

SPECIFICATION

Apparatus for Removing Sliding Clasp Fastener Coupling Element Residuals

The present invention relates to an apparatus
5 for removing coupling element residuals in a chain of interengaged coupling elements of pair of coupled sliding clasp fastener stringers.

One known practice of gapping or providing
10 element-free gaps in a chain of interengaged coupling elements of a pair of coupled sliding clasp fastener stringers is composed of two distinct and independent steps; a process of cutting off a group of intermeshing coupling heads, leaving coupling element residuals on
15 stringer tapes, and a process of removing the coupling element residuals from the stringer tapes. A remover of coupling element residuals is disclosed in Japanese Patent Publication No. 47-20101, the remover comprising saw-toothed
20 scraper disks drivable for continued rotation and a pair of spaced guides for guiding a coupled pair of sliding clasp fastener stringers as they are fed below the scraper disks, the guides being spring-biased to bring the chain of coupling elements
25 therebetween into contact with the scraper disks while they are revolving. The remover also includes means for normally urging the coupling element chain away from the scraper disks, the means being retractable, upon detecting an
30 opening in the chain where the chain is devoid of coupling heads, so as to allow coupling element residuals in the chain to get into contact with the scraper disks, whereupon the coupling element residuals are scraped off the fastener tapes. Since
35 the stringer tapes as the coupling element residuals thereon engage the scraper disk are resiliently supported only between the guides the reactive force with which the coupling element residuals are held against the scraper disks is relatively small, and thus the scraper disks cannot
40 firmly engage the coupling element residuals, with the result that some element debris may remain unremoved on the stringer tapes.

According to the invention, there is provided an
45 apparatus for removing coupling element residuals in a chain of interengaged coupling elements of a coupled pair of sliding clasp fastener stringers, comprising: a frame; a scraper roll rotatably mounted on said frame and having
50 peripheral tooth means, said scraper roll being adapted to be driven for continuous rotation; a tumbler roll idly rotatably supported on said frame for carrying the sliding clasp fastener stringers on its peripheral portion confronting said tooth means, said tumbler roll including a wing
55 projecting radially outwardly thereof for bringing the chain of coupling elements thereon into contact with said tooth means by rotation of said tumbler roll; and means on said tumbler roll for
60 engaging the sliding clasp fastener stringers at a predetermined position thereon so as to place the coupling element residuals on said wing, said tumbler roll being rotatable by engagement of said engaging means with the sliding clasp

65 fastener stringers while the latter are being fed along.

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

70 Figure 1 is a fragmentary plan view of a pair of coupled sliding clasp fastener stringers having helically coiled elements including coupling element residuals to be removed;

75 Figure 2 is a front elevational view of an apparatus, constructed in accordance with the present invention, for removing the coupling element residuals of Figure 1;

80 Figure 2A, appearing with Figure 1, is an enlarged front view of a guide for a pair of sliding clasp fastener stringers;

Figure 3 is an enlarged fragmentary view, with parts in cross section, of a tumbler roll and a scraper roll, the tumbler roll being temporarily locked against rotation;

85 Figure 4 is a fragmentary cross-sectional view taken along line IV—IV of Figure 3;

90 Figure 5 is a view similar to Figure 3, showing the position of the working parts in which coupling element debris is just about to be scraped off;

Figure 6 is a fragmentary cross-sectional view taken along line VI—VI of Figure 5;

95 Figure 7 is a fragmentary plan view of a pair of coupled sliding clasp fastener stringer having injection-molded, discrete coupling elements including coupling element residuals to be taken away;

100 Figure 8 is a front elevational view of a modified apparatus, according to the invention, for removing the coupling element residuals of Figure 7; and

Figure 9, on sheet 4, is an enlarged cross-sectional view of a tumbler roll and a scraper roll in the apparatus of Figure 8.

105 The principles of the present invention are particularly useful when embodied in an apparatus such as shown in Figure 2, generally indicated in its entirety by the numeral 10. The apparatus 10 basically comprises a frame 11, a scraper roll 12 rotatably mounted on the frame 11 and drivable for continuous rotation by a suitable motor (not shown), a base plate 13 vertically adjustably mounted on the frame 11, a pair of idler guide rolls 14, 15 rotatably mounted on the base plate 13, and a tumbler roll 16 idly rotatably mounted on the base plate 13. A guide 17 is pivotally mounted on the base plate 13, and a tumbler stop 18 is fixed to the base plate 13.

