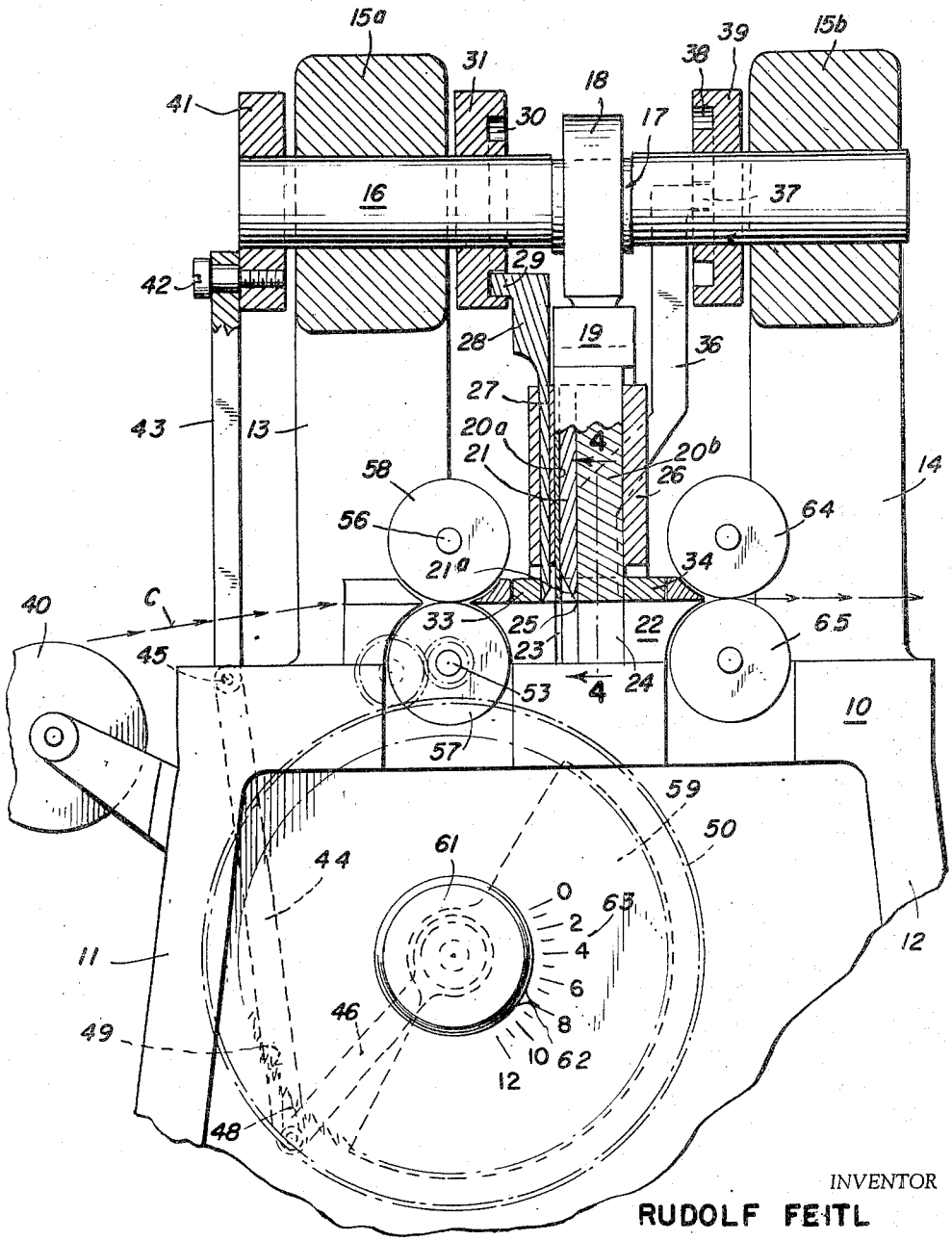
Dec. 24, 1957 R. FEITL 2,817,403

SLIDE FASTENER MANUFACTURE

Filed June 24, 1954 4 Sheets-Sheet 1

FIG. 1



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SLIDE FASTENER MANUFACTURE

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FIG. 2

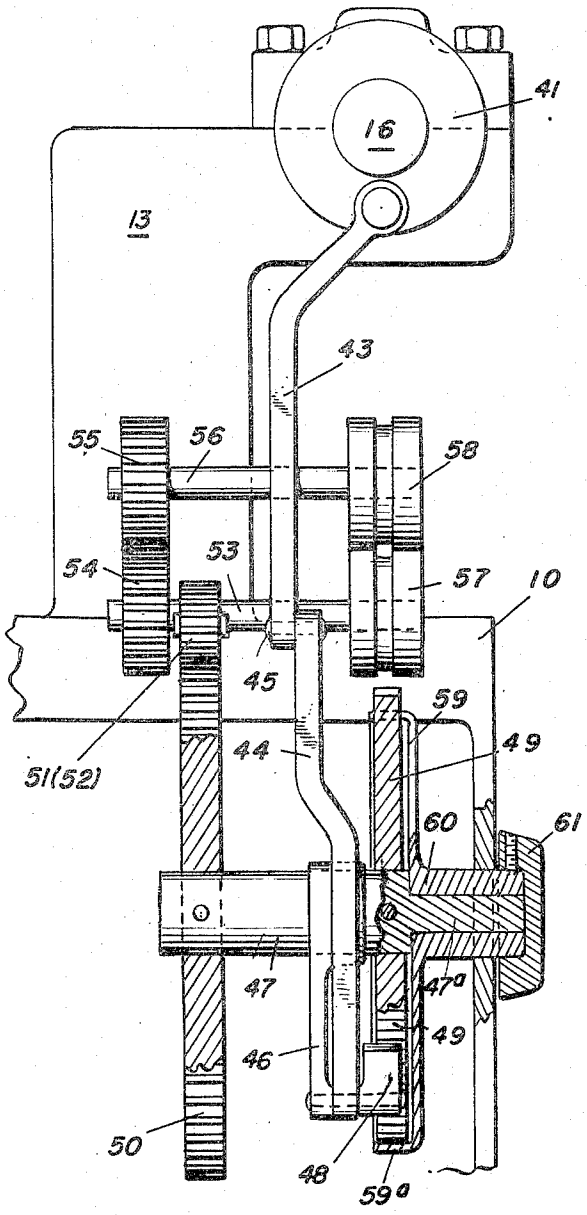


