Description

This invention relates to an automatic lock slider according to the preamble of claim 1.

A conventional slider of the automatic lock type is typically provided with a pull tab and a spring-actuated locking prong operatively associated therewith such that upward tilting of the pull tab lifts and releases the locking prong from engagement with the coupling elements of the slide fastener, and bringing the pull tab back in a position parallel with the slider body urges the locking prong down into the path of the cooupling elements to lock the slider against any movement. Design considerations have been given such that the slider has on one hand a lock function in which the locking prong penetrates inbetween and locks adjacent coupling elements against movement under and up to a predetermined amount of pressure, and on the other hand a ratchet function in which with greater pressure the locking prong ascends and allows the coupling elements to move underneath and past the locking prong. The maximum allowable lock strength of the locking prong is defined by a critical pressure at which the coupling elements begin to shift out of position on the fastener or otherwise sustain damage.

Certain structural features have been proposed, whereby the coupling elements when subjected to a pressure beyond the critical point are allowed to move, while being tilted, past and underneath and clear the locking prong without suffering physical damage.

US-A 2 571 024 discloses an automatic lock slider according to the preamble of claim 1. In this prior art slider the locking prong is integrally formed with the pull tab and has a vertically extending locking surface and a canted cam surface contiguous thereto. The cavity disposed in the lower wing of the slider in confronting relation to the locking prong is progressively reduced in depth toward the position of the diamond head to provide an upwardly slanted cam surface. Such device can perform the necessary lock and ratchet functions provided that a predetermined length of the locking surface and a predetermined angle of the canted cam surface are accurately maintained. However, the length of the locking surface is determined by the dimensional relations between a slider guide channel, a locking prong and coupling elements. The amount of ingress of the locking prong into the guide channel is variable considerably with dimensional errors resulting from aggregated tolerances in the finish of locking prong, guide channel and coupling elements or in the chamfering of coupling elements. All these dimensional errors when added up would result in unduly strong lock function or conversely in greater ratchet function or reduced lock effect. This means that an extremely high degree of accuracy is required for the finished parts dimensions.

With the foregoing difficulties of the prior art in view, the present invention is aimed at the provision of an automatic lock slider for a slide fastener which is capable of accurate and smooth lock and ratchet performance with greater dimensional tolerances of the slider parts.

This object is realized by the basic concept of the invention set forth in the characterizing part of claim 1.

Further developments of the invention are set forth in the depending claims.

The present invention will be more apparent from the following description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment of the invention and in which like reference numerals refer to like and corresponding parts throughout the several views.

FIG. 1 is a longitudinal cross-sectional view of a slider embodying the invention mounted on a slide fastener chain;

FIG. 2 is a schematic side elevational view on enlarged scale of a portion of the slider of FIG. 1, illustrating the operative relationship between the locking prong and the fastener coupling elements;

FIGS. 3 - 6 inclusive are longitudinal cross-sectional views of a rear portion of the slider in FIG. 1, illustrating the behavior of the coupling element in progression; and

FIG. 7 - 9 inclusive are longitudinal cross-sectional views of a modified form of the slider in FIG. 1.

Referring now to the drawings and FIG. 1 in particular, there is shown in longitudinal cross-section an automatic lock slider generally designated at 10 for use on a slide fastener. The slider 10 has a slider body 11 which includes upper and lower spaced parallel wings 12 and 13 which are joined at their front ends by a connecting neck 14 commonly known as a diamond head. The upper and lower wings 12, 13 are generally similar in shape and inwardly flanged along their lateral side edges as at 15. Formed in and extending vertically through the connecting neck 14 is a retention groove 16 for receiving one end of a spring locking member 20 later described.

The upper and lower wings 12 and 13 of the slider 10 define therebetween a generally Y-shaped guide channel 17 for the passage therethrough of a pair of stringers each including a support tape 18 and a row of coupling elements 19 of a discrete formation.

Formed on the upper surface of the upper wing 12 adjacent to the neck 14 is a first retaining lug 21 which holds the locking member 20 in place against lateral movement. A second retaining lug 22 is formed likewise on the upper wing 12 adjacent to an aperture 23 communicating with the guide channel 17 and is adapted to restrict ascending movement of the free end of the locking member 20 which functions as a locking prong hereafter described.

