

7990356-3

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PATENT SPECIFICATION

(11)

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- (21) Application No. 36967/76 (22) Filed 7 Sept. 1976
 (31) Convention Application No. 2 540 201
 (32) Filed 10 Sept. 1975
 (31) Convention Application No. 2 627 640
 (32) Filed 19 June 1976 in
 (33) Fed. Rep. of Germany (DE)
 (44) Complete Specification published 25 Oct. 1978
 (51) INT CL⁷ A44B 19/12
 (52) Index at acceptance E2S 1A2A 1A2B1 1A3C
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(19)



(54) IMPROVEMENTS IN OR RELATING TO SLIDING CLASP FASTENERS

(71) We, OPTI PATENT- FORSCHUNGS- UND FABRIKATIONS-AG, a Company organised under the laws of Switzerland, of Burgstrasse 24, CH-8750 Glarus, Switzerland, 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 to sliding clasp fasteners having rows of interlocking members made from plastics monofilament, in which each interlocking member has a connecting loop bearing an interlocking head, loop-forming links of monofilament which are extended to form arms, and in which the arms are incorporated into a support fabric and are joined to the respective arms of adjacent members by rearward connecting portions projecting beyond the support fabric and providing guidance for a slider comprising an upper plate, lateral guide faces attached thereto and lateral flanges attached thereto, together with a core, while the two fastener strips formed in this way are fixed to a suitable article (for example a garment) by means of sewing threads with stitches disposed in the vicinity of the fixing arms. The arms in sliding clasp fasteners of this type can overlap each other when seen in a projection on the plane of the fastener, in the known manner, but it is also possible to arrange them alongside and parallel to each other in the same plane, so as to provide mutual support to each other in the manner propounded in Specification No. 37148/76 (Serial No. 1,527,636) of even date herewith.

The pitch in the known sliding clasp fasteners of this type is not necessarily stable, because the stitches of sewing thread pass through the fastener strips. Depending on the construction of the support fabric, the spacing between the arms of the members and the type of sewing threads used, the pitch may undergo spontaneous

changes during sewing or gradual changes in use, by reason of the extension, shrinkage or swelling of the sewing threads, brought about possibly by the absorption of atmospheric moisture or the effects of laundering or dry cleaning. The pitch of course denotes the distance between adjacent interlocking heads in a row of interlocking members. The pitches of the two co-operating fastener strips in a sliding clasp fastener must coincide within very narrow tolerances and they must moreover remain stable. Furthermore, the sliders in known sliding clasp fasteners of this type exhibit excessive drag when the lateral flanges on them project under the fastener strips and consequently the material of the associated article, the garment for example, does not pass through the slider at the same rate as the strips. This effect is also attributable to the sewing threads. In fact, the action inside the sliders in the known sliding clasp fasteners of this type can be described as an interlocking action with engagement and disengagement by lateral forcing apart. This denotes that when the slider is moved along the fastener, the fastener strips inside it are urged away from or towards each other and bent into a V formation with more or less curved V-arms, the movement taking place in a single plane. Thus adjacent interlocking members of each row are forced apart in the curved regions of the fastener strips, so that normal interlocking can take place. In practice, the known sliding clasp fasteners of this type can have adjacent members of one row forced apart as much as desired. The associated sliders have a very wide throat, i.e., a large angle of opening. The material of the associated article opposes the action of forcing apart, to different degrees depending on the arrangement of the sewing seam. The sewing seams produced when sliding clasp fasteners of this type are sewn into an associated article can differ very widely, depending on the sewing machine

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available to the user of the fastener and so on.

There is another known type of sliding clasp fastener, in which the rows of interlocking members are not forced apart and together by bending into a V formation in a single plane inside the slider, but rather in which one of the rows of interlocking members is taken into a second plane above the plane of the fastener, so that an interlocking action with a vertical pressing engagement takes place inside the slider, although it is accompanied by more or less slight additional forcing apart as described above. This type of action was devised in order to make a sliding clasp fastener in which the slider will not move under a transverse pull even if no special slider locking mechanism is provided. In fact the guide channels for the rows of interlocking members in the known slider are so formed that there are no force components under a transverse pull that could tend to move the slider in the direction of opening.

