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CUTTING SLIDE FASTENERS TO LENGTH

Filed April 21, 1955

2 Sheets-Sheet 1

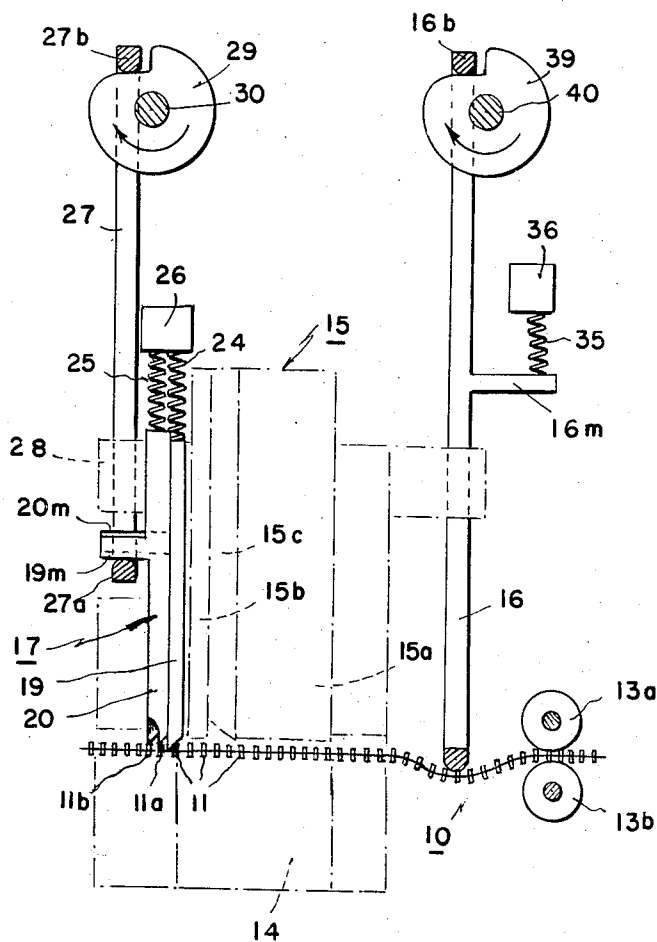


FIG. 1

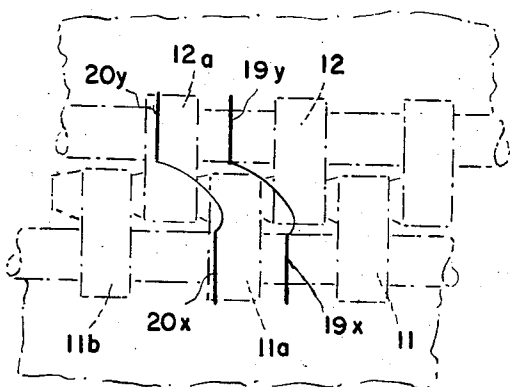


FIG. 4

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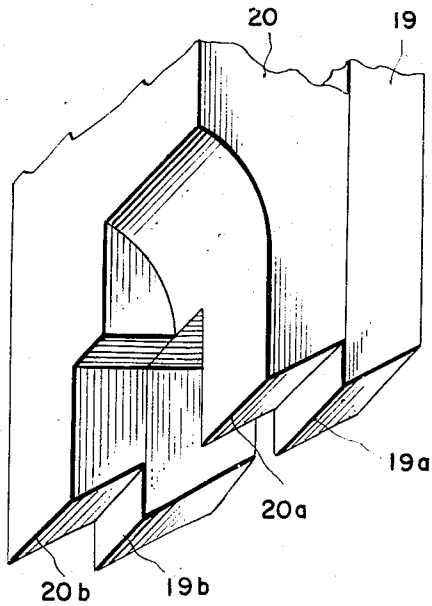


