

PATENT SPECIFICATION

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(54) SLIDING CLASP FASTENER

(71) We, YOSHIDA KOGYO K.K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumi-cho, 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:-

This invention relates generally to sliding clasp fasteners and particularly to a sliding clasp fastener of the type having a pair of series of discrete fastener elements carried along the inner longitudinal edge of opposed stringer tapes.

The prior art includes a wide variety of sliding clasp fasteners of the discrete type in which a series of interengageable fastener elements are mounted astride the longitudinal beaded edge of each of the oppositely disposed stringer tapes in uniformly spaced apart relationship. Since sliding clasp fasteners of this type have a relatively high coupling strength, they are often employed in beltless trousers such as jeans which are designed to tightly fit around the waist of a person who wears them to dispense with the need for a belt. In such an instance, severe lateral forces tending to pull the coupled stringer tapes away from each other are exerted on the sliding clasp fastener. Therefore, the slider needs to be positively locked in its uppermost position against downward movement along the fastener elements. To this end, the slider is provided with a locking prong formed on the pull tab, which prong is brought into locking engagement with the fastener elements within the guide channel of the slider to secure the same against movement along the fastener elements when the pull tab lies flat against the slider. Various sliding clasp fasteners of the discrete type are known in which each of the fastener elements has ridges or teeth on its inner peripheral surface for biting or gripping

engagement with the beaded tape edge so as to prevent the fastener elements from being shifted out of position relative to and disengaged from the beaded tape edge. A common drawback of these conventional sliding clasp fasteners is that the slider often fails to be positively locked and retained in place because the fastener elements are still liable to become tilted relative to the beaded tape edge with the resultant disengagement of the locking prong with the fastener element within the slider guide channel when a severe lateral pull tending to separate the coupled stringer tapes away from each other is applied to the sliding clasp fastener. Another disadvantage is that even when the fastener element is tilted only slightly with respect to the beaded tape edge, the locking prong may go out of locking engagement therewith because the fastener elements have a relatively small contacting surface against which the locking prong abuts in its locked position. A further disadvantage is that the locking prong is susceptible to accelerated wear and deformation because the tilted fastener elements permit the locking prong to be forcibly disengaged therefrom when a severe lateral pull is exerted on the sliding clasp fastener.

According to the invention there is provided a sliding clasp fastener including a pair of stringer tapes each carrying on and along its inner longitudinal beaded edge a series of uniformly spaced, interengageable discrete fastener elements, each of said fastener elements including a coupling head and a pair of legs extending rearwardly from said coupling head, the legs having oppositely disposed inner wall portions and oppositely facing outer faces, each of said legs also having oppositely facing flat side faces lying substantially at right angles to said outer faces and perpendicular to the plane of the stringer tape, said inner wall portions each being in the form of an arcuate concave sur-

face, such that said inner wall portions jointly provide a continuous inner peripheral surface of substantially circular contour which is interrupted by a slot defined by opposed edges of said upper and lower legs, said peripheral surface peripherally gripping the beaded edge, said legs each having a plurality of teeth formed integrally therewith and projecting from the oppositely disposed inner wall portions towards the teeth of the other leg, each said tooth on each leg being disposed in registry with a corresponding one of the teeth on the other leg, the teeth on each leg being spaced apart from each other along the length of the beaded tape edge and being located substantially on the inner wall portion at the place where the leg is otherwise the most reduced in thickness as measured in the direction perpendicular to the plane of the stringer tapes, said teeth being so disposed that their respective outer side surfaces lie substantially flush with, or slightly inwardly of, the outer side faces of the leg, and each tooth being disposed in firm biting engagement with the beaded tape edge to secure the fastener element in position against tilting movement relative thereto.

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

Figure 1 is a top plan view of a preferred sliding clasp fastener according to the invention, showing a pair of stringer tapes coupled together.

Figure 2 is a perspective view of the fastener element with part broken away for clarity of illustration;

Figure 3 is a vertical cross-sectional view of one of the stringer tapes; and

Figure 4 is a vertical cross-sectional view taken along the line IV-IV of Figure 1.