According to the present invention, a sliding clasp fastener comprises rows of interlocking members made from plastics monofilament, in which each interlocking member has a loop bearing an interlocking head, loop-forming links of monofilament which are extended to form arms, and in which the arms are incorporated into a support fabric and are joined to the respective arms of adjacent members by rearward connecting portions projecting beyond the support fabric and providing guidance for a slider comprising an upper plate, lateral guide faces attached thereto and lateral flanges attached thereto, together with a core, with the fastener strips formed in this way fixed to a suitable article by means of sewing seams with stitches disposed in the vicinity of the arms, the maximum longitudinal spacing of one loop from an adjacent loop during opening or closing of the fastener being limited to an amount approximately equal to the thickness of an interlocking head by the restriction placed on the bending of the support fabric in the plane of the fastener, and the slider being provided with flanges on the core for deflecting the material to which the fastener strips are secured, which flanges also define guide channels for the loops and interlocking heads of the rows of interlocking members to engage and disengage the interlocking heads during closing and opening of the fastener by a force applied in a direction at 90° to the plane of the fastener. One preferred embodiment is characterised in this connection in that the slider adapted for press engagement incorporates fastener strip guide channels arranged parallel to each other in the direction of and to each

side of the longitudinal axis of the fastener and substantially forming a tuning-fork shape (having two parallel arm sections, a tail section and oblique transition sections between the arms and the tail) with one arm section above the other in a projection parallel to the plane of the fastener and normal to the longitudinal axis of the fastener, and that the core is shaped into a connecting bridge which is disposed in the vicinity of the arms and terminates in front of the oblique transition section. Such guide channels make it possible to shape the connecting bridge as just described above. The fact that, on the one hand, the connecting bridge terminates in front of the oblique transition sections and, on the other hand, there are two parallel arms has the immediate effect that the slider can be pushed on to the interlocked rows of interlocking members both from the start side and from the end side (preceded by disengagement of the end side), over the engaged fastener strips, which is a significant advantage not only for the slider assembly but also for the operation of sewing sliding clasp fasteners according to the invention into articles which must be fitted with sliding clasp fasteners. Moreover, this form of guide channels for the fastener strips results in easier and more reliable slider movement, thereby avoiding interlocking faults even when the slider is moved rapidly.

The maximum longitudinal spacing of the loops is brought about by forcing apart the interlocking members in the direction of the longitudinal axis of the fastener, which takes place in the plane of the fastener in a conventional slider for sliding clasp fasteners and is brought about by bending the rows of interlocking members or fastener strips in the fastener strip guide channels of the slider in the longitudinal plane of the fastener. According to the invention, this parting is restricted, without however giving rise to engagement problems of any kind, since interlocking of the heads is not brought about with engagement by lateral force but by a pressing action in a vertical plane at 90° to the longitudinal plane, although accompanied by a slight additional lateral force. The invention arises from the realisation that the load-carrying structure in a sliding clasp fastener of the type under discussion must be adapted so that the pitch remains stable in all operating conditions, irrespective of the sewing seam or the sewing operation used to sew the fastener strips to an associated article. By stabilising the pitch a restriction is placed on the ability of the loops to move apart along the longitudinal axis and gives rise to no operating difficulties, because the slider in the sliding

clasp fastener of the invention has two fastener strip guide channels adapted for a press engagement action. The fact that material deflection flanges are provided ensures that the material of the article to which the sliding clasp fastener is sewn does not pass through the slider with the fastener strips.

10 Longitudinal movement of the loops can be restricted by various methods, within the scope of the invention, according to the design of the support fabric. The arrangement adopted in one preferred embodiment is such that the support fabric has warp threads running in the longitudinal direction of the fastener, constituting for example the twill threads of the support fabric or the loop-forming threads of a plaited structure, within which the fixing arms are laid like a weft, and that the bending of the support fabric in the longitudinal plane restricts "opening up" of the loops. In this case, a plurality of low-expansion warp threads can be used. The feature that the longitudinal spacing is restricted to a maximum approximately equal to the breadth of the connecting heads, ensures that the specified press engagement can be carried out without difficulties. Since the individual interlocking members in a sliding clasp fastener of the invention can deform elastically like springs, especially when made from relatively fine plastics monofilaments of diameter 0.5 mm, for example, longitudinal spacing can also be restricted by means characterised in that the clearance between the loop-forming lengths of monofilament is even slightly smaller than the breadth of the interlocking heads. In this case, slider operation brings about an elastic meshing action (engagement and disengagement) between the interlocking heads of one row of members on the one hand and connecting loops on the other row on the other.