FIG. 3

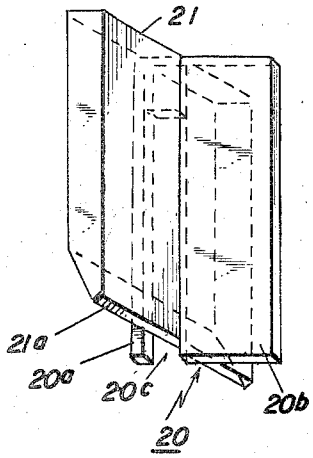
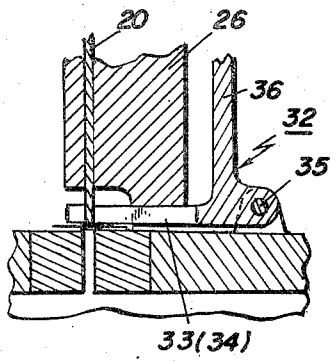


FIG. 4



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SLIDE FASTENER MANUFACTURE

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FIG. 5

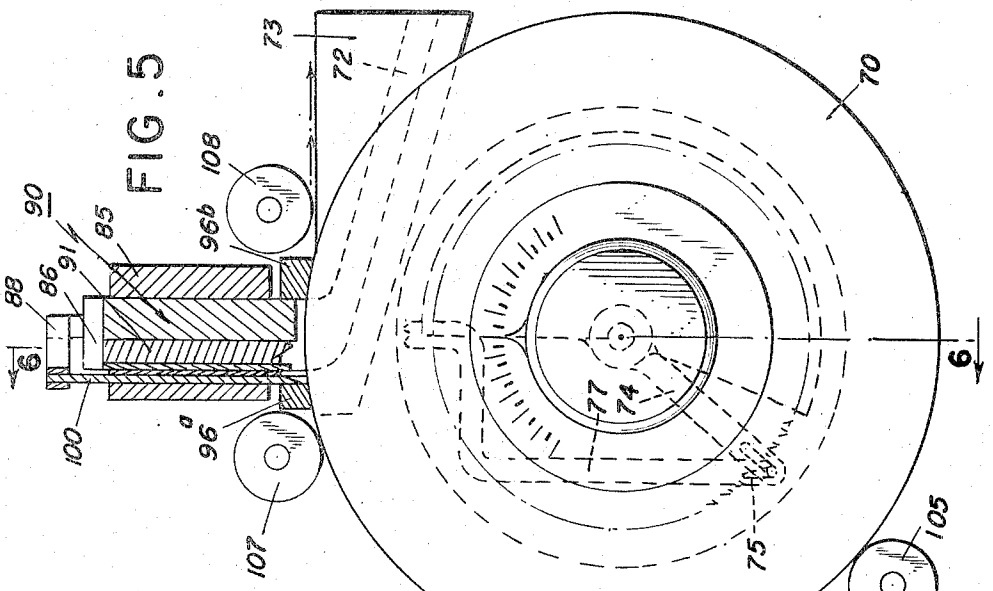
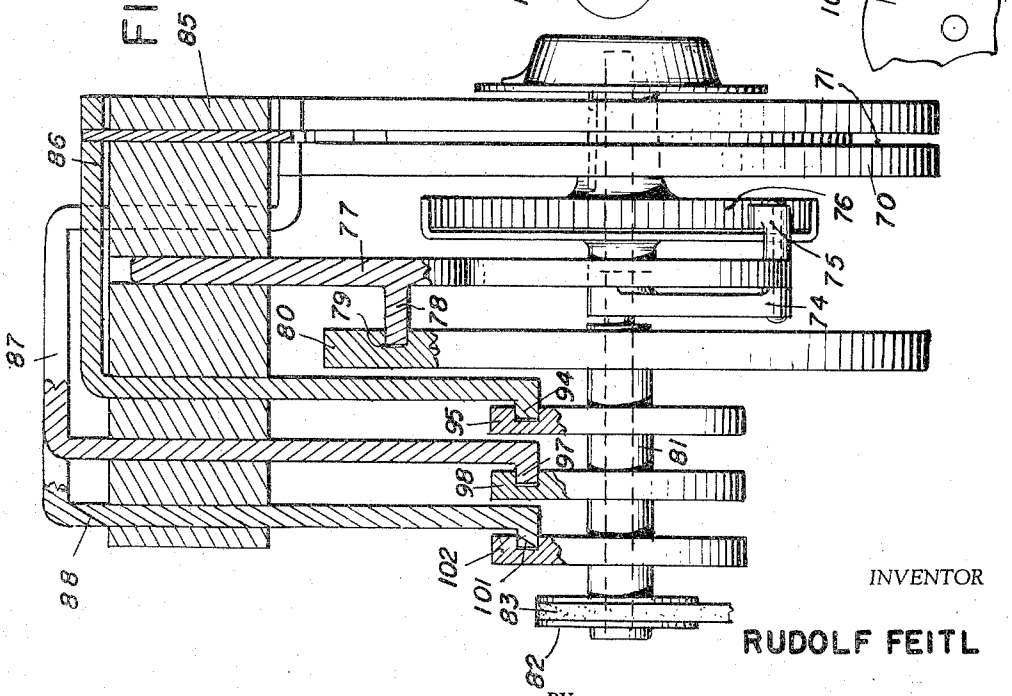