FIG. 2

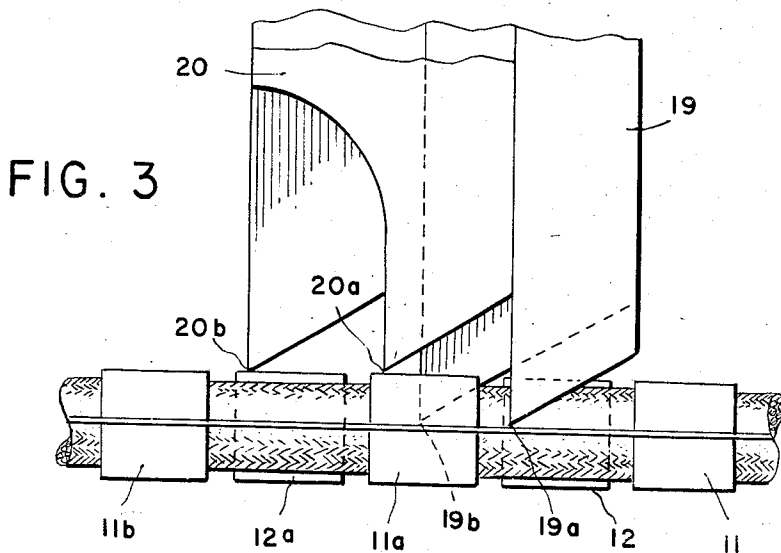


FIG. 3

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1

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CUTTING SLIDE FASTENERS TO LENGTH

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4 Claims. (Cl. 164—89)

This invention relates to improvements in slide fastener manufacture and more particularly to an improved control means for apparatus employed to produce from continuous fastener chain a succession of measured lengths of slide fastener or zipper chain each characterized by an element-free extension at one end and an element-free needle gap adjacent the other end thereof, and which functions to insure substantial uniformity in the lengths of the fastener chains produced by such apparatus.

In my prior application Serial No. 449,295 now Patent No. 2,798,549, issued July 9, 1957, I have disclosed and claimed control mechanism for such apparatus operating on the principle of a so-called stretching pin, disposed just forwardly of the element-removing punch set, lowering on to the chain and thereby tensioning and/or shifting it against a more rearward point of chain anchorage as established by a so-called locating pin. Such a locating pin is disposed a small fixed distance rearwardly (upstream) of the punch set calculated to insure vertical registry of the fastener elements to be removed with the element-removing punches, and its tip or working edge is adapted to lower into the space between two adjacent fastener elements disposed in substantial vertical registry therewith and to abut the side face of the following one of said elements as the chain is shifted forwardly by the stretching pin. While satisfactorily performing its intended function of insuring that the element-removing punches completely rather than partially remove those elements intended to be removed, thereby to avoid the condition of partial elements remaining on the fastener tapes, control mechanism according to my application has been found to be lacking in other important respects. For example, the prior control means fails in insuring that the lengths of fastener chain being severed from the continuous chain have exactly (within permissible tolerances) uniform length, such being a feature which is of course desirable for uniformity in the product, but more important a very necessary feature in the case of fastener elements having a small element-free gap near its top end for needle passage.

In explanation, such an element-free gap must be kept small and in addition, it must be very accurately spaced from the top end of the fastener if it is to serve its intended purpose of preventing needle breakage, such following from the fact that if improperly located, the gap will not be in position to pass the needle harmlessly. Actually, the permissible tolerances in placement of the needle gap are so small as to preclude variation in the length of the fastener chains or zippers being produced by as much as the pitch distance of the fastener elements of the particular fastener chain. Since the control means of my prior application can result in variation in the length of the fastener chains or zippers being produced by an amount approximating this distance, its use without more is open to serious objection.

Broadly stated, a main object of the present invention is the provision of a control means for apparatus em-

2

ployed in the production from continuous fastener chain of measured lengths of fastener or zipper chain, each characterized by an element-free extension at one end and an accurately positioned element-free needle gap near its other end, which is so constructed and arranged as to insure uniformity in the length of the fastener chains being produced within permissible tolerances.

A more particular object of the invention is the provision of control means as aforesaid capable of reducing the maximum possible variation in the length of fastener chains being produced to approximately 50% of the variation which can occur when using the control means as disclosed in my prior application aforesaid.

