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(54) APPARATUS FOR ASSEMBLING SLIDERS WITH FASTENER STRINGERS

(71) We, YOSHIDA KOGYO K.K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumicho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates generally to the art of sliding clasp fastener manufacture, and more specifically to apparatus for use in assembling sliders with fastener stringers or a fastener chain, by which latter term is meant a continuous length of coupled fastener stringers.

The assemblage of sliders with fastener stringers has heretofore been effected by use of a slider holder which functions merely to hold a slider in upside-down disposition on a slider rest formed thereon, with the pull tab of the slider telescopically received in a channel extending downwards from the slider rest. The pair of fastener stringers are manipulated into the channelled slider body, either through its flared front end or contracted rear end, so as to emerge either coupled or uncoupled out of the opposite end of the slider body.

30 Since the slider holder is effective only to hold the slider in a predetermined assembly position thereon as aforesaid, the smooth guidance of the fastener stringers into and out of the slider depends solely on the manual dexterity of the assemblyman. Above all, for attaching sliders to the respective fastener lengths of a fastener chain on which bottom stops have been mounted (see Figure 2 of the accompanying drawings), the coupled stringers of the fastener chain must be carefully threaded into and out of the successive sliders by utilizing the narrow, longitudinal tape spacings between the rows of interlocking fastener elements. In case a pair of

oppositely directed sliders are to be assembled with each fastener length of the fastener chain (Figure 7), the threading of the chain through the sliders requires an even higher degree of manual skill and mental concentration on the part of the assemblyman.

Thus, as will be evident from the above noted state of the art, the difficulties involved in assembling sliders with a fastener chain or stringers have been a serious bar to the truly efficient manufacture of sliding clasp fasteners.

According to one aspect of the invention, there is provided apparatus for assembling sliders with fastener stringers, wherein each of the sliders includes a channelled body having a flared front end and a contracted rear end, and a pull tab, said apparatus comprising, in combination, a slider holder for immovably holding at least one slider thereon for the assemblage of said fastener stringers therethrough, said fastener stringers being intended to be introduced in coupled form into said slider through said contracted rear end thereof, and a stringer separator arranged close to and on the stringer exit side of said slider holder, said stringer separator being adapted to cause said fastener stringers to be progressively separated away from each other as the same emerge uncoupled out of said flared front end of said slider.

According to another aspect of the invention there is provided apparatus for assembling sliders with fastener stringers, wherein each of the sliders includes a channelled body having a flared front end and a contracted rear end, and a pull tab, said apparatus comprising, in combination, a slider holder for immovably holding a pair of sliders thereon with their contracted rear ends disposed against each other for the assemblage of said fastener stringers therethrough, a stringer guide arranged

close to said slider holder on one side thereof, said stringer guide being adapted to cause said fastener stringers to be introduced uncoupled into one of said pair of sliders through said flared front end thereof in a streamlined manner, and a stringer separator arranged close to said slider holder on the opposite side thereof, said stringer separator being adapted to cause said fastener stringers to be progressively separated away from each other as the same emerge uncoupled out of said flared front end of the other of said pair of sliders.

The invention will be described by way of examples with reference to the accompanying drawings in which like reference characters denote corresponding parts of the several views, and wherein;

Figure 1 is a perspective view of one form of fastener assembly apparatus constructed in accordance with this invention;

Figure 2 is a plan view of a fastener chain with a slider attached thereto by use of the apparatus shown in Figure 1;

Figures 3 and 4 are plan views explanatory of the way the fastener chain is assembled through the slider by use of the apparatus shown in Figure 1.

Figure 5 is a perspective view also explanatory of the way the fastener chain is assembled through the slider by use of the apparatus shown in Figure 1;

Figure 6 is a perspective view of a second form of fastener assembly apparatus representing another specific adaptation of the invention;

Figure 7 is a plan view of a fastener chain with a pair of oppositely directed sliders attached to each fastener length thereof by use of the apparatus shown in Figure 6;

Figure 8 is a plan view explanatory of the way the fastener chain is assembled through the pair of sliders by use of the apparatus shown in Figure 6;

Figures 9 and 10 are perspective views also explanatory of the way the fastener chain is assembled through the pair of sliders by use of the apparatus shown in Figure 6; and

Figure 11 is a perspective view explanatory of the way the fastener chain is withdrawn from the apparatus shown in Figure 6 following its assemblage through the pair of sliders.