FIG. 6



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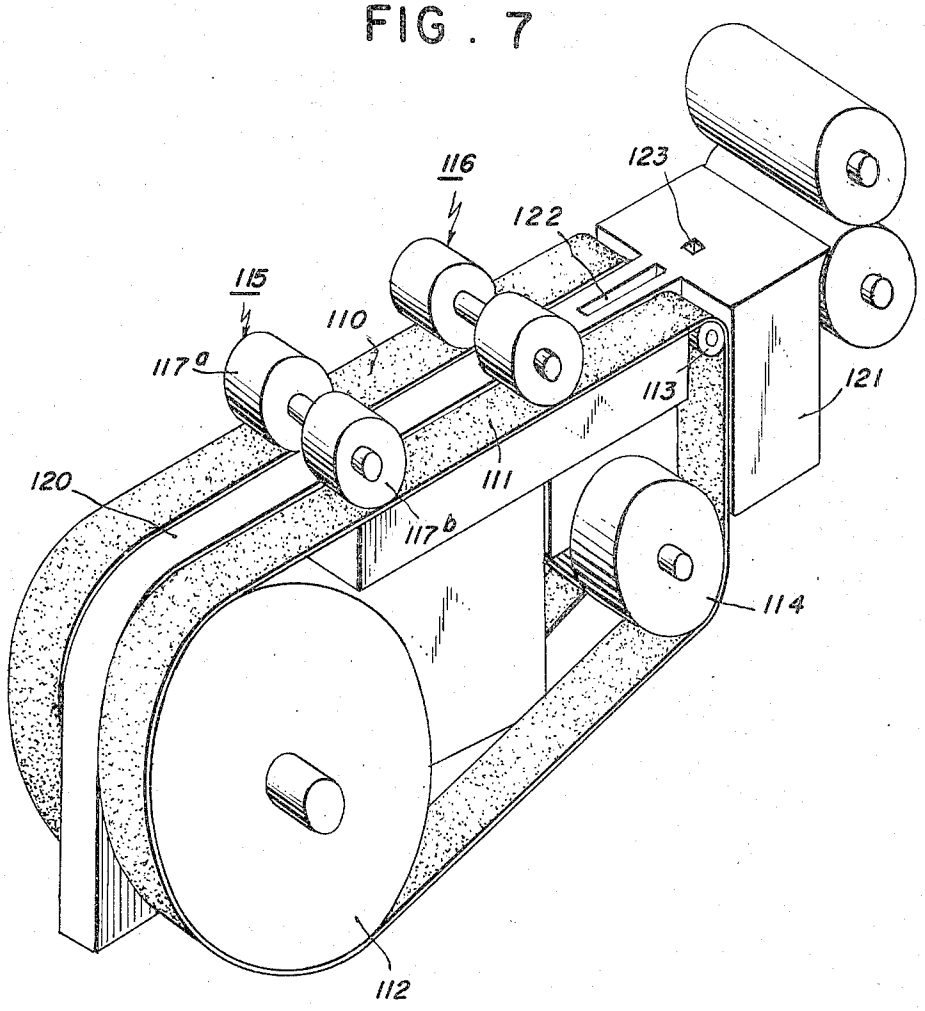
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SLIDE FASTENER MANUFACTURE

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FIG. 7



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2,817,403

SLIDE FASTENER MANUFACTURE

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Application June 24, 1954, Serial No. 439,112

6 Claims. (Cl. 164—49)

This invention relates to improvements in slide fastener manufacture, and more particularly to improved apparatus for the quantity production of measured lengths of individual fastener chain, characterized by element-free spaces or gaps at the ends thereof, from a so-called continuous fastener chain.

According to present practice, measured lengths of slide fastener or zipper chain are produced by severing them in succession, or as needed, from a long length of continuous fastener chain supplied in roll form. Since continuous fastener chain consist of two interengaged fastener tapes carrying uniformly spaced fastener elements continuously throughout the entire length of their adjacent edges, it becomes necessary to remove a small number of the fastener elements at or adjacent the ends of the measured lengths of fastener chain for the numerous applications of such chain requiring element-free extensions at the ends thereof, or an element-free gap adjacent one end, as necessary, for example, to apply end-stops and/or separators and to provide space for a needle to be safely passed through the tapes where such are attached by sewing at their ends.

