

April 16, 1968

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3,377,666

BUCKLE FOR FLEXIBLE STRAPPING

Filed July 20, 1966

2 Sheets-Sheet 1

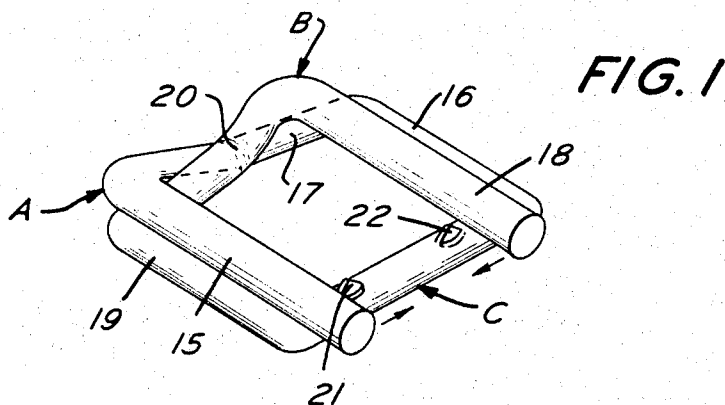


FIG. 3

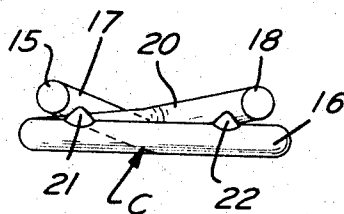


FIG. 2

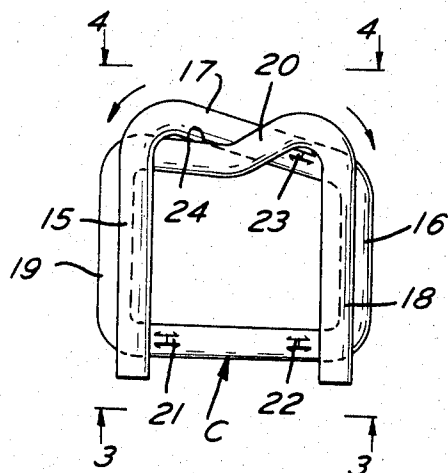
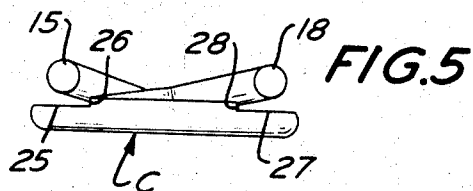
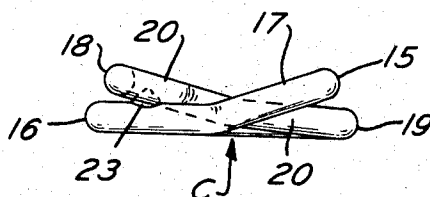