120 As shown in Figure 1, a coupled pair of sliding clasp fastener stringers 19, 20 of continuous or substantially endless length to be processed by the apparatus 10 includes opposed stringer tapes 21, 21 and a chain 22 of a pair of interengaged coupling elements 23, 23 of the helically coiled type mounted respectively on the stringer tapes 21, 21 by sewing stitches along opposed longitudinal tape edges. The coupling element chain 22 has a plurality of elongate openings or slots 24 located at spaced intervals

therealong, there being a plurality of chain lengths 25 each disposed between adjacent two of the openings 24 and corresponding to an individual sliding clasp fastener length. The interengaged coupling elements 23, 23 include intermeshing coupling heads 26 in each chain length 25, but each opening 24 is devoid of any coupling heads and is laterally bounded by coupling element residuals 27 such as coupling element leg portions and turned-over portions.

As best illustrated in Figure 6, the scraper roll 12 comprises a pair of coaxial saw-toothed disks 30, 31 spaced axially from each other and each having a peripheral series of sawteeth or serrations 32. The disks 30, 31 are spaced by a spacer 33 disposed therebetween and are fixed to a drive axle 34 for co-rotation.

A pair of vertical rails 35, 36 (Figure 2) are mounted on the frame 11 and extend parallel to each other. The base plate 13 has a pair of parallel vertical slots 37, 38 in which the rails 35, 36 are slidably fitted, respectively, for guided vertical movement of the base plate 13 on the frame 11. The base plate 13 is fixed to the frame 11 by a plurality of bolts 39 extending respectively threadedly into the frame 11 through a plurality of vertically elongate holes 40 in the base plate 13. The base plate 13 thus can be fixed to the frame 11 at selected positions thereon within vertical limits determined by the length of the holes 40.

In Figures 2 to 4 inclusive, the tumbler roll 16 includes a pair of substantially oval members 41, 42 (Figure 4) each including a central circular portion 43 and a pair of diametrically opposite wings 44, 45 extending radially outwardly from the central circular portion 43. The wings 44, 45 have a pair of cavities 46, 47, respectively, that open radially outwardly and are disposed between the oval tumbler members 41, 42. Each of the wings 44, 45 has an arcuate peripheral surface 48 on which the pair of sliding clasp fastener stringers 19, 20 are supportable. A pair of pawls 49, 50 are pivotally mounted in the cavities 46, 47, respectively. Each pawl 49, 50 is connected at one end to a pin 51 extending across one of the cavities 46, 47 into the tumbler members 41, 42, and has a locking prong 52 at the other end. Each of the pawls 49, 50 has an arcuate slot 53 that is situated substantially centrally between the ends of the pawl and through which loosely extends a pin 54 spanning across one of the cavities 46, 47 between the tumbler members 41, 42. The tumbler members 41, 42 jointly have a pair of recesses 55 (only one shown) opening the cavities 46, 47 and each receive therein a spring 56 acting between the bottom of the recess 55 and one of the pawls 49, 50 and normally urging the locking prong 52 out of the corresponding one of the cavities 46, 47.

A circular plate 57 is coaxially secured to the tumbler roll 16, which is idly rotatable on a shaft 58 extending from the base plate 13. The arcuate surface 48 on each tumbler wing 44, 45 comprises a portion of an imaginary cylinder

describable about the shaft 58. The circular plate 57 has a pair of diametrically opposite notches 59, 60 in its circumference which are angularly spaced from the wings 44, 45.

As best shown in Figure 2, the tumbler stop 18 includes a support 62 bolted to the base plate 13, and a locking rod 63 slidably disposed in a vertical bore 64 in the support 62, there being a spring 65 acting on the rod 63 for normally biasing the rod 63 toward the circular plate 57 to place its distal end into one of the notches 59, 60 upon alignment of such distal rod end with said one notch. The force with which the rod 63 is biased toward the circular plate 57 is such that the distal rod end disposed in one of the notches 59, 60 holds the tumbler roll 16 non-rotatable, but is forcibly movable out of said one notch when the tumbler roll 16 is caused to rotate around the shaft 58.

