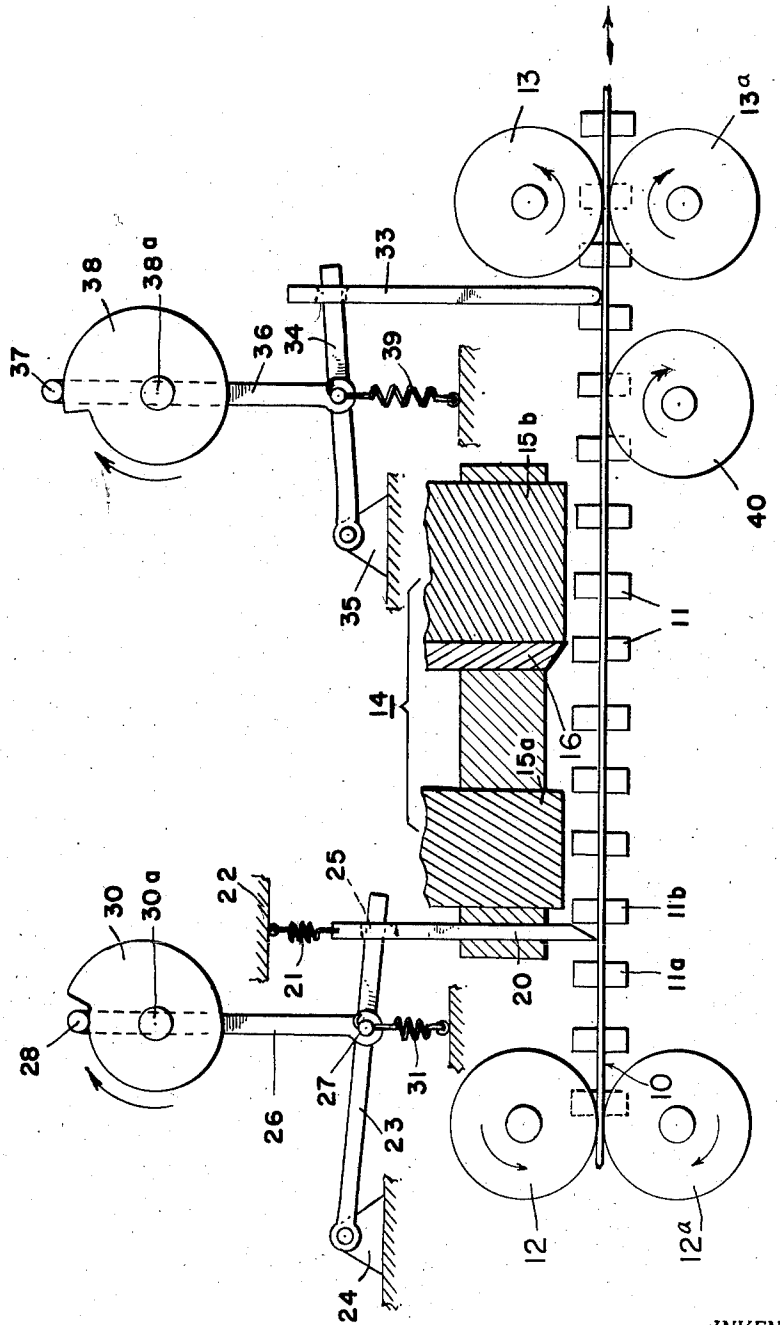
July 9, 1957 R. FEITL 2,798,549

SLIDE FASTENER MANUFACTURE

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FIG. 1



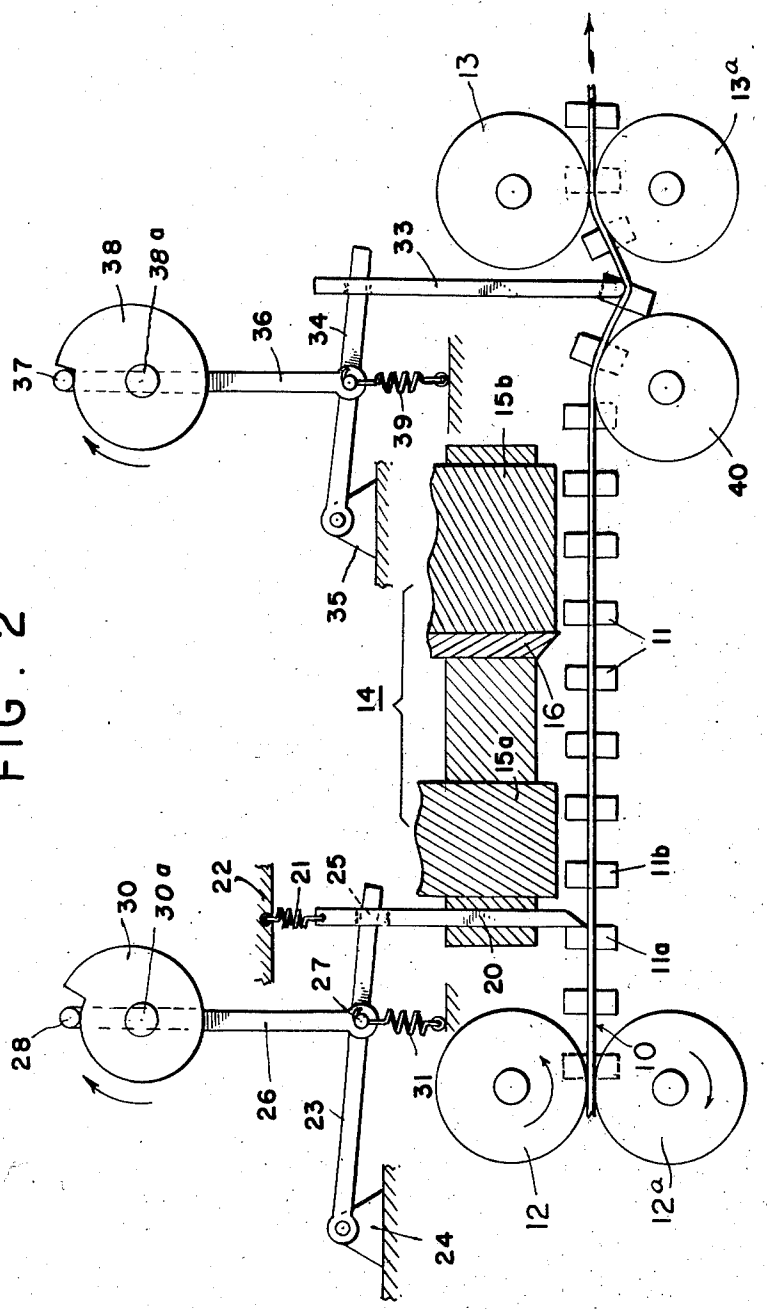
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FIG. 2



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SLIDE FASTENER MANUFACTURE

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Application August 12, 1954, Serial No. 449,295

5 Claims. (Cl. 164—49)

This invention relates to improvements in slide fastener manufacture, and more particularly to a control mechanism for apparatus employed in producing measured lengths of individual slide fastener chain having element-free spaces at or adjacent the ends thereof from a long length of continuous fastener chain supplied in roll form, for example.

One such apparatus as disclosed in my prior application Serial No. 439,112, filed June 24, 1954, is characterized by a punch assembly including closely spaced element-removing punch blades disposed lengthwise of or in the direction that the continuous chain is fed to the punch assembly with a step-by-step motion, said punch blades functioning on each working stroke simultaneously to remove the groups of interengaged elements from two closely spaced length portions of the chain which are related to one another in lengthwise direction as are the element-free spaces or gaps at the adjacent ends of two measured lengths of fastener chain being produced. As explained in said application, it is imperative not only that the element-removing punch strike the required number of the fastener elements (more properly, the interengaged or intermeshed coupling heads thereof) to be removed at each stroke of the punch, but also that the groups of elements to be removed are so positioned with respect to the punch that the endmost element or elements thereof are completely removed rather than only partially removed, as may occur if a transverse end edge of the punch strikes an endmost element of a group of elements disposed in the path of its movement, and thereupon cuts through said element in manner as to but partially rather than completely remove same.

It is a main object of the present invention to provide, in apparatus for producing from continuous fastener chain a succession of measured lengths of slide fastener chain characterized as aforesaid, an effective and practical means for so controlling the position of the chain with respect to the path of travel of the element-removing punch as to insure that all elements of the group or groups intended to be removed at each stroke of said punch are completely removed from the chain.

