

- 1 -

Title:- PULL TAB APPLICATOR FOR A MACHINE FOR
AUTOMATICALLY ASSEMBLING SLIDE FASTENER
SLIDERS

Description:-

5 The present invention relates to a pull tab applicator for automatically applying pull tabs successively to slider bodies in an automatic assembling machine for successively assembling sliders for slide fasteners.

10 Japanese Patent Publication No. 57-41244 published on September 2, 1982 discloses a pull tab applicator for use with an assembling machine which assembles slide fastener sliders. The disclosed pull tab applicator has a pair of jaws for gripping the
15 opposite side edges of a pull tab supplied onto a slider body in the the assembling machine. While the jaws are moving in a direction to bring down the pull tab, they are cammed apart from each other out of engagement with the pull tab.

20 One problem with the prior pull tab applicator is as follows: During the spreading movement of the jaws, the pull tab is liable to be tilted laterally toward one of the jaws. This tendency of the pull tab is particularly strong where the pull tab is larger
25 in its upper portion than in its lower portion, i.e. it has a high center of gravity in its vertical position. The pull tab as it is applied to the slider body is

also apt to fall in the opposite direction due to vibration of the assembling machine. As a consequence, the pull tab supplied to the assembling machine tends to be improperly positioned, adversely affecting the subsequent process of assembling the pull tab on the slider body.

According to the present invention, there is provided a pull tab applicator for applying a pull tab to a slider body in a machine for assembling a slide fastener slider, comprising: a pair of jaws at least one of which is movable relatively away from and toward the other, said jaws being disposed to confront the face and back, respectively, of a supplied pull tab, said jaws having confronting surfaces, respectively, at least one of said confronting surfaces having a slot for receiving said pull tab therein, said slot being inclined in a direction to bring down the pull tab towards a recumbent position as applied to the slider body; and a driver coupled to at least one of said jaws for moving said one jaw between a first position close to the other jaw to hold the pull tab in said slot therebetween and a second position remote from the other jaw to allow the pull tab to be brought down in said direction.

It is believed possible by means of the present invention to provide a pull tab applicator capable to bring down a pull tab properly at all times by positively guiding the pull tab in the direction to bring down the pull tab.

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 plan view, partly in cross section, of a pull tab applicator embodying the present invention;

Figure 2 is a front elevational view, partly in cross section, of the pull tab applicator shown in Figure 1;

5 Figure 3 is a plan view, partly in cross section, of the pull tab applicator, showing a condition immediately after a pull tab has started to be brought down towards a recumbent position;

10 Figure 4 is a view similar to Figure 3, illustrating a condition in which the pull tab has completely been brought down to the recumbent position;

Figure 5 is a fragmentary vertical cross-sectional view of a slider body and front and rear jaws which are relatively positioned when a pull tab is supplied onto the slider body;

15 Figure 6 is a view similar to Figure 5, showing the front and rear jaws immediately after they have started to bring down the pull tab;

Figure 7 is a view similar to Figure 5, showing the front and rear jaws after the pull tab has fully been brought down;

5 Figure 8 is a perspective view of a slider body and a pull tab as the latter is supplied onto the slider body;

Figure 9 is a perspective view of the slider body shown in Figure 8 with the pull tab brought down thereon;

10 Figure 10 is a perspective view of the slider body of Figure 8 with the pull tab assembled thereon;

Figure 11 is a perspective view of another slider body and a pull tab as the latter is supplied onto the slider body;

15 Figure 12 is a perspective view of the slider body shown in Figure 11 with the pull tab brought down thereon;

Figure 13 is a perspective view of the slider body of Figure 11 with the pull tab assembled thereon;

20 Figure 14 is a fragmentary plan view of front and rear jaws according to a modification of the present invention; and

Figure 15 is a fragmentary plan view of front and rear jaws according to another modification of the present invention.

1 The principles of the present invention are particularly useful when embodied in a pull tab

applicator generally designated by the reference numeral 10 in Figures 1 and 2.

Prior to describing the pull tab applicator 10 in detail, a slider body and a pull tab to be assembled thereon will first be described with reference to Figures 8 through 10. As shown in Figure 8, a slider body 11 is composed of a pair of upper and lower wings 12, 13 spaced from each other and interconnected by a connector (not shown), the upper and lower wings 12, 13 defining therebetween a generally Y-shaped guide channel 14 for guiding a pair of rows of slide fastener coupling elements (not shown). The upper wing 12 supports thereon a cantilevered lug 15 of a substantially inverted U-shape joined at one end near the connector. The opposite free end of the lug 15 is spaced from the upper wing 12, leaving a gap 16 therebetween. A rectangular pull tab 17 to be assembled on the slider body 11 has two holes 18 defined therein near opposite ends thereof. The pull tab applicator 10 essentially operates to supply the pull tab 17 so that the pull tab 17 is held endways against the upper wing 12 with the lower hole 18 positioned closely to the free end of the lug 15, as shown in Figure 8. Then, the pull tab 17 is translated toward the lug 15 until the lug 15 is inserted through the lower hole 18 to a position 19 indicated by the two-dot-and-dash lines in Figure 8. Thereafter, the