The locking member 20 is made of a resilient material as a whole, and it has a downwardly curved end 20a receiving and anchored in the retention groove 16 and a straight vertically depending free end which serves as a locking prong 20b resiliently movable through the aperture 23 into and out of the guide channel 17. The locking prong 20b is brought into and out of engagement with the coupling elements 19 in the guide channel normally by manipulation of a pull tab 24 in a well known manner. The locking prong 20b is adapted to penetrate into a space between an adjacent pair of the discrete coupling el-

ements 19. The locking prong 20 includes a bulged support portion 20c adjoining the prong 20b, the bulged portion 20c defining with the upper surface of the upper wing 12 a lateral bore 25 for pivotally receiving a spindle 26 of the pull tab 24. The spindle 26 has a peripheral cam surface for operatively engaging the bulged portion 20c.

The general construction and operation of the automatic lock slider 10 as above described is conventional, and hence no further explanation will be required.

Now, according to an important aspect of the present invention, the locking prong 20b is provided at its outer rear portion with a locking cam surface 20d extending from the vertical surface 20e to a horizontal end surface 20f at a canted angle of 20° - 30°, this being 20° in the case of FIG. 2.

The angle in the range of 20° - 30° at which the locking cam surface 20d assumes with respect to a plane perpendicular to the plane of the slider 10 is consistant with the angle at which the coupling elements 19 on the fastener can tilt and sink without becoming displaced or dislodged. It has been found that smaller angles than 20° for the locking surface 20d would result in insufficient force for the coupling elements 19 to lift the locking prong 20b, or explained otherwise, in unduly increased locking strength prohibiting the coupling elements 19 to tilt and sink to a desired extent. Greater locking surface angles than 30° would result in unduly reduced locking strength, or explained otherwise, in increased ratchet function or increased tendency to lift the locking prong 20b. Also importantly, in normal locking position of the locking prong 20b, the locking cam surface 20d has its upper end point 20d' located slightly above the upper end surface of the coupling element 19.

There is provided a cavity 27 in the inner or upper surface of the lower wing 13 in confronting relation to the aperture 23, the cavity opening to the guide channel 17 and being defined by sloped surfaces 27a and 27b on opposite ends of a flat bottom surface 27c.

Forces directly exerted on the fastener chain to spread apart the same urge the coupling element 19 to tilt in abutting engagement with the locking prong 20b and sink into the cavity 27. This dual movement of the coupling element 19 is effected by the presence of forces or stresses barely reaching or immediately premature of the critical point of a slider lock strength at which the coupling element 19 would be shifted out of position or separated from the support tape 18. The critical angle at which the coupling element 19 can tilt at once and sink or descend is normally 20° - 30°.

The behavior or the above dual movement of the coupling element 19 in contact with the locking prong 20b is illustrated in FIGS. 3 - 6 inclusive, in which the coupling element 19 initially in locked position begins to tilt and sink under the influence of external pressures upon the fastener chain as the upper front corner 19a of the element 19 slides down along the locking cam surface 20d of the locking prong 20b. The cam surface 20d serves not only to permit the coupling element 19 to tilt as shown in FIGS. 3 and 4 but also to lift the locking prong 20b in contact with the coupling element 19 against spring tension in the locking member 20 as shown in FIG. 5. The coupling element 19 continues to advance in sliding contact with the locking prong 20b until the upper rear corner 19b of the element 19 reaches the rear end corner of the locking prong 20b, at which time the coupling element 19 is in effect released from the locking prong 20b and thereafter guided up along the upgrade cam surface 27a of the cavity 27 back onto a regular track in the guide channel 17 as shown in FIG. 6. If it were not for the upgrade cam surface 27a, the coupling element 19 would stand upright during forward travel and end up in getting jammed against the frontal cavity wall.

FIGS. 7 - 9, inclusive, show a modified form of slider according to the invention in which the locking prong 20b in its normal locking position is disposed in spaced apart relation to the peripheral wall of the aperture 23 which confronts the rear vertical portion of the locking prong 20b. The locking prong 20b is thus spaced from the wall of the aperture 23 across a gap 28 which is proven experimentally to be preferably about 0.2 mm. The provision of the gap 28 allows the locking prong 20b to flex by resiliency of the locking member 20 counterclockwise in the direction of the diamond 14 as pressures are applied to the fastener to cause the coupling elements 19 to lean or tilt and sink in the cavity 27 as shown in FIG. 8, until the prong 20b restores its upright position upon departure from the coupling elements 19 as shown in FIG. 9. This flexing movement of the locking prong 20b is proven experimentally to save approximately 1 kg. of load upon the coupling elements 19 as compared to the case where the locking prong 20b is disposed normally in abutting relation to the peripheral wall of the aperture 23 as shown in the embodiment of FIG. 1 and thus literally facilitates ascending motion of the locking prong 20b.