FIG. 4



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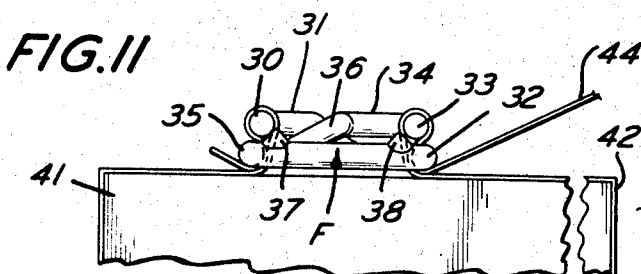
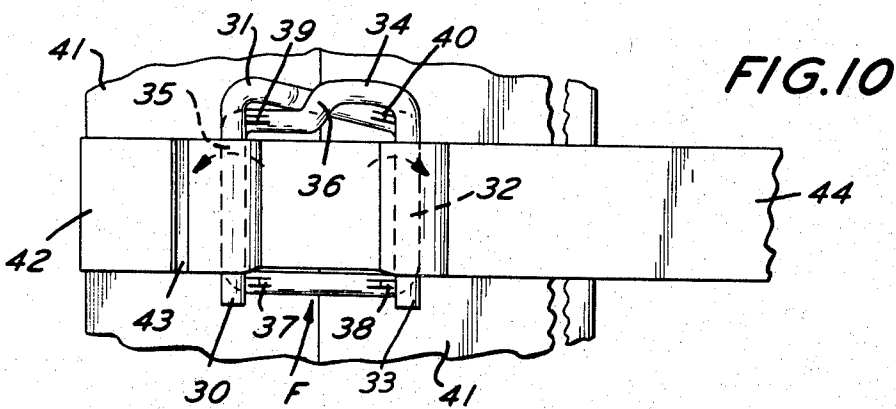
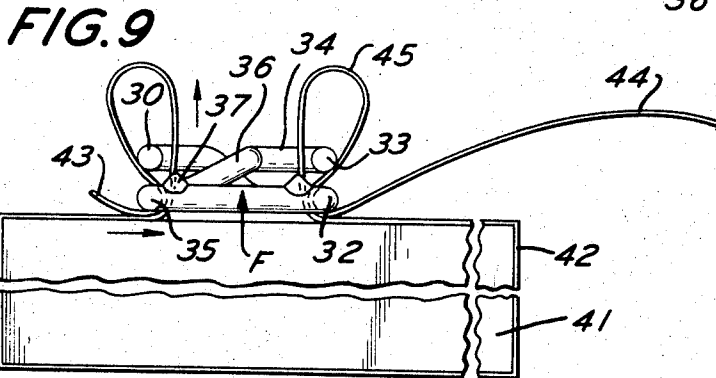
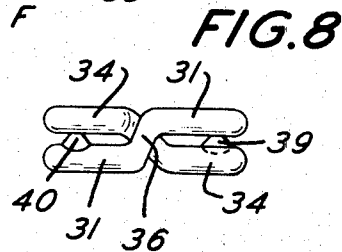
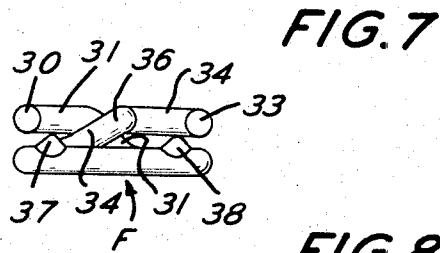
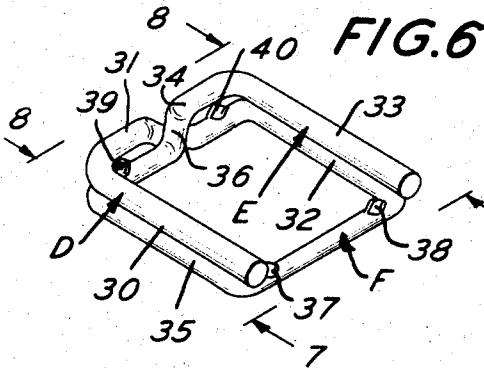
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2 Sheets-Sheet 2



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BUCKLE FOR FLEXIBLE STRAPPING

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12 Claims. (Cl. 24-16)

This invention relates to buckles for use in connection with flexible strapping materials. More particularly, it relates to buckle constructions wherein provision is made for maintaining parallelism between load-bearing members and minimizing distortion of the buckle under full load.

Buckles of the general type described herein have been used in the past in connection with flexible non-metallic strapping. A prior art patent which describes such a buckle and its uses is U.S. Patent 3,014,256 issued on Dec. 26, 1961.

Prior art buckles, when subjected to tensions, have had a great tendency to distort. Such distortion produces unequal distribution of forces among load bearing members which, ultimately, can result in shearing of the strapping used in connection with the buckles and/or loss of buckle effectiveness.

It has now been found possible to incorporate in such buckles means for maintaining parallelism and preventing such distortions. Further, it has been found desirable to incorporate into the buckles means for snubbing the strapping as tension is applied so that slippage will be minimized.

Accordingly, it is an object of this invention to provide a buckle suitable for use with flexible plastic strapping.

It is an additional object of this invention to provide a buckle of the character described wherein integral means are provided for maintaining parallelism between load-bearing members.

Additionally, it is an object of the invention to provide a buckle made from a single piece of wire wherein means are provided for resisting distortion forces engendered by the application of tension of the strapping threaded on said buckle.

