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ADJUSTABLE STRAP FASTENER

This invention relates to a strap fastener for adjustably connecting a strap to a variety of articles.

The term "strap" includes a belt or band.

Various adjustable strap fasteners or buckles
5 have been proposed which may be manipulated to adjust the effective length of a strap on for example a bag or a safety seat belt on a motor car.

Advanced such fasteners are made of a plastic material formed into an integrally molded structure
10 which generally comprises a pair of opposing side flanges, a grip end portion at the one ends of the side flanges, an anchor end portion at the opposite ends of the side flanges and a plurality of parallel cross bars disposed in between the grip and anchor end portions
15 and extending transversely across between the side flanges. In use, one end portion of a strap or the like is looped about one of the cross bars, passed under the anchor end of the fastener and secured in place as by rivetting. The other end portion of the

strap which is adapted for length adjustment is looped about another cross bar, passed under the grip end of the fastener and gripped therebetween against displacement. For ease of insertion or passage of the strap between the cross bar and the grip end portion, the gap therebetween is desirably the larger the better. Conversely, however, the larger the gap, the tendency will be greater for the strap to get loose under tension. Vice versa, this tendency is less the smaller the gap, but the insertion of the strap becomes more difficult.

A proposition is made to thicken the fastener, or to incline the gap defining surfaces instead of enlarging the insertion gap, as disclosed in Japanese Patent Kokai (laid-open) Publication 54-144244. Such attempts are however not satisfactory in that the resulting fastener is costly and becomes unsightly.

It is believed possible by means of the invention to provide an adjustable strap fastener made of a plastic material which is simple in construction and reliable in operation.

It is also believed possible by means of the invention to provide an adjustable strap fastener which is relatively low in profile, yet capable of easy insertion of a strap but resistant to force tending to loosen the strap from the adjustable strap fastener.

It is also believed possible by means of the invention to provide an

adjustable strap fastener which has multi-point stops for the strap to hold the same against displacement under heavy tension.

5 A further believed possibility of the invention is to provide an adjustable strap fastener capable of holding a strap against displacement with a holding force which increases as a tension on the strap becomes greater.

10 A further believed possibility of the invention is to provide an adjustable strap fastener which can be manipulated with utmost ease.

According to the present invention, there is provided a strap fastener molded of synthetic resin for adjustably connecting ends of a strap, comprising:

15 (a) a head portion;

(b) a pair of parallel spaced side flange portions extending from said head portion in a common direction and having respective bottom surfaces;

20 (c) a connecting portion extending perpendicularly to said side flange portions and interconnecting them at their distal ends;

(d) a pair of parallel spaced first and second cross bars extending parallel to said connecting portion and joined with said side flange portions, said first cross
25 bar being disposed adjacent to said head portion;

(e) said head portion having a first sharp corner edge disposed adjacent to said first cross bar and lying flush with said bottom surfaces of said side flange portions; and

5 (f) said first cross bar including a pair of integral top and bottom portions displaced from one another in a direction parallel to said side flanges, said top portion having a first projection extending toward said grip head portion and terminating in a
10 second sharp corner edge, said bottom portion having a second projection extending toward said connecting portion and terminating in a third sharp corner edge, said first projection having a top surface and a flat bottom surface emerging together to jointly define said
15 second sharp corner edge, said second projection having a flat top surface and a bottom surface merging together to jointly define said third sharp corner edge, said flat bottom surface and said flat top surface of said first cross bar lying in a plane extending parallel to
20 the general plane of said strap fastener and substantially containing the longitudinal central axis of said first cross bar, said first and second sharp corner edges, in plan view, being spaced from one another by a distance larger than the thickness of the
25 strap.

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

Figure 1 is a front plan view of an adjustable strap fastener according to an embodiment of the present
30 invention;

Figure 2 is a rear plan view of the strap fastener of Figure 1;

Figure 3 is a side elevational view of the strap

fastener of Figure 1;

Figure 4 is an end elevational view of the strap fastener of Figure 1;

Figure 5 is a cross-sectional view taken along
5 the line V - V of Figure 1;

Figure 6 is a cross-sectional view on enlarged scale taken along the line VI - VI of Figure 1;

Figures 7 and 8 are schematic views utilized to explain the operative relations of the strap fastener
10 and the strap;

Figure 9 is a view similar to Figure 6 but showing another embodiment of the invention;

Figure 10 is a cross-sectional view taken along the line X - X of Figure 9;

15 Figure 11 is a view similar to Figure 1 but showing a further embodiment of the invention;

Figure 12 is a cross-sectional view taken along the line XII- XII of Figure 11;

Figure 13 is a cross-sectional view taken along
20 the line XIII - XIII of Figure 11; and

Figures 14 - 17 inclusive illustrate still another modification of the strap fastener according to the invention.

Figures 1 through 8 show an adjustable strap
25 fastener generally designated 10 according to one embodiment of the present invention.