Figure 1 shows a sliding clasp fastener 10 comprising a pair of oppositely disposed stringer tapes 11, 11 each having a series of uniformly spaced apart, interengageable discrete fastener elements 12 attached on and along its longitudinal beaded or reinforced edge 13. The pair of series of fastener elements 12 on the opposed stringer tapes 11, 11 are taken into and out of mutual engagement by a slider (not shown) reciprocable along the fastener elements 12 to close and open the sliding clasp fastener 10.

Each of the fastener elements 12 includes a body 12a of generally U-shaped configuration having a coupling head 14 and a pair of spaced apart upper and lower legs 15, 16 formed integrally with and extending rearwardly from the coupling head 14 at its upper and lower portions, respectively. The coupling head 14 has a coupling recess (not shown) formed in one side thereof and an outwardly extending coupling projection 17 on the other side thereof. The coupling pro-

jection 17 is complementary in shape to the coupling recess so that the coupling projection 17 of each of the fastener element 12 on one of the stringer tapes 11, 11 is snugly received in the coupling recess in its mating fastener element on the other string tape 11 when the sliding clasp fastener 10 is closed upon movement of the slider along the fastener elements 12.

Each of the fastener elements 12 is attached to the stringer tape 11 with the upper and lower legs 15, 16 arranged astride the longitudinal beaded tape edge 13 as best shown in Figure 3. The fastener element 12 extends longitudinally substantially at a right angle to the beaded tape edge 13 with the coupling head 14 projecting beyond the latter. The upper and lower legs 15, 16 are mirror images of the other and hence are disposed symmetrically with respect to the longitudinal axis of the fastener element body 12a, as best shown in Figure 3. The upper and lower legs 15, 16 have respective oppositely facing outer flat faces 18 each lying in a plane substantially parallel to the stringer tape 11 and opposite flat side faces 19, 20 lying substantially at right angles to the stringer tape 11. The upper and lower legs 15, 16 also have a pair of oppositely disposed inner wall portions 21, 22 each in the form of an arcuate, concave surface, which portions merge into a curved portion 23 of the coupling head 14 at their one ends to provide a jointly a continuous, smooth inner peripheral surface 24 of substantially circular contour which is interrupted by a slot 25 defined by opposed edges 26, 27 of the legs 15, 16. The slot extends substantially centrally of the height or thickness of the fastener element body 12a between the opposite outer flat faces 18, 18.

Each of the upper and lower legs 15, 16 has a pair of teeth 28, 28 formed integrally therewith and projecting from the inner wall portion 21(22) towards the teeth 28, 28 of the opposed leg. Each of the fastener elements 12 is clamped on and around the beaded tape edge 13 with the continuous peripheral surface 24 peripherally embracing the beaded edge and with the pair of teeth 28, 28 on each inner wall portion 21(22) disposed in biting or gripping engagement with the beaded edge 13 as best shown in Figure 3, to eliminate or reduce the possibility of the fastener elements 12 becoming tilted relative thereto or disengaged therefrom. In this condition, the opposed edges 26, 27 are also held in gripping engagement with the stringer tape 11 closely adjacent to the beaded tape edge 13. Each of the teeth 28 terminates short of the plane of the stringer tape 11.

The fastener element 12 has the upper and lower legs 15, 16 initially flared outwardly prior to attachment to the beaded

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tape edge 13, and the legs 15, 16 are deformed or pressed toward each other from the outwardly-flared configuration into a compressed configuration as shown in the drawings to bring the legs 15, 16 into clamping or gripping engagement with the beaded tape edge 13 with the teeth 28 on the legs held in firm biting engagement therewith.

Each of the pair of teeth 28, 28 on the inner wall portion 21 is disposed in registry with a corresponding one of the other pair of teeth 28, 28 on the inner wall portion 22, and the teeth 28, 28 on each inner wall portion are spaced apart from each other along the length of the beaded tape edge. Each of the two pairs of teeth 28 on the inner wall portions 21, 22 are located at what are otherwise the thinnest portions 29, 29 of the legs 15, 16 in diametrically opposed relationship when viewed in the direction of the length of the beaded tape edge 13. Thus, the pair of teeth 28 on each leg 15 (16) serve to increase its mechanical strength at its weakest portion 29. This prevents the upper and lower legs 15, 16 from being deformed away from each other in a direction perpendicular to the stringer tape 11 when the sliding clasp fastener 10 is subjected to severe external stresses, thereby ensuring that the legs 15, 16 can be positively held in firm gripping engagement with the beaded tape edge 13.