The invention will now be described by way of example in terms of one specific adaptation thereof with reference to Figures 1 to 5. The fastener assembly apparatus illustrated in Figure 1 is adapted for assembling sliders with a fastener chain to the form illustrated in Figure 2, that is, for attaching one slider to each fastener length of the chain. The fastener chain is supplied in the form of a continuous length of

coupled stringers to which bottom stops have been attached.

Referring more specifically to Figure 1, the illustrated fastener assembly apparatus broadly comprises a slider holder 10 for holding a slider 11 for the assemblage of the fastener chain 12 therethrough, and a stringer separator 13 for separating the pair of stringers of the fastener chain away from each other after they have been guided through the slider.

The slider holder for use in the fastener assembly apparatus of Figure 1 can be of any suitable construction known in the art. The illustrated slider holder 10, for example, includes a frame 14 having a pair of opposed side walls 15. The tops of these side walls 15 are adapted to provide in combination a slider rest 16, and a pair of vertical grooves 17 are formed in the respective internal surfaces of the side walls to provide a channel for receiving the pull tab 18 of the slider 11 as the same is placed upside down on the slider rest. Mounted within the frame 14 is a slider locking mechanism, not shown, which operates to immovably lock the slider on the slider rest 16 as by means of a detent projecting into the aperture 19 in the slider pull tab 18. Following the assemblage of each fastener length of the fastener chain 12 through the slider 11, the unshown slider locking mechanism can be caused to unlock the slider in order that the latter may be readily withdrawable from the slider rest 16 together with the attached stringers.

The stringer separator 13 is in the form of a column of substantially pentagonal or diamond-shaped cross section fixedly mounted close to, and on the stringer exit side of, the slider holder 10. It will be noted, by referring also to Figures 3 and 4, that the cross section of the pentagonal column constituting the stringer separator 13 is symmetrical with respect to its longitudinal axis which is aligned with the longitudinal axis of the slider 11 mounted in position on the slider rest 16 of the slider holder 10. The top surface 20 of the pentagonal column should be on a level with, or higher than, the internal surface of the top wing 21 of the channeled slider body 22 mounted in position on the slider rest 16.

It is important to note that the pentagonal column of the stringer separator 13 includes a pair of vertical stringer separating surfaces 23 which, when viewed in a plan view as shown in Figure 3 or 4, diverge in a direction away from the slider holder 10. The angle between these divergent stringer separating surfaces 23 should be so determined as to permit the pair of stringers of the fastener chain 12 to

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separate away from each other in the most streamlined fashion as they emerge uncoupled from the flared front end 24 of the channeled slider body 22 on the slider rest

16. Stated in more concrete terms, the angle between the stringer separating surfaces 23 should be equal to, or slightly greater than the angle between the divergent portions of the side flanges 25 of the slider body 22 bounding the usual Y-shaped guide channel therethrough.

It will have been understood from the foregoing description that the slider 11 for use with the fastener assembly apparatus of Figure 1 can be of the well known type comprising the apertured pull tab 18 and the channeled body 22, the pull tab being pivotally or hingedly connected to the body. The slider body 22 comprises the top wing 21 and a bottom wing 26, with the side flanges 25, which wings are interconnected by a web or neck 27 so as to define the Y-shaped guide channel through the slider body. The top and bottom wings 21 and 26 are so shaped as to provide the flared front end 24 and a contracted rear end 28, and the aforesaid web 27 is located centrally at the flared front end 24 of the slider body 22.

For assembling the slider 11 with the fastener chain 12 as shown in Figure 2 by use of the above described fastener assembly apparatus, the slider should first be mounted on the slider rest 16 of the slider holder 10 by having its pull tab 18 inserted fully into the channel formed by the pair of grooves 17, with the flared front end 24 of the slider body 22 directed toward the stringer separator 13. As the unshown slider locking mechanism of the slider holder 10 functions to engage the aperture 19 in the pull tab 18, the slider 11 can be immovably supported on the slider rest 16 in upside-down disposition.

The adjacent longitudinal edge portions of the coupled stringers of the fastener chain 12 should then be manipulated into the contracted rear end 28 of the slider body 22. This manipulation of the stringers into the slider body may be started from a pair of slits 29, Figure 2, formed in the free tape spacing 30 of the fastener chain. As the interengaged elements 31 of the fastener chain 12 are successively guided into the slider body 22 as shown in Figure 3, the fastener chain may be pulled as indicated by the arrow in Figure 5 so that the fastener elements 31 successively emerge disengaged from the flared front end 24 of the slider body as shown in Figure 4.