While it is of course possible manually to remove the fastener elements as required from the measured lengths of fastener chain following their production, such is an extremely slow and tedious operation. Accordingly, apparatus has been devised for this purpose, one such apparatus being disclosed and claimed in Soave application Serial No. 375,437, filed August 20, 1953, now Patent No. 2,752,997, dated July 3, 1956. Although such apparatus have greatly simplified and speeded up the operation of removing the fastener elements as required, they operate on the principle of removing the elements at a location along the length of the fastener chain feeding from the roll, which is spaced from the free end thereof in the direction of said roll a distance equal to or a multiple of the length of the individual fastener chains being produced, and of thereupon severing the measured lengths from the free-end portion of the chain. Thus, in addition to requiring two punches, i. e. an element-removing punch and a fastener chain cut-off or severing punch, which are physically spaced from one another an exact predetermined distance apart, analysis will show that the prior apparatus, for successful operation in respect to accuracy of length of the individual fastener chains being produced, and accuracy in the location of the element-free portions or gaps thereof, require precise synchronism of the spaced punches and an extremely close control of the rate of feed of the fastener chain moving therebetween.

The prior apparatus are also open to the objection that they fail to take into account the need for the element-removing punch hitting a certain number of the fastener elements in the exact manner that all the elements struck will be cut through and removed in their entirety. For example, unless said fastener elements are properly positioned with respect to the path of the punch, it may

happen that the punch will cut through the middle of the endmost element or elements of the group being operated on, with the result that only half of said element or elements is removed, leaving the other half remaining on the tape to serve no useful purpose and possibly to interfere with the required slider or end stop actuation.

With the above in mind, it is a main object of the present invention to provide improved and simplified apparatus for producing measured lengths of individual slide fastener chain having element-free portions at or adjacent the ends thereof from continuous fastener chain.

A further main object of the invention is the provision of apparatus of the stated character which, by combining the element-removing and fastener-chain severing punches into a single operating unit, avoids the requirement of such punches being precisely synchronized in operation, as when they are physically separate and spaced from one another.

Another important object of the invention is the provision of apparatus as stated above, which also incorporates means for insuring that the element-removing punch will invariably hit or strike the elements to be removed in the exact manner as to insure complete removal of the endmost element or elements, as distinguished from cutting through such element or elements so as to leave a portion thereof still attached to the fastener tape.

A still further object of the invention is the provision of apparatus for the quantity production of measured lengths of individual fastener chain having element-free portions or gaps at predetermined locations along the length thereof from continuous fastener chain supplied in roll form, characterized in that the punches for removing the fastener elements and for cutting off successive measured lengths of fastener chain are combined so as to operate in unison, and by a means for feeding the continuous fastener chain intermittently to said punches which is highly positive in its action because of its ability to impart feed motion to the chain tapes at locations physically close to said punches.

Yet another object of the invention is the provision of apparatus particularly adapted to produce from indeterminate lengths of continuous fastener chain individual fastener lengths of such chain having an element-free extension at one end, usually the bottom end of the fastener, and an element-free gap between the elements which is located adjacent the other end of the fastener at a point where the needle passes through the fastener tapes in securing them to a garment waistband, for example.

The above and other objects and advantages of apparatus according to the invention will appear from the following detailed description thereof, reference being had to the accompanying drawings illustrating alternate forms which such apparatus may take, in which:

Fig. 1 is a broken-away, part-sectional front elevational view of one form of apparatus for producing measured lengths of fastener chain, each having an element-free space of extension at one end thereof and a short-length element-free needle gap adjacent its other end, from an indeterminate length of continuous fastener chain supplied in roll form in accordance with the present invention;

Fig. 2 is an end view, partly in section, looking into the left end of Fig. 1 with the roll or drum on which the continuous fastener chain is supplied being removed, the view illustrating the means for drawing off measured lengths of the chain intermittently from the drum;

Fig. 3 is a perspective detail view illustrating the element-removing and fastener chain severing punches combined as an operating unit according to the invention;

Fig. 4 is a section taken along line 4—4 of Fig. 1, illustrating certain details of the presser foot;

Fig. 5 is a front elevation corresponding generally to Fig. 1, but illustrating another form of apparatus according to the invention;

Fig. 6 is a part-sectional view taken along line 6—6 of Fig. 5; and

Fig. 7 is a perspective view of a portion of another modified apparatus according to the invention, which is characterized by a belt-type chain feeding means which actively feeds the chain up to the point at which it is engaged by the fastener-chain severing punch, the view in the interest of clarity omitting the punch assembly and the locating pin and presser foot associated therewith.

Referring to Figs. 1–4, inclusive, illustrating one form of apparatus according to the invention, reference numeral **10** designates a bed or table supported on legs **11**, **12** and supporting forwardly angled standards **13**, **14** (Fig. 2) mounting bearings **15***a*, **15***b* journaling a longitudinally extending main shaft **16** which is continuously driven by power means (not shown). Preferably, the main shaft has a center crank **17** adapted, through connecting rod **18**, to impart reciprocating motion to a ram **19** carrying a punch assembly (Fig. 3) consisting of punches **20**, **21**, of which the punch **20** is longitudinally disposed and the punch **21** is transversely disposed.

