

SPACE FORMING DEVICE FOR SLIDE FASTENER CHAIN

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This invention relates to improvements of a space forming device adapted to provide a slide fastener chain having a row of successive meshing fastener elements such as coil elements and the like with a space of a predetermined length from which fastener elements are removed.

As shown in Japanese Patent Application Laid-Open No. 156104/1981, a device for forming a space in a slide fastener chain has been known in which a fastener elements removing means including a cutter, a knockout means and the like is provided on a frame of the device, a movable guide plate and a stationary guide plate are disposed on the frame embracing the fastener elements removing means therebetween, a guide clearance for the slide fastener chain is defined between the upper surface of the frame and the under surfaces of the two guide plates and the movable guide plate is adapted to move horizontally away from the stationary guide plate so that the clearance between the guide plates is increased to allow the slide fastener chain to be inserted into the above-mentioned guide clearance and, thereafter, the movable guide plate is moved back horizontally towards the stationary guide plate to the initial position so that the two guide plates may perform their guiding function.

However, in the above-mentioned prior art device, as the movable guide plate moves back horizontally to its initial position, the inner edge of the movable guide plate tends to catch the adjacent edge of the associated fastener tape of the slide fastener chain such as to cause the

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fastener tape to turn up and, thus, the slide fastener chain cannot be guided in a proper state. When this occurs, it is necessary to correct the improper state of the slide fastener chain by again moving the movable guide plate horizontally and this leads to reduction in operation efficiency. In addition, the time space required to insert the slide fastener chain into the guide space and to move the movable guide plate is also relatively long.

According to a first aspect of the present invention there is provided a space forming device for a slide fastener chain comprising a fastener elements removing means disposed on a frame of the device for removing fastener elements in an area of predetermined length from said fastener chain having a row of successive meshing fastener elements, a pair of guide plates disposed on said frame in an opposing spaced relationship to embrace said fastener elements removing means therebetween, one guide plate being fixed so that there is a guide-clearance for guiding said slide fastener chain defined between an upper surface of said frame and an under surface of said fixed guide plate, characterized in that the other guide plate is so assembled on said frame that it can move slantingly outwardly and upwardly away from said one guide plate, to allow insertion of the slide fastener chain, and so

that said other guide plate can thereafter be moved slantingly inwardly and downwardly to an operative position, in which there is a guide clearance, for guiding said slide fastener chain, defined between an upper surface of said frame and an under surface of said other guide plate.

According to a second aspect of the present invention there is provided a space forming device for a slide fastener chain comprising a fastener elements removing means disposed on a frame of the device for removing fastener elements in an area of predetermined length from said fastener chain having a row of successive meshing fastener elements, a pair of guide plates disposed on said frame in an opposing spaced relationship to embrace said fastener elements removing means therebetween, characterized in that each one of said guide plates is so assembled on said frame that it can move slantingly outwardly and upwardly away from the other guide plate, to allow insertion of the slide fastener chain, and so that each guide plate can thereafter be moved slantingly inwardly and downwardly to an operative position, in which there is a guide clearance, for guiding said slide fastener chain, between a respective upper surface of said frame and an under surface of said guide plate.

The invention will be described by way of example with reference to the accompanying drawings, wherein:-

Fig. 1 is a plan view of one embodiment of the

present invention with a portion thereof broken away;

Fig. 2 is a cross sectional view taken along the line II - II of Fig. 1;

Fig. 3 is a cross sectional view taken along the line
5 III - III of Fig. 1;

Fig. 4 is similar to Fig. 2, but shows the movable guide plate in the position which it assumes when it has been outwardly and upwardly moved;

Fig. 5 is a fragmentary vertically sectional view
10 showing the slide fastener chain in its inserted condition;

Fig. 6 is similar to Fig. 5, but shows the slide fastener chain and movable guide plate in the positions which they assume when normally set;

Fig. 7 is a fragmentary vertically sectional view on
15 an enlarged scale showing the shearing-off of the upper legs of the fastener element row by the cutter; and

Fig. 8 is similar to Fig. 7, but shows the removal operation of the fastener element row.