Each of the teeth 28 is of wedge-shaped configuration having a pair of opposite parallel flat side surfaces 30, 30 and a pair of inclined surfaces 31, 31 converging outwardly towards its distal or outer edge.

Each side surface 30 has a substantially triangular shape as best shown in Figure 3. Preferably, the pair of teeth 28, 28 on each leg 15 (16) are so disposed that their respective outer side surfaces 30, 30 lie flush with the side flat faces 19, 20 respectively, as best shown in Figures 2 and 4. Alternatively, each pair of teeth 28, 28 may be disposed closely adjacent to the opposite peripheral edges of the inner peripheral surface 24 so that the outer side surfaces 30, 30 are disposed slightly inwardly of the side faces 19, 20. As mentioned previously, each tooth 28 bites into the beaded tape edge 13 so that it deforms the tape edge 13 immediately adjacent to the outer side surface 30 to provide a depressed region 32 as shown in Figure 4. The slider is provided with a locking prong 33 at one end as indicated in dotted lines in Figure 4 which prong is selectively brought into locking engagement with one of the fastener elements 12 within the guide channel of the slider to thereby secure the slider against movement along the fastener elements when the pull tab lies flat against the slider. More specifically, in the locked position of the slider, the locking prong 33 has its distal end portion disposed in the de-

pressed region 32 in close contact relation to the outer side face 19 and outer side surface 30 as shown in Figure 4. Thus, the area of contact of the fastener element 12 with the locking prong 33 is increased by virtue of the provision of the tooth 28. This ensures that the locking prong 33 can positively be held in locking engagement with the fastener element in the locked position of the slider even when a severe lateral pull is exerted on the coupled stringer tapes 11, 11.

WHAT WE CLAIM IS:-

1. A sliding clasp fastener including a pair of stringer tapes each carrying on and along its inner longitudinal beaded edge a series of uniformly spaced, interengageable discrete fastener elements, each of said fastener elements including a coupling head and a pair of legs extending rearwardly from said coupling head, the legs having oppositely disposed inner wall portions and oppositely facing outer faces, each of said legs also having oppositely facing flat side faces lying substantially at right angles to said outer faces and perpendicular to the plane of the stringer tape, said inner wall portions each being in the form of an arcuate concave surface, such that said inner wall portions jointly provide a continuous inner peripheral surface of substantially circular contour which is interrupted by a slot defined by opposed edges of said upper and lower legs, said peripheral surface peripherally gripping the beaded edge, said legs each having a plurality of teeth formed integrally therewith and projecting from the oppositely disposed inner wall portions towards the teeth of the other leg, each said tooth on each leg being disposed in registry with a corresponding one of the teeth on the other leg, the teeth on each leg being spaced apart from each other along the length of the beaded tape edge, and being located substantially on the inner wall portion at the place where the leg is otherwise the most reduced in thickness as measured in the direction perpendicular to the plane of the stringer tape, said teeth being so disposed that their respective outer side surfaces lie substantially flush with, or slightly inwardly of, the outer side faces of the leg, and each tooth being disposed in firm biting engagement with the beaded tape edge to secure the fastener element in position against tilting movement relative thereto.

2. A sliding clasp fastener according to claim 1, in which each of said teeth is of wedge shaped configuration having a pair of inclined surfaces converging outwardly toward its distal end, each of said side surfaces being of substantially triangular shape when viewed in the direction of the length of the beaded tape edge.

3. A sliding clasp fastener substantially as herein described with reference to and as



tape edge 13, and the legs 15, 16 are deformed or pressed toward each other from the outwardly-flared configuration into a compressed configuration as shown in the drawings to bring the legs 15, 16 into clamping or gripping engagement with the beaded tape edge 13 with the teeth 28 on the legs held in firm biting engagement therewith.

