin 71 is located laterally of the arm 66, and an advanced locking position in which the stop pin 71 engages a bottom face of the arm 66 as for instance shown in FIG. 8. Movement of the locking pin 72 between the positions thereof, is enacted by a pneumatic cylinder and piston means 73, the moving piston thereof, not shown in the drawing, is connected to the pin 71 for moving the same in longitudinal direction between the two positions thereof.

Preferably, an additional microswitch 102 (FIG. 6) is provided connected for instance to the block 32 and cooperating with an additional set screw 104 mounted on the arm 66 between the pivot pin 68 and the stop finger 64.

The wiring diagram for the control means for controlling the operation of the movable elements of the apparatus in proper time sequence is illustrated in FIG. 10. As shown in FIG. 10, a conductor 106 is connected at one end to one pole of a current supply and at the other end to a conductor 108 in which the normally open contacts 110 and 112 of a first relay R1 are located as well as a variable resistor 114. The other end of the conductor 108 is connected to a third conductor 116 which leads over a toggle switch 118 back to the other pole of the current supply. The movable arm 114' of the adjustable resistor is connected to a conductor 120 connected to one end of a rectifier 122, the other end of which is connected to the conductor 116. Connected to the rectifier 122 is the solenoid coil 124 of the magnetic clutch 44 so that when the coil 124 is energized, the magnetic clutch will be engaged so that the pulleys 44 will be driven from the motor 56 to thereby drive the belts 40 extending over the lower rollers 38 to thus feed the slide fastener chain in longitudinal direction. The microswitch 78 is a single-pole, double-throw switch, the movable contact thereof is connected to the conductor 106 and at the start of operation of the machine at which the lower end of the stop finger 64 extends into one of the gaps G of the chain, the microswitch 78 is in the position as shown in FIG. 10 in which its movable contact engages the stationary contact 126. A conductor 128 is connected at one end to the contact 126 of the microswitch 78 and at the other end to the conductor 108, between the contact 122 and the adjustable resistor 14. The microswitch 98, cooperating with the reciprocating slide 14, is likewise a single-pole, double-throw switch, which, when the slide at the start of the operation is in its upper rest position, is located in the position as shown in FIG. 10, in which the movable contact of the microswitch 98 engages the stationary contact 130. A conductor 132 is connected at one end to the contact 130 and at the other end to the conductor 116. The relay coil of a second relay R2 is arranged in the conductor 132, and the microswitch 102 is arranged between the relay coil R2 and the end of the conductor 130 which is connected to the conductor 116. A pair of normally open contacts 134 and 136 connected to the relay R2 to be closed upon energization of the latter are connected in parallel to the microswitch 102. The coil 140 of a solenoid valve $V_1$ for operation of the pneumatic cylinder and piston means 73 connected to the stop pin 71, is connected by a conductor 142 to the other contact 138 of the microswitch 98, and to the conductor 116. A conductor 144 connects the relay coil of a realy R1 in parallel to the coil 140 of the aforementioned solenoid valve. The normally closed contacts 148 and 150 of the relay R1, the normally open contacts 152 and 154 of the relay R2, and the coil 156 for a solenoid valve $V_2$ for operating the pneumatic cylinder and piston means 22 connected to the slide 14 carrying the cutting blade 16, are connected in series with each other by a conductor 147, one end of which is connected to the other stationary contact 146 of the microswitch 78 and the other end of which is connected to the conductor 116.

The apparatus as described above will operate as follows:

At the start of the operation the lever 62 is turned to the position as shown in FIG. 9, so that the upper rollers 28 are lifted and the leading end of the slide fastener chain C is threaded by hand, beneath the lifted upper rollers. The cam connected to the lever 62 is then turned in opposite direction back to the position shown in FIG. 2, so that the springs 36 will move the rollers 28 downwardly to engage the upper faces of the two stringers of the slide fastener chain and to press the