The accompanying drawings illustrate one example
20 embodying the present invention. Referring to Figs. 1 and 2, a cutter 4 is disposed above a space forming station 3 on the upper surface 2 of a frame 1 and connected to an upper plunger (not shown) for upward and downward movement. A die block 5 is held in position within the frame 1 in the space
25 forming station 3. The above-mentioned cutter 4 and die block 5 possess a length which corresponds to each of the spaces to be formed in a slide fastener chain 6 of indefinite length. The cutter 4 and die block 5 provide a

fastener elements-removing means in cooperation with a knock-out means 7 which has a length equal to the length of the cutter and die block. Details of the construction and operation of the fastener elements removing means will be
5 described hereinafter.

A pair of opposing and spaced guide plates 8 and 9 are disposed on the upper surface 2 of the frame 1 embracing the above-mentioned fastener elements-removing means therebetween with the opposing inner edges 10, 11 of the guide
10 plates defining a clearance W therebetween. A guide clearance 14 is defined between the upper surface 2 of the frame 1 and the under surfaces 12, 13 of the guide plates 8, 9.

In the illustrated embodiment, the guide plate 8 is fixedly secured to the frame 1 whereas the guide plate 9 is
15 slantingly movable relative to the frame 1 between the position shown in Fig. 2 and the position shown in Fig. 4 in which the guide plate 9 is disposed upwardly and outwardly away from the guide plate 8.

That is, as shown in Figs. 1, 2 and 3, the guide
20 plate 9 is secured to slidable members 17 by means of bolts 18 and the slidable members 17 are slidably received in the corresponding slide rail portions 16 formed by frame portions 1A, 1B of the frame 1, respectively. The movable guide plate 9 is further secured by means of a bracket 21
25 and a bolt 22 to the piston rod 20 of an air cylinder 19 secured to a support bracket 15 which is in turn secured to the frame 1.

The above-mentioned slide rail portions 16 are

inclined upwardly and outwardly from the guide plate 8 and the guide plate 9 is slantingly movable between the two positions as shown in Figs. 2 and 4 by the movement of the piston rod 20 as the air cylinder 19 is actuated. In Fig. 3, reference numeral 23 denotes components of the frame 1 and reference numeral 24 denotes fastening bolts for securing the components 23 to the frame 1.

As is more clearly shown in Figs. 7 and 8, the above-mentioned cutter 4 comprises two opposing blades 25, 26 defining a clearance D therebetween and a protruding member 27 interposed between the blades 25, 26. As shown in Fig. 7, the above-mentioned clearance D is so designed that the outer end portions of the upper legs of meshed fastener elements row 28 of the slide fastener chain 6 are cut by the blades 25, 26.

As more clearly shown in Figs. 2 and 3, the above-mentioned frame 1 is constituted by the frame portions 1A, 1B and 1C connected together as a unitary structure and fixedly secured to the upper surface of a bed 31. The frame 1 is formed with a through cavity 32 in communication with the guide clearance 14.

Disposed within the cavity 32 are pressure pads 33, 34 which can move upwardly and downwardly towards and away from the corresponding fastener tapes 29, 30 of the slide fastener chain 6 which are disposed in the guide clearance 14. The above-mentioned die block 5 is securely positioned between the pressure pads 33, 34.

The die block 5 is formed with a center through-slit

35 for slidably receiving the above-mentioned knockout means 7. Formed between the upper and lower ends of the knockout means 7 is a bulged portion 36 which is positioned in an opening 37 defined between the pressure pads 33, 34 and the lower end 38 of the knockout means 7 is secured to a holder 39 which is in turn connected to a lower plunger 40.

Return springs 41, 42 are interposed between the frame 1 and holder 39 to impart a downwardly directed return force to the holder 39 and similarly, springs 43, 44 are interposed between the holder 39 and pressure pads 33, 34, respectively, to impart upwardly directed forces to the pressure pads 33, 34.

The height of the knockout means 7 is so selected that when the holder 39 is raised by the action of the lower plunger 40 the knockout means 7 projects above the upper end of the die block 5 by a certain distance.

With the above-mentioned construction and arrangement of the components in the illustrated embodiment of the space forming device for slide fastener chains, the device operates as follows:

The air cylinder 19 is actuated to cause the guide plate 9 to slide slantingly outwardly and upwardly along the slide rail portions 16 from the position shown in Fig. 2 to the position shown in Figs. 4 and 5. As a result, the guide clearance 14 opens wider as shown in Figs. 4 and 5.