A further object of the invention is the provision of control means of the stated character employing two chain holding or locating pins which are so constructed and spaced from one another that the tip or working edge of at least one of said pins will always on first contact with the chain enter the space between the two adjacent fastener elements in substantially vertical registry therewith, thereby to substantially reduce the amount of shifting movement or stretch which is possible to be imparted to the chain by a stretching pin operating similarly to the stretching pin of my prior application aforesaid, as compared to the shifting movement or stretch that can be imparted to said chain by the stretching pin operating against a point of chain anchorage as established by only one said locating pin according to my prior application.

A more specific object of the invention is the provision of control means for insuring against variation in the length of individual fastener chains being produced from a continuous fastener chain which, while employing chain locating and chain stretching means generally as disclosed in my prior application aforesaid, differs in that the chain locating means as herein proposed takes the form of two pins which are effectively spaced from one another in the direction of chain length a distance corresponding to the normal spacing between any two fastener elements of the same row thereof making up said chain.

Yet another object of the invention is the provision of a control means employing two chain holding or locating pins as aforesaid, whose arrangement is such that they may operate on the same stringer, or one on one stringer and the other on the other stringer.

Still another object of the invention is the provision of chain holding or locating pins for control means according to the present invention, characterized by said pins having two sets of locating tips or edges, of which one set operates on the fastener elements of one stringer and the other set operates on the fastener elements of the companion stringer, and wherein both sets of tips or edges are combined into a single chain holding or locating assembly.

The above and other objects and features of advantage of control means for fastener-chain producing apparatus according to the present invention will appear from the following detailed description, taken with the accompanying drawing, wherein—

Fig. 1 is a diagrammatic side elevational view of the improved control means as herein provided which illustrates same in working relation to the punch set of the fastener-chain producing apparatus and a continuous fastener chain being acted upon by said apparatus;

Fig. 2 is a broken-away perspective view illustrating one form of chain holding or locating means employed in the control means of the invention;

Fig. 3 is a broken away schematic side elevation illustrating a typical lowering action of the locating means as shown in Fig. 2 on the fastener elements then in substantial vertical registry therewith; and

Fig. 4 is a view looking down on the fastener elements

shown in Fig. 3, the chain locating means being omitted but the lines of engagement of the working edges thereof with the elements being assumed and illustrated.

Referring to the drawings, reference numeral 10 designates a length of continuous chain comprising laterally spaced, longitudinally extending tapes carrying uniformly spaced inter-engaged fastener elements 11, 12, along adjacent edges. Said chain is drawn from a source of supply such as a roll thereof (not shown) preferably by spaced sets of draw-off and feed rolls, of which the forward set of rolls designated 13a, 13b is shown, the action thereof being intermittently to advance the drawn-off lengths of chain from left to right across a supporting die block 14 operatively related to a punch set designated 15. Although only schematically shown, it will be understood that the punch set is preferably of the type disclosed in my copending application Serial No. 439,112 filed June 24, 1954, now Patent No. 2,817,403, issued Dec. 24, 1957, in that it combines an element-removing punch 15a having length corresponding to that of the element-free portion desired to be provided at the bottom end of the finished measured lengths of fastener chain being produced, and spaced rearwardly therefrom by a fixed distance corresponding to that occupied by two or three interengaged fastener elements 11, 12, a second element-removing punch 15b of length corresponding to that of the short-length needle gap desired to be formed near the top end of said finished lengths of fastener chain. Preferably, also, the punch set includes a transversely arranged cutting punch 15c disposed so that the line of its cutting edge coincides with a transverse line traversing the rearward end of the element-removing punch 15a, and which functions to sever a measured length of fastener chain provided with element-free portions as aforesaid from the continuous chain upon each working stroke of the punch set 15. To achieve this result, the punch set is positioned with respect to the feed motion of the continuous chain 10 so that when the chain is at rest between each two of its successive feed movements, the line of separation between the most forward drawn-off length of chain and the next following length of chain is in exact vertical registry with the cutting line or edge of the cutting punch 15c. Thus, each working stroke of the punch set effects removal of the fastener elements from a short-length portion of the chain having length corresponding to that of the punch 15a and being located immediately forwardly of the line of separation between the most forward and next following drawn-off lengths of chain; simultaneously therewith it effects removal of the elements for a short-length portion having length corresponding to that of the rearwardly disposed punch 15b and being spaced rearwardly from said line of separation by a distance corresponding to the spacing between the punches 15a, 15b, and finally it severs the most advanced drawn-off length of chain from the next following drawn-off length thereof.