More particularly, it is an object of the invention to provide a control means as aforesaid employing a locating pin disposed a short fixed distance ahead of the punch and which is adapted to lower into the space between two fastener elements of the chain and thereupon to provide an abutment against which the second or following of said two elements is adapted to engage and thereby to be located upon the chain being stretched or drawn taut toward its free end, combined with a stretching pin disposed to the other or downstream side of the punch and which is adapted to move against the chain in manner as to tauten it and thereby locate the groups of elements to be removed in invariably fixed position with respect to the punch, which position is such that said elements are completely removed upon the punch partaking of its working stroke.

Yet another object of the invention is the provision of

element locating and chain stretching pins combined with a punch mechanism for removing at least one group of fastener elements from a fastener chain, which pins are so interrelated with respect to one another and to said punch mechanism that immediately upon the locating pin engaging the chain the stretching pin will impart to the chain any additional movement required to bring said group of elements directly under the punch and in position such that all elements of the group, including the endmost elements, are completely removed by the punch.

Still another object of the invention is the provision of control mechanism as aforesaid characterized by inexpensive yet practical construction and which is thoroughly dependable in its operation.

The above and other objects and features of advantage of the control means of the present invention will appear from the following detailed description thereof, taken with the accompanying drawings diagrammatically illustrating the same, and wherein

Fig. 1 illustrates control mechanism according to the invention substantially at the instant that the locating pin has lowered on to the chain, and just prior to the stretching pin lowering thereon; and

Fig. 2 is a corresponding view illustrating the action of the chain stretching pin in causing the slight further movement and/or tensioning of the chain as results in all elements of the group or groups to be removed being positioned with respect to the punch as to be completely removed upon the latter partaking of its working stroke.

In the drawings, reference numeral **10** designates a length of continuous chain, i. e. two longitudinal tapes carrying uniformly spaced interengaged fastener elements **11** along its adjacent edges, which has been drawn from a roll thereof (not shown) and is being moved from left to right with a step-by-step motion by spaced sets **12**, **12***a* and **13**, **13***a* of draw-off and feed rollers which are intermittently driven. Said rollers draw off measured lengths of chain from the supply roll and feed same beneath a punch assembly **14** which is schematically illustrated only but which may be of the type disclosed in my aforesaid application Serial No. 439,112, in that it comprises spaced-apart element-removing punch blades **15***a*, **15***b* disposed longitudinally or in the direction of feed motion of the chain **10**, and a transverse severing blade **16** disposed in the space between said blades **15***a*, **15***b*. As described in said application, the blade **15***a* is adapted to remove a group of the elements **11** from the chain at a location thereof which is spaced a distance of two or three elements from a transverse line corresponding to that of the cutting edge of the chain severing blade **16**, thereby to provide an element gap adjacent one (usually the upper) end of each measured length of chain severed from the continuous chain by the blade; and the blade **15***b* is adapted to remove a group of elements at a location beginning with said transverse line and extending a short distance toward the free end of the chain, thereby to provide an element-free extension at the bottom end of each length of fastener chain severed from the continuous chain. It will be understood that the length of chain drawn from the roll thereof by each intermittent operation of the draw-off and feed rollers determines the length of each single or individual fastener chain severed from the continuous chain by the action of the transverse blade **16**.

As explained in my prior application aforesaid, it is very necessary that the chain be positioned relatively of the punch assembly **14** as a whole, but more particularly of the element-removing blades **15***a*, **15***b* thereof so that, when the punch assembly partakes of its working stroke, said blades shall completely remove all of the elements of the two groups engaged thereby. Such of course requires that each group of elements not only underlies the

blade for effecting removal thereof, but also that the transverse end edges of each said blade extend beyond the transverse side faces of the endmost fastener elements of the group, so that the blade, in partaking of its working stroke, cannot strike an element in such manner as to only partially remove same. The present invention is concerned with control means for insuring the required positioning of the chain and fastener elements to be removed with respect to punch blade or blades as aforesaid, all as will appear from the following description thereof.

