

[54] **INTERLOCKING FASTENER WITH INCREASED RESISTANCE TO SEPARATION**

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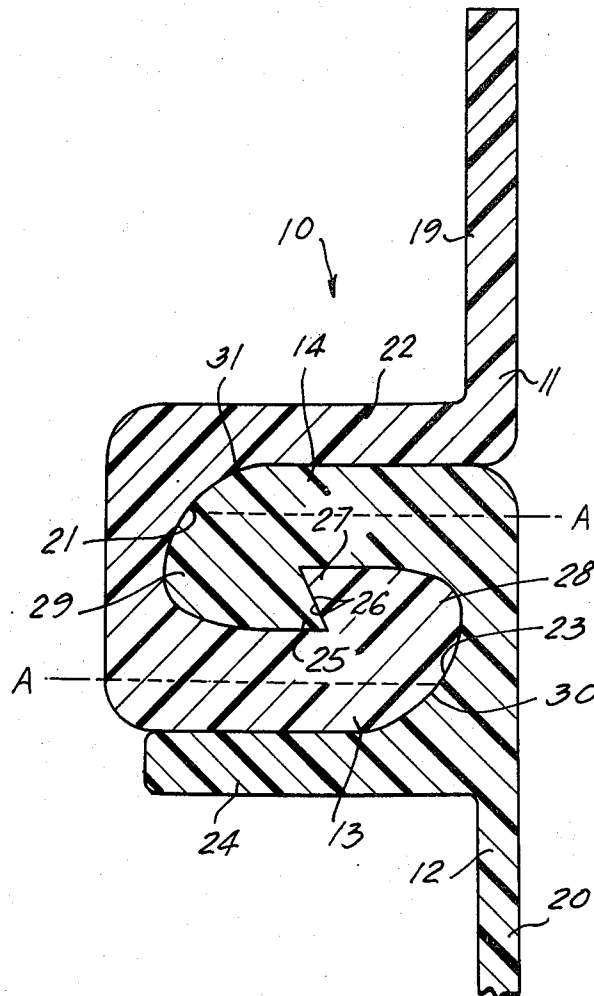
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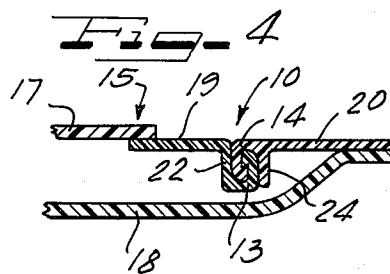
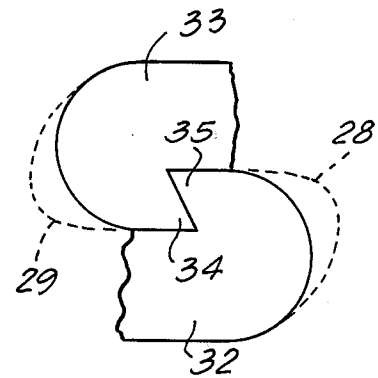
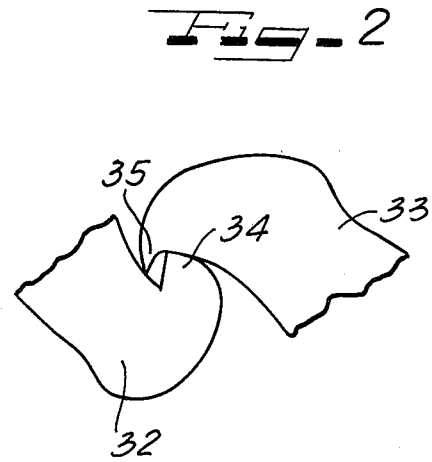
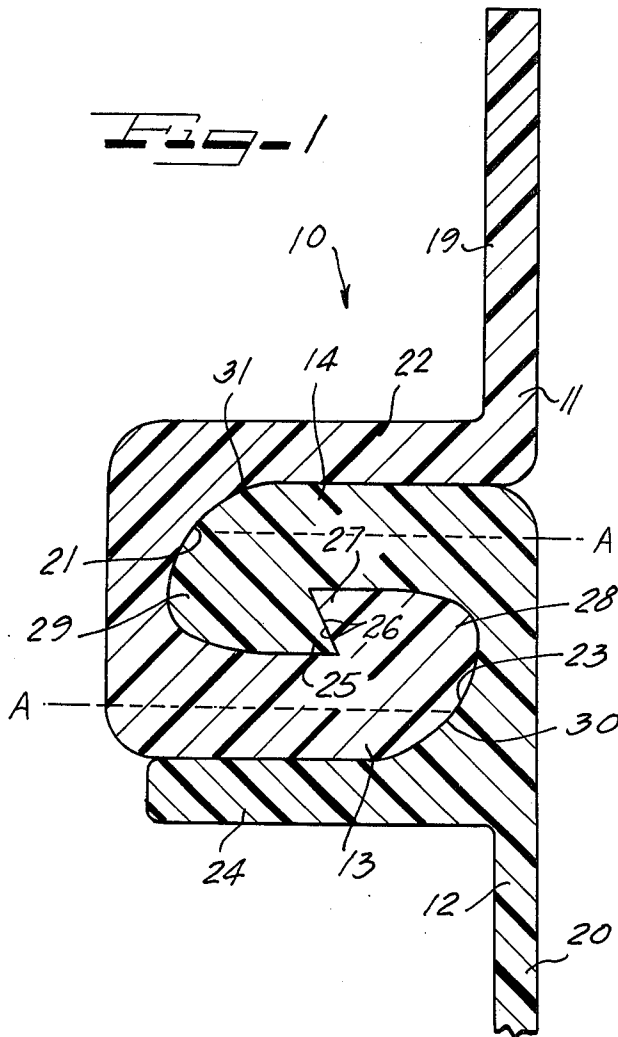
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[57] **ABSTRACT**