Fig. 1 is intended to show the correct position of the chain with respect to the element-removing punches 15a, 15b, and of course the punch 15c as well. Hence, the fastener elements 11, 12 intended to be removed are all properly located in the path of travel of the punch set as insures that the element-removing punches, in partaking of their working stroke will effect complete removal of each and all the elements of the two groups to be removed, rather than only partially cutting through certain of said elements, more particularly the end elements of each group, as might occur if the group of elements to be removed are not properly aligned with said punches. As explained in my aforesaid application Serial No. 449,295, this correct positioning is effected by a so-called stretching pin 16 operating in conjunction with a control or locating pin assembly generally designated 17 (Fig. 1), the stretching pin 16 being located forwardly of the punch set and the locating pin assembly being located a fixed distance rearwardly or upstream of said punch set. The stretching pin 16 is timed to lower on to the chain in the

interval between each two successive feed movements thereof and prior to the punches 15a, 15b of the punch set striking the chain, thereby to impart a tensioning and limited shifting movement to that portion of the chain extending beneath the punch set from a rearward point of chain anchorage, as is determined by engagement of the tip or working end of the locating pin assembly 17 with the chain consequent to its lowering against the chain substantially in unison with the stretching pin. More particularly, a tip or working end of the locating pin assembly 17 engages and thereupon acts to hold the chain fixed at a point to the rear of the punch set and the stretching pin 16 pulls the chain from such held point thereof. By properly spacing the locating pin assembly 17 from the rearward edge of the punch set, the fastener elements intended to be removed can be brought into exact vertical alignment or registry with the punches 15a, 15b as necessary to their being completely rather than partially removed upon said punches partaking of their working stroke.

As forecast above, a control system to the extent so far described, while functioning satisfactorily to insure complete removal of the fastener elements struck by the element-removing punches 15a, 15b, has been found to be lacking in any ability of insuring uniformity in the length of the measured lengths of fastener chain being produced, within the comparatively small tolerances dictated by the required accurate positioning of the short-length needle gap a fixed distance from the top end of each said measured length of fastener or zipper chain. This unsatisfactory condition stems from the fact that the use of a locating assembly 17 comprising a single pin having but one tip or working edge (according to my prior application Serial No. 449,295), can result in a length variation in two finished lengths of fastener chain amounting to as much as approximately the full pitch distance between the fastener elements of the same row, such as the two elements identified by the reference numerals 11, 11a, or 11a, 11b. To explain, let us assume the two conditions as follows: (a) The tip or working edge of a single locating pin lowering directly into the space between the elements 11 and 11a and just to the right or forward side face of the element 11a, and (b) the tip or working edge of the locating pin lowering first on to the elements 11 near or possibly to the right (forward side) of its transverse center line. When the stretching pin 16 lowers under condition (a), the chain is shifted only the relatively minute amount required to abut the element 11a with the tip of the locating pin. However, under condition (b), lowering of the stretching pin 16 results in shifting movement of the chain 10 by an amount such as to first move fastener element 11 out from under the locating pin tip, followed by a further amount of chain movement required to abut element 11a with said tip, making a total of approximately the full pitch distance between elements 11 and 11a. This difference in shifting movement of the chain under the action of the stretching pin 16 thus can result not only in a corresponding unwanted variation in the length of the individual fastener chains being produced, but also in a corresponding error in the spacing of the needle gap from the top end of the chain.

To overcome this obvious disadvantage to the prior control, the present invention provides that the locating pin assembly 17 comprise at least two pin members designated 19, 20 rather than the single locating pin as heretofore, and more particularly that said pin members are spaced from one another in the direction of chain length by an amount equalling the space between any two of the fastener elements of the same row thereof, such as the fastener elements designated 11a, 11b. Similarly to the locating pin of my aforesaid application, the aforesaid locating pins 19, 20 are mounted to reciprocate toward and away from the chain and preferably are guided to have sliding bearing in the same supporting