While the arrangement of punches may vary, depending on the number and distribution of the element-free spaces desired, the punch arrangement illustrated is that capable of severing from a continuous fastener chain measured lengths of slide fastener or zipper chain, each having a short length element-free gap located adjacent one end, usually the upper end, of the fastener chain and an element-free extension at the other or bottom end thereof, as disclosed in Soave application Serial No. 381,553, filed September 22, 1953, now Patent No. 2,708,968. Accordingly, the element-removing punch **20** comprises a shorter blade **20***a* for removing but the small number of elements necessary to form the short-length gap at the upper end of the fastener chains being produced, and a longer blade **20** for removing the larger number of elements necessary to produce the element-free extension at the bottom end of the next adjacent one of the fastener chains being produced, and said punch blades are moreover spaced from one another a distance **20***c* equaling the length of chain occupied by a small number of fastener elements, i. e. two or three interengaged elements, with the result that a small number of fastener elements are retained on the fastener chains between the short-length gap formed by the action of the punch blade **20***a* and the larger element-free space in advance thereof, as formed by the action of the punch blade **20***b*. The term "element-removing punch" (or punches) as used throughout the specification and claims means a punch or punches of the type capable of cutting away the interengaged coupling heads of the fastener elements struck thereby and hence does not necessarily imply a complete removal of said elements from the fastener-chain tapes as would also involve removal of the clamping-jaw ends of the fastener elements from the tape beads.

The punch arrangement is further such that the aforesaid punch **21** is mounted in the space **20***c* between the blades of the punch **20** and that it is mechanically affixed to said punch **20** and operates in unison therewith. The width of the punch **21** is greater than the width of the fastener chains being produced, and its lower end is tapered and terminates in a cutting edge **21***a*, which is raised slightly from the lower cutting edges of the punch blades **20***a*, **20***b* of the punch **20**.

Mounted to the upper side of the bed **10** and disposed directly below the punch assembly **20**, **21** is a fixed die-block **22**. The top surface of this die block intersects the path of travel of the cutting edges of the punch blades **20***a*, **20***b* and said die-block is accordingly provided with vertical through passages **23**, **24** both to permit said punch blades to enter same to the depth necessary for them to complete their respective strokes, and also to permit the elements removed from the chain tapes to pass to a collecting receptacle mounted, for example, in or to the bed just below the die-block. The aforesaid top surface of the die-block is at the level of the cutting edge **21***a* of the transverse punch **21** when the latter is at the lowermost limit of its stroke, and hence serves as a fixed abutment **25** against which said edge strikes in performing its cutting function.

Assuming that a length of continuous fastener chain feeding across the top surface of the die-block **22** is held stationary thereagainst during the interval that the punch assembly **20**, **21** moves into operative contact therewith, and that the fastener chain is so registered with the longitudinal punch **20** that the interengaged coupling heads of the fastener elements thereof are vertically aligned with said punch, it becomes obvious that, in partaking of its working stroke, said punch assembly effects removal of a small number of the fastener elements located a small distance to the chain-supply side of the line of the cutting edge **21***a* of the transverse punch **21**, simultaneously therewith effects removal of a greater number of the elements starting at said transverse line and extending to the other side of said line, and thereupon severs a length of the chain on a line corresponding to said cutting-edge line. Assuming further that an accurately measured length of chain is fed to the punch assembly in the interval between the working strokes thereof, it also becomes obvious that each actuation of said punch assembly results in the production of a measured length of chain characterized by an element-free extension at its trailing or bottom end, and an element-free gap adjacent its leading or top end (the latter resulting from the next preceding stroke of the punch assembly).

Continuing experience with punch mechanisms for removing small numbers of fastener elements from a continuous fastener chain reveals it to be imperative that the element-removing punch strike the group of elements to be removed in such manner that the endmost element or elements of the group are completely removed, rather than being partially removed only as might occur if the end edge of the punch strikes said element along its middle line, thereby removing but a half of said element and leaving the other disabled half secured to a chain tape. To avoid this undesirable condition, there is provided a reciprocatory locating pin **27** having sliding bearing in a head **26** (in which the punch assembly **20**, **21** also slides in its reciprocating motion), said pin being located so as to engage the oncoming material slightly in advance of the punch **20**. Said pin is integral with upwardly extending arm **28** formed at its upper end with a horizontal projection **29** extending as a cam follower into a cam slot cut in the radial face of a disc **31** affixed to the main shaft **16**. Accordingly, arm **28**, and therefore locating pin **27**, are reciprocated in timed relation to the reciprocation of the punch assembly **20**, **21**, and this timing is such that the locating pin **27** lowers on to the chain moving thereunder just ahead of the punches **20**, **21** lowering into contact with said chain.

As seen in Fig. 1, the lower end of the locating pin **27** terminates in a point and, assuming that the groups of fastener elements to be removed by the action of punch blades **20***a*, **20***b* are so positioned beneath said blades that the latter will completely remove said elements, including the endmost element or elements of the groups, the pointed end of the pin will enter the space between two adjacent fastener elements on the same tape, thereby to hold said tape and hence the chain stationary and in the exact longitudinal position required for said punch

blades to completely remove all elements of said group, against the feeding tension or momentum forces to which the chain is subjected. On the other hand, should the chain be so positioned longitudinally of the punch blades that the pointed end of the locating pin **27** strikes an element, continued tension effective on the chain will cause it to move forwardly the slight distance necessary for the pin to ride off said element into the space between said element and the next following one, whereupon it acts as before to hold the chain against any further movement under said feed tension.