45 The fastener strips (interlocking members and support fabric) in a sliding clasp fastener of the invention must fit the fastener strip guide channels in the slider as exactly as possible. Accordingly, the invention is further characterised in that the fastener strip guide channels are adapted to the thickness of the fastener strips in the immediate proximity of the arms and to the height of the loops bearing the interlocking heads, and are formed by the inner faces of the lateral flanges on one side and the inner faces of the material deflecting flanges on the other side. It is self-evident that the inner face of the upper plate also forms a boundary of the fastener strip guide channels. The distance between the two fastener strip channels at the slider mouth, relative to each other and to the plane of the

fastener, in a sliding clasp fastener of the invention, is kept as small as possible and need only be approximately equal to the height of the connecting loops and the interlocking heads, relative to the plane of the fastener. It is obvious that the slider must allow passage for the sewing seam used to attach a sliding clasp fastener of the invention to an associated article, after the fastener has been sewn to the article. The simplest method of ensuring this is characterised in that a seam passage slot is formed in the slider, between the lateral flanges and the material deflection flanges.

The advantages of a sliding clasp fastener of the invention are that the pitch of the fastener can no longer be disadvantageously affected by the sewing operations required to sew the sliding clasp fastener into an associated article. Although the maximum spacing of the interlocking members in a sliding clasp fastener of the invention is restricted by the load-carrying structure, the sliding clasp fastener is attached sufficiently flexibly to the associated article, even in the sewn state, with respect to bends and kinks out of or within the plane of the fastener. The stiffening of the support fabric when displayed in the bent, which limits the movement of adjacent loops away from each other at the bend does not influence the interlocking action, because this is brought about by press engagement while particular advantages arise with respect to slider assembly, especially when the slide described above is adopted.

Several embodiments of the invention will now be described in more detail with reference to the accompanying schematic drawings, in which:—

Figure 1 is a plan view, on a greatly enlarged scale, of part of a sliding clasp fastener of the invention, with the slider sectioned in the plane of the fastener;

Figure 2 is a section on the line A—B of Figure 1;

Figure 3 is a section on the line C—D of Figure 1;

Figure 4 is a section on the line E—F of Figure 1;

Figure 5 is a section on the line G—H of Figure 1;

Figure 6 corresponds to Figure 5 but shows another embodiment of sliding clasp fastener of the invention, with its slider;

Figure 7 is a plan view of the complete slider of Figure 1;

Figure 8 is an enlarged plan view of part of yet another embodiment of a sliding clasp fastener of the invention, with the slider;

Figure 9 is a section on the line I—K of Figure 8, on an even larger scale;

Figure 10 is a view of the fastener of Figure 9 in the direction of the arrow M;

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Figure 11 is another view of the fastener of Figure 9, looking in the direction of the arrow L; and

Figures 12, 13 and 14 are schematic views of a slider being pushed on to a sliding clasp fastener of the invention from the start or end side.

In Figures 1 to 7, a sliding clasp fastener has two rows 1 of interlocking members 2 made from plastics monofilament, the interlocking members 2 consisting of connecting loops 3, interlocking heads 4, loop-forming limbs 5 of monofilament and arms 6. The arms 6 when seen in a projection on the plane of the fastener can lie alongside each other in one plane or one over another. In either case, the arms 6 are incorporated into a support fabric 7, which one arm 6 connected to a respective arm 6 of an adjacent member by rearward connecting portions 8, which project beyond the support fabric 7. The slider 9 is guided on the rearward connecting portions 8. The slide 9 in every case has an integral upper plate 10, lateral guide faces 11 attached thereto and lateral flanges 12 attached thereto, together a core 13 penetrating centrally to the other side of the fastener. When the sliding clasp fastener has been sewn into an associated article 14, the slider upper plate 10 can obviously lie under the article 14 (Figures 1 to 5) or alternatively over the article 14 (Figure 6). In both cases the fastener strips 15 (members and support fabric) formed in the manner described are attached to the associated article 14 by a sewing seam 16 having stitches 17 disposed in the vicinity of the fixing arms 6. In the sliding clasp fastener shown, relative movement between adjacent interlocking members 2 in one row is restricted by the support fabric 7, to an extent determined by the gaps 18 indicated in Figure 1, in the support fabric. It will be seen that the maximum clearance A (Figure 2) that can be created between adjacent loops is approximately equal to the breadth B (Figure 2) of the interlocking heads 4, measured in the longitudinal direction of the fastener. This definition relates to a projection on the plane of the fastener where the fastener strips 15 start to diverge in V formation. The core of the slider 9 is provided with material deflection flanges 19, which contribute in a manner to be described below in more detail to the effects of providing the slider 9 with two fastener strip guide channels 10 near the core 13, which are adapted for press engagement action. In the preferred embodiment shown, the support fabric 7 incorporates warp threads 21 running in the longitudinal direction of the fastener and fashioned for example as twill threads in the support fabric or as loop-forming threads in a plaited structure, it being the gaps 18 be-

