

PARTS APPLICATOR FOR A MACHINE FOR
AUTOMATICALLY ASSEMBLING SLIDE FASTENER
SLIDERS

2184780

5 The present invention relates to an apparatus
for automatically applying slider parts such as pull
tabs, locking prongs, springs and covers, successively
to slider bodies in an automatic assembling machine for
successively assembling sliders for slide fasteners.

10 There has been proposed an automatic slider
assembling machine of the type wherein a turntable,
with a plurality of slider bodies retained thereon at
circumferentially spaced intervals, is intermittently
rotated through a series of working stations or units
15 disposed around the turntable for automatically
applying various slider parts such as pull tabs,
locking prongs, springs and covers, successively to the
slider bodies, thereby successively assembling slide
fastener sliders. In application, each slider part is
20 delivered from a chute directly onto one of the slider
bodies on the turntable, and then is attached by
clinching or pressing to the slider body.

 With this constcution, each working station or
unit requires two separate devices, i.e. a parts
25 supplying device and a parts applicator with the result
that the slider assembling machine becomes bulky and
complex in construction. Since the slider parts to be

applied are rather small and light, an accurate setting of such slider parts onto a desired position on the slider bodies is difficult to achieve by way of the conventional direct parts delivery from the chute to the sliders bodies. This difficulty becomes more critical where the slider parts are resilient because due to their own resiliency, such slider parts tend to displace from the desired position on the slider bodies after their delivery. This improper part setting necessarily result in defective slider fastener sliders.

According to the present invention, there is provided an apparatus for applying a slider part to a slider body in a machine for assembling a slide fastener slider, comprising: a rockingly movable support block; an elongate applicator rod slidably mounted on said support block and having at one of its opposite ends an operating portion positionable between a first position to receive a supplied slider parts and a second position to attach the slider part to a slider body in response to rocking movement of said support block; spring means for urging said support block in a direction to place said operating portion into said first position; a linear-motion plate cam engageable with said support block for urging the latter against the force of said spring means to move said operating portion toward said second position; an actuating block connected with said plate cam and engageable with the other end of said applicator rod for urging the latter in one direction to cause said operating portion to apply the slider part to the slider body while said operating portion is held in said second position; and drive means operatively connected with said plate cam for reciprocating the same.

It is believed possible by means of the present invention to provide a slider parts applicator which is compact and simple in construction, which is capable of receiving a slider part reliably from a chute and then applying the slider parts accurately to the desired position on a slider body and which can be incorporated in a slider assembling machine with utmost ease.

The invention will be described by way of example with reference to the accompanying drawings, wherein like references refer to like parts unless the context requires otherwise and wherein:-

Figure 1 is a schematic front elevational view of a slider parts applicator embodying the present invention;

Figure 2 is an enlarged cross-sectional view of a portion of Figure 1, showing a locking prong delivered from a chute to an operating portion of the applicator;

Figure 3A is a perspective view of a finished or assembled slide fastener slider with a locking prong applied to a slider body by the applicator shown in Figure 1;

5 Figure 3B is a longitudinal cross-sectional view of the slider shown in Figure 3A;

Figure 3C is a fragmentary perspective view of the slider shown in Figure 3A with the locking prong before it is attached to the slider body;

10 Figure 3D is a view similar to Figure 3B, showing the locking prong held in unlocking position;

Figure 4 is a view similar to Figure 1, showing parts in a different condition;

15 Figure 5 is an enlarged cross-sectional view of a portion of Figure 4, showing the locking prong attached to the slider body by the operating portion of the applicator; and

20 Figure 6 is a diagrammatic plan view of an automatic slider assembling machine incorporating the slider parts applicator of Figures 1 to 5.

The principles of the present invention are particularly useful when embodied in an apparatus, generally denoted by the reference numeral 10 in Figure 1, for applying a locking prong to a slider body with a
25 pull tab pre-assembled therewith.

The apparatus or applicator 10 generally comprises a substantially rectangular support block 11

rotatably mounted by a shaft 12 on a frame 13 disposed radially outwardly of an intermittently rotatable base or turntable 14, and an elongate applicator rod 15 slidably mounted on the support block 11 and extending longitudinally through the support block 11 with its opposite ends projecting from the support block 11. The applicator rod 15 has at its one end (upper end in Figure 1) an operating portion 16 and at the other end a cam follower in the form of a roller 17 held in rolling engagement with a cam surface 18a of a linear-motion plate cam 18 slidably mounted on the frame 13. The support block 11 also includes a cam follower in the form of a roller 19 held in rolling engagement with the cam surface 18a of the plate cam 18. The plate cam 18 is reciprocably movable to oscillate the support block 11 about the shaft 12 to cause the operating portion 16 to move angularly toward and away from an outlet 20a of a parts supply chute 20. An actuator block 21 is secured to a rear end of the plate cam 18 and is engageable with the roller 17 on the applicator rod 15 to force the applicator rod 15 forewardly. The actuator block 21 is connected to a piston rod 22a of a fluid-actuated cylinder 22 so that upon actuation of the cylinder 22, the actuator block 21 and hence the plate cam 18 connected thereto reciprocates to oscillate the support block 11 and the applicator rod 15 supported thereby. A tension spring