Means are also provided for pressing the chain tapes against the die body **22** during the punching operation so that the chain is firmly held and maintained free of wrinkles during such operation. Such preferably comprises a presser pad or foot **32** which, as seen in Fig. 4, may have the form of a forked member whose forks or tines **33, 34** (Fig. 1) are adapted to bear against the die bed somewhat outwardly of the punch assembly. Rather than being of true forked construction, the forks may extend continuously around the punch assembly so as to define an opening for the punches thereof. Preferably, the presser foot **32** is pivoted as at **35** to the bed **10** rearwardly of the punch assembly, so as to pivot in a generally vertical path. Pivotal movement may be imparted to the presser foot as by means of an integral arm **36** extending upwardly therefrom and terminating at its upper end in a horizontal projection **37** functioning as a cam follower operating into a slot **38** provided in the radial face of a disc **39** keyed or otherwise affixed to the main shaft **16** to rotate therewith. Thus, rotation of the drive shaft imparts up and down motion to the presser foot **32**, with its down motion supplying a holding pressure on the chain disposed beneath same. The operation of the presser foot is of course timed to that of the punch assembly so that it lowers just in advance of the punch assembly striking the chain and is maintained lowered for the short interval required for the punches to act on the chain.

The continuous fastener chain designated C, from which measured lengths are produced as aforesaid, is supplied in roll form, being preferably wound on a drum **40** suitably mounted at one (the left) side of the apparatus. Means are provided for successively drawing off measured lengths of the chain from the drum **40** and for feeding said length as a continuous web and with a step-by-step or intermittent motion along a generally horizontal path traversing the path of motion of the punch assembly **20, 21**. As seen in Figs. 1 and 2, such means includes a collar **41** keyed or otherwise affixed to said main shaft **16** and which mounts a crank pin **42**. A connecting link **43** is connected at its upper end to said crank pin and at its lower end to an arm **44** by means of an intermediate flexible joint **45**. Pivotally connected to the lower end of arm **44** is a crank **46** whose inner end is journaled on a stub shaft **47** suitably supported from the apparatus bed and leg structure. At its outer end the crank **46** carries a pawl **48** which is adapted to engage with the peripheral teeth of a ratchet wheel **49** affixed to the shaft **47** and thereby to rotate said pawl and shaft. Affixed to said shaft and driven thereby is a gear wheel **50** driving through idler **51** a pinion **52** on shaft **53**, said shaft mounting a gear **54** meshing with a gear **55** driving a shaft **56** disposed parallel to said shaft **53**. Shafts **53, 56** carry the feed or draw-off rolls **57, 58** between which the chain is threaded. Since rolls **57, 58** are driven intermittently from main shaft **16** through the pawl and ratchet driving connection described, upon each cycle of their operation they draw a length of the continuous chain from the drum **40** and advance it to the action of the aforesaid punches **20, 21** of the punch assembly.

It will be seen from the above that the angular rotation of ratchet wheel **49** responsive to an upward stroke of the arm **44** determines the angular rotation of the draw-off rolls **57, 58** and hence the length of continuous chain drawn from the drum **40** per each revolution of the main shaft **16**. Such is made use of in providing for an adjustment of the length of continuous chain drawn from the drum. For this purpose, a segmental plate **59** journaled on shaft **47** is provided, said plate having a cylindrical flange **59*a*** which is adapted to extend over a portion of the toothed periphery of the ratchet wheel **49**, as determined by the angular position of said plate. When the flange **59*a*** extends over some of the teeth with which the pawl **48** would normally engage, the latter cannot ratchet with these teeth, with the result that the ratchet wheel is not given its full angular movement. However, depending on the position of the plate **59**, the pawl **48** may ride off the flange and, when this occurs, the pawl ratchets with the wheel **49** and imparts rotation to it and a corresponding feed motion to the chain.

To enable the angular position of plate **59** to be varied in accordance with the particular length of slide fastener chain desired to be produced, said plate **59** is provided with a tubular neck **60** which is journaled on a reduced-diameter forwardly extending portion **47*a*** of the shaft **47** and carries at its outer or front end a knob **61** provided with an index **62**. As seen in Fig. 1, the index can be moved along a scale **63** inscribed on a front cover plate affixed to the supporting structure **10—12**, as generally indicated. The scale **63** is calibrated in inches of fastener chain length and, by turning knob **61** to the desired fastener chain length, the angular position of the adjustment plate **59** will be shifted as necessary to insure that each upward stroke of the arm **44** results in angular motion of the ratchet wheel **49** corresponding to that required for the particular measured length of fastener chain desired to be drawn from the drum **40**.

It will be observed that the intermittent draw-off and feed means as aforesaid provides regularly occurring intervals during which the chain is at rest. By design, actuation of the punch assembly is timed to take place only when the chain is at rest, i. e. during such intervals. Accordingly, chain feed and punch motion are effectively correlated so as to produce individual fastener chains in succession and at a rate of one length of fastener chain per each cycle of operation of the apparatus, as determined by one complete revolution of the main shaft **16**. It is also to be observed that the chain draw-off and feed means always operate at a constant and uniform rate, since adjustment in length of chain drawn from the drum **40** per each cycle of operation is achieved through change of the duration of the drawing-off operation, as distinguished from the speed thereof.