tween the threads that permit (and limit) bending of the support fabric and thus limit the longitudinal movement of adjacent loops away from each other. The arms 6 are associated as weft with these warp threads 21. With relatively fine plastics monofilament of diameter 0.5 mm for example, the elastic deformation of the interlocking members 2 can be additionally exploited for the press engagement action of interlocking, with the result that the longitudinal displacement of one interlocking member 2 with respect to an adjacent member at the bend can be restricted to a clearance between the loops of monofilament which is actually smaller than the breadth B of the interlocking heads 4. It will be seen in comparing Figures 3 to 5 that the fastener strip guide channels 20 match the thickness D of the fastener strips 15 near the arms 6 and the height H of the connecting loops 3 and the interlocking heads 4, and are formed on the one hand by the inner faces 22 of the lateral flange 12 and on the other hand by the inner faces 23 of the material deflecting flanges 19 and obviously the inner faces 24 of the slider upper plate 10. A seam passage slot 25 is provided between the flanges 12 and the material deflecting flanges 19, as shown more particularly in Figure 7. The handle 26 for operating the slider can be attached either to the core 13 or to the slider upper plate 10, as shown in Figure 1 to 5 and 7 and Figure 6 respectively. The choice depends on whether the sliding clasp fastener is to remain hidden or freely visible when sewn into the associated article 14.

The sliding clasp fastener shown in Figures 8 to 14 once again has rows 1 of interlocking members 2 made from plastics monofilament. The interlocking members 2 in turn consist of connecting loops 3, interlocking heads 4, loop-forming limbs 5 of plastics monofilament and arms 6. As shown, the arms 6 when seen in a projection on the plane of the fastener can lie alongside each other in one plane or one over another. In either case, the fixing arms 6 are incorporated into a support fabric 7 with one arm of one member secured to a respective arm of an adjacent member by rearward connecting portions 8, which project beyond the support fabric 7. The slider 9 is guided on the portion loops 8. The slider 9 has an integral upper plate 10, lateral guide faces 11 attached thereto and lateral flanges 12 attached thereto, together with a core 13 penetrating centrally to the other side of the fastener. When the sliding clasp fastener has been sewn into an associated article 14, the slide upper plate 10 can obviously lie as under the article 14 (Figures 8 to 14) or alternatively over the article 14 (not shown). In both cases the fastener strips

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15 (rows of members and support fabrics) formed in the manner described are attached to the associated article 14 by a sewing seam 16 having stitches 17 disposed in the vicinity of the fixing arms 6, relative longitudinal movement of adjacent loops of one row of interlocking members 2 is restricted by the support fabric 7, as indicated in Figures 8 to 14. It will be seen that the movement is restricted to a clearance A between the loop-forming lengths 5 of monofilament approximately equal to the breadth B of the interlocking heads 4 measured in the longitudinal direction of the fastener, where the fastener strips 15 diverge in V formation. The core 13 of the slider 9 is provided with material deflection flanges 19, which contribute to the effects of providing the slider 9 with two fastener strip guide channels 20 near the core 13, which are adapted for press engagement action. In the preferred embodiment of the invention shown, the support fabric 7 incorporates warp threads 21 running in the longitudinal direction of the fastener and laid for example as twill threads in the support fabric or as loop-forming threads in a plaited structure, and are so laid and arranged that they restrict movement of the loops in the manner described. The arms 6 are incorporated as weft threads with these warp threads 21. With sliding clasp fasteners made from relatively fine plastics monofilament of diameter 0.5 mm for example, the elastic deformation of the interlocking members 2 can be additionally exploited for the press engagement action of interlocking, with the result that the relative movement of adjacent interlocking members 2 of one row can be restricted to a clearance between the loops of monofilament which is actually smaller than the breadth B of the interlocking heads 4. The slider 9 is again adapted for press engagement and incorporates fastener strip guide channels 20. In contrast to the fastener shown in Figures 1 to 7, the channels 20 of which when viewed in a projection on the plane of the fastener diverge, (Figures 1 and 7) the channels 20 here are parallel, when viewed in a projection on the plane of the fastener, to the longitudinal axis of the fastener. In a projection parallel to the plane of the fastener and normal to the longitudinal fastener axis, the channels 20 have an arrangement like a tuning fork as is shown more particularly in Figure 9. The channels 20 are formed by two parallel arms 27, parallel to the plane of the fastener, with one arm 27 above the other, a tail section 28 lying in the plane of the fastener and oblique transition sections 29 between the parallel arms 27 and the tail section 28. The core 13 is shaped into a connecting bridge, disposed in the vicinity of the arms 27 and

