

Oct. 21, 1958

J. NAGEL
SLIDE FASTENERS

2,856,664

Filed May 7, 1953

3 Sheets-Sheet 1

Fig. 1

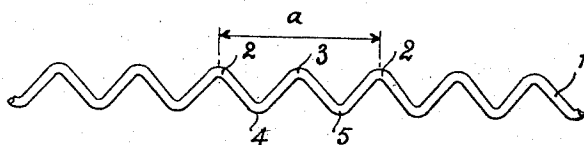


Fig. 2

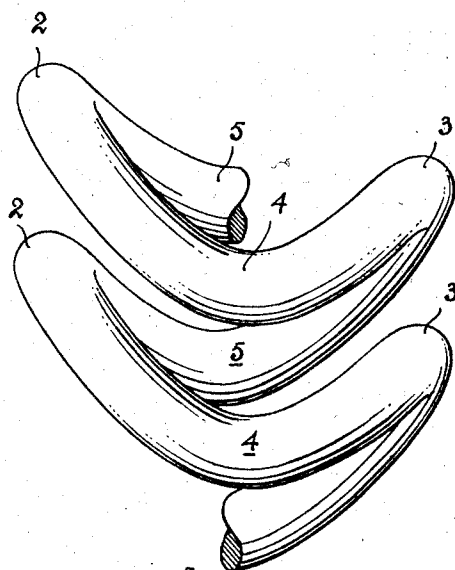
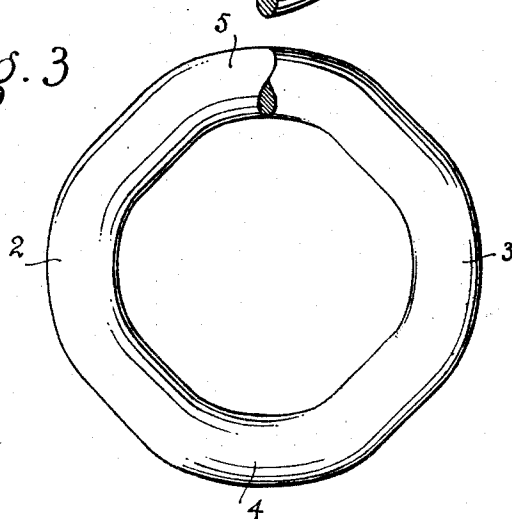


Fig. 3



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3 Sheets-Sheet 2

Fig. 4

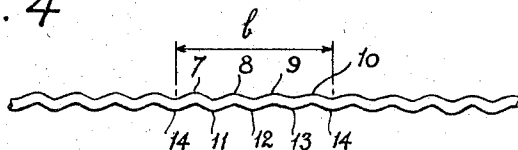


Fig. 5

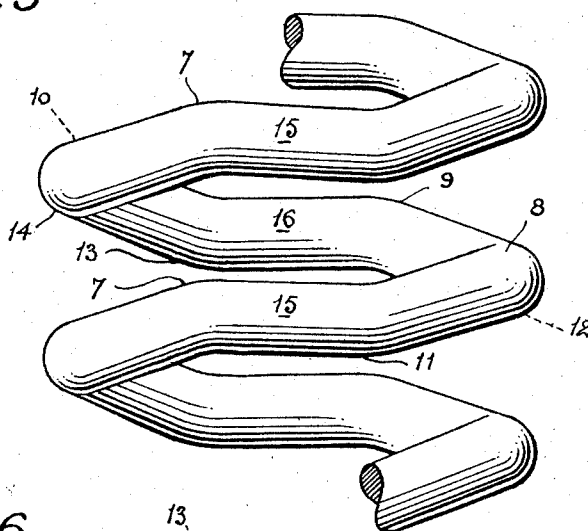
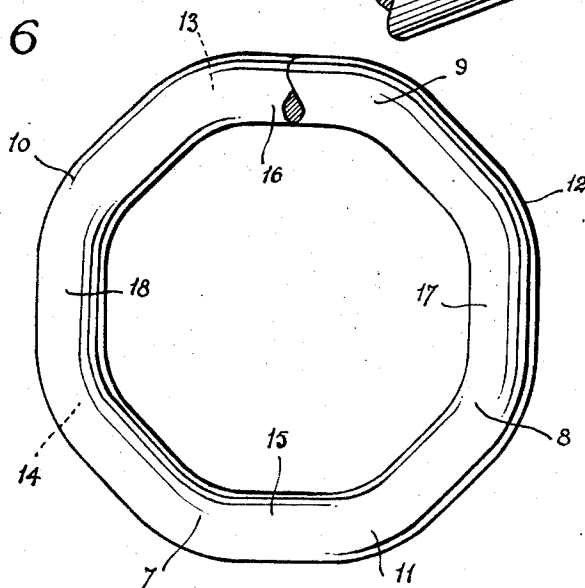