lower faces against the belts **40.** The chain is pulled by hand until the lower end of the stop finger **64** dorps into one of the gaps G of the chain, and assumes the position as shown in FIG. **7,** while the locking pin **71** is in its locking position projecting with a portion thereof beyond the lower edge of the arm **66** carrying the stop finger **64.** At the start of the operation, the slide **14** carrying the cutting blade **16** is in its upper position, as likewise shown in FIG. **7.** In this position of the stop finger **64** and blade **16,** the microswitches **78** and **98** are in the position as shown in the wiring diagram of FIG. **10,** that is the microswitch **78** engages with its movable contact the stationary contact **126** and the microswitch **98** engages with its movable contact the stationary contact **130.** The motor **56** is then started and the toggle switch **118** closed so that current will flow through the microswitch **78,** the conductors **128, 108** the movable arm **114'** of the adjustable resistor through the conductor **120,** and the rectifying means **122,** through the coil **124** of the magnetic clutch **44** so that the latter will be engaged, the belts **40** are driven and the fastener chain C is moved in the longitudinal direction as indicated by the arrow X in FIG. **7.** The microswitch **102** is normally in the open position as shown in FIG. **10,** and it is moved to its closed position only if the lower end of the stop finger **64** rides over a slider **5** on the chain. To energize the relay coil **R2** at the s start of the operation, a switch **103** bridging the microswitch **102** is momentarily closed by hand, thus energizing the relay coil **R2** which closes, when energized, the normally open contacts **134, 136** and **152, 154.**

When during feeding of the chain in longitudinal direction a bottom stop at the end of the gap, into which the stop finger extends, engages the curved portion **64''** of the front edge of the stop finger **64,** the latter is moved by camming action in upward direction to the position as shown in FIG. **8,** so that the arm **66** carrying the stop finger is slightly tilted in counterclockwise direction from the position shown in FIG. **7,** to the position shown in FIG. **8,** in which the lower edge of the arm **66** engages the locking pin **71.** In this position of the arm **66,** the set screw **76** thereon will cooperate with the microswitch **78,** to move the latter from the position shown in FIG. **10** to a position in which the movable contact thereof engages the contact **146.** This interrupts flow of current to the coil **124** of the magnetic clutch **144,** so that the latter becomes disengaged and so that further feeding of the chain in longitudinal direction is stopped. At the same time, current flows through the microswitch **78** to the conductor **147** the closed contact **148, 150** and the contacts **152, 154** of the relay **R2,** which are now likewise closed due to the energization of relay **R2,** through the coil **156** of the solenoid valve $V_2$ connected to the cylinder **22,** which causes feeding of compressed air in the upper end of the cylinder so that the slide **14** carrying the cutting blade **16** moves in downward direction and cooperates with the anvil **20,** to cut the chain in transverse direction substantially midway of the gap. When the cutting blade **16** reaches its lowermost position, as shown in FIG. **8,** the pin **100** projecting laterally from the yoke **26** on the upper end of the slide **14** cooperates with the microswitch **98,** to move the latter from the position as shown in FIG. **10,** to the position in which the movable contact of the microswitch **98** contacts the stationary contact **138.** In this position of the microswitch **98,** the coil of the relay **R2** is deenergized so that the contacts **142, 136** as well as the contacts **152, 154** connected to the relay **R2,** move again to the open position, as shown in FIG. **10.** Opening of the contacts **152** and **154,** will cause deenergization of the coil **156** of the solenoid valve $V_2$ for the cylinder **2** so that the valve will move to a position in which compressed air is fed to the lower end of the cylinder and the cutting blade **16** moves therefore bakc to its upper position. At the same time, the coil **140** of the solenoid valve $V_1$ connected to the cylinder **73** is energized moving the solenoid valve $V_1$ for the cylinder **73** to a position in which compressed air is fed to the front end of the cylinder causing thereby retraction of the pin **71** to its inactive position. At the same time, the coil of the relay **R1** is also energized which causes closing of the normally open contacts **110, 112** and **111, 113** connected to the relay **R1,** and opening of the normally closed contacts **148, 150** of this relay. Since the contacts **110** and **112** are closed, the coil **124** of the magnetic clutch **44** is reenergized so that the continouus chain is again moved in longitudinal direction and since the locking pin **31** is withdrawn to its inactive position, the finger **64** will ride up on the bottom stop and ride during continuous movement of the chain on the coupling elements connecting the two stringers thereof as shown in FIG. **6.**

When the cutting blade **16** moves to its upper position, the microswitch **98** will move to the position as shown in FIG. **10,** however, the microswich **78** will still remain in the position in which its movable contact engages the stationary contact **146,** so that the realy coil **R1** will remain energized and the contacts **110, 112** and **111, 113** will remain respectively in engaged position, so that the coil **124** of the magnetic clutch **44** will remain energized and feeding of the chain in longitudinal direction will continue so that the stop finger will drop into the next gap of the chain to the position as shown in FIG. **1,** causing the microswitch **78** to move to the position shown in FIG. **10,** thus deenergizing **R1** and coil **140** of the solenoid valve for cylinder **73** to thereby move the locking pin **71** to the locking position, while current will flow through coil **124** of the magnetic clutch **44,** whereafter the cycle is repeated.