terminating in front of the oblique transition sections 29. Figures 10 and 11 show how the sliding clasp fastener lies in the slider 9 when the slider 9 is drawn along. The slider 9 can be moved along without difficulty and brings about disengagement when it is moved in the opening direction. This is shown in Figures 12 to 14, which at the same time also demonstrate that the reverse is true, i.e., that the slider 9 can also be pushed onto a sliding clasp fastener from the other side and in the closure direction.

WHAT WE CLAIM IS:—

1. A sliding clasp fastener comprising rows of interlocking members made from plastics monofilament, in which each interlocking member has a loop bearing an interlocking head, loop forming limbs of monofilament which are extended to form arms, and in which the arms are incorporated into a support fabric and are joined to the respective arms of adjacent members by rearward connecting portions projecting beyond the support fabric and providing guidance for a slider comprising an upper plate, lateral guide faces attached thereto and lateral flanges attached thereto, together with a core, with the fastener strips formed in this way fixed to a suitable article by means of sewing seams with stitches disposed in the vicinity of the arms, the maximum longitudinal spacing of one loop from an adjacent loop during opening or closing of the fastener being limited to an amount approximately equal to the thickness of an interlocking head by the restriction placed on the bending of the support fabric in the plane of the fastener, and the slider being provided with flanges on the core for deflecting the material to which the fastener strips are secured, which flanges also define guide channels for the loops and interlocking heads of the rows of interlocking members to engage and disengage the interlocking heads during closing and opening of the fastener by a force applied in a direction at 90° to the plane of the fastener.

2. A sliding clasp fastener as in Claim 1, wherein the support fabric has warp threads running in the longitudinal direction of the fastener, constituting for example the twill threads of a weave or the loop-forming threads of a plaited structure, within which the arms of the members are laid like a weft, the restriction placed on the bending of the support fabric being determined by the lateral spacing of the warp threads.

3. A sliding clasp fastener as in Claim 1 or Claim 2, wherein the maximum longitudinal spacing of adjacent loops during opening or closing is (slightly) smaller than the breadth of the interlocking heads.

4. A sliding clasp fastener as in any one of



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15 (rows of members and support fabrics) formed in the manner described are attached to the associated article 14 by a sewing seam 16 having stitches 17 disposed in the vicinity of the fixing arms 6, relative longitudinal movement of adjacent loops of one row of interlocking members 2 is restricted by the support fabric 7, as indicated in Figures 8 to 14. It will be seen that the movement is restricted to a clearance A between the loop-forming lengths 5 of monofilament approximately equal to the breadth B of the interlocking heads 4 measured in the longitudinal direction of the fastener, where the fastener strips 15 diverge in V formation. The core 13 of the slider 9 is provided with material deflection flanges 19, which contribute to the effects of providing the slider 9 with two fastener strip guide channels 20 near the core 13, which are adapted for press engagement action. In the preferred embodiment of the invention shown, the support fabric 7 incorporates warp threads 21 running in the longitudinal direction of the fastener and laid for example as twill threads in the support fabric or as loop-forming threads in a plaited structure, and are so laid and arranged that they restrict movement of the loops in the manner described. The arms 6 are incorporated as weft threads with these warp threads 21. With sliding clasp fasteners made from relatively fine plastics monofilament of diameter 0.5 mm for example, the elastic deformation of the interlocking members 2 can be additionally exploited for the press engagement action of interlocking, with the result that the relative movement of adjacent interlocking members 2 of one row can be restricted to a clearance between the loops of monofilament which is actually smaller than the breadth B of the interlocking heads 4. The slider 9 is again adapted for press engagement and incorporates fastener strip guide channels 20. In contrast to the fastener shown in Figures 1 to 7, the channels 20 of which when viewed in a projection on the plane of the fastener diverge, (Figures 1 and 7) the channels 20 here are parallel, when viewed in a projection on the plane of the fastener, to the longitudinal axis of the fastener. In a projection parallel to the plane of the fastener and normal to the longitudinal fastener axis, the channels 20 have an arrangement like a tuning fork as is shown more particularly in Figure 9. The channels 20 are formed by two parallel arms 27, parallel to the plane of the fastener, with one arm 27 above the other, a tail section 28 lying in the plane of the fastener and oblique transition sections 29 between the parallel arms 27 and the tail section 28. The core 13 is shaped into a connecting bridge, disposed in the vicinity of the arms 27 and