Fig. 6



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3 Sheets-Sheet 3

Fig. 7

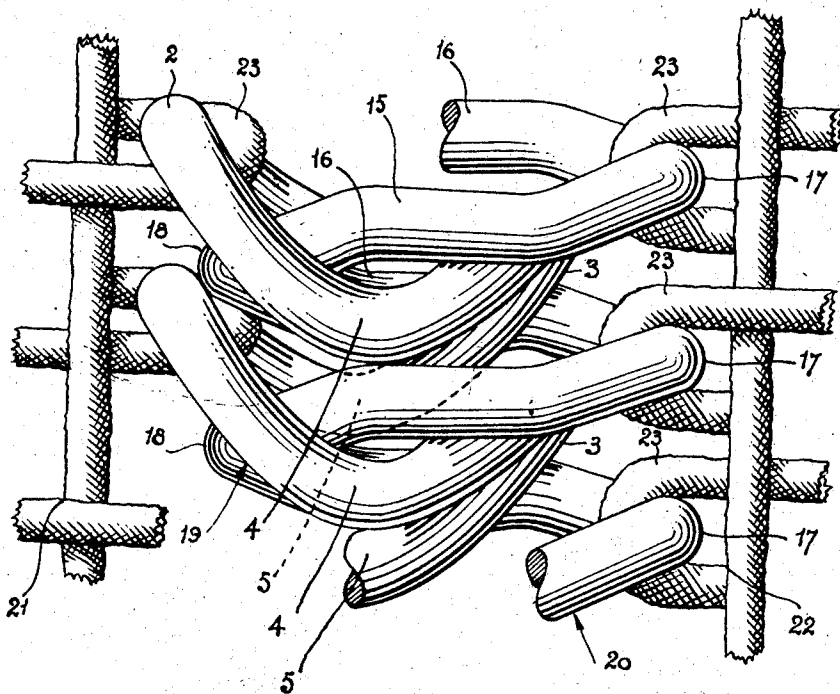
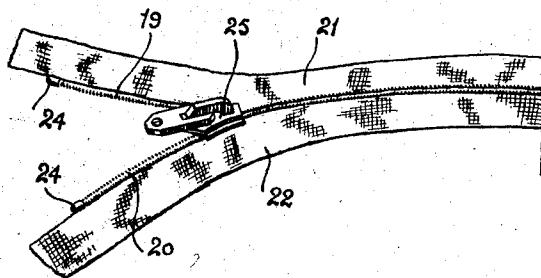


Fig. 8



2,856,664

SLIDE FASTENERS

Jean Nagel, Paris, France

Application May 7, 1953, Serial No. 353,558

Claims priority, application France May 13, 1952

1 Claim. (Cl. 24—205.13)

This invention relates to so-called slide fasteners, and it has for its object an improved construction of fasteners of this kind.

The first known slide fastener construction effected a closure by the mutual interlocking of alternately distinct elements. Since then, slide fastener devices have been proposed in which the two mutually engaging members are constituted by two wires wound as helices of the same diameter, of the same pitch and in opposite directions.

Such helices may engage each other and, if they are both made with rectilinear wires, each whorl of one inserts itself upon a whorl of the other and possesses two points of contact with it in a plane of symmetry of the two helices, the distance of which from the axes depending on the depth of their engagement. This depth is however limited, the helices having the same diameter, and it is necessarily very much less than their radius. Besides, the engagement is maintained only by friction. Finally the reactions at the points of contact of the helices which are all situated on one side of the axis of the helix, produce a couple which tends to distort the helix.