Each of the pair of teeth 28, 28 on the inner wall portion 21 is disposed in registry with a corresponding one of the other pair of teeth 28, 28 on the inner wall portion 22, and the teeth 28, 28 on each inner wall portion are spaced apart from each other along the length of the beaded tape edge. Each of the two pairs of teeth 28 on the inner wall portions 21, 22 are located at what are otherwise the thinnest portions 29, 29 of the legs 15, 16 in diametrically opposed relationship when viewed in the direction of the length of the beaded tape edge 13. Thus, the pair of teeth 28, 28 on each leg 15 (16) serve to increase its mechanical strength at its weakest portion 29. This prevents the upper and lower legs 15, 16 from being deformed away from each other in a direction perpendicular to the stringer tape 11 when the sliding clasp fastener 10 is subjected to severe external stresses, thereby ensuring that the legs 15, 16 can be positively held in firm gripping engagement with the beaded tape edge 13.

Each of the teeth 28 is of wedge-shaped configuration having a pair of opposite parallel flat side surfaces 30, 30 and a pair of inclined surfaces 31, 31 converging outwardly towards its distal or outer edge.

Each side surface 30 has a substantially triangular shape as best shown in Figure 3. Preferably, the pair of teeth 28, 28 on each leg 15 (16) are so disposed that their respective outer side surfaces 30, 30 lie flush with the side flat faces 19, 20 respectively, as best shown in Figures 2 and 4. Alternatively, each pair of teeth 28, 28 may be disposed closely adjacent to the opposite peripheral edges of the inner peripheral surface 24 so that the outer side surfaces 30, 30 are disposed slightly inwardly of the side faces 19, 20. As mentioned previously, each tooth 28 bites into the beaded tape edge 13 so that it deforms the tape edge 13 immediately adjacent to the outer side surface 30 to provide a depressed region 32 as shown in Figure 4. The slider is provided with a locking prong 33 at one end as indicated in dotted lines in Figure 4 which prong is selectively brought into locking engagement with one of the fastener elements 12 within the guide channel of the slider to thereby secure the slider against movement along the fastener elements when the pull tab lies flat against the slider. More specifically, in the locked position of the slider, the locking prong 33 has its distal end portion disposed in the de-

pressed region 32 in close contact relation to the outer side face 19 and outer side surface 30 as shown in Figure 4. Thus, the area of contact of the fastener element 12 with the locking prong 33 is increased by virtue of the provision of the tooth 28. This ensures that the locking prong 33 can positively be held in locking engagement with the fastener element in the locked position of the slider even when a severe lateral pull is exerted on the coupled stringer tapes 11, 11.

WHAT WE CLAIM IS:-

1. A sliding clasp fastener including a pair of stringer tapes each carrying on and along its inner longitudinal beaded edge a series of uniformly spaced, interengageable discrete fastener elements, each of said fastener elements including a coupling head and a pair of legs extending rearwardly from said coupling head, the legs having oppositely disposed inner wall portions and oppositely facing outer faces, each of said legs also having oppositely facing flat side faces lying substantially at right angles to said outer faces and perpendicular to the plane of the stringer tape, said inner wall portions each being in the form of an arcuate concave surface, such that said inner wall portions jointly provide a continuous inner peripheral surface of substantially circular contour which is interrupted by a slot defined by opposed edges of said upper and lower legs, said peripheral surface peripherally gripping the beaded edge, said legs each having a plurality of teeth formed integrally therewith and projecting from the oppositely disposed inner wall portions towards the teeth of the other leg, each said tooth on each leg being disposed in registry with a corresponding one of the teeth on the other leg, the teeth on each leg being spaced apart from each other along the length of the beaded tape edge, and being located substantially on the inner wall portion at the place where the leg is otherwise the most reduced in thickness as measured in the direction perpendicular to the plane of the stringer tape, said teeth being so disposed that their respective outer side surfaces lie substantially flush with, or slightly inwardly of, the outer side faces of the leg, and each tooth being disposed in firm biting engagement with the beaded tape edge to secure the fastener element in position against tilting movement relative thereto.

2. A sliding clasp fastener according to claim 1, in which each of said teeth is of wedge shaped configuration having a pair of inclined surfaces converging outwardly toward its distal end, each of said side surfaces being of substantially triangular shape when viewed in the direction of the length of the beaded tape edge.

3. A sliding clasp fastener substantially as herein described with reference to and as

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illustrated in the accompanying drawings.

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