The strap fastener 10 is made of a synthetic

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resin or plastic material formed into an integral molded construction generally rectangular in shape as shown in Figures 1 and 2. The strap fastener 10 comprises a head portion 11 at one of its ends, a
5 connecting portion 12 at the other end, a pair of opposed side flange portions 13, 14 extending longitudinally between and secured to opposite ends of the head portion 11 and the connecting portion 12, a first cross bar 15 adjacent to the head portion 11, and
10 a second cross bar 16 adjacent to the connecting portion 12, the cross bars 15 and 16 extending in spaced parallel relation to each other between and connected to the opposed side flange portions 13 and 14.

The head portion 11, as shown in Figure 5,
15 includes a projecting tab 11a of reduced thickness, a bevelled portion 11a' extending downwardly from the tab 11a at an angle, and a lower portion 11b extending from the bevelled portion 11a' downwardly substantially at a right angle to the plane of the fastener 10 adjacent
20 the first cross bar 15, the lower portion 11b terminating with a flat bottom surface 11c lying flush with the bottom surfaces of the opposed side flanges 13, 14. The flat bottom surface 11c has a (first) sharp corner edge 11d which serves as a first strap stop as later
25 described.

The side flange portions 13, 14 are tapered from the region of the second cross bar 16 toward the connecting

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portion 12.

The first cross bar 15, as better shown in Figure 6, includes a pair of integral top and bottom portions 15a, 15b displaced from one another in a direction parallel to the side flange portions 13, 14 so as to provide a pair of first and second projections 15a', 15b'. The first projection 15a' extends toward the head portion 11 and terminates in a second sharp corner edge 15e which is defined jointly by a flat bottom surface 15c and an arcuate top surface 15c', while the second projection 15b' extends toward the connecting portion 12 and terminates in a third sharp corner edge 15f which is defined jointly by a flat top surface 15d and an arcuate bottom surface 15d'. The flat bottom surface 15c of the first projection 15a' and the flat top surface 15d of the second projection 15b' extend in opposite directions from substantially the midpoint of the thickness of the cross bar 15, and also in a plane substantially parallel to the general plane of the fastener 10, the flat surfaces 15c, 15d lying slightly above the middle of the height of the side flange portions 13, 14. The second sharp corner edge 15e, as viewed in plan, (i.e. as in Fig. 1) is spaced from the first sharp corner edge 11d by a distance larger than the thickness of the strap S. The second and third sharp corner edges 15e, 15f serve as second and third stops as later described. The bevelled portion 11a' faces the second corner edge 15e, as shown in Fig. 6.

As better shown in Figure 7, the strap or belt S is inserted into the strap fastener 10, first with one of its ends designated S_1 looped about the second cross bar 16 and passed underneath the connecting portion 12, the extension of the strap S at this end being secured in place as by rivetting or stitching. The other end of the strap designated S_2 is then looped about the first cross bar 15 and passed underneath the lower portion 11b of the head portion 11, in which instance the leading end portion of the strap S_2 is brought into contact with the flat bottom surface 11c.

While the strap end S_1 is held stationary, the strap end S_2 is adjustable in length to suit the particular application. This adjustment may be made by pulling out the leading strap end S_2 to shorten the effective length of the strap S as disposed in the condition of Figure 7, or, shown in Figure 8, by rotating the fastener 10 counter-clockwise about the connecting portion 12 to release the strap end S_2 and thereby pulling the strap S out to shorten or in to lengthen the effective length of the strap S as desired.

It is to be noted that the strap fastener 10 thus constructed is, as shown in Figure 6, provided with multi-point stops, namely, at corners 11d, 15e and 15f along the path of the strap S_2 which is to be adjusted in length, so that the strap S is firmly held

against displacement which would otherwise occur under the influence of heavy tension exerted in use. This multi-point stop arrangement permits an increase in the gap between the grip head 11 and the first cross bar 15 to facilitate insertion of the strap. Another advantage of the present structure is that the strap fastener 10 can be made to present a relatively low profile, which is aesthetically and economically desirable.

10 Figures 9 and 10 illustrate a modification of the strap fastener 10 already described in which the only addition is the provision of alternate ridges 17 and grooves 18 for the regions of the head 11 with which the strap S comes in direct contact when mounted
15 in normal use. Such regions comprise the flat bottom surface 11c, the arcuate top surface portion 15a and the bottom portion 15b. More specifically, the bottom surface 11c has throughout the length thereof the ridges 17 and the grooves 18 extending parallel to the
20 side flange portion 13. The ridges 17 and the grooves 18 are also provided at the sharp corners 15e, 15f of the first cross bar 15 and extend normal to the general plane of the fastener 10. This ridge-and-groove arrangement gives a rise to the effect of gripping the
25 inserted strap S.

Figures 11, 12 and 13 inclusive show another modification in which the lower portion 11b of

the head 11 extends toward the first cross bar 15 in a direction parallel to the side flange portions 13,14 with the result that the bottom surface 11c is enlarged also toward the first cross bar 15, the arrangement being
5 conceived to improve the gripping effect. The sharp corner 11d of the lower portion 11b is spaced from the sharp corner edge 15g of the cross bar 15, as viewed from the plan, by a distance which is larger than the thickness of the strap or belt S. The
10 ridge-and-groove arrangement of Figures 9 and 10 may also be combined to further enhance the gripping effect. Again, bevelled portion 11a' faces the second sharp corner edge.