As mentioned before, the microswitch **102** is monentarily closed whenever the lower end of the stop finger **64** rides over a slider on the chain which causes after the initial start of the operation energization of the relay **R2.** If, however, a slider should be accidentally omitted from a portion of the chain between adjacent gaps, **R2** will not be reenergized and the contacts **134, 136** and **152,** will stay open so that the apparatus will be automatically stopped, the operator can remove the cut fastener in which the necessasry slider is missing by hand, and subsequently restart the machine in the manner as described above.

For removing the cut slide fastener from the apparatus an endless transporting belt, not shown in the drawing, may be provided, or the upper face of the block **2** downstream of the anvil **20** may be inclined and connected to a downwardly extending chute so that the cut slide fasteners will move by gravity away from the cutting blade **16.**

Instead of reciprocating the slide **14** and the cutting blade **16** carried at the lower end thereof, by cylinder and piston means controlled by a solenoid valve, in the manner as described above, it is also possible to reciprocate the slide **14** and the cutting blade **16** carried thereby by crank means **164,** schematically shown in

FIG. 11, in which the crank pin 164' engages in a bore 14' of the slide 14 and in which the crank means 164 are driven over a one revolution clutch 165 through a belt drive 162 from a motor 160 mounted at appropriate location on the support means of the apparatus. In this case, the coil 156 controlling the solenoid valve for the cylinder 22, is replaced by a coil connected to the clutch 165 to cause engagement and disengagement of the latter in a known manner.

Likewise it is possible to move the locking pin 71 by other means than described above, between its active locking position and its withdrawn inactive position, and such a modification is schematically illustrated in FIG. 12. As shown in this Figure, the locking pin is connected at its rear end thereof to a double armed lever 166, mounted for pivotal movement intermediate its ends on a pivot pin 168 projecting upwardly from a bracket 170 connected to the member 70. A compression spring 174 connected at opposite ends to the member 70 and the lever 166, in a position as shown in FIG. 12, normally holds the pin 71 in its locking position and an electromagnet 172 cooperates with the other end of the lever 166 to move the latter to its unlocking position when the coil of the electromagnet 172 is energized. In this case, the coil 140 shown in FIG. 10 is used not to control the solenoid valve connected to the operating cylinder of the locking pin 71, but a corresponding coil is used for energizing the electromagnet 172.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of apparatus for cutting individual slide fasteners from a continuous slide fastener chain differing from the types described above.

While the invention has been illustrated and described as embodied in an apparatus for cutting individual slide fasteners from a continuous slide fastener chain, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, farily constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. An apparatus for cutting individual slide fasteners from a continouus slide fastener chain having two stringers the inner edges of which are provided along first portions of the chain with interengaged coupling elements and having second portions alternating with said first portions and being free of coupling elements to define a gap between the inner edges of said second portions and in which the two stringers are connected to each other at one end of each gap by a bottom stop, and in which the two stringers of the chain are cut transversely in the region of each gap, said apparatus comprising support means, cutting means on the support means and including a cutting blade movable between a rest position and a cutting position; moving means for moving said blade between said positions thereof; feeding means mounted on said support means for moving the chain in longitudinal direction, said feeding means being arranged adjacent said blade and upstream of the latter, as considered in the direction of movement of the chain; a stop finger movable between an inactive position in which an end of said finger rides on the engaged coupling elements of the first finger portions and a stopping position in which said end has moved into a gap formed between the inner edges of the second stringer portions to thereby engage with a curved front edge thereof a bottom stop at the end of the respective gap, said stop finger being arranged with respect to said feeding means so that the latter engage the stringers downstream of said front edge of said stop finger to pull the respective bottom stop against said curved front edge of said finger so that the latter tends to move back to its inactive position; locking means mounted on said support means movable between an inactive position and a locking position and cooperating in said locking position with said stop finger to prevent the latter after its end has moved into said gap to move to its inactive position; and control means cooperating with said feeding means, said locking means and said moving means for stopping operation of said feeding means when said end of said stop finger after having moved into a gap engages the bottom stop at the end of the stop while said locking means is in said locking position, for then moving said blade from its rest to its active position and back to its rest position and thereafter moving said locking means to its inactive position and simultaneously restarting said drive means so that said curved edge on said stop finger will cause the latter to move to its inactive position, due to the camming action imparted to said curved dege of said stop finger by the bottom stop pulled thereagainst.