Still another object of the invention is to provide integral detents on buckles made from a single piece of wire which will maintain parallelism between the primary load-bearing members thereof by limiting their motion.

It is also an object of this invention to provide a buckle which is easy to thread and in which the tendency of initial loops of strapping to slide off load-bearing members is minimized.

A further object of the invention is to provide a buckle construction wherein linear and arcuate movement of load-bearing members, under load, is resisted.

Among the other objects of the invention is the provision of a buckle of the character described which is economical to manufacture, rugged in construction, easy to utilize in connection with flexible plastic strapping and which distributes loads evenly among its load-bearing members.

Another object of the invention is to provide a buckle which resiliently snubs strapping threaded therethrough upon the application of tension.

These and other objects of the invention will be apparent to those skilled in the art, particularly those familiar with the prior art constructions, by a consideration of the

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description which follows when read in conjunction with the drawings wherein:

FIGURE 1 represents a perspective view of a buckle incorporating the invention.

FIGURE 2 represents a plan view of the buckle shown in FIGURE 1, with slight modification thereto vis-a-vis the number of detents.

FIGURE 3 represents an end view of the buckle shown in FIGURE 2, taken along the line 3-3 of FIGURE 2.

FIGURE 4 represents an end view of the buckle shown in FIGURE 2, taken along line 4-4 of FIGURE 2.

FIGURE 5 represents a modified form of the buckle shown in FIGURE 2 and, more particularly, represents the modification as it would appear in an end view similar to FIGURE 3.

FIGURE 6 represents a perspective view of another buckle embodying the invention.

FIGURE 7 represents an end view of the buckle shown in FIGURE 6, taken along line 7-7 of FIGURE 6.

FIGURE 8 represents an end view of the buckle shown in FIGURE 6, taken along line 8-8 of FIGURE 6.

FIGURE 9 represents a fragmentary elevation showing the buckle of FIGURE 6 being used in connection with the overwrapping of a package with strapping, as it would appear after the strapping had been threaded through the buckle but prior to the tensioning thereof.

FIGURE 10 represents a fragmentary plan view of the buckle and strapping shown in FIGURE 9, also as they would appear before the application of tension.

FIGURE 11 represents a fragmentary elevation showing the buckle of FIGURE 6 as it would appear in use, after tension had been applied to the strapping. This figure differs from FIGURE 9 only with respect to the tensioned condition of the strapping and buckle.

Turning now to the drawings, wherein like reference numerals designate like parts and wherein, further, a consistent terminology will be used throughout, consideration should be given to the buckle shown in FIGURE 1.

The buckle of FIGURE 1, like all other buckles of the instant invention, is formed from a single piece of wire. The wire which preferably has a circular or arcuate cross-section is shaped or formed into a first, generally U-shaped portion A; a second, generally U-shaped portion B; and an intermediate wire portion C. Portion A includes a distal leg 15, a shorter proximal leg 16 and an intermediate bight 17. In a similar manner, U-shaped portion B includes a distal leg 18, a shorter proximal leg 19 and an intermediate bight 20. Legs 15 and 18 are formed from the free ends of the single piece of wire which was bent into the configuration shown in FIGURE 1. Intermediate wire portion C connects the proximal legs 16 and 19 of portions A and B.

As will be observed from the figure, intermediate wire portion C and proximal legs 16 and 19 lie in the same plane and preferably, in plan view, are U-shaped in configuration with intermediate wire portion C representing the bight of that U. Distal legs 15 and 18, which are the primary load-bearing members of the buckle, lie in a second plane, which is spaced apart from the first plane and these legs are parallel to each other. Maintenance of this parallelism, under load, is of extreme importance and, consequently, various types of detents are provided for this purpose in the various embodiments of the invention.

As shown in FIGURE 1, two such detents namely a detent 21, proximal leg 15 and a detent 22, proximal leg 18 are provided. These detents may take the form of swages integral with intermediate wire portion C and extend from the plane containing wire portion C toward the plane containing legs 15 and 18. As shown, in a no-load condition, there is no contact between leg 15 and detent 21 or between leg 18 and detent 22. However, when conditions of load cause these legs to move toward each other in the direction indicated by the arrows, then they will contact their respective detents and motion in that direction will be arrested.