pull tab 17 is brought down into a recumbent position on the slider body 11 as illustrated in Figure 9. At this time, the pull tab 17 is tilted down in a direction away from the gap 16. After the pull tab 17 has been placed on the slider body 11 as shown in Figure 9, the lug 15 is deformed by a punch 20 (Figure 10) in an assembling machine so that the free end of the lug 15 is pressed against the upper wing 12, closing the gap 16, whereupon a slide fastener slider 21 is completed.

As shown in Figure 1, a number of slider bodies 11 are placed respectively in recesses 22 defined at circumferentially spaced intervals in the upper surface of a circular base 23 rotatable by a central drive shaft 24, the recesses 22 being open upwardly and radially outwardly. The base 23 is intermittently rotated to bring one of the slider bodies 11 at a time to a pull tab applying position 25 where the pull tab applicator 10 is located radially outwardly of the base 23.

In the pull tab applying position 25, there is also located a pull tab supply chute 26 (Figure 2) slightly inclined for supplying a succession of pull tabs 17 to the pull tab applying position 25. The pull tab supply chute 26 and a pull tab feeder (not shown) combined therewith may be of any suitable construction which can feed pull tabs 17 successively one by one to

the pull tab applying position 25.

As illustrated in Figures 1 and 2, the pull tab applicator 10 has a pair of front and rear jaws 27, 28 which are relatively movable and have respective confronting surfaces 29, 30 that are slightly inclined in line with the chute 26. The confronting surfaces 29, 30 are normally held closely to each other in a plane lying in alignment with the path of movement of the pull tabs 17 along the chute 26. More specifically, the confronting surfaces 29, 30 are disposed in facing relation to the face and back, respectively, of the pull tab 17 supplied from the chute 26 and positioned horizontally between the front and rear ^{jaws} ~~grippers~~ 27, 28 and positioned substantially vertically between the outlet 31 of the chute 26 at its lower end and a pull tab applying area 32 on the slider body 11 received in one of the recesses 22, as better shown in Figure 5.

The surface 30 of the rear ^{jaw} ~~gripper~~ 28 has a vertical slot 33 opening toward the surface 29 of the front gripper 27. The slot 33 is open at its upper and lower ends and is substantially vertically aligned with the chute outlet 31 and the pull tab applying area 32. The slot 33 is inclined in a direction in which to bring down the supplied pull tab 17 towards a recumbent position, as indicated by the arrow A in Figure 2.

The rear jaws 28 is detachably coupled by a

screw 34 to the front end of a first slide 35 reciprocably slidably inserted in a first guide groove 36 defined in a support block 37 fixed to a machine base (not shown) by means of a plurality of screws 38.

- 5 The first slide 35 has a rear end 39 coupled to a driver 40 which moves the first slide 35 back and forth in the first guide groove 36.

The driver 40 comprises a connecting rod 41 vertically movably supported on the machine base and
10 actuatable by means of a suitable actuator such as an air cylinder or a motor, a link 42 pivotably joined to the upper end of the connecting rod 41, a shaft 43 fixed at one end to the link 42 and rotatably supported on the support block 37, a link 44 having one end fixed
15 to the other end of the shaft 43, and a shaft 45 attached to the rear end 39 of the first slide 35 and rotatably fitted in an oblong hole 46 defined in the other end of the link 44. The driver 40 thus arranged can convert vertical reciprocating movement of the
20 connecting rod 41 as indicated by the arrow B to horizontal back-and-forth movement of the first slide 35 as indicated by the arrow C.

The front jaw 27 is detachably coupled by a screw 47 to the front end of a second slide 48
25 reciprocably slidably inserted in a second guide groove 49 defined in the support block 37 parallel to the first guide groove 36. The second slide 48 has a

lateral arm 50 disposed near the front end of the second slide 48 and projecting remotely from the first slide 35. The arm 50 extends in confronting relation to the front end face 51 of the support block 37. The
5 second slide 48 is normally urged to move toward the driver 40 by a tension spring 52 coupled to and extending between a pair of spring retainer pins 53, 54 secured respectively to the arm 50 and the support block 37. The second slide 48 has a rear end face 55
10 which lies substantially flush with or slightly projects from the rear end face 56 of the support block 37 when the second slide 38 is held at rest in its forward position as shown in Figures 1 and 2.