2. An apparatus as defined in claim 1, and including a support lever tiltably mounted on said support means and carrying at one end thereof said stop finger extending downwardly from said one end, and biasing means connected to the other end of said lever tending to tilt the latter in a direction in which the stop finger is moved into a gap.

3. An apparatus as defined in claim 2, wherein said lever is a double armed lever pivoted about a pivot axis intermediate its ends and having an upper and a lower edge, said locking means comprising a pin adapted to engage said lower edge of said lever, on the side of the pivot axis which is distant from said one end after said finger connected to said one end has dropped into a gap.

4. An apparatus as defined in claim 1, wherein said feeding means comprise a first pair of transversely spaced rotatable means and a second pair of transversely spaced rotatable means arranged to engage the stringers of the chain at opposite faces laterally of the engaged coupling elements, one of said pairs of transversely spaced rotatable means being driven, said end of said stop finger being arranged in the inactive position thereof between the other pair of rotatable means and in the stopping position of said finger between said one pair of rotatable means.

5. An apparatus as defined in claim 4, wherein said first pair of rotatable means comprises a pair of transversely spaced rollers adapted to engage upper faces of the stringers, and wherein said second ppair of rotatable means comprises a pair of transversely spaced rollers and a pair of belts respectively extending in elon-

gated loops partly about said second pair of rollers, and engaging the stringers on the lower faces thereof, and including drive means for driving said belts, and biasing means urging said first pair of rollers towards said second pair.

**6.** An apparatus as defined in claim **5**, and including manually operable means for moving said first pair of rollers away from said second pair against the force of said biasing means.

**7.** Apparatus as defined in claim **5**, wherein the diameter of each of said second pair of rollers is at most ¾th of an inch, preferably ⅝th of an inch.

**8.** Apparatus as defined in claim **2**, and including means cooperating with said support lever and the stop finger carried thereby to adjust the position of the stop finger in feeding direction of the chain relative to the blade so that the distance between the transverse cut through the chain, produced by the blade, from the bottom stop at the end of each gap may be adjusted.

**9.** Apparatus as defined in claim **2**, and including a guide lever located beneath said support lever and extending substantially parallel thereto, said guide lever being pivoted at one end and having at the other end a downwardly extending projection adapted to engage the upper faces of said stringers and being formed at said other end with a slot through which said stop finger extends.

**10.** Apparatus as defined in claim **1**, wherein said support means comprises a base, having an upper face along which the chain is movable, and including elongated weight means removably mounted on said base upstream of said feeding means and having a lower face facing said upper face of said base and being adapted to engage the upper faces of the stringers, said weight means being formed with a guide passage therethrough for guiding the slide fastener chain in longitudinal direction.

**11.** Apparatus as defined in claim **1**, wherein said moving means for moving said blade comprises pneumatic cylinder and piston means.

**12.** Apparatus as defined in claim **1**, wherein said moving means for moving said blade comprises motor means and crank means driven by said motor means and connected to said blade.

**13.** Apparatus as defined in claim **1**, wherein said locking means comprises a pin movable between said inactive and said locking position, and means for moving said pin between said positions thereof.

**14.** Apparatus as defined in claim **13**, wherein said means for moving said pin comprises pneumatic piston and cylinder means.

**15.** Apparatus as defined in claim **13**, and including a lever tiltable about an axis substantially normal to that of said pin and carrying said pin at one end thereof, said means for moving said pin between the positions thereof comprises biasing means connected to said lever for biasing the latter in the direction in which said pin is in said locking position and electromagnet means cooperating with the other end of said lever for tilting the latter about said axis to a position in which said pin is in its inactive position.

**16.** Apparatus as defined in claim **1**, wherein said cutting blade is a pinking blade having in a plane normal to the direction of its movement a zig-zag shaped cutting edge.

**17.** Apparatus as defined in claim **2**, wherein said slide fastener chain comprises a pair of top stops on the stringers on the other end of each gap and a slider on each of said first portions of the chain, said stop finger riding over each of said sliders during movement of the chain in longitudinal direction and thus senses the presence or absence of a slider on each of said first chain portions, said control means including means for stopping the apparatus when said stop finger senses the absence of a slider on a first chain portion.

* * * * *