Figures 14, 15, 16 and 17 inclusive show a further modification of the strap fastener 10 in which
15 the first cross bar 15, the second cross bar 16 and the connecting portion 12 are disposed out of alignment with respect to the general plane of the strap fastener 10. This is better illustrated in Figure 14 from which it will be understood that the second bar 16 is
20 displaced above the level of the connecting portion 12 and the first cross bar 15 is displaced slightly above the level of the second cross bar 16. The connecting portion 12 has a bottom surface lying flush with a plane in which the bottom surfaces of the side flanges 13, 14 lie. The first
25 cross bar 15 is recessed as at 19 throughout the length thereof for saving the amount of synthetic resin material used. In this embodiment, each of the flange

portions 13 is thickened as a region supporting the cross bar 15 and the head portion 11, and the flat surfaces 15e, 15f of the cross bar 15 extend substantially flush with the top surface of the flange portion 13. This arrangement, as appears clearly from Figures 16 and 17, provides a tendency for the rotational force upon the connecting portion 12 to orient toward the top of the fastener 10 and for the rotational force upon the lower portion 11b to orient toward the bottom of the fastener 10. This tendency becomes greater the larger the tension applied to the strap S, thus ensuring firm anchorage of the strap S even when the same is roughly handled.

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CLAIMS:

1. A strap fastener molded of synthetic resin for adjustably connecting ends of a strap, comprising:
- (a) a head portion;
 - 5 (b) a pair of parallel spaced side flange portions extending from said head portion in a common direction and having respective bottom surfaces;
 - (c) a connecting portion extending perpendicularly to said side flange portions and
 - 10 interconnecting them at their distal ends;
 - (d) a pair of parallel spaced first and second cross bars extending parallel to said connecting portion and joined with said side flange portions, said first cross bar being disposed adjacent to said
 - 15 head portion;
 - (e) said head portion having a first sharp corner edge disposed adjacent to said first cross bar and lying flush with said bottom surfaces of said side flange portions; and
 - 20 (f) said first cross bar including a pair of integral top and bottom portions displaced from one another in a direction parallel to said side flanges, said top portion having a first projection extending toward said grip head portion and terminating in a
 - 25 second sharp corner edge, said bottom portion having a second projection extending toward said connecting portion and terminating in a third sharp corner edge,



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said first projection having a top surface and a flat bottom surface merging together to jointly define said second sharp corner edge, said second projection having a flat top surface and a bottom surface merging together to jointly define said third sharp corner edge, said flat bottom surface and said flat top surface of said first cross bar lying in a plane extending parallel to the general plane of said strap fastener and substantially containing the longitudinal central axis of said first cross bar, said first and second sharp corner edges, in plan view, being spaced from one another by a distance larger than the thickness of the strap.

2. A strap fastener according to claim 1, said head portion having a bottom surface lying flush with said bottom surfaces of said side flange portions and partly defining said first sharp corner edge, said bottom surface having throughout the length thereof alternate ridges and grooves intersecting said first corner edge.

3. A strap fastener according to claim 1 or 2, said first cross bar having throughout the length thereof alternate ridges and grooves extending normal to the general plane of said strap fastener across said second sharp corner edge.

4. A strap fastener according to claim 1, 2 or 3 said first cross bar having throughout the length thereof



alternate ridges and grooves extending normal to the general plane of said strap fastener across said third sharp corner edge.

5 5. A strap fastener according to claim 1, said head portion having a bevelled portion facing toward said second sharp corner edge, said head portion further having a lower portion extending from said bevelled portion at a right angle to the general plane of said strap fastener and terminating with a bottom surface
10 lying flush with said bottom surfaces of said side flange portions, said bottom surface of said lower portion partly defining said first sharp corner edge.

15 6. A strap fastener according to claim 1, said head portion having a bevelled portion facing toward said second sharp corner edge, said head portion further having a lower portion projecting from said bevelled portion toward said first cross bar in a direction parallel to said side flange portions, said edge of said lower portion defining said first sharp corner edge.

20 7. A strap fastener according to any one of claims 1 to 6, said top surface of said first projection and said bottom surface of said second projection being arcuate.

25 8. A strap fastener according to claim 1, said connecting bar, said second cross bar and said first cross bar lying in three levels, each spaced from a plane in which said bottom surfaces of said side flange portions lie.



9. A strap fastener according to any preceding claim, lowermost surfaces of said connecting bar and said head portion lying in the same plane.

5 10. An adjustable strap fastener substantially as described with reference to and as illustrated in Figures 1 to 8 of the accompanying drawings.

10 11. An adjustable strap fastener substantially as described with reference to and as illustrated in Figures 1 to 8 modified as in Figures 9 and 10 of the accompanying drawings.

12. An adjustable strap fastener substantially as described with reference to and as illustrated in Figures 1 to 8 modified as in Figures 11, 12 and 13 of the accompanying drawings.

15 13. An adjustable strap fastener substantially as described with reference to and as illustrated in Figures 1 to 8 modified as in Figures 14 to 17 of the accompanying drawings.