A separably releasable fastener formed from resiliently yieldable material having a greater crown or rib mass of material on the respective crown portions of the heads aligned with the teeth of the heads or offset toward the hook sides of the heads, whereby resistance to separating distortion of the teeth or hook portions of the heads is increased in relation to the greater crown or rib mass of material, as compared to a conventional fastener of this type in which a uniform generally semi-circular crown formation from the tips of the teeth to the back of the heads is the normal profile configuration.

4 Claims, 4 Drawing Figures





INTERLOCKING FASTENER WITH INCREASED RESISTANCE TO SEPARATION

This invention relates to separably releasable fasteners formed from resiliently yieldable material, and is more particularly concerned with improvements in the interlocking head structures of such fasteners.

Separably releasable fasteners are commonly formed from resiliently yieldable material, generally comprising extruded plastic material, as is well known.

It has heretofore been standard practice to make the interlocking hook teeth heads with a crown profile that is approximately semicircular from the tip of the tooth to the back of the head. A problem that was always encountered in this type of construction was the limited holding ability of the teeth when subjected to cross tensile stress, that is, the stress to which the teeth are subjected by opposite pull on the fastener strips tending to separate the teeth. On trying to find the cause of this difficulty, I filmed in slow motion what happens when a fastener of the normal construction is subjected to a cross tensile stress, and observed that just before the fastener actually parted under stress, the outside head of the fastener had become completely distorted. Its mass had moved toward the back of the head and its tooth had become almost negligible. On the other hand, the inside head of the fastener was distorted substantially less.

It is therefore an important object of the present invention to overcome the foregoing and other deficiencies, disadvantages, and problems in separably releasable fasteners formed from resiliently yieldable material, and to attain important improvements and advantages and new and improved results in such fasteners as will hereinafter become apparent.

Another object of the invention is to provide a new and improved separably releasable fastener formed from resilient material and having a new and improved locking head construction.

A further object of the invention is to provide a new and improved separably releasable fastener formed from resilient material wherein the heads of the fastener elements or strips have improved retaining ability.

Still another object of the invention is to provide a new and improved separably releasable fastener formed from resiliently yieldable material in which the resistance to separating distortion of the teeth of the heads is substantially increased as compared to prior constructions.

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawing although variations and modifications may be effected without departing from the spirit and scope of the novel concepts embodied in the disclosure, and in which:

FIG. 1 is a large scale sectional detail view of a separably releasable fastener embodying features of the invention.