Such control means comprises two control pins acting in combination with one another and with the aforesaid punch assembly **14**. Both of said pins are vertically disposed and are positioned above the chain **10** for limited vertical movement toward and away from the latter. One of said pins designated **20**, which is hereinafter termed the "locating" pin, is biased towards the chain by a spring **21** reactive between its upper end and a fixed part **22** of the machine, but its movement toward and away from the chain is positively controlled by an arm **23** pivoted at one end to a fixed fulcrum **24** and having a lost motion connection **25** to said pin at its other end. Limited angular motion is imparted to the arm **23** by means of a rod **26** connected at its lower end to said arm by means of a pivot **27** and whose other end is shown to be offset as at **28** so as to engage on the edge surface of a peripheral cam **30**. A spring **31** imparts a constant downward pull on the rod **26** whereby it acts as a cam follower in converting rotary motion of the cam **30** into angular motion of the arm **23** and hence vertical motion of the locating pin **20**, i. e. downwardly under the action of spring **21** as the arm **23** moves in clockwise direction and upwardly with said arm as the latter moves in counter-clockwise direction.

The other control pin which is designated **33** and hereinafter referred to as a "stretching" pin is connected at its upper end to the outer end of a spring arm **34** pivoted at its inner end to a fixed fulcrum **35**. Limited swinging or oscillatting motion is imparted to said arm **34** by means of a rod **36** whose upper end is offset as at **37** as to engage on the edge of a peripheral cam **38**, said rod being held in constant engagement with the cam edge by a pull-down spring **39** whereby it acts as a cam follower.

Preferably, the locating pin **20** and the stretching pin **33** are mounted to reciprocate in a fixed head (not shown) in which the punch mechanism also reciprocates and it will be understood that said pins, like the punch assembly, are energized only during the intervals between each two successive feed movements of the chain, i. e. during the intervals when the draw-off feed rollers are inactive. The pin driving cams **30** and **38** are shown to be carried by individual mounting shafts **30***a*, **38***a* which may be powered from the main shaft which drives the punch assembly through a suitable driving connection, or they may be mounted on the drive shaft so as to be driven directly thereby. By analysis of cam position as shown in the two views, it can be seen that the locating pin **20** is timed to lower on to and engage the fastener chain somewhat ahead of the stretching pin **33**, and it is to be understood that both said pins will begin their lowering movement before corresponding movement of the punch assembly **14** is initiated and also that said pins will remain in their lowered position for the full interval that the punch blades **15***a*, **15***b* and **16** of said assembly are acting on the elements and chain tapes disposed in their respective paths.

According to a further feature of the invention, the locating pin **20** is spaced a predetermined distance rearwardly (upstream) of the corresponding transverse end edge of the punch blade **15***a*, this distance, by reference particularly to Fig. 2, being slightly less than the distance between the most advanced (right-side) transverse edge of the following one of two fastener elements **11***a*, **11***b* beneath said locating pin **20** and between which the tip thereof is adapted to enter when the pin is lowered and the endmost element of the group of elements to be removed by the punch blade **15***a*. Finally, it will be seen that the stretching pin **33**, which is disposed forwardly or downstream of the punch mechanism **14**, and just to the rear (upstream) of the set of rollers **13**, **13***a*, is lowerable to a position in which its lower or tip end moves well below the normal horizontal path of chain travel. Hence, in its lowered position, the stretching pin is adapted to bend a short length portion of the chain out of its plane and thereby to impart slight endwise movement to the chain, and also to stretch it or draw it taut, as will be explained. To render this action of the stretching pin more positive, a special tape-supporting roller **40** is disposed somewhat rearwardly of said pin, this roller being at the level of the lower roller **13***a* of the roller set **13**, **13***a*. Thus, upon the stretching pin **33** striking the chain, the short length thereof which extends between rollers **40** and **13***a* is bent to extend as a V rather than straightway, which results in controlled pull being imparted on the length of the chain running to the punch assembly **14**.