Among the known fastening devices with helices, it has been proposed, in order to obtain an improved hooking, to form one of the helices with a wire which is not rectilinear but which is bent and bent back again regularly into rectilinear segments constituting the sides of teeth alternately in opposite directions, which are present in the helix at the rate of two opposite teeth having the same direction for each whorl. The fastening results from the engagement, in each whorl of the helix having narrow whorls, of the front tooth of a whorl of the helix having bent whorls. Here also, the depth of the engagement being relatively small, the closed device has an excessive apparent width and it is subjected to a couple which tends to bend it. It follows that, after being used for a certain time, a distortion of the whorls occurs and the closure gets loose or the device functions badly.

A fastening device of the same type has also been proposed, in which the whorls are deformed with respect to the spire on the two helices in such manner that, on the side on which the latter face each other, each whorl of one forms a transverse half loop, each whorl of the other a kind of hook. This construction does not eliminate the drawbacks pointed out above and, besides, the helices cannot be obtained directly by the winding of bent wires, but, on the contrary, the deformation must be effected after winding.

According to my invention, I provide a slide fastener device of the type referred to which avoids the drawbacks described above, and which is essentially characterized by the fact that the two helices are provided by winding wires bent into regular segments which are in multiples of four per whorl, one having segments alternately oblique and perpendicular to the axis of the helix, the other having segments inclined to the axis in the same direction and having a smaller external diameter, its diameter

at the apices being substantially equal to the diameter on the flat of the first one.

As a result of this construction the interlocking takes place at the apices of each whorl of the helix of smaller diameter which are situated in a plane containing the axis of this helix and, in the other helix, on sides which are segments perpendicular to the axis and opposed in pairs, at points stepped by a half-pitch in a parallel direction to the axes. This construction offers the following advantages: there is no couple distorting the helices; the strength of the closure is increased for it results from a positive interlocking of the said apices with the said sides; the engagement is deep and the apparent width of the device when closed is not appreciably greater than the diameter of the helices as it appears on the faces of the device.

According to a preferred embodiment, the helix of smaller diameter has two apices or teeth in the same direction for each whorl, the helix of large diameter has four apices in the same direction per whorl.

Referring to the accompanying drawings, which represent by way of example a preferred embodiment of the invention:

Fig. 1 is a small scale view of a bent wire intended to form one of the members of the fastener;

Fig. 2 and Fig. 3 are a large scale elevation and plan, respectively, of a portion of the helix obtained by winding the wire shown in Fig. 1;

Fig. 4 is a view of the bent wire intended to form the other member of the fastener, on the same scale as that of Fig. 1;

Figs. 5 and 6 are a large scale elevation and plan, respectively, of a portion of the helix obtained by winding the wire shown in Fig. 4;

Fig. 7 is an elevation of a portion of two interlocked members of the fastener according to the invention;

Fig. 8 is a perspective view of a portion of the slide fastener according to the invention, secured in position on two portions of a webbing which it is desired to join together.

As seen in Fig. 1, and according to a known disposition, a wire 1, bent in equal segments almost at right angles to each other, is used to define the helix of one member of the fastener. The portion of the length of this wire which corresponds to one whorl of the helix after winding is designated by *a*; it is seen that this whorl comprises two apices or teeth 2 and 3 in one direction and two apices or teeth 4 and 5 in the other. The helix is wound in a winding direction which, according to Figs. 2 and 3, corresponds to a left-hand pitch. Seen endwise, owing to the four angles per whorl of the wound wire, its contour has a square-like appearance.

Fig. 4 represents a wire 6 of the same diameter as the wire 1, intended according to the invention to define the other member of the fastener by winding it to form a helix of the same pitch as the first one but in an opposite direction and having a larger diameter. The length of one whorl after winding is designated by *b*. It is seen that the wire is bent in smaller segments than those shown in Fig. 1 and at more obtuse angles and that whorl comprises four apices 7, 8, 9 and 10 (Figs. 5 and 6) in one direction and four apices 11, 12, 13 and 14 in the opposite direction. After being wound in a direction opposite to that of the wire of the first member, a helix is obtained having a right-handed pitch, as shown in Fig. 5. Seen endwise, owing to the eight angles per whorl of wound wire, its contour has an octagonal appearance. The angle comprised between successive segments of the bent wire has been so chosen with respect to the pitch, that, in the whorls, the segments are alternately inclined in a direction perpendicular to the axis of the helix, as, for exam-

ple, the segments 15 and 16 seen sidewise and the segments 17 and 18 seen endwise in Fig. 6.