23 extends between the frame 13 and a lever 24 connected in unison with the support block 11 via the shaft 12 and urges the support block 11 in the clockwise direction in Figure 1. The amplitude of
5 rocking movement of the support block 11 is essentially determined by the shape of the cam surface 18a of the plate cam 18; however, to limit rotating movement of the support block 11 in the clockwise direction, there is provided a stop bolt 25 threaded through a bracket
10 26 secured to the frame 13. The stop bolt 25 is adjustably locked in position by a nut 27 threaded over the stop bolt 25 and has one end normally held against one sidewall of the support block 11 to hold the operating portion 16 in a position close to the outlet
15 20a of the chute 20. The projecting length of the stop bolt 25 which extends between the bracket 26 and the support block 11 can be adjusted by the nut 27 to adjust the position of the operating portion 16 accurately with respect to the chute outlet 20a.

20 The cylinder 22 is actuated to extend its piston rod 22a whereupon the actuator block 21 and the plate cam 18 move forwardly to cause a raised portion of the cam surface 18a to engage the cam follower 19. With this engagement, the support block 11 is forced by the
25 plate cam 18 to turn about the shaft 12 in the counterclockwise direction in Figure 1 against the force of the tension spring 23 to thereby move the

operating portion 16 downwardly toward one of a plurality of recesses 28 which are defined in an outer peripheral wall of the turntable 14 at circumferentially spaced intervals for receiving slider bodies.

5 This rotating movement of the support block 11 in the counterclockwise direction is limited by a stop bolt 29 threaded through the bracket 26 in parallel relation to the stop bolt 25 and adjustably locked in position by a nut 30 threaded over the stop bolt 29. The stop bolt
10 29 has one end normally facing toward the sidewall of the support block 11. The projecting length of the stop bolt 29 which extends between the bracket 26 and the support block 11 can be adjusted by the nut 30 to adjust the position of the operating portion 16
15 accurately with respect to the recess 28 in the turntable 14.

As the piston rod 22a of the cylinder 22 is further extended, the actuator block 21 is brought into engagement with the roller 17 as shown in Figure 2 and
20 then forces the applicator rod 15 forwardly. The forward movement of the piston rod 22a is limited by the stop bolt 31 threaded through a bracket 32 secured to the plate cam 18. The stop bolt 31 is adjustably locked in position by a nut 33 threaded thereover and
25 has one end normally facing toward an end surface of the frame 13. The projecting length of the stop bolt 31 which extends between the bracket 32 and the frame

13 can be adjusted by the nut 33 in such a manner that the operating portion 16 assumes the position of Figure 5 when the piston rod 22a is fully extended. On retracting movement of the piston rod 22a, the actuator rod 15 moves rearwardly under the force of a pair of compression springs 34 extending between and acting between the applicator rod 15 and the support block 11.

The operating portion 16 of the applicator rod 15 includes, as shown in Figure 2, a lower guide member 35, a first presser pad 36 slidably disposed on the guide member 35, and a second presser pad 37 slidably disposed on the first presser pad 36. The presser pads 36, 37 are normally retracted from the front end of the guide member 35.

15 The operating portion 16 further includes a pair of side plates 38 (only one shown) resiliently connected with the guide member 35 so as to define, jointly with the guide member 35 and the presser pads 36, 37, a pocket 39 for receiving therein a locking prong 40 to be applied to a slider body 41 (Figure 5). The side plates 38 are normally urged toward each other to hold the locking prong edgewise in the pocket 39 against displacement of the operating portion 16. The guide member 35, the first and second presser pads 36, 37 and 25 the side plates 38 are all resiliently connected with the body of the applicator rod 15 by means of non-illustrated compression springs acting therebetween

so that they are movable not only in unison with the applicator rod 15 when the compression springs are in free or non-loaded condition, but also in independence from one another when the compression springs yield under the forces applied to the respective members 35 - 38. The chute 20 includes an upper guide plate 20b projecting from the outlet 20a to such an extent that it ensures a stable delivery of each locking prong 40 into the pocket 39 but does not interfere with the operating portion 16 when the latter moves angularly toward and away from the chute 20.