The action of the control means as aforesaid will now be briefly explained. First, it should be explained that Fig. 2 represents, in diagrammatic manner, the ideal alignment of the groups of fastener elements to be removed with the punch blades **15***a*, **15***b* for removing same, as ultimately brought about by the action of said control means. When so aligned, it will be seen that the transverse end edges of said punch blades in effect appreciably overhang the endmost fastener elements of said groups to be removed so that all elements of the groups, including said endmost elements, will be completely removed upon said punch blades completing their working stroke. This desirable alignment of the group fastener elements to be removed with respect to punch blades is brought about (*a*) by the tip of the locating pin **20** first entering the space between said two fastener blades **11***a*, **11***b* disposed generally beneath said pin, such entry being at some random position as respects the adjacent side edges of said two fastener elements, as is indicated in Fig. 1; and (*b*) by the stretching pin **33** then lowering on to the chain, such first imparting to the chain any small movement thereof in feed direction required to bring the advanced side edge of the following elements **11***a* of said two elements into edge-abutting relation with the tip of the locating pin **20**, and, secondly, pulling or stretching the chain against the point of chain anchorage as established by the aforesaid abutment of element **11***a* with the locating pin. Thus, there results a positive stretching of the length of chain extending between locating and stretching pins which, by proper design and relationship of parts, is such as to properly align the groups of fastener elements to be removed with the punches acting to effect their removal, so that all elements of the groups, and in particular the endmost elements thereof, are completely rather than partially removed.

The above description of control means operation was given on the assumption that the tip of the locating pin **20** lowered directly or in the first instance into the space between said two fastener elements **11***a*, **11***b*. Should such not be the case, and, instead, the locating pin lowers directly on the element **11***b*, assumed to be positioned a slight distance to the left of its Fig. 1 position, the lost motion connection **25** between the pin actuating arm **23** and the locating pin becomes effective and enables the tip of the pin to strike against and then ride harmlessly on the upper surface of said element as it is moved rightwise by the first action of the stretching pin **33** on the chain. As explained above, such first action is to move said element **11***b* to the approximate position in which it is shown in Fig. 1, and results in the tip of the pin **20** dropping into the space between the elements **11***a*, **11***b* under the action of the pin-biasing spring **21**. When

such occurs, the control means operates as under the first condition described above.

From the above, it will be seen that the invention provides simple yet effective means which functions invariably to insure that all elements of the group or groups of fastener elements of a continuous fastener which are intended to be removed by a punch mechanism of the specified character are in fact completely removed. While the control means has been illustrated and described as applied to a punch mechanism of the type adapted to remove two closely adjacent groups of elements from the chain, it will be understood that it is equally applicable to punch mechanism for removing but a single group and/or two widely spaced groups of such elements from the chain.

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 drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In apparatus for removing groups of fastener elements from a continuous slide fastener chain at predetermined places along the length of the chain including reciprocating punch means and means for feeding the chain in a generally linear path and with a step-by-step motion to the action of the punch means, the combination therewith of control means for insuring accurate positioning of each group or groups of fastener elements to be removed in the path of the punch means whereby said means effects complete removal of all elements of said group or groups, said control means comprising chain locating and chain stretching pins mounted for reciprocatory movement into and out of engagement with the chain, said locating pin being positioned a predetermined distance rearwardly of said punch means whereby its tip may enter the space between two fastener elements disposed a predetermined distance upstream of the elements to be removed by the action of said punch means, and said stretching pin being positioned to the forward or

downstream side of said punch means and being adapted upon engagement of its tip with the chain first to impart thereto any further movement of the chain in feed direction required to abut the following of said two fastener elements with the tip of said locating pin, and thereupon to stretch said chain in said feed direction against the anchorage point established by said abutment, and means for timing the actuation of said control means to occur between each two feed movements of the chain and prior to the punch means engaging said chain.

2. The combination set forth in claim 1, wherein the distance of the locating pin from the punch means is at least as great as the distance between said pin and the adjacent endmost element of the group or groups thereof to be removed.

3. The combination set forth in claim 1, wherein the stretching pin is timed to engage the chain subsequent to the locating pin engaging said chain.

4. The combination as set forth in claim 1, wherein the locating and stretching pins are reciprocated by means individual thereto, the means for reciprocating the locating pin including a lost motion connection enabling the locating pin to give when lowering directly on to a fastener element disposed in its path.

5. The combination set forth in claim 1, wherein the chain feeding means includes a lower roller and wherein said stretching pin is positioned intermediate said lower roller and a rearwardly disposed additional roller disposed at the level thereof, said rollers together serving as spaced points of support which support the chain against the action of the stretching pin in moving thereagainst.

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