The guide 17 shown in Figures 2 and 2A comprises a body 66 pivotally mounted on the base plate 13 by means of a pin 67 and normally urged toward the tumbler roll 16 by a spring 68 acting between the body 66 and a spring seat 69 fixed to the base plate 13. The guide body 66 has a slot 70 at a position remote from the pin 67 and a channel 71 for receiving the sliding clasp fastener stringers, 19, 20 therein so as to guide the stringers 19, 20 therealong. The guide body 66 also has a groove 77 in the channel 71, the sliding clasp fastener chain 22 being movable in and along the groove 77. The slot 70 is located centrally of the groove 77 and acts as a clearance for the locking prongs 52 of the pawls 49, 50. A support plate 72 covers the channel 71 and is pressed against the guide body 66 under the force of a spring 73 so as to retain the sliding clasp fastener stringers 19, 20 in the channel 71. By pulling a handle lever 74 fixed to the support plate 72, the support plate 72 can be moved away from the guide body 66 for facilitating the insertion of the sliding clasp fastener stringers 19, 20 into the channel 71.

An adjustment screw 75 threadedly extending through a flange 76 mounted on the frame 11 allows fine positional adjustment of the base plate 13.

The apparatus 10 operates as follows: The base plate 13 is positionally adjusted by the adjusting screw 75 so that the tumbler roll 16 is spaced a suitable distance from the scraper roll 12. The coupled pair of sliding clasp fastener stringers 19, 20 is placed around the guide roll 14, through the channel 71 in the guide 17, around the tumbler roll 16, and thence around the guide roll 15. The scraper roll 12 is continuously driven to rotate counterclockwise in the direction of the arrow 78 (Figure 2), and the sliding clasp fastener stringers 19, 20 are fed along in the direction of the arrowheads 79. In Figures 3 and 4, the tumbler roll 16 is held nonrotatable by the distal end of the rod 63 received in one of the notches 59 as long as the pawl 49 is pressed downwardly under one of the chain lengths 25, with the locking prong 52 retained in the cavity

46. At this time, the sliding clasp fastener stringers 19, 20 slide in their advancing movement over the arcuate surface 48 of one of the tumbler wings 44 which is temporarily held immovable at a position away from the scraper roll 12. The sliding clasp fastener stringers 19, 20 while being progressed are pressed down against the arcuate surface 48 of the tumbler wing 44 by the slotted portion of the guide body 66, and are guided in the channel 71 and the groove 77 so that the sliding clasp fastener chain 22 moves along in alignment with the cavity 46.

When one of the openings 24 in the chain 22 arrives at the tumbler wing 44 and moves onto the arcuate surface 48, the locking prong 52 projects out of the cavity 46 upwardly into the opening 24 under the force from the spring 56. Further advancing movement of the sliding clasp fastener stringers 19, 20 causes an end of one of the chain lengths 25 that follows the opening 24 in which the locking prong 52 has entered, to engage the locking prong 52 and force the pawl 49 to move with the stringers 19, 20. At this time, the coupling element residuals 27 along the opening 24 are placed on the arcuate surface 48 of the wing 44. The locking rod 63 of the tumbler stop 18 is then forcibly displaced downwardly by the force with which the pawl 49 is pushed forwardly by the advance of the sliding clasp fastener stringers 19, 20, until the distal rod end is placed out of the notch 59. The tumbler roll 16 starts rotating counterclockwise in the direction of the arrow 61 (Figure 5), whereupon the tumbler wing 44 angularly moves to a position below the scraper roll 12. The coupling element residuals 27 on the arcuate surface 48 of the wing 44 are brought into contact with the sawteeth 32 of the disks 30, 31 while they are revolving, as best shown in Figure 6. The coupling element residuals 27 are scraped away by contact with the sawteeth 32. The coupling element residuals 27 are reliably removed since they are held against the arcuate surface 48 of the tumbler wings 44, 45. The spacer 33 between the saw-toothed disks 30, 31 has a selected thickness such that the sawteeth 32 on the disks 30, 31 do not impair the sewing stitches by which the coupling elements 23, 23 are attached to the stringer tapes 21, 21. It is preferable to rotate the scraper roll 12 in a direction that is opposite to the direction of travel of the sliding clasp fastener stringers 19, 20 where they are engaged by the scraper roll 12, whereby the sawteeth 32 can strike the coupling element residuals 27 at an increased relative speed for reliable removal of the residuals 27. Further, the arcuate surface 48 of each wing 44, 45 should have a length equal to that of each opening 24 in the sliding clasp fastener chain 22 that is to be processed by the apparatus 10.