The two members of the closure so constituted (Fig. 8), which will be designated by 19 for the square helix and by 20 for the octagonal helix, are mounted, in accordance with a usual arrangement, on webbings or tapes 21 and 22 intended to be sewn on the edges of the fabric to be joined. Each of the webbings or tapes is defined by a strip, the warp threads of which are lacking in the central portion and which is folded in two back upon itself. The weaving is such that the distance between the weft threads 23 (Fig. 7) is equal to the pitch of the helices so that each whorl is held by a weft thread engaged in that whorl. The helices of the two opposite edges of the gap to be closed are in this manner secured to the fabric according to an alignment of corresponding parts of the whorls for each helix, the square helix by its apices 2, for example, the octagonal helix by its sides 17, for example. The helices therefore present themselves to each other in the position shown by the juxtaposition of Figs. 2 and 5. The end of each helix mounted on its webbing or tape is covered by a fastened metal fitting 24. The engagement and the disengagement of the helices for closing or opening are obtained by a sliding runner 25 of known construction provided with converging engagement grooves.

In Fig. 7 is shown the position of engagement of the whorls after closing. It is seen that the tooth 3 of each whorl of the square helix has passed beyond the segment 18 of a whorl of the octagonal helix in order to become engaged in that whorl sufficiently deeply for the hollows of the lateral teeth 4 and 5 of the square helix to be at the origin of the lateral segments 15 and 16 of the octagonal helix and to be hooked on these sides, which ensures a great resistance to the tearing apart of the two fastening members.

Furthermore, in the position of complete engagement represented in Fig. 7, the two points of contact of a whorl of the square helix are in a plane containing the axis of this helix (hollow of the opposite teeth 4 and 5) and the two points of contact of a whorl of the octagonal helix are situated on sides perpendicular to the axis and opposite in pairs, 15 and 16, of this helix. These points of contact are therefore stepped regularly by half a pitch in a parallel direction to the axes of the helices and the helices are subjected to contact forces which are, for each whorl of the square helix, situated in a plane containing the axis of the helix and, for each whorl of the octagonal helix, in a plane parallel to the axis of the helix and very close to this axis. It follows that the reactions do not

produce any perceptible couple tending to bend the helices, thereby avoiding the distortions which rapidly put out of service known devices of this type.

Calculation shows that the width of the device according to the invention, when it is closed, is equal to $0.5d_1 + 0.66d_2$, where d_1 and d_2 are the external diameters of the helices of small diameter and of large diameter respectively, while in known devices of this type the width reaches at least $0.75 (d_1 + d_2)$. So the device according to the invention is much more flexible, thinner and has a better appearance than known devices, which advantages are to be added to that of a greater resistance to being torn apart and of better wear.

What I claim is:

15 A slide fastener having two mating fastener elements adapted to be interengaged by a sliding clasp, said elements consisting of two lengths of coiled wire, one of said lengths being left-hand wound and defining one of said elements and the other of said lengths being right-hand wound and defining the other of said elements, the coils of both wires having regular polygonal shapes, the coils of one of said wires being four-sided and having a first pair of opposite corners defined by portions of the coil bent in one direction away from a plane at right angles to the longitudinal axis of the coil with a second pair of opposite corners being defined by portions of the coil similarly bent in the opposite direction away from said plane, and the coils of the other of said wires having a multiple of four sides with a set of sides parallel to planes perpendicular to the axis of the coil alternating around the coil and an alternate set of sides inclined to said planes, the four-sided coil having a smaller diameter than the second-named coil and being adapted for inter-engagement with said second-named coil, one of said parallel sides of said second-named coil being adapted to be secured to the material to be fastened and one of said corners of said opposite pairs of said first-named coil being adapted to be similarly secured with the corner opposite the secured corner engaging in the space within the second-named coil when the two coils are inter-engaged.

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