With the guide clearance 14 kept wide open as mentioned above, the slide fastener chain 6 is inserted at an angle from the side of the guide plate 9 into the portion

of the guide clearance 14 between the under surface 12 of the guide plate 8 and the upper surface 45 of the pressure pad 33 in the direction of the arrow X as shown in Fig. 5, and the center line of meshing between the opposing fastener elements in the fastener element row 28 is positioned right above the center line of the die block 5 and knockout means 7 to thereby dispose the slide fastener chain 6 in the position shown by the chain line 46 in Fig. 5.

Thereafter, the guide plate 9 is moved slantingly inwardly and downwardly in the direction of the arrow Y (Fig. 5) to the position shown in Fig. 6 by the action of the air cylinder 19.

In the operation described hereinabove, since the guide plate 9 moves slantingly upwardly and downwardly at an angle with respect to the frame 1 between the position in which the guide plate 9 is disposed away from the guide plate 8 and the normal position in which the guide plate 9 is in alignment with the guide plate 8, the distance of movement of the guide plate 9 can be reduced without it being interfered with by the cutter 4 or the like and the slide fastener chain 6 can be easily inserted into the clearance in a short time space. In addition, as the guide plate 9 moves slantingly from above onto the slide fastener chain 6 held in the position shown by the chain line 46 upon the returning of the guide plate, the inner edge 11 of the guide plate 9 does not interfere with the adjacent or outer edge of the fastener tape 30 and the possibility of the fastener tape edge turning-up is thereby eliminated.

When the guide plate 9 and slide fastener chain 6

assume the positions shown in Fig. 6, the upper plunger (not shown) is moved downwardly to lower the cutter 4.

In the final phase of the downward movement of the cutter 4, the edges 25, 26 of the cutter 4 shear off the outer end portions of the upper legs of the fastener element row 28 and at the same time, the protruding member 27 of the cutter 4 pushes the head portions of the meshing fastener elements row 28 to flatten the meshing fastener elements and thereby relax sewing threads 47, 48 which attach the fastener element row 28 to the fastener tapes 29, 30.

The upper plunger is so regulated that the cutter 4 terminates its downward movement at the time point when the threads 47, 48 are relaxed and, thereafter, the lower plunger 40 is moved upwardly.

As the lower plunger 40 moves upwardly, the holder 39 and knockout means 7 also move upwardly and at the same time, the pressure pads 33, 34 are urged upwardly under the force of the springs 43, 44 until the upper surfaces 49, 50 of the pads pinch the fastener tapes 29, 30, respectively, in cooperation with the under surfaces 12, 13 of the guide plates 8, 9, respectively, such as to hold the fastener tapes in position whereupon the pressure pads 33, 34 cease their upward movement and only the springs 43, 44 are compressed by the continuing upward movement of the holder 39. As the holder 39 continues to move upwardly, the knockout means 7 also moves upwardly until the leading or upper end of the knockout means 7 and the protruding member 27 of the cutter 4 pinch and hold the fastener element row 28

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therebetween. At this point, when the movement of the upper plunger is changed so that it moves upwardly, the fastener element rows 28 which are nipped between the leading end of the knockout means 7 and the protruding member 27 of the cutter 4 are raised from the fastener tapes 29, 30 as shown in Fig. 8 whereby the section of the fastener element row 28, the upper legs of which have been sheared off as stated above, is released and removed from the sewing threads 47, 48.

Thereafter, the lower plunger 40 is moved back downwardly and the upper plunger is moved back upwardly to the normal position from which the upper plunger initiates its following downward movement to thereby return the device to the position shown in Fig. 6. With the device in this position, the chain is automatically advanced through the device until the next portion of the chain to be formed with a space is brought to the space forming station 3 of the frame 1.

Incidentally, when the knockout means 7 secured to the holder 39 moves downwardly as the lower plunger 40 moves downwardly, the under shoulders 51, 52 of the bulged portion 36 on the knockout means 7 engage the inwardly directed projections 53, 54 on the pressure pads 33, 34, respectively, to pull the pressure pads 33, 34 downwardly.