It will be observed from a consideration of Figures 3 and 4 that the stringers which have passed the slider 11 are smoothly separated away from each other as their

opposed longitudinal edges move in sliding contact with the respective stringer separating surfaces 23 of the separator 13. Since, in this manner, the rows of fastener elements 31 are disengaged from each other just as they enter the contracted rear end 28 of the slider body 22, as illustrated in Figure 3, the leading end of the fastener elements is not to be caught by the web 27 of the slider body to impede the travel of the fastener chain through the slider. The fastener chain can therefore be efficiently assembled through the slider.

When the fastener chain 12 is pulled through the slider 11 to a required degree, the slider locking mechanism of the slider holder 10 may be actuated to unlock the slider. The pull tab 18 of the slider may now be pulled out of the slider holder channel to withdraw the slider from the slider rest 16 together with the attached fastener chain.

Figure 6 illustrates another specific adaptation of the invention, in which the fastener assembly apparatus is intended for use where a pair of oppositely directed sliders 11a and 11b are to be assembled with each fastener length of the fastener chain 12 as illustrated in Figure 7. The sliders 11a and 11b are identical in construction with the slider 11 explained above in connection with the preceding embodiment of the invention.

The fastener assembly apparatus illustrated in Figure 6 broadly comprises a slider holder 10a, the stringer separator 13 fixedly mounted close to the slider holder on the fastener chain exit side thereof, and a stringer guide 50 also fixedly mounted close to the slider holder on the stringer entrance side thereof. The stringer separator 13 can be exactly identical in construction with that shown in Figure 1, so that no explanation will now be given thereon.

The slider holder 10a used in this second adaptation of the invention differs slightly from the above described slider holder 10, in that the side walls 15a of the former have two pairs of vertical grooves 17a and 17b in their opposed internal surfaces. The two channels thus formed by the grooves 17a and 17b are adapted to receive the respective pull tabs 18 of the sliders 11a and 11b, in such a manner that the two sliders are mounted upside down on a slider rest 16a on the top of a holder frame 14a with their contracted rear ends 28 disposed against each other. Although not shown in the drawing, it is assumed that the usual slider locking mechanism is provided within the holder frame 14a to immovably lock the sliders 11a and 11b on the slider rest 16a.

The stringer guide 50 newly incorporated

in this fastener assembly apparatus includes a support structure 51 substantially integrally joined to the holder frame 14a and having a horizontal top surface 52 arranged flush with the top of the holder frame. A guide column 53 of substantially diamond-shaped cross section is fixedly mounted at the center of the top surface 52 of the support structure 51, and a guide plate 54 is further secured at the top of the guide column 53.

When seen in a plan view as in Figure 8, the guide column 53 is generally elongated in the direction of the aligned longitudinal axes of the sliders 11a and 11b on the slider rest 16a. The guide column 53, moreover, is similar in cross sectional shape to the stringer separator 13 but is smaller and oppositely directed.

The guide plate 54 mounted atop the guide column 53 has a pair of flanges 55 projecting downwardly from its respective side edges. As will be understood from a consideration of Figure 8, these side flanges 55 are arranged in streamlined extensions from the respective side flanges 25 of the adjacent slider 11b on the slider rest 16a. It will also be noted from Figure 8 that the side flanges 55 are spaced from the guide column 53 sufficiently to permit the respective rows of fastener elements 31 of the fastener chain 12 to pass longitudinally therebetween. Furthermore, the spacings between the side flanges 55 and the top surface 52 of the support structure 51 must be sufficient to permit the respective rows of fastener elements 31 to pass laterally outwardly therethrough. The guide plate 54, as well as the guide column 53 thereunder, has a V-shaped indentation 56 for receiving at least part of the flared front end 24 of the adjacent slider 11b on the slider rest 16a.

The fastener assembly apparatus of Figure 6 being constructed as hereinbefore described, the sliders 11a and 11b can be assembled in the following manner with each fastener length of the fastener chain 12 as shown in Figure 7. The pull tabs 18 of the two sliders may first be inserted into the respective channels formed by the pairs of grooves 17a and 17b in the side walls 15a of the slider holder frame 14a so that the sliders may be mounted on the slider rest 16a with their contracted rear ends 28 opposed to each other. The sliders 11a and 11b are assumed to be immovably locked in position by the unshown slider locking mechanism of this slider holder 10a.

As illustrated in Figure 9, the slit (29) edges of the fastener chain 12 are then manipulated into the respective spacings between the guide plate 54 and the support structure 51 on both sides of the guide

column 53. The pair of stringers of the fastener chain 12 should be succeedingly threaded through the channeled bodies 22 of the sliders 11b and 11a. The fastener elements 31 of the fastener chain 12 are temporarily disengaged by the guide column 53 of the stringer guide 50 and are again interengaged as they succeedingly travel through the channeled slider bodies 22, as illustrated in Figure 8. By then pulling the fastener chain 12 as indicated by the arrow in Figure 10, the rows of fastener elements 31 emerge disengaged from the flared front end 24 of the slider 11a.