The rear end 39 of the first slide 35 has a
15 lateral arm 57 projecting in confronting relation to the rear end face 55 of the second slide 38. The arm 57 supports thereon a pair of vertically spaced adjustment bolts 58, 59 that are threaded through the arm 57 and adjustably locked in position by means of
20 respective nuts 60, 61 threaded over the adjustment bolts 58, 59. The adjustment bolt 58 has its tip end held against the rear end face 56 of the support block 37 to hold the first slide 35 in position with respect to the support block 37. The adjustment bolt 59 is
25 held endways against the rear end face 55 of the second slide 48. When the first slide 35 is moved toward the base 23, the second slide 48 is also moved therewith by

the adjustment bolt 59. The projecting length of the adjustment bolt 58 which extends between the arm 57 and the rear end face 56 of the support block 37 can be adjusted by the nut 60 to adjust the position of the first slide 35 with respect to the support block 37. The slot 33 can be positioned into accurate alignment with the outlet 31 of the chute 26 by such adjustment of the bolt 58. The projecting length of the adjustment bolt 59 which extends between the arm 57 and the rear end face 55 of the second slide 48 is likewise adjustable by the nut 61 to adjust any gap between the confronting surfaces 29, 30 of the front and rear jaws grippers 27, 28.

Another adjustment bolt 62 is threaded through the arm 50 of the second slide 48 and has its tip end facing the front end face 51 of the support block 37. The length of the adjustment bolt 62 between the arm 50 and the front end face 51 of the support block 37 can be adjusted by means of a nut 63 threaded over the adjustment bolt 62. When the second slide 48 is moved toward the driver 40 under the resiliency of the tension spring 52, the tip end of the adjustment bolt 62 engages the front end face 51 of the support block 37 to stop the second slide 48 and hence the front jaw gripper 27.

The pull tab applicator 10 of the foregoing construction operates as follows:

When one of the recesses 22 carrying the slider bodies 11 reaches the pull tab applying position 25, the base 23 is stopped, and the non-illustrated pull tab feeder is operated to cause one of the pull tabs 17 to slide down the chute 26 by gravity into the slot 33 between the confronting surfaces 29, 30 of the front and rear jaws 27, 28 which are held at rest as shown in Figures 1 and 2. The pull tab 17 thus positioned in the slot 33 has its lower portion located in the pull tab applying area 32 on the slider body 11 and is retained between the front and rear jaws 27, 28 as shown in Figure 5.

Then, the connecting rod 41 is moved upwardly to cause the links 42, 44 to move the first slide 35 in a direction away from the base 23 toward the driver 40. Since the adjustment bolt 49 is also moved with the first slide 35, the second slide 48 is allowed to move with the first slide 35 under the resiliency of the tension spring 52. The front and rear jaws 27, 28 are therefore moved together in unison to displace the pull tab 17 to the position of Figure 6 (which is the same as the two-dot-and-dash-line position shown in Figure 8). At this time, the free end of the lug 15 passes through the lower hole 18 of the pull tab 17 with the lower end thereof moving through the gap 16.

Upon continued movement of the first and second slides 35, 48 toward the driver 40, the adjustment bolt

62 on the arm 50 of the second slide 48 engages the front end face 51 of the support block 37, thereby stopping the second slide 48 and hence the front gripper 27, as shown in Figure 3. However, the first slide 35 keeps on moving until the rear jaw 28 is displaced far away from the front jaw 27 as illustrated in Figure 4. With the rear jaw 28 moved away from the front jaw 27 as shown in Figure 7, the pull tab 17 is brought down in the direction of the arrow A into a substantially horizontal recumbent position on the slider body 11, as shown in Figure 9.

When the pull tab 17 is completely brought down, the connecting rod 41 of the driver 40 is lowered to enable the links 42, 44 to move the first slide 35 toward the base 23. On the movement of the first slide 35 toward the base 23, the adjustment bolt 59 on the arm 57 of the first slide 35 engages the rear end face 55 of the second slide 48 and then pushes the second slide 48 toward the base 23 against the resilient forces of the tension spring 52. The movement of the first and second slides 35, 48 is brought to a stop when the adjustment bolt 58 on the arm 57 of the first slide 35 engages the rear end face 56 of the support block 37.

Before the first and second slides 35, 48 are thus stopped, the base 23 is angularly moved by an angular interval equal to the pitch or angular spacing

between adjacent recesses 22 for positioning the slider body 11 carried by the next recess 22 into the pull tab applying position 25 in preparation for receiving a next pull tab 17 from the chute 26. The preceding slider body 11 to which the pull tab 17 has been applied is delivered to a next processing station where the lug 15 is pressed down against the upper wing 12 by the punch 20 (Figure 10) to retain the pull tab 17 on the slider body 11. The pull tab applicator 10 then repeats the aforesaid cycle of operation.