Prior to describing the operation of the apparatus 10, the slider body 41 and the locking prong 40 to be assembled thereon are first described with reference to Figures 3A - 3D. The slider body 41 includes a pair of parallel spaced lugs 42 of a substantially inverted U shape disposed on an upper wing 43 of the slider body 41. A substantially rectangular pull tab 44 has at its one end a trunnion or pivot 45 rotatably received in the lugs 42, and two holes 46a, 46b defined therein near opposite ends thereof. The locking prong 40 is bent from a strip of resilient sheet metal into a generally S shape and includes a retaining portion 47 at one end, a locking portion 48 at the other end, and a presser portion 49 of a generally inverted U shape contiguous to the locking portion 48. The locking prong 40 is assembled

with the slider body 41 from an upper side of the upper wing 43 with the pull tab 44 held in a recumbent position lying flatwise over the upper wing 43, as shown in Figure 3B. In assembling operation, the retaining portion 47 is forced into a vertical hole 50 defined in a front end portion of the slider body 41 until its lateral shoulders 47a are hooked on a pair of locking noses 51 (Figure 3C) projecting into the hole 50. With the locking prong 40 thus assembled on the slider body 41, the presser portion 49 is forced against the pivot 45 of the pull tab 44 under the resiliency of the locking prong 40, and the locking portion 48 projects through an aperture 52 in the upper wing 43 into a generally Y-shaped guide channel 53 defined in the slider body 41. When the pull tab 44 is turned from the recumbent position of Figure 3B to the tilting position of Figure 3D, a cam 54 on the pivot 45 engages the presser portion 49 of the locking prong 40 to retract the locking portion 49 from the guide channel 53 into the aperture 52.

The parts applicator 10 will operate as follows:

For purposes of illustration, the operation begins with parts of the applicator 10 in the condition of Figure 1. In this condition, the piston rod 22a of the cylinder 22 is fully retracted to hold the plate cam 18 in its retracted position. The support block 11 is held in engagement with the stop bolt 25 and hence is

prevented from turning clockwise about the shaft 12 under the force of the tension spring 23. With this engagement, the operating portion 16 is located close to the outlet 20a of the chute 20. The turntable 14 is
5 held at rest with one of the recesses 28 held in confronting relation to the parts applicator 10 and one of the locking prongs 40, which has been delivered from the chute 20 into a pocket 39 in the operating portion 16, is resiliently held in the pocket 39 (Figure 2).

10 The cylinder 22 is actuated to extend its piston rod 22a to advance the actuator block 21 and the plate cam 18. Advancing movement of the plate cam 18 causes the raised portion of the cam surface 18a to engage the cam follower 19 whereupon the support block 11 turns
15 clockwise about the shaft 12 against the force of the tension spring 23 until the support block 11 abuts against the stop bolt 29 (Figure 1 to Figure 4). Upon engagement of the support block 11 with the stop bolt 29, the operating portion 16 is located close to the
20 recess 28 in confronting relation to a slider body 41 held in the recess 28 with the pull tab 44 lying flatwise over the upper wing 43 of the slider body 41.

As the piston rod 22a is further extended, the actuator block 21 is brought into engagement with the
25 roller 17 and forces the latter forwardly. Thus, the applicator rod 15 advances toward the slider body 41 to thereby cause the operating portion 16 to force or

press the locking prong 40 onto the slider body 41 until they are assembled together as shown in Figure 5.

A detailed description of a sequence of parts applying operations is given below with reference to
5 Figures 3C and 5. Upon advancing movement of the applicator rod 15, all the members or parts 35 - 38 of the operating portion 16 move toward the slider body 41. The advancing movement of the side plates 38 and the guide member 35 of the operating portion 16 is
10 brought to a stop when the side plates 38 engage the respective lugs 42 of the slider body 41 and the guide member 35 projects through the hole 46a of the pull tab 44 into engagement with the upper wing 43 of the slider body 41 adjacent to a lower edge (Figure 5) of the
15 aperture 52. At this time, the locking prong 40 is supported on the guide member 35. Upon continued advancing movement of the applicator rod 15, the first and second presser pads 36, 37 move forwardly to force the locking prong 40 against the slider body 41. The
20 forward movement of the first presser pad 36 is brought to an end when the presser portion 49 of the locking prong 40 engages the pivot 45 of the pull tab 44 with the locking portion 48 projecting through the aperture 52 into the guide channel 53 in the slider body 41.
25 Thereafter, the second presser pad 37 is further advanced to force the retaining portion 47 of the locking prong 40 into the hole 50 in the slider body 41

until the lateral shoulders 47a are hooked on the locking noses 51 (Figure 3C to Figure 5). Immediately thereafter, the stop bolt 31 engages the frame 13, thereby stopping the forward movement of the piston rod 22a. Then the cylinder is actuated to retract its piston rod 22a to move actuator block 21 and the plate cam 18 rearwardly whereupon the applicator rod 15 and the support block 11 return to their initial positions shown in Figure 1, under the forces of the compression springs 34 and the tension spring 23, respectively.