FIG. 2 is a representation of a conventional fastener showing the same as the interlocking heads are under stress substantially at the moment before the separation.

FIG. 3 is a more or less schematic illustration to demonstrate the difference between the prior art structure and construction of the present invention.

FIG. 4 illustrates a sectional view of the releasable fastener as applied to a bag.

FIG. 1, illustrates a separably releasable fastener 10 formed from resiliently yieldable material such as a suitable plastic comprising a first fastener strip 11 and a second fastener strip 12 each of which has at least one interlocking fastener head, in this instance comprising an inner head 13 on the first strip 11 and an outer head 14 on the second strip 12. The inner head 13 may be on the inside of a bag 15 closed by the fastener 10 as in FIG. 4, and having walls 17 and 18. The strips 11 and 12 have respective body flanges 19 and 20 and may comprise a part of the walls 17 and 18 of the bag 15 for which fastener provides a closure or may be attached to the bag walls.

Cooperating with the head 13 to provide a socket groove 21 receptive of and generally complementary to the head 14 is a retaining flange 22. Similarly cooperating with the head 14 to provide a socket groove 23 complementary to and receptive of the head 13 is a retaining flange 24. It will be understood that the head 13 and the flange 22 are formed integral in one piece with the strip 11 and the head 14 and the flange 24 are formed integral in one piece with the strip 12. Both of the strips may be manufactured by an extrusion process as is customary.

For closing the fastener 10 from an open, separated relationship of the strips 11 and 12, the heads 13 and 14 are aligned with the groove sockets 23 and 21 and the strips pressed toward one another which with appropriate resilient yielding of the retaining flanges 24 and 22 will permit respective complementary teeth 25 and 27 on the heads 13 and 14 to push past one another into interlocking engagement. For this purpose, as is customary, the teeth 25 and 27 are of generally hook shape having interlockingly engaged hook surfaces 26 which extend generally laterally relative to the generally central axis A between the back side and the hook tooth side of each of the heads 13 and 14. Because of the undercut interhooked relationship of the teeth 25 and 27, they will retain the heads 13 and 14 against separation until separating tensile stress will pull the heads apart or the heads are separated by a conventional slider.

In order to strengthen the heads 13 and 14 to improve the interlocking and separation resistance of the teeth 27 and 25, the length or height of the heads at the hook side of the axis A of each and generally in alignment with the teeth 25 and 27 is increased as compared to the conventional separable fastener heads of this type. To this end, a greater crown mass or rib mass of material 28 aligned with the tooth 27 is provided on the crown area of the head 13 and a similar crown mass or rib mass 29 generally aligned with the tooth 25 is provided on the crown portion or area of the head 14. The crown mass ribs 28 and 29 are offset toward the hook tooth portion side of the axis A of each of the heads 13 and 14. This provides a significant reinforcement or stiffening, and resistance to separating distortion of the hook tooth portions of the heads.

To improve the separating and closing characteristics of the heads 13 and 14 under controlled conditions while taking advantage of the new and improved retaining characteristics provided by the increased rib masses 28 and 29, the crown area portions of the heads 13 and 14 are of substantially less mass toward the backsides of the Axes A of the heads. Thus the crown area por-

tion of the head 13 slopes fairly sharply away from the rib 28 as indicated at 30, and the crown area portion of the head 14 slopes fairly sharply away from the rib 29 as indicated at 31. This relieves the heads from undue strain or stress on the hook teeth 25 and 27 during not only closing of the fastener 10 but also opening of the fastener 10 by normal means.

In order to provide a visual demonstration of the difference in structure and action of a conventional or standard fastener assembly, and more particularly the standard semicircular crown heads, and the new and improved structure and action of the heads of the present invention, FIGS. 1, 2 and 3 are referred to. In FIG. 3 standard fastener heads 32 and 33 are shown in their relaxed interengaged relation of their hook teeth 34 and 35. For graphic illustration of the difference in crown structure of the heads 32 and 33 in comparison with the heads 13 and 14 of the present invention, the additional mass of the ribs 28 and 29 has been indicated in FIG. 3 in dash outline as contrasted to the normal semi-cylindrical crown profile of the standard heads 32 and 33 as shown in full outline.