As the tumbler roll 16 is further rotated, the locking prong 52 of the pawl 49 disengages the end of the chain length 25, and the distal end of the rod 63 now enters the notch 60. The tumbler roll 16 is then held non-rotatable again, at which

time the other tumbler wing 45 takes the position of Figures 2 and 3 for a next cycle of operation.

A coupled pair of continuous sliding clasp fastener stringers 80, 81 shown in Figure 7 comprise a pair of opposed stringer tapes 82, 82 and a chain 83 of a pair of interengaged coupling elements 84, 84 of the discrete type which are mounted as by injection-molding on and astride a pair of opposed longitudinal tape edges. A plurality of openings 85 (only one illustrated) are provided in the chain 83 by severing intermeshing coupling heads 86. Coupling element residuals 87 that are composed mainly of coupling element legs are attached to both surfaces of the stringer tapes 82, 82 as best shown in Figure 9. The sliding clasp fastener stringers 80, 81 are processed for the removal of the coupling element residuals 87 in an apparatus generally indicated at 88 in Figure 8. The apparatus 88 comprises a frame 89, a pair of first and second scraper assemblies 90, 91 each including a scraper roll 92 rotatable on the frame 89, a base plate 93 mounted on the frame 89, and a tumbler roll 94 rotatable on the base plate 93. Each tumbler roll 94 includes a pair of diametrically opposite wings 95, 96 in which there are pivotally mounted a pair of spring-loaded pawls 97, 98, respectively. In Figure 9, each scraper roll 92 comprises a pair of saw-toothed disks 99, 100 having peripheral sawteeth 101 and axially spaced from each other by a spacer 102 located therebetween. There are a pair of guide recesses 103, 104 in an arcuate surface of each wing 95, 96 on which the sliding clasp fastener stringers 80, 81 are supportable, portions of the coupling element residuals 87 that are on one of the tape surfaces being receivable in the guide recesses 103, 104. As illustrated in Figure 8, a pair of brakes 105, 105 are adjustably supported on the base plates 93, 93, respectively, each brake 105 having a brake shoe 106 engageable with the tumbler wings 95, 96. Each base plate 93 supports a pair of idler rolls 107, 108 one on each side of the tumbler roll 94.

The sliding clasp fastener stringers 80, 81 are guided through the inlet guide 109 into the first scraper assembly 90 where they extend around the idler roll 107, the tumbler roll 94, and the idler roll 108. The stringers 80, 81 then travel around a guide roller 110, are transported by a first feed roller unit 111, and are fed to the second scraper assembly 91 via a guide roller 112, a tensioning roller 113, a guide roller 114, and a guide roller 115. The stringers 80, 81 are fed around the idler roll 108, the tumbler roll 94, and the idler roll 107, and are discharged out of the apparatus 10 by means of a second feed roller unit 116. With such an arrangement, the coupling element residuals 87 on one of the stringer tape surfaces are scraped off by the first scraper assembly 90, and those on the other stringer tape surface are removed by the second scraper assembly 91. Although the tumbler rolls 94, 94 tend to be rotated at fluctuating speeds because of the intermittent engagement of the scraper rolls 92, 92 with the coupling element residuals 87 that

are discrete, such a tendency is substantially eliminated or damped by the brake shoes 106, 106 frictionally engaging the tumbler wings 95, 96. Accordingly, the tumbler rolls 94, 94 rotate smoothly at a constant speed.