It will be apparent from the description of the preceding embodiment that the pair of stringers which have passed the slider 11a are separated in a streamlined manner away from each other, as their adjacent longitudinal edges move in sliding contact with the respective stringer separating surfaces 23 of the separator 13.

When the fastener chain 12 is pulled through the sliders 11a and 11b to a required degree, the slider locking mechanism of the slider holder 10a may be caused to unlock both sliders. The trailing side of the fastener chain 12 may then be raised, as indicated by the arrow in Figure 11, to pull the rows of fastener elements 31 away from under the guide plate 54. The sliders 11a and 11b are now readily withdrawable from the slider rest 16a together with the attached fastener chain 12.

In this second adaptation of the invention, each stringer of the fastener chain 12 travels a meandering path as it is required to pass through two consecutive, oppositely directed sliders arranged between the stringer guide 50 and the stringer separator 13. It will be appreciated, however, that the guide 50 and the separator 13 are so configured and arranged with respect to the two sliders that the paths of travel of the fastener stringers are as streamlined as feasible. The fastener chain 12 can therefore be pulled smoothly through the sliders as there is practically no possibility of the rows of fastener elements 31 being caught by the webs 27, the side flanges 25 or the contracted rear ends 28 of the two sliders or by the flared front end 24 of the slider 11b.

WHAT WE CLAIM IS:

1. Apparatus for assembling sliders with fastener stringers, wherein each of the sliders includes a channelled body having a flared front end and a contracted rear end, and a pull tab, said apparatus comprising, in combination, a slider holder for immovably holding at least one slider thereon for the assemblage of said fastener stringers therethrough, said fastener stringers being intended to be introduced in coupled form into said slider through said contracted rear

in this fastener assembly apparatus includes a support structure 51 substantially integrally joined to the holder frame 14a and having a horizontal top surface 52 arranged flush with the top of the holder frame. A guide column 53 of substantially diamond-shaped cross section is fixedly mounted at the center of the top surface 52 of the support structure 51, and a guide plate 54 is further secured at the top of the guide column 53.

When seen in a plan view as in Figure 8, the guide column 53 is generally elongated in the direction of the aligned longitudinal axes of the sliders 11a and 11b on the slider rest 16a. The guide column 53, moreover, is similar in cross sectional shape to the stringer separator 13 but is smaller and oppositely directed.

The guide plate 54 mounted atop the guide column 53 has a pair of flanges 55 projecting downwardly from its respective side edges. As will be understood from a consideration of Figure 8, these side flanges 55 are arranged in streamlined extensions from the respective side flanges 25 of the adjacent slider 11b on the slider rest 16a. It will also be noted from Figure 8 that the side flanges 55 are spaced from the guide column 53 sufficiently to permit the respective rows of fastener elements 31 of the fastener chain 12 to pass longitudinally therebetween. Furthermore, the spacings between the side flanges 55 and the top surface 52 of the support structure 51 must be sufficient to permit the respective rows of fastener elements 31 to pass laterally outwardly therethrough. The guide plate 54, as well as the guide column 53 thereunder, has a V-shaped indentation 56 for receiving at least part of the flared front end 24 of the adjacent slider 11b on the slider rest 16a.

The fastener assembly apparatus of Figure 6 being constructed as hereinbefore described, the sliders 11a and 11b can be assembled in the following manner with each fastener length of the fastener chain 12 as shown in Figure 7. The pull tabs 18 of the two sliders may first be inserted into the respective channels formed by the pairs of grooves 17a and 17b in the side walls 15a of the slider holder frame 14a so that the sliders may be mounted on the slider rest 16a with their contracted rear ends 28 opposed to each other. The sliders 11a and 11b are assumed to be immovably locked in position by the unshown slider locking mechanism of this slider holder 10a.

As illustrated in Figure 9, the slit (29) edges of the fastener chain 12 are then manipulated into the respective spacings between the guide plate 54 and the support structure 51 on both sides of the guide

column 53. The pair of stringers of the fastener chain 12 should be successingly threaded through the channeled bodies 22 of the sliders 11b and 11a. The fastener elements 31 of the fastener chain 12 are temporarily disengaged by the guide column 53 of the stringer guide 50 and are again interengaged as they successingly travel through the channeled slider bodies 22, as illustrated in Figure 8. By then pulling the fastener chain 12 as indicated by the arrow in Figure 10, the rows of fastener elements 31 emerge disengaged from the flared front end 24 of the slider 11a.