terminating in front of the oblique transition sections 29. Figures 10 and 11 show how the sliding clasp fastener lies in the slider 9 when the slider 9 is drawn along. The slider 9 can be moved along without difficulty and brings about disengagement when it is moved in the opening direction. This is shown in Figures 12 to 14, which at the same time also demonstrate that the reverse is true, i.e., that the slider 9 can also be pushed onto a sliding clasp fastener from the other side and in the closure direction.

WHAT WE CLAIM IS:—

1. A sliding clasp fastener comprising rows of interlocking members made from plastics monofilament, in which each interlocking member has a loop bearing an interlocking head, loop forming limbs of monofilament which are extended to form arms, and in which the arms are incorporated into a support fabric and are joined to the respective arms of adjacent members by rearward connecting portions projecting beyond the support fabric and providing guidance for a slider comprising an upper plate, lateral guide faces attached thereto and lateral flanges attached thereto, together with a core, with the fastener strips formed in this way fixed to a suitable article by means of sewing seams with stitches disposed in the vicinity of the arms, the maximum longitudinal spacing of one loop from an adjacent loop during opening or closing of the fastener being limited to an amount approximately equal to the thickness of an interlocking head by the restriction placed on the bending of the support fabric in the plane of the fastener, and the slider being provided with flanges on the core for deflecting the material to which the fastener strips are secured, which flanges also define guide channels for the loops and interlocking heads of the rows of interlocking members to engage and disengage the interlocking heads during closing and opening of the fastener by a force applied in a direction at 90° to the plane of the fastener.

2. A sliding clasp fastener as in Claim 1, wherein the support fabric has warp threads running in the longitudinal direction of the fastener, constituting for example the twill threads of a weave or the loop-forming threads of a plaited structure, within which the arms of the members are laid like a weft, the restriction placed on the bending of the support fabric being determined by the lateral spacing of the warp threads.

3. A sliding clasp fastener as in Claim 1 or Claim 2, wherein the maximum longitudinal spacing of adjacent loops during opening or closing is (slightly) smaller than the breadth of the interlocking heads.

4. A sliding clasp fastener as in any one of

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- Claims 1 to 3, wherein the guide channels are adapted to the thickness of the fastener strips near the arms and to the height of the loops and the interlocking heads, and are formed by the inner faces of the lateral flanges on one side and the inner faces of the material deflecting flanges on the other side.
5. A sliding clasp fastener as in any one of Claims 1 to 4, wherein the slider incorporates fastener strip guide channels arranged parallel to each other in the direction of and to each side of the longitudinal axis of the fastener, having two parallel arms, a tail section and oblique transition sections, and that the core is shaped into a connecting bridge disposed in the vicinity of the parallel arms and terminating in front of the oblique transition sections.
6. A sliding clasp fastener substantially as hereinbefore described with reference to Figures 1 to 5 of the accompanying drawings.
7. A sliding clasp fastener substantially as hereinbefore described with reference to Figure 7 of the accompanying drawings.
8. A sliding clasp fastener substantially as hereinbefore described with reference to Figures 8 to 11 of the accompanying drawings.
9. A sliding clasp fastener substantially as hereinbefore described with reference to Figures 12 to 14 of the accompanying drawings.
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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1978.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.