Claims

1. An automatic lock slider (10) for a slide fastener having a slide fastener chain provided with coupling elements (19) comprising: a slider body (11) including upper and lower wings (12, 13) spaced in parallel to each other and joined together at their front ends to define a guide channel (17) therebetween; a pull tab (24) pivotally mounted on the slider body (11); a locking member (20) operable by said pull tab (24) and including a locking prong (20b) movable through an aperture (23) into and out of the guide channel (17); said lower wing (13) having a cavity (27) disposed in its inner surface contiguous to said guide channel (17) in confronting relation to said prong (20b) to allow said coupling element (19) to sink therein; and said locking prong (20b) having a cam surface (20d) downwardly canted at an angle consistent with an angle at which said coupling elements (19) tilt under stresses barely reaching the critical point at which said coupling elements (19) become displaced or separated, characterized in that said locking member (20) is made of a resilient material having one end secured to said slider body and the opposite end freely disposed at which said lock-

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ements 19. The locking prong 20 includes a bulged support portion 20c adjoining the prong 20b, the bulged portion 20c defining with the upper surface of the upper wing 12 a lateral bore 25 for pivotally receiving a spindle 26 of the pull tab 24. The spindle 26 has a peripheral cam surface for operatively engaging the bulged portion 20c.

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The behavior or the above dual movement of the coupling element 19 in contact with the locking prong 20b is illustrated in FIGS. 3 - 6 inclusive, in which the coupling element 19 initially in locked position begins to tilt and sink under the influence of external pressures upon the fastener chain as the lower front corner 19a of the element 19 slides down along the locking cam surface 20d of the locking prong 20b. The cam surface 20d serves not only to permit the coupling element 19 to tilt as shown in FIGS. 3 and 4 but also to lift the locking prong 20b in contact with the coupling element 19 against spring tension in the locking member 20 as shown in FIG. 5. The coupling element 19 continues to advance in sliding contact with the locking prong 20b until the upper rear corner 19b of the element 19 reaches the rear end corner of the locking prong 20b, at which time the coupling element 19 is in effect released from the locking prong 20b and thereafter guided up along the upgrade cam surface 27a of the cavity 27 back onto a regular track in the guide channel 17 as shown in FIG. 6. If it were not for the upgrade cam surface 27a, the coupling element 19 would stand upright during forward travel and end up in getting jammed against the frontal cavity wall.

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ing prong (20b) is integrally formed, said locking prong (20b) extending through said aperture substantially at right angles to the plane of the fastener, and said locking member (20) is operatively associated with but formed as a separate part from said pull tab (24).

2. An automatic lock slider according to claim I, said cam surface (20d) being canted at an angle of 20° - 30°.

3. An automatic lock slider according to claim 2, said locking prong (20b) having an effective cam surface commencing at a position above the upper end surface of said coupling element (I9).

4. An automatic lock slider according to one of the claims 1 to 3, said locking prong (20b) in its normal locking position having its rear portion by a gap (28) spaced from the peripheral wall of said aperture.