Claims

1. An apparatus for removing coupling element residuals in a chain of interengaged coupling elements of a coupled pair of sliding clasp fastener stringers, comprising: a frame; a scraper roll rotatably mounted on said frame and having peripheral tooth means, said scraper roll being adapted to be driven for continuous rotation; a tumbler roll idly rotatably supported on said frame for carrying the sliding clasp fastener stringers on its peripheral portion confronting said tooth means, said tumbler roll including a wing projecting radially outwardly thereof for bringing the chain of coupling elements thereon into contact with said tooth means by rotation of said tumbler roll; and means on said tumbler roll for engaging the sliding clasp fastener stringers at a predetermined position thereon so as to place the coupling element residuals on said wing, said tumbler roll being rotatable by engagement of said engaging means with the sliding clasp fastener stringers while the latter are being fed along.

2. An apparatus according to claim 1, including a base plate positionally adjustably mounted on said frame, said tumbler roll being mounted for idling rotation on said base plate, and said tumbler roll being movable toward and away from said scraper roll on adjustment of said base plate.

3. An apparatus according to claim 1, said wing having an arcuate surface on which the sliding clasp fastener stringers are supportable, said arcuate surface comprising a portion of a cylinder describable about the axis of said tumbler roll.

4. An apparatus according to claim 1 for removing a plurality of spaced groups of coupling element residuals in a chain of interengaged coupling elements of coupled pair of sliding clasp fastener stringers, there being an opening in the chain at each of the groups of coupling element residuals and a plurality of chain lengths of the coupling elements, each chain length between adjacent two of the openings, said wing having a cavity therein, said engaging means comprising a pawl pivotally mounted in said cavity and having a prong for projecting into one of the openings in the chain and engaging an end of one of the chain lengths which is adjacent to said one of the openings, said engaging means further including a spring acting between said pawl and said tumbler roll and normally urging said prong out of said cavity.

5. An apparatus according to claim 4, said

60 scraper roll comprising a pair of coaxial saw-toothed disks spaced from each other, said wing of the tumbler roll being positionable in confronting relation to said scraper roll with said cavity located between said pair of saw-toothed disks.

6. An apparatus according to claim 1, including stop means on said frame for temporarily locking said tumbler roll against rotation until said engaging means is engaged by the sliding clasp fastener stringers to rotate said tumbler roll.

7. An apparatus according to claim 6, said tumbler roll including a coaxial circular plate having a notch in its periphery, said stop means comprising a rod movable to place its one end into and out of said notch, and a spring acting on said rod and normally biasing said rod end toward said circular plate.

8. An apparatus according to claim 6, including guide means supported on said frame for pressing the sliding clasp fastener stringers against said wing when said tumbler roll is temporarily stopped by said stop means.

9. An apparatus according to claim 8, said guide means comprising a body pivotally supported on said frame and having a groove, and a spring acting on said body for normally urging said body against the sliding clasp fastener stringers with the chain disposed in said groove.

10. An apparatus for removing a plurality of spaced groups of coupling element residuals in a chain of interengaged coupling elements of a coupled pair of sliding clasp fastener stringers, comprising: a frame; a scraper roll rotatably mounted on said frame and having peripheral tooth means, said scraper roll being adapted to be driven for continuous rotation; a tumbler roll idly rotatably supported on said frame for carrying the sliding clasp fastener stringers on its peripheral portion confronting said tooth means, said tumbler roll including a pair of wings projecting radially outwardly thereof in diametrically opposed relation for bringing the chain of coupling elements on one of the wings at a time into contact with said tooth means when said tumbler roll is rotated; and means on said tumbler roll for engaging the sliding clasp fastener stringers at a predetermined position thereon so as to place one of the groups of coupling element residuals at a time on said one of the wings, said tumbler roll being rotatable by engagement of said engaging means with the sliding clasp fastener stringers when the latter are fed.

11. An apparatus substantially as herein described with reference to and as illustrated in Figures 2 to 6 inclusive of the accompanying drawings.

12. An apparatus substantially as herein described with reference to and as illustrated in Figures 8 and 9 of the accompanying drawings.



are discrete, such a tendency is substantially eliminated or damped by the brake shoes 106, 106 frictionally engaging the tumbler wings 95, 96. Accordingly, the tumbler rolls 94, 94 rotate smoothly at a constant speed.