Thereafter, the turntable 14 is angularly moved through an angular interval equal to the spacing between the adjacent recesses 28 for positioning the slider body 41 retained in the next recess 28 in preparation for application of a next locking prong 40 by the applicator 10. The preceding slider body 11 to which the locking prong 40 has been applied is delivered to a next processing station. The parts applicator 10 then repeats the aforesaid cycle of operation.

Figure 6 shows an example of slide fastener assembling machine in which the parts applicator 10 is incorporated as one of successive operating units disposed circumferentially around the turntable 14. In timed relation to stepwise rotation of the turntable 14, one slider body 41 is supplied at a time to one of the recesses 28 by a slider body supply unit 55, then a pull tab 44 is applied to the slider body 41 by a pull

tab applicator 56, thereafter, a locking prong 40 is applied to the slider body 41 by the parts applicator 10 of the present invention, and finally an assembled slider is discharged from a discharge unit 60.

5 Disposed between adjacent processing units 55, 56, 10, 57 are inspecting devices 58, 59, 60 for discriminating good sliders from defective or inferior sliders. The inspecting units 55, 56, 10, 57 are electrically connected with the discharging unit 57 and with another
10 discharging unit 61 and control the operation of the two discharging units 57, 61 for discharging the good sliders and the inferior sliders separately therefrom.

As described above, the operating portion 16 of the applicator rod 15 is angularly reciprocated between
15 a first position to receive a slider part or locking prong 40 from the chute 20 and a second position close to a slider body 41 retained on the turntable 14, in response to pivotal movement of the support block 11. In the second position, the operating portion 16 is
20 movable to force the locking prong 40 against the slider body 41 in response to linear reciprocating movement of the applicator rod 15. With this construction, an accurate attachment of the slider part to the slider body is achieved even though such slider
25 part is relatively small, light and sometimes resilient. The aforesaid rocking movement of the support block 11 and the linear reciprocating movement

of the applicator rod 15 are obtained by a single drive means 22 through the plate cam 18 and the actuator block 21 connected thereto. The parts applicator 10 thus constructed is compact and simple in construction as a whole, and hence can be incorporated in the automatic slider assembling machine with utmost ease.

10

15

20

25



CLAIMS:-

1. An apparatus for applying a slider part to a slider body in a machine for assembling a slide fastener slider, comprising:

- 5 (a) a rockingly movable support block;
- (b) an elongate applicator rod slidably mounted on said support block and having at one of its opposite ends an operating portion positionable between a first position to receive a supplied slider part and a second position to attach the slider part to a slider body in response to rocking movement of said support block;
- 10 (c) spring means for urging said support block in a direction to place said operating portion into said first position;
- 15 (d) a linear-motion plate cam engageable with said support block for urging the latter against the force of said spring means to move said operating portion toward said second position;
- (e) an actuating block connected with said plate cam and engageable with the other end of said applicator rod for urging the latter in one direction to cause said operating portion to apply the slider part to the slider body while said operating portion is held in said second position; and
- 20 (f) drive means operatively connected with said plate cam for reciprocating the same.
- 25 (f) drive means operatively connected with said plate cam for reciprocating the same.

2. An apparatus according to claim 1, further



- 17 -

including spring means acting between said support block and said applicator rod for urging the latter in a direction opposite to said one direction.

3. An apparatus according to claim 1 or 2, further
5 including a pair of stop bolts alternately engageable with said support block for limiting rocking movement of said support block.

4. An apparatus according to claim 3, said stop bolts being adjustably locked in position by a pair of
10 nuts, respectively.

5. An apparatus according to any preceding claim, further including a stop bolt connected to said plate cam for limiting the forward movement of the latter.

6. An apparatus according to claim 5, said stop
15 bolt being adjustably locked in position by a nut.

7. An apparatus according to any preceding claim, said operating portion being resiliently connected with a body of said applicator rod and movable both in unison with and in independence from said applicator rod.

20 8. An apparatus according to claim 7, said operating portion including a guide member, a first presser pad slidably disposed on said guide member and a second presser pad slidably disposed on said first presser pad, said first and second presser pads being
25 normally retracted from said guide member for enabling the slider part to be held on said guide member.

9. An apparatus according to claim 8, further



- 18 -

including a pair of side plates disposed on opposite
sides of said guide member so as to define, jointly
with said guide member and said first and second
presser pads, a pocket for receiving therein the slider
5 part.

10. An apparatus according to claim 9, said
side plates being resiliently urged toward each other
for holding the slider part therebetween.

10

15

20

25