In the illustrated embodiment, although the fastener element row 28 is sheared off only at the upper legs thereof, the present invention is not limited to such an arrangement. The present invention can be also applied to the arrangements disclosed in Japanese Utility Model Application Publication No. 16713/1978 and Japanese Patent Application

Publication No. 37322/1982 for shearing the fastener elements row off. Namely, in these Japanese Patent and Utility Model Applications, the fastener element row is sheared off at the central meshing portion of the elements and the remaining portions of the sheared off elements are removed from the corresponding fastener tape by the use of a scraping means or the like which engages and removes the remaining portions upon relative movement against the fastener tapes. The subject invention can be applied to such a shearing arrangement.

In addition to the arrangement in which a slide fastener chain of indefinite length is intermediately formed with successive spaces, the device of the present invention can be also applied to the arrangement in which a single space is formed at a desired position of a slide fastener chain of definite length and the arrangement in which the fastener element row in a single slide fastener chain is cut short. In these arrangements, the slide fastener chain is manually set on the apparatus one by one and the air cylinder 19 which moves the movable guide plate is actuated through a treadable switch (not shown).

In the illustrated embodiment, although only the guide plate 9 is movable, it is also possible for the other guide plate 8 to be provided with a similar moving means so that it can also move slantingly upwardly and outwardly at an angle with respect to the frame. Furthermore, the drive means for moving the or each guide plate is not limited to the illustrated air cylinder, but a full mechanical drive mechanism may be employed in place of the air cylinder.

CLAIMS:-

1. A space forming device for a slide fastener chain comprising a fastener elements removing means disposed on a frame of the device for removing fastener elements in an area of predetermined length from said fastener chain having a row of successive meshing fastener elements, a pair of guide plates disposed on said frame in an opposing spaced relationship to embrace said fastener elements removing means therebetween, one guide plate being fixed so that there is a guide-clearance for guiding said slide fastener chain defined between an upper surface of said frame and an under surface of said fixed guide plate, characterized in that the other guide plate is so assembled on said frame that it can move slantingly outwardly and upwardly away from said one guide plate, to allow insertion of the slide fastener chain, and so that said other guide plate can thereafter be moved slantingly inwardly and downwardly to an operative position, in which there is a guide clearance, for guiding said slide fastener chain, defined between an upper surface of said frame and an under surface of said other guide plate.

2. A space forming device for a slide fastener chain comprising a fastener elements removing means disposed on a frame of the device for removing fastener elements in an area of predetermined length from said fastener



chain having a row of successive meshing fastener elements, a pair of guide plates disposed on said frame in an opposing spaced relationship to embrace said fastener elements removing means therebetween,

5 characterized in that each one of said guide plates is so assembled on said frame that it can move slantingly outwardly and upwardly away from the other guide plate, to allow insertion of the slide fastener chain, and so that each guide plate can thereafter be moved slantingly
10 inwardly and downwardly to an operative position, in which there is a guide clearance, for guiding said slide fastener chain, between a respective upper surface of said frame and an under surface of said guide plate.

3. A space forming device as claimed in Claim 1 or 2,
15 in which the or each said movable guide plate includes slidable members which are slidably received in corresponding slide rail portions formed in said frame.

4. A space forming device as claimed in Claim 1, 2 or 3
in which the or each said movable guide plate is
20 actuated by an air cylinder.

5. A space forming device as claimed in Claim 4, in which said air cylinder is actuated automatically or through a treadable switch.

6. A space forming device as claimed in any preceding
25 claim, in which said fastener elements removing means is



adapted and arranged to be intermittently actuated so that it forms said spaces in said slide fastener chain with a predetermined spaced relationship between each.

5 7. A space forming device as claimed in any preceding claim, in which said fastener elements removing means includes a cutter and a die block which are opposed to each other.

10 8. A space forming device as claimed in Claim 7, in which said cutter includes two opposing blades defining a clearance therebetween for shearing off outer ends of upper legs of fastener elements to be removed.

15 9. A space forming device as claimed in Claim 8, in which said cutter includes a protruding member interposed between said blades, and said die block includes a knockout means which cooperates with said protruding member.

20 10. A space forming device as claimed in Claim 7, 8 or 9, in which said cutter and die block are adapted to shear off meshing head portions of said fastener elements to be removed.

11. A space forming device substantially as described with reference to and as illustrated in the accompanying drawings.