The thickness W of the pull tab 17 (Figure 8) can be met by adjusting the distance or gap between the confronting surfaces 29, 30 of the front and rear grippers 27, 28. Such adjustment can be effected by varying the projecting length of the adjustment bolt 58 to adjust the position in which the first slide 35 is to be stopped and also by varying the projecting length of the adjustment bolt 59 to adjust the position in which the bolt 59 pushes the rear end face 55 of the second slide 48. During this adjustment, the pull tab 17 is prevented from being laterally tilted since it is received fully or at least partly in the slot 33.

Figures 11 through 13 show a slider body 65 of a different configuration having a pair of lugs 66, 67 mounted on an upper wing 68 of the slider body 65. A pull tab 69 is positioned between the lugs 66, 67 which are thereafter deformed by a punch 70 (Figure 13) to

retain the pull tab 69 on the slider body 65. Since the pull tab 69 as it is supplied onto the slider body 65 is not required to be moved longitudinally on the slider body 65, the second slide 48 and hence the front jaw 27 should be kept immovable with respect to the support block 37. To this end, the adjustment bolt 62 is adjusted to position its tip end against the front end face 51 of the support block 37 when the second slide 48 is in the position shown in Figures 1 and 2.

Alternatively, the front jaw 27 and hence the second slide 48 may be fixed with respect to the support block 37, and only the rear jaw 28 and hence the first slide 35 may be moved back and forth with respect to the support block 37. According to a further alternative, the tip end of the adjustment bolt 62 may be slightly spaced from the front end face 51 to move the front gripper 27 slightly from the position of Figures 1 and 2 to start bringing down the pull tab 17.

Figure 14 shows a modification in which a slot 71 is defined in the surface 29 of the front jaw 27 in registry with the slot 33 in the surface 30 of the rear jaw 28. The pull tab is received jointly in the slots 33, 71.

Where a pull tab has a pair of locking prongs, the surface 29 of the front jaw 27 may have a pair of grooves 72, 73 (Figure 15) for receiving such locking prongs, respectively, when the pull tab is

located in the slot 33 of the rear gripper 28.

As described above, the front and rear jaws 27, 28 are detachably fastened to the second and first slides 48, 35, respectively. This is advantageous because the front and rear jaws 27, 28 may be replaced with different jaws to meet various slider bodies and pull tabs of different shapes. Where slider bodies and pull tabs of only a particular design are contemplated, however, the front and rear jaws 27, 28 may be permanently fixed to or integrally formed with the second and first slides 48, 35, respectively.

15

20

25

**CLAIMS:**

1. A pull tab applicator for applying a pull tab to a slider body in a machine for assembling a slide fastener slider, comprising:

(a) a pair of jaws at least one of which is movable relatively away from and toward the other, said jaws being disposed to confront the face and back, respectively, of a supplied pull tab, said jaws having confronting surfaces, respectively, at least one of said confronting surfaces having a slot for receiving said pull tab therein, said slot being inclined in a direction to bring down the pull tab towards a recumbent position as applied to the slider body; and

(b) a driver coupled to at least one of said jaws for moving said one jaw between a first position close to the other jaw to grip the pull tab in said slot therebetween and a second position remote from the other jaw to allow the pull tab to be brought down in said direction.

2. A pull tab applicator according to claim 1, said confronting surface of said other jaw having another slot defined in registry with said first-mentioned slot for receiving said pull tab.

3. A pull tab applicator according to claim 1 or 2, said confronting surface of said other jaw having a



- 17 -

pair of grooves for receiving a pair of locking prongs, respectively, of the pull tab.

4. A pull tab applicator according to any preceding claim, further including a support block having first and second guide grooves, a first slide reciprocably fitted in said first guide groove, and a second slide reciprocably fitted in said second guide groove and operatively coupled to said first slide, said jaws being detachably mounted on said first and second slides, respectively, said first slide being coupled to said driver.

5. A pull tab applicator according to claim 4, said first slide having an arm supporting a pair of adjustment bolts engageable with said support block and said second slide, respectively, when said first slide is moved by said driver to displace said one jaw toward said other jaw.

6. A pull tab applicator according to claim 5, further including a spring acting between said second slide and said support block for normally urging said other jaw to move with said one jaw while the latter is moving from said first position to said second position.

7. A pull tab applicator according to claim 6, said second slide having an arm supporting an adjustment bolt engageable with said support block to limit the movement of said other jaw with said one jaw.