Considering the bights 17 and 20, it will be observed that these cross each other both in plan view and in elevation. Initial loading of the buckle may produce a clockwise torquing of bight 20 and leg 18 about a pivot point represented by the junction of legs 19 and 20. In this case, detent 22 will tend to resist such torquing. Similar counter-clockwise torquing by bight 17 and leg 15 around a pivot point represented by the junction of leg 16 and bight 17 is doubly resisted. First it is resisted by detent or swage 21 and second by the juxtaposition which occurs between bight 17 and bight 20, although such actual juxtaposition is not necessary in all species of the invention. The exact configuration of bights 17 and 20 may vary, as will be observed in other species of the invention, but in all instances, they cross between the two planes previously described (e.g. the plane containing the distal legs and the plane containing the proximal legs) and they also are canted to compensate for the difference in length between the proximal and distal legs of portion A and B, when such differences exist, so that these legs may be co-terminal.

Having achieved a general understanding of some of the principles of the invention from a consideration of FIGURE 1, attention should now be directed to the modified embodiment of the invention shown in FIGURES 2 to 4 inclusive.

As shown in FIGURE 2, the buckle includes a third detent 23 located on bight 17 and extending upward toward the plane containing legs 15 and 18. Under load conditions, leg 18 and bight 20 will tend to torque clockwise in the direction indicated by the arcuate arrow proximate their junction. This action will be resisted by contact between detent 22 and leg 18, as well as by contact between detent 23 and bight 20.

Counter-clockwise torquing of leg 15 and bight 17, in the direction indicated by the arcuate arrow proximate their junction, will also be doubly resisted. It is resisted by contact between leg 15 and detent 21 and also by juxtaposition of bight 20 and overlying bight 17 in the area, indicated by the numeral 24. This contact further acts to transmit equalizing forces to leg 18.

It should be noted in FIGURE 2 that, when viewed in plan, legs 15 and 18 do not completely overlie legs 19 and 16, respectively. On the contrary, as shown, there is only about 50% overlay. While complete overlying registration is within the scope of the invention, it is preferred to use an overlay of less than 100% for buckles in no-load condition. It has been found that displacement of the distal legs internally of the proximal legs, preferably so that the overlay is between 25% and 75%, produces an optimum snubbing action when the tape is threaded in the buckle. Such snubbing or pinching action has been found desirable in buckles of the invention. Once tension is applied the tensioned strapping tends to move these members into contact and alignment.

The buckles shown in FIGURES 1 and 2 have distal legs 15 and 18 which are longer than their associated proximal legs and the distal legs are co-terminating. These distal legs extend beyond intermediate wire portion C (as seen in plan view) and this extension is found to be an aid in rapid threading of the buckle and in preventing the strapping from sliding off during initial tensioning or

heavy loading, particularly at locations having no associated swage.

In FIGURE 5, an alternate form of detent is shown which is suitable for use in connection with buckles of the invention. As shown therein, intermediate wire portion C is provided with two terminal shoulders. Associated with leg 15 is a shoulder comprising a flat portion 25 and offset 26. The shoulder associated with leg 18 includes a flat portion 27 and an offset portion 28. Otherwise, the buckle is the same as that shown in FIGURE 1 with these shoulders serving the same general purpose as detents 21 and 22. The action of the shoulders is apparent. Under tension, legs 15 and 18 will move downward toward intermediate portion C, at which time they will contact, respectively, flat portions 25 and 27. Additional tensioning will tend to cause the legs 15 and 18 to move toward each other. However, when they abut the offsets 26 and 28, motion in this direction will be limited.

Turning now to the embodiments shown in FIGURES 6 to 8 inclusive, we find an enlargement of the concept of detents for maintaining parallelism. The buckle shown in FIGURES 6 to 8 inclusive may be generally characterized as parallelepipedal. This buckle incorporates an additional means for maintaining parallelism which will be described fully.