block or member in which the element-removing punches 15a, 15b and the cutting punch 15c have bearing. Illustratively, movement of said pins 19, 20 toward the chain is effected by springs 24, 25 reactive between the upper ends of said pins and a fixed block 26, and retracting movement of said pins away from the chain is effected by means of a rod 27 guided in a bracket 28 extending from said supporting block, the lower transverse end 27a of the rod extending under offset arms 19m, 20m, respectively, projecting from the locating pins 19, 20, and the upper end 27b of the rod being formed as a cam follower engaging the periphery of a plate cam 29 which is constantly driven as by a powered shaft 30. While mounted to lower and retract in unison, the aforesaid locating pins 19, 20 may move relatively to one another, since they have in effect a lost motion connection with their actuating rod 27.

The aforesaid stretching pin 16 is similarly urged toward the chain as by a spring 35 held in compression between a fixed block or part 36 and an offset arm 16m extending integrally from said pin as shown, and it is positively retracted from the chain by means of a plate cam 39 to whose periphery the upper or follower end 16b of the pin is held by the aforesaid spring 35. The cam 39 is fast on a shaft 40 driven at the same speed as the aforesaid cam shaft 29 as by driving means common to both said shafts, and it operates to effect lowering of the stretching pin substantially in unison with lowering of the locating pins 19, 20.

Preferably and as seen in Fig. 2, the tip ends of the locating pins 19, 20 are sufficiently wide that they extend over both the fastener stringers and they are each provided with two laterally spaced and longitudinally offset working edges, one for one stringer and the other for the other stringer. Considering the aforesaid longitudinal pin spacing, there results an arrangement according to which the locating pins 19, 20 have a set of working edges 19a, 20a effective on the stringer to one side of the longitudinal center line of the fastener chain 10, and a longitudinally offset but corresponding set of working edges 19b, 20b effective on the stringer to the other side of said longitudinal center line, with the edges 19a, 20a and 19b, 20b being spaced from one another a distance approximately equalling the spacing between any two fastener elements of the same stringer, and the longitudinal offsetting of the working edges of the same locating pin approximately equalling one-half the pitch distance of the fastener elements of the same chain.

The operation of the control means of the invention will be first described as if the locating pins 19, 20 were provided with but the two working edges 19a, 20a disposed to operate on one stringer only. By virtue of the spacing of said working edges, lowering of the locating pins results in at least one working edge entering the space between two of the fastener elements of the same stringer which are then disposed below the pins. For example and referring to Fig. 3, although working edge 20a may lower onto the fastener element 11a as shown, working edge 19a is positioned to directly enter the space between the fastener elements 11, 11a. Upon the stretching pin now lowering onto the chain as in Fig. 1, the latter is thereby shifted forwardly as heretofore, but only by the very small amount as results in the right or forward side face of the fastener element 11a abutting said working edge 19a. Such is of course in sharp contrast to the substantially greater distance that the chain might be shifted to the right by the stretching pin 16 if but a single locating pin 19 or 20 were employed, because in such a case, the locating pin could lower onto an element, for example the element 11a, with lowering of the stretching pin 16 then resulting in forward tensioning and shifting of the chain until the next following element 11b abuts the working edge thereof. While the single locating pin might also enter the space between two elements such as those designated 11a, 11b at a point there-

of quite close to the following element 11b, the possibility of the other condition taking place also of course means that the lengths of the fastener chains produced, when using the single locating pin, could vary as much as approximately the full pitch distance of the fastener elements of the chain. On the other hand, the net result of the use of two locating pins 19, 20 whose working edges 19a, 20a are spaced as aforesaid is to reduce by about one-half the maximum possible variation in the length of the fastener chain being produced.