The working of the aforesaid apparatus may be described briefly as follows: After adjusting it to the desired measured length of slide fastener chain to be produced, the apparatus is put into operation, such resulting in successive lengths of continuous chain being drawn from the drum **40** by the cyclical or intermittent operations of the rolls **57, 58**, as described. Such roll action also normally feeds the two most advanced drawn-off length portions of the chain beneath the combined element-removing and chain-severing punches **20, 21**. The action of said punches is simultaneously to remove a small number of fastener elements from adjacent the forward end of the second most advanced measured length portion and a greater number of fastener elements from the rearward end (which is immediately adjacent said forward end) of the first most advanced length portion, and thereupon to sever said most advanced length portion from said second most advanced length portion. The severed length portion is carried out of the machine as by a pair of tension rolls **64, 65** (Fig. 1) which may be powered through drive connections to the shafts **53, 56** and driven at a rate as to impart a slight tension on the portion of chain extending between said rolls and the locating pin **27**. The aforesaid second most advanced measured length is then fed, by the next operation of the draw-off and feed rolls, to the position of said first most

advanced measured length, whereupon the cycle repeats itself and continues so to do as long as the apparatus is maintained in operation.

Figs. 5 and 6 illustrate apparatus operating on the principle of and serving similar function as that previously described but differing therefrom in structural detail. This difference is principally that the continuous fastener chain C is trained over and fed to the action of the combined element-removing and fastener-chain severing punches by a relatively large diameter feed roll or wheel **70** which is driven with a step-by-step motion, rather than being fed over a fixed die-block, as in the prior described apparatus. The feed wheel **70** is provided with a peripheral groove **71** which is so positioned axially that the coupling heads of the fastener elements of the chain trained over and supported on the wheel periphery overlies it (the groove). Thus, when the element-removing punches strike and cut through the fastener elements, their coupling heads enter said groove and thence drop into a chute provided as by an angled slot **72** provided in a blade-like member **73** inserted in said groove.

The aforesaid wheel **70** is driven intermittently by pawl and ratchet means generally as previously described, of which arm **74** carries a pawl **75** adapted to ratchet with teeth on the periphery of a ratchet wheel **76**. Said arm **74** is actuated by an upright arm **77** having a projection **78** functioning as a cam follower and which engages in a cam groove **79** formed in the radial face of a disc **80** affixed fast on a tubular main shaft **81**. Said main shaft carries at its rearward end a pulley **82** over which is trained a belt **83** extending to a motor or other source of drive for the main shaft. The ratchet wheel **76** is mechanically coupled to the feed wheel **70** whereby angular motion of the former, as imparted to it by the pawl **74**, is transmitted to said feed wheel.

By reference to Fig. 6, it will be noted that the upper terminal end of the arm **77** has sliding bearing in a fixed head **85** which is disposed above the feed wheel **70** and extends front to rear of the apparatus. Also slidably mounted for reciprocatory movement in said head **85** are the forwardly angled arms **86**, **87** and **88**. Said arm **86** carries at its upper front end the punch assembly comprising an element-removing punch **90** and a transversely arranged fastener-chain severing punch **91** corresponding to the previously described punch assembly **20**, **21**. At its lower rearward end, the arm **86** is formed with a lateral extension **94** serving as a cam follower seating in a cam groove provided in the radial face of a disc or collar **95** fast on the main shaft **81**.

The aforesaid arm **87** mounts at its upper front end a presser pad or foot corresponding to the aforesaid presser foot **32** and consisting of the parts **96***a*, **96***b* (Fig. 5), and its lower rearward end is formed with a lateral extension **97** engaging as a cam follower in a cam groove provided in the peripheral face of a disc or collar **98**, also fast on the main shaft **81**.

Finally, the aforesaid arm **88** carries at its upper front end a locating pin **100** corresponding to the previously described locating pin **27**. At its lower rearward end the arm **88** is formed with a lateral extension **101** engaging as a cam follower in a cam groove provided in the peripheral face of a disc or collar **102**, also fast on the main shaft **81**.

From the above, it will be seen that, upon the apparatus being put into operation by connecting main shaft **81** with a source of power, continuous fastener chain from a drum **104** is drawn onto the periphery of the feed wheel **70** and, consequent to the intermittent angular motion imparted the latter through the pawl and ratchet means, is fed with a step-by-step motion to the action of the punch assembly **90**, **91**. The locating pin **100** functions as does the previously described locating pin **27** to properly position the chain with respect to the element-removing punch so that the latter completely removes all fastener elements struck thereby. In manner similar to the previously described presser foot **32**, the presser foot **96***a*, **96***b* functions to press the chain tapes directly about the groups of elements to be removed against the periphery of the feed wheel so that the latter functions as a die-block in addition to a chain feed means.

It will be understood that means for adjusting the length of fastener chain drawn from the drum **95** corresponding to that previously described is incorporated into the pawl and ratchet means according to the present modification, and that pressure rollers **105**, **106**, **107** and **108** bearing against the periphery of the feed wheel **70**, as illustrated, insure that proper chain tension is maintained.