Claims

1. An apparatus for removing coupling element residuals in a chain of interengaged coupling elements of a coupled pair of sliding clasp fastener stringers, comprising: a frame; a scraper roll rotatably mounted on said frame and having peripheral tooth means, said scraper roll being adapted to be driven for continuous rotation; a tumbler roll idly rotatably supported on said frame for carrying the sliding clasp fastener stringers on its peripheral portion confronting said tooth means, said tumbler roll including a wing projecting radially outwardly thereof for bringing the chain of coupling elements thereon into contact with said tooth means by rotation of said tumbler roll; and means on said tumbler roll for engaging the sliding clasp fastener stringers at a predetermined position thereon, so as to place the coupling element residuals on said wing, said tumbler roll being rotatable by engagement of said engaging means with the sliding clasp fastener stringers while the latter are being fed along.

2. An apparatus according to claim 1, including a base plate positionally adjustably mounted on said frame, said tumbler roll being mounted for idling rotation on said base plate, and said tumbler roll being movable toward and away from said scraper roll on adjustment of said base plate.

3. An apparatus according to claim 1, said wing having an arcuate surface on which the sliding clasp fastener stringers are supportable, said arcuate surface comprising a portion of a cylinder describable about the axis of said tumbler roll.

4. An apparatus according to claim 1 for removing a plurality of spaced groups of coupling element residuals in a chain of interengaged coupling elements of coupled pair of sliding clasp fastener stringers, there being an opening in the chain at each of the groups of coupling element residuals and a plurality of chain lengths of the coupling elements, each chain length between adjacent two of the openings, said wing having a cavity therein, said engaging means comprising a pawl pivotally mounted in said cavity and having a prong for projecting into one of the openings in the chain and engaging an end of one of the chain lengths which is adjacent to said one of the openings, said engaging means further including a spring acting between said pawl and said tumbler roll and normally urging said prong out of said cavity.

5. An apparatus according to claim 4, said

60 scraper roll comprising a pair of coaxial saw-toothed disks spaced from each other, said wing of the tumbler roll being positionable in confronting relation to said scraper roll with said cavity located between said pair of saw-toothed disks.

65 6. An apparatus according to claim 1, including stop means on said frame for temporarily locking said tumbler roll against rotation until said engaging means is engaged by the sliding clasp fastener stringers to rotate said tumbler roll.

70 7. An apparatus according to claim 6, said tumbler roll including a coaxial circular plate having a notch in its periphery, said stop means comprising a rod movable to place its one end into and out of said notch, and a spring acting on said rod and normally biasing said rod end toward said circular plate.

8. An apparatus according to claim 6, including guide means supported on said frame for pressing the sliding clasp fastener stringers against said wing when said tumbler roll is temporarily stopped by said stop means.

9. An apparatus according to claim 8, said guide means comprising a body pivotally supported on said frame and having a groove, and a spring acting on said body for normally urging said body against the sliding clasp fastener stringers with the chain disposed in said groove.

10. An apparatus for removing a plurality of spaced groups of coupling element residuals in a chain of interengaged coupling elements of a coupled pair of sliding clasp fastener stringers, comprising: a frame; a scraper roll rotatably mounted on said frame and having peripheral tooth means, said scraper roll being adapted to be driven for continuous rotation; a tumbler roll idly rotatably supported on said frame for carrying the sliding clasp fastener stringers on its peripheral portion confronting said tooth means, said tumbler roll including a pair of wings projecting radially outwardly thereof in diametrically opposed relation for bringing the chain of coupling elements on one of the wings at a time into contact with said tooth means when said tumbler roll is rotated; and means on said tumbler roll for engaging the sliding clasp fastener stringers at a predetermined position thereon so as to place one of the groups of coupling element residuals at a time on said one of the wings, said tumbler roll being rotatable by engagement of said engaging means with the sliding clasp fastener stringers when the latter are fed.

11. An apparatus substantially as herein described with reference to and as illustrated in Figures 2 to 6 inclusive of the accompanying drawings.

12. An apparatus substantially as herein described with reference to and as illustrated in Figures 8 and 9 of the accompanying drawings.