5. An automatic lock slider according to claim 4, said gap (28) being approximately 0.2 mm.

Patentansprüche

1. Selbstsperrender Schieber (10) für einen Reißverschluß, der eine mit Kuppelgliedern (19) versehene Reißverschlußkette aufweist, umfassend: einen Schieberkörper (11) mit einem Oberschild und einem Unterschild (12, 13), die im Abstand parallel zueinander angeordnet und an ihren Vorderenden miteinander verbunden sind, um dazwischen einen Führungskanal (17) zu begrenzen; einen Griff (24), der an dem Schieberkörper (11) schwenk bar gelagert ist; ein Sperrteil (20), das mit dem Griff (24) betätigbar ist und eine Sperrklaue (20b) aufweist, die durch eine Öffnung (23) in den Führungskanal (17) hinein und aus diesem heraus bewegbar ist; wobei der Unterschild (13) in seiner in den Führungskanal (17) übergehenden Innenfläche eine der Sperrklaue (20b) gegenüberliegende Vertiefung (27) aufweist, so daß die Kuppelglieder (19) in diese eintauchen können; und wobei die Sperrklaue (20b) eine Steuerkurvenfläche (20d) aufweist, die mit einem Winkel nach unten geneigt ist, der einem Winkel entspricht, in dem die Kuppelglieder (19) unter Belastungen gekippt werden, die den kritischen Wert nicht ganz erreichen, bei dem die Kuppelglieder (19) verlagert oder getrennt werden, dadurch gekennzeichnet, daß das Sperrteil (20) aus einem elastischen Material hergestellt ist, wobei ein Ende an dem Schieberkörper befestigt und das gegenüberliegende Ende, an dem die Sperrklaue (20b) einstückig ausgebildet ist, frei angeordnet ist, wobei die Sperrklaue (20b) im wesentlichen rechtwinklig zur Ebene des Reißverschlusses durch die besagte Öffnung hindurchragt und das Sperrteil (20) mit dem Griff (24) gekuppelt, aber als getrenntes Bauteil von diesem ausgebildet ist.

2. Selbstsperrender Schieber nach Anspruch 1, wobei die Steuerkurvenfläche (20d) unter einem Winkel von 20 bis 30° abgeschrägt ist.

3. Selbstsperrender Schieber nach Anspruch 2, wobei die Sperrklaue (20b) eine wirksame Steuerkurvenfläche hat, die an einer Stelle über der oberen Endfläche des Kuppelglieds (19) beginnt.

4. Selbstsperrender Schieber nach einem der Ansprüche 1 bis 3, wobei die Sperrklaue (20b) in ihrer normalen Sperrstellung mit ihrem hinteren Bereich durch einen Spalt (28) von der Umfangswand der besagten Öffnung getrennt ist.

5. Selbstsperrender Schieber nach Anspruch 4, wobei der Spalt (28) ungefähr 0,2 mm beträgt.

Revendications

1. Curseur (10) à blocage automatique pour fermeture à glissière comportant une chaîne de fermeture à glissière munie d'éléments d'accouplement (19) comprenant : un corps (11) de curseur comportant des ailes supérieure et inférieure (12, 13) espacées l'une de l'autre parallèlement et réunies à leurs extrémités avant en vue de définir entre elles un canal de guidage (17) ; une tirette (24) montée de façon pivotante sur le corps (11) de curseur ; un élément de blocage (20) susceptible d'être actionné par ladite tirette (24) et comprenant une saillie (20b) de blocage susceptible d'être déplacée dans une ouverture (23) en vue de pénétrer dans le canal de guidage (17) et de sortir de celui-ci ; ladite aile inférieure (13) comportant une cavité (27) disposée dans sa surface intérieure contiguë audit canal de guidage (17), en face de ladite saillie (20b) de verrouillage afin de permettre auxdits éléments d'accouplement (19) de s'y enfoncer ; et ladite saillie (20b) de blocage comportant une surface (20d) de came qui est biseautée vers le bas avec un angle correspondant à l'angle dans lequel basculent lesdits éléments d'accouplement (19) sous l'effet des contraintes en atteignant à peine le point critique à partir duquel lesdits éléments d'accouplement (19) sont déplacés, ou séparés, caractérisé en ce que ledit élément de blocage (20) est réalisé en un matériau élastique dont une des extrémités est fixée audit corps de curseur et dont l'extrémité opposée, sur laquelle est réalisée ladite saillie de blocage (20b) formant une seule pièce avec elle, est libre, ladite saillie de blocage (20b) s'étendant dans ladite ouverture sensiblement à angle droit par rapport au plan de la fermeture, et ledit élément de blocage (20) étant associé fonctionnellement à ladite tirette (24) tout en constituant une pièce séparée de celle-ci.

2. Curseur à blocage automatique selon la revendication 1, ladite surface de came (20d) étant biseautée avec un angle de 20° à 30°.

3. Curseur à blocage automatique selon la revendication 2, ladite saillie de blocage (20b) comportant une surface efficace de came qui commence à un emplacement situé au-dessus de la surface d'extrémité supérieure desdits éléments d'accouplement (19).

4. Curseur à blocage automatique selon l'une des revendications 1 à 3, ladite saillie de verrouillage (20b) présentant, en position de blocage normale, une partie arrière espacée de la paroi périphérique de ladite ouverture par un intervalle (28).

5. Curseur à blocage automatique selon la revendication 4, ledit intervalle (28) étant approximativement de 0,2 mm.