It will be apparent from the description of the preceding embodiment that the pair of stringers which have passed the slider 11a are separated in a streamlined manner away from each other, as their adjacent longitudinal edges move in sliding contact with the respective stringer separating surfaces 23 of the separator 13.

When the fastener chain 12 is pulled through the sliders 11a and 11b to a required degree, the slider locking mechanism of the slider holder 10a may be caused to unlock both sliders. The trailing side of the fastener chain 12 may then be raised, as indicated by the arrow in Figure 11, to pull the rows of fastener elements 31 away from under the guide plate 54. The sliders 11a and 11b are now readily withdrawable from the slider rest 16a together with the attached fastener chain 12.

In this second adaptation of the invention, each stringer of the fastener chain 12 travels a meandering path as it is required to pass through two consecutive, oppositely directed sliders arranged between the stringer guide 50 and the stringer separator 13. It will be appreciated, however, that the guide 50 and the separator 13 are so configured and arranged with respect to the two sliders that the paths of travel of the fastener stringers are as streamlined as feasible. The fastener chain 12 can therefore be pulled smoothly through the sliders as there is practically no possibility of the rows of fastener elements 31 being caught by the webs 27, the side flanges 25 or the contracted rear ends 28 of the two sliders or by the flared front end 24 of the slider 11b.

WHAT WE CLAIM IS:

1. Apparatus for assembling sliders with fastener stringers, wherein each of the sliders includes a channelled body having a flared front end and a contracted rear end, and a pull tab, said apparatus comprising, in combination, a slider holder for immovably holding at least one slider thereon for the assemblage of said fastener stringers therethrough, said fastener stringers being intended to be introduced in coupled form into said slider through said contracted rear



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end thereof, and a stringer separator arranged close to and on the stringer exit side of said slider holder, said stringer separator being adapted to cause said fastener stringers to be progressively separated away from each other as the same emerge uncoupled out of said flared front end of said slider.

2. Apparatus as claimed in claim 1, wherein said stringer separator is in the form of a column of polygonal cross section including a pair of vertical stringer separating surfaces which, when seen in a plan view, diverge in a direction away from the said slider holder, whereby said fastener stringers emerging uncoupled out of said flared front end of said slider are separated away from each other as their adjacent longitudinal edges move in sliding contact with said stringer separating surfaces, respectively, of said column.

3. Apparatus as claimed in claim 2, wherein said channelled body of said slider comprises top and bottom wings interconnected by a web at said flared front end thereof, wherein said slider is held in upside-down disposition on said slider rest, and wherein said column has a top surface which is arranged substantially on a level with the internal surface of said top wing of said slider held in upside-down disposition on said slider holder.

4. Apparatus for assembling sliders with fastener stringers, wherein each of the sliders includes a channelled body having a flared front end and a contracted rear end, and a pull tab, said apparatus comprising, in combination, a slider holder for immovably holding a pair of sliders thereon with their contracted rear ends disposed against each other for the assemblage of said fastener stringers therethrough, a stringer guide arranged close to said slider holder on one side thereof, said stringer guide being adapted to cause said fastener stringers to be introduced uncoupled into

one of said pair of sliders through said flared front end thereof in a streamlined manner, and a stringer separator arranged close to said slider holder on the opposite side thereof, said stringer separator being adapted to cause said fastener stringers to be progressively separated away from each other as the same emerge uncoupled out of said flared front end of the other of said pair of sliders.

5. Apparatus as claimed in claim 4, wherein said stringer guide comprises a support structure having a top surface, a guide column of substantially diamond-shaped cross section mounted centrally on said top surface of said support structure, and a guide plate mounted atop said guide column and having a pair of side flanges projecting downwardly therefrom, said side flanges being sufficiently spaced from said guide column to permit the respective rows of fastener elements of said fastener stringers to pass longitudinally therebetween.

6. Apparatus as claimed in claim 5, wherein said side flanges of said guide plate are sufficiently spaced from said top surface of said support structure to permit the respective rows of fastener elements of said fastener stringers to pass laterally outwardly therebetween.

7. Apparatus as claimed in claim 5, wherein said slider holder includes a frame on the top of which said pair of sliders are held immovably, and wherein said top surface of said support structure of said stringer guide is substantially flush with said top of said frame of said slider holder.

8. Apparatus substantially as herein described with reference to and as illustrated in the accompanying drawings.

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