With the locating pins 19, 20 extending over both the chain stringers and having longitudinally offset working edges 19b, 20b, in addition to and being spaced or offset rearwardly of said edges 19a, 20a, the desirable result of both stringers being always displaced or shifted an equal amount is achieved. This will be understood by an analysis of Fig. 4, wherein assumed lines of contact made by the two sets of working edges 19a, 20a and 19b, 20b are indicated by the designations 19x, 20x, and 19y, 20y, with the "x" designations applying to the one stringer carrying the fastener elements 11, 11a, 11b and so on, and the "y" designations applying to the other stringer which carries the oppositely disposed fastener elements designated 12, 12a and so on. From this view, it will be seen that although the working edges 20a, 20b of the pin 20 lower on the corresponding, oppositely disposed fastener elements 11a and 12a, as indicated by contact lines 20x, 20y, the working edges 19a, 19b of the pin 19 enter the spaces between the corresponding, oppositely disposed elements 11, 12 and 11a, 12a, respectively, such being indicated by edge or contact lines 19x, 19y. Accordingly, lowering of the stretching pin 16 (which is common to both stringers) shifts both the stringers to the right the identical amount as brings fastener element 11a into abutting relation with working edge 19a and as also brings fastener element 12a into abutting relation with working edge 19b. Thus, equal displacement of the chain stringers and a correspondingly true and accurate location of the opposite fastener elements thereof is obtained in simple yet effective manner.

Although two sets of locating pin working edges have been illustrated and described, it is of course within the scope and purview of the invention to employ two locating pins 19, 20 together having a total of two working edges disposed as are either the edges 19a, 20a, or are the edges 19b, 20b, i. e., disposed to operate on one and the same stringer. Alternatively, the locating pins 19, 20 may be provided with but two edges which are located as the edges 19a, 20b, or as the edges 19b, 20a. By all such alternative arrangements, the principal aim of the invention, namely, that of substantially reducing the maximum possible variation in the length of the fastener chain being produced can be attained, but such alternate arrangements do not provide the advantage of identical displacement of both stringers made possible by locating pins arranged as in Figs. 2 and 3, for example.

Without further analysis, it will be seen that the invention provides control means for apparatus used in producing measured lengths of slide fastener chain characterized as aforesaid which satisfies the objectives of the invention outlined in the opening portion of this specification. However, 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. Control means for insuring substantial uniformity in the length of each of a succession of measured zipper lengths of fastener chain being produced from continuous fastener chain feeding with a step-by-step motion along a predetermined path of movement comprising, in combination, fastener-chain severing means disposed along said path, locating-pin means disposed a small fixed dis-

7

tance rearwardly and a stretching pin located generally forwardly of said severing means, said locating-pin means and said stretching pin being mounted for lowering and retracting movement on to and away from the chain, means operatively related to each for lowering said locating-pin means and said stretching pin on to the chain during the intervals that said chain is at rest whereby said locating pin means is adapted to establish a point of chain anchorage disposed rearwardly of said severing means and said stretching pin is adapted to impart a controlled pull on the portion of the chain extending to the locating-pin means as tends to shift said chain portion forwardly, said locating-pin means comprising a pair of parallel pin members and means mounting said pin members for movement toward the chain in unison and for movement relative to one another upon engaging the chain, said pin members each having chain-engaging working edges which are spaced from one another in the direction of chain length a distance substantially equal to the spacing between any two adjacent fastener elements of the same one of the two rows thereof making up the fastener chain whereby, as said pin members move on to the chain, at least one of said working edges is adapted to lower into the space between the two adjacent fastener elements of the same row thereof then in approximate registry with said pin members and thereupon to engage the side edge of the rearward one of said two adjacent fastener elements, thus to limit the amount that the said chain portion extending to the stretching pin can shift forwardly under the pull exercised on said chain portion by said stretching pin.

2. The combination as set forth in claim 1, wherein the locating pin members each having width such that it extends over both stringers making up the fastener chain and are each provided with at least one working edge for engagement with but a single stringer.

8

3. The combination as set forth in claim 1, wherein each locating-pin member is provided with two working edges which are spaced from one another in lateral direction an amount such that they extend, respectively, over the stringers making up the chain and are moreover offset longitudinally from one another the distance of approximately half the pitch distance of the fastener elements of the chain, the corresponding working edges of the locating pins being spaced from one another a distance which substantially equals the spacing between two adjacent fastener elements of the same row thereof as aforesaid.

4. The combination as set forth in claim 1, wherein one locating-pin member has a working edge disposed over one stringer and the other locating-pin member has a working edge which is disposed over the other stringer making up said fastener chain, said working edges being spaced from one another in the direction of length of the fastener chain a distance such that they are adapted to coact with two corresponding, oppositely disposed fastener elements of the stringers.

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