Fig. 7 generally illustrates another form of continuous chain feed means which is designed positively to feed said chain past the point of it being acted upon by at least one of the element-removing punches and up to the point of it being acted on by the fastener-chain severing punch. According to this modification the continuous chain is drawn from its storage drum (not shown) and fed from left to right with a step-by-step motion by means of a laterally spaced pair of endless bands or belts **110**, **111**, each driven by its roller **112** and tensioned by its rollers **113**, **114**, the chain being held against the upper flight of the endless bands by spaced sets **115**, **116** of hold-down rollers **117***a*, **117***b*, as illustrated.

Disposed between the upper flights of the aforesaid endless driving bands **110**, **111** is a longitudinal rib **120** disposed to underlie the coupling heads of the fastener elements of the chain being fed by the action of the endless band and hold-down rollers against the tape components of said fastener chain. Said rib at its forward or rightwise end connects with a vertically disposed block **121** whose upper surface corresponds to that of said rib. In said rib, at approximately the junction thereof with the block, is formed an elongated vertical slot **122**, and in said block and longitudinally aligned with the slot **122** is provided a short-length vertical slot or hole **123**. Said slots **122** and **123** correspond to the slots **24**, **23**, respectively, provided in the die-block **22** of the Figs. 1–4 modification, and, considering that the endless feed bands **110**, **111** extend laterally of the longer slot **122**, it will be seen that said bands exercise feeding action on the chain up to the point of said chain being acted on by the longer punch portion corresponding to the punch portion **20***b* (Fig. 3). Since the fastener-chain severing punch corresponding to the transverse punch **21** (Fig. 3) is adapted to move against the upper face of the block **121** immediately adjacent the transverse corner thereof connected with the rib **120**, it will also be clear that the endless bands **110**, **111** positively feed the chain substantially up to the point of it being acted upon by the aforesaid fastener-chain severing punch corresponding to the transverse punch **21** (Fig. 3).

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Apparatus for producing measured lengths of slide fastener chain each having an element-free extension at its bottom end and an element-free needle gap adjacent its top end from continuous fastener chain consisting of laterally spaced fabric tapes carrying along their adjacent longitudinal edges rows of oppositely disposed, uniformly spaced fastener elements having coupling heads which are interengaged so as to secure the tapes together throughout their entire length comprising, in combination, a compound punch assembly including a pair of longitudinally disposed element-removing punches, one having length corresponding to the length of the element-free end extension to be provided at the bottom

end of the measured lengths of fastener chain being produced and the other having length corresponding to the length of the needle gap to be provided near the top ends of said measured lengths, said punches being spaced from one another a distance corresponding to the spacing of said needle gap from the top-end edge of said measured lengths, and a transversely disposed fastener-chain severing punch for cutting off measured lengths of fastener chain from the continuous fastener chain and being located between the longitudinally disposed punches and extending across the end of said one longitudinal punch nearer said other one thereof, means for reciprocating said compound punch assembly thereby to effect movement of all said punches in unison, a die block cooperatively related with said compound punch assembly, means including sets of feed means for intermittently drawing off from a source of the continuous fastener chain lengths thereof corresponding to the measured lengths being produced and for feeding said drawn-off lengths over the die block to the action of said punches, means interrelating the actuation of said punch-assembly reciprocating means and said chain feed means in such manner that said punches act on the chain only during the intervals between each two successive feed movements of said chain, and means for registering the elements required to be removed to provide said element-free extension and needle gap with the appropriate element-removing punches including one set of said feed means disposed and operative to tension the portion of the chain about to be acted upon by said punch assembly and a locating pin reciprocable with but adapted to lower on to the chain prior to said punch mechanism lowering thereon, said locating pin being disposed a predetermined small distance rearwardly of the punch assembly and having a lower end adapted to enter the space between two adjacent fastener elements of the chain disposed immediately below the same thereby to hold the engaged point of the chain stationary against the tensioning action of said one set of feed means.

2. Apparatus as set forth in claim 1, wherein means are provided for varying the length of the chain drawn from the source and fed to the punch assembly in accordance with the measured length of fastener chain desired to be produced.

3. Apparatus as set forth in claim 1, wherein the chain-feed means includes a feed wheel over which the chain drawn from the source is trained and being arranged immediately beneath said punch assembly, whereby when said wheel is at rest its peripheral edge surface serves as

the die block for said punch assembly, said wheel being provided in said peripheral edge surface with a groove of width corresponding generally to the distance between the adjacent edges of the chain tapes, said groove serving to receive the cutting edge of the element-removing punches and the removed portions of said elements, and means for imparting step-by-step rotation to said wheel.

4. Apparatus as set forth in claim 1, combined with a presser foot extending across the chain and generally about said punch means, and means for lowering said presser foot on to the chain in timed relation to the reciprocation of said punch assembly which is such that the presser foot engages the chain ahead of the punch assembly making operative contact therewith.

5. Apparatus as set forth in claim 1, wherein the chain draw-off and feed means includes two longitudinally extending endless bands spaced from one another by a stationary member the approximate distance that the tapes of the chain are spaced from one another, hold-down rollers for pressing the tapes of the chain against said bands, and means for imparting step-by-step motion to said bands, and wherein the end of said stationary member between the forward ends of the endless bands is disposed beneath said punch assembly and serves as a die block therefor.

6. Apparatus as set forth in claim 5, wherein said end of the stationary member is provided with an aperture for the reception of the cutting edges of the element-removing punches and its upper surface provides a rigid abutment in the path of motion of the fastener-chain severing punch.

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