As distinguished from the generally semi-cylindrical profile of the conventional fastener head crown from the tip of the hook tooth to the back of the head, it will be observed in FIG. 1 that the crown profile of the heads 13 and 14 shows an elongation of the surface from the hook tooth tip in each instance to the top of the greater rib mass of material in the crown, with the profile arc of generally non-cylindrical form sloping off to the back of the head.

Referring then to FIG. 2 in an endeavor has been made to faithfully reproduce what has been observed in a slow motion picture analysis of what occurs when a fastener with a standard head structure of a separable resiliently yieldable material is placed under stress. The depiction in FIG. 2 is at the moment just before separation of the hook teeth 34 and 35 of the fastener heads 32 and 33. It will be seen that under the separating stress the outside head 33 has become completely distorted. Its crown mass has, in effect, moved backward and its hook tooth 35 has shrunk by material displacement to become almost negligible. On the other hand, the tooth 34 of the inside head 32 has not been distorted anywhere near as much. This is in contradistinction to what had been presumed that the inside and outside heads would distort or yield equally, and provides an explanation for the actual often inefficient performance of the standard head profile structure. By contrast, the heads 13 and 14 provided according to the present invention with the greater crown mass rib structure 28, 29 generally aligned with the hook teeth will attain during separating stress what had heretofore been assumed to occur, that is, the mass of the crown portions of the fastener heads will distort or displace more uniformly in both of the heads, with the rib masses in effect filling in at the backsides of the head crown portions, and the hook teeth turning on one another into the releasing position, rather than almost disappearing.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a separably releasable fastener formed from resiliently yieldable material and comprising at least one inner head on a first fastener strip and a complemen-

tary outer head on a second fastener strip, each head having a back side and a hook tooth side at respectively opposite sides of a generally central axis extending through a crown area of the head, each head having on its hook tooth side a hook tooth portion provided with a hook surface extending generally laterally relative to the central axis of the head, the hook surfaces of the hook tooth portions being interlockingly engaged with one another, and the hook tooth portions under conditions of stress separating through distortion of said hook tooth portions until they release from one another, the improvement comprising:

a greater crown mass of material on the respective crown areas at the tooth portion side of the axis of each of the heads and generally aligned with the hook tooth portion at that side of the axis;

and the crown area of each head at the back side of the axis being of substantially less mass than the greater crown mass of material at the hook tooth side of the axis;

whereby resistance to separating distortion of the hook tooth portions of said heads is increased because of said greater crown mass of material, as compared with fastener heads having a generally uniform mass semi-cylindrical crown profile from the hook tooth sides to the back sides of the heads.

2. A fastener according to claim 1, wherein the each hook tooth portion has a tip at the end of its hook surface and the head has a crown profile with surface elongation substantially parallel to the head axis and extending from the tooth tip to the greater crown mass of material, and said profile extending arcuately over the greater crown mass and sloping therefrom over the less mass at the back side of the head in each instance.

3. In a separably releasable fastener formed from resiliently yieldable material and comprising at least one inner head on a first fastener strip and a complementary outer head on a second fastener strip, each head having a back side and a hook tooth side at respectively opposite sides of a generally central axis extending through a crown area of the head, each head having on its hook side a hook tooth portion provided with a hook surface extending generally laterally relative to the central axis of the head, the hook surfaces of the hook tooth portions being interlockingly engaged with one another, and the hook tooth portions under conditions of stress separating through distortion of said hook tooth portions until they release from one another, the improvement comprising:

a rib mass of material on each of the respective crown areas of said heads offset toward the tooth portion side of said axis of each head and aligned with the hook tooth portion of each head;

and the crown area of each head at the back side of the axis being of less mass than the rib mass of material;

whereby resistance to separating distortion of the hook tooth portions of said heads is increased because of the rib mass of material, as compared with fastener heads having a generally uniform semi-cylindrical crown profile from the hook tooth sides to the back sides of the head.

4. A fastener according to claim 3, wherein each hook tooth portion has a tooth tip at the end of its hook surface and the head has a rib profile with a surface elongation substantially parallel to the head axis and extending from the tooth tip to the rib mass of material, and said profile continuing arcuately over the rib mass and sloping therefrom over the less mass at the back side of the head in each instance.

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