It will be observed that the buckle includes a first generally U-shaped portion D comprising a distal leg 30 formed from one end of the single piece of wire, a bight 31 and a shorter proximal leg 32. The buckle also includes a second generally U-shaped portion E having a distal leg 33 formed from the other end of the single piece of wire, a bight 34 and a shorter proximal leg 35. The two proximal legs are connected by an intermediate wire portion F. As in the previous embodiments, the proximal legs 32 and 35, as well as intermediate wire portion F, lie in a first common plane and are preferably, in plan view, U-shaped in configuration with intermediate wire portion F representing the bight of that U. Distal legs 30 and 33, which are the primary load-bearing members of the buckle, lie in a second plane which is spaced apart from the first plane and these legs are parallel to each other with maintenance of this parallelism being an important aspect of the invention.

In this particular modification, it should be noted that first and second U-shaped portions D and E are mirror images. As a consequence, bights 31 and 34 cross each other when viewed in both plan and elevation. The cross-over area or intersection is generally represented by the location of numeral 36 in FIGURE 6. Because of this cross-over there is an inter-locking relationship which lends rigidity to the entire buckle structure and further aids in maintaining parallelism between proximal legs 32 and 35, as will be explained below. Additional detents, in the form of swages have been shown in this embodiment and extend upward from the plane containing proximal legs 32, 35, and intermediate wire portion F. These swages, as shown, include detents 37 and 38 formed integrally with intermediate wire portion F, a swage 39 on bight 34, and a swage 40 on bight 31. All of these swages are in the same plane and all extend toward the plane containing legs 30 and 33. When legs 30 and 33 move toward each other, as under initial tension, their motion is limited by these swages. Further, these swages resist torquing tendencies and the combined effect of the swages and the inter-locking construction in area 36 is to lend rigidity to the entire buckle under full load conditions. The exact number and location of the swages may be varied and is a function of the exact configuration of the buckle and the desired degree of rigidity. Such design considerations in fully utilizing my inventive concept are well within the skill of those familiar with this art.

The utilization of embodiments of the invention is exemplified in FIGURES 9 to 11 where the buckle shown is that which has just been described in connection with

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FIGURES 6 to 8 inclusive. A package to be wrapped is generally represented in these figures with the numeral 41. It is desired to wrap the package with strapping 42 and to utilize the buckle of the invention to retain this strapping in tensioned juxtaposition to package 41. One method of doing this is as follows:

Referring to FIGURE 9, a free end 43 of the strapping 42 is threaded under leg 35 (as shown by the horizontal arrow) and then upward through the center of the buckle (as shown by the vertical arrow), looped over distal leg 30, between legs 30 and 35 and then under leg 35 again so that two thicknesses of strapping are present between legs 35 and package 41. The free end 43 should be positioned so that it extends, for example, at least 1 inch past the extreme of the buckle. Pulling on the strapping while keeping free end 43 fixed will eliminate the loop and will tend to make the left side of the buckle (with reference to FIGURE 9) assume the configuration shown in FIGURE 11. Note that leg 30, by virtue of this initial tension, has moved toward leg 33 and into contact with swages 37 and 39. Further, the initial tensioning has caused leg 30 to move toward leg 35 in the vertical direction so as to clamp a portion of the strapping therebetween and effectively prevent slippage thereof. The operation can also be performed without reference to the package and the buckle threaded in advance of application to the package.

If precut length of strapping is being utilized, the other end 44 can be threaded in the same manner as end 43. However, where a continuous roll of strapping is used, then end 44 can be best threaded by forming a loop 45, pushing it up through the center of the buckle and bending it to slip over and encircle arm 33. The entire strapping assembly can then be tensioned into the configuration shown in FIGURE 11 by pulling on end 44, after which this end can be cut to length.

Tensioning can be done by hand or with the aid of various tensioning devices. These devices are capable of applying tensions which functionally destroyed the prior art buckles. Accordingly, some discussion is warranted to illustrate the advantages of the embodiment shown. Initial tension, as shown in FIGURE 11, causes the primary load-bearing legs 30 and 33 to move toward each other. It also causes them to move resiliently downward toward their associated proximal legs 35 and 32 and snub the strapping. Detents provided for that purpose stop the horizontal motion and, once the tape is snubbed, downward motion ceases too. With the buckle thus "locked up" by tension what is the result of additional tensions of orders of magnitude less than the tensile strength of the strapping but greater than those which could easily be applied by pulling on end 44 without the aid of a tensioning device. While such excess tensionings produce a variety of forces the most deleterious effect is to spread legs 32 and 35 in a way which tends to destroy their parallelism and make the distance between them, proximate their intersection with bights 31 and 34, greater than the length of section F. The dotted arcuate arrows in FIGURE 10 represent the net effect of this tendency. But, when this occurs, the interlocking effect at intersection 36 (i.e. the juxtaposition of a vertical portion of bight 31 with a vertical portion of bight 34) resists this spreading tendency and maintains the parallelism of the proximal legs.

In view of the variations and modifications which can be made to the invention as disclosed herein and in further view of other modifications, which will doubtless become evident to others skilled in the art dependent upon their individual preferences and particular needs, I claim all such modifications and variations of my invention, as disclosed or suggested herein, insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

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1. A buckle, for use in connection with flexible strapping, comprising a single piece of wire formed as follows:

- (a) a first, generally U-shaped portion including a distal leg formed from one end of said single piece of wire, a proximal leg and a bight;
- (b) a second, generally U-shaped portion including a distal leg formed from the other end of said single piece of wire, a proximal leg and a bight;
- (c) an intermediate wire portion connecting the proximal leg of each U-shaped portion; said two proximal legs and said intermediate wire portion lying in a first plane and having a U-shaped configuration; said two distal legs lying parallel to each other in a second plane; each of said bights extending from said first plane to said second plane and
- (d) at least one stop means formed as an integral part of said wire and located thereon intermediate the ends of the wire and proximate to at least one of said distal legs, and said stop means being engageable by at least one of said distal legs to limit relative motion of said distal legs toward each other.

2. The buckle of claim 1 wherein said stop means are projections extending from said first plane toward said second plane.

3. The buckle of claim 1 wherein said bights cross each other both in plan and in elevation and wherein, further, the proximal leg of each U-shaped portion is shorter than the distal leg of said portion.

4. The buckle of claim 3 wherein said stop means are projections extending from said first plane toward said second plane.

5. A buckle, for use in connection with flexible strapping, comprising a single piece of wire formed as follows:

- (a) a first, generally U-shaped portion including a distal leg formed from one end of said single piece of wire, a shorter proximal leg and a bight;
 - (b) a second, generally U-shaped portion including a distal leg formed from the other end of said single piece of wire, a shorter proximal leg and a bight; and
 - (c) an intermediate wire portion connecting the proximal legs of each U-shaped portion; said proximal legs being parallel to each other and lying in the same first plane as said intermediate wire portion; said distal legs being parallel to each other and lying in a second plane;
- first stop means including each of said bights extending from said first plane to said second plane and crossing each other in both plan and elevation, their intersection including an area of juxtaposition in a plane perpendicular to said first plane and said bights being engageable with each other at that intersection to maintain the parallelism of said proximal legs when tension applied thereto tends to spread them.

6. The buckle of claim 5 which further includes second stop means located in said first plane which limit motion of said distal legs toward each other.

7. The buckle of claim 6 wherein said second stop means are in the form of projections formed in said wire which extend from said first plane toward said second plane.

8. The buckle of claim 5 wherein said first and second U-shaped portions are mirror images.

9. The buckle of claim 5 wherein said distal legs both terminate beyond said intermediate wire portion.

10. The buckle of claim 8 which further includes projections formed in said wire which extend from said first plane toward said second plane and limit motion of said distal legs toward each other.

11. The buckle according to claim 5 wherein said bights have respective corresponding first portions located generally in said first plane, have respective corresponding second portions lying in said second plane and have respective angled intermediate portions between said first and

second portions, said angled portions forming said intersection.

12. A buckle for use in connection with flexible strapping, comprising a single piece of wire formed as follows:

- (a) a first generally U-shaped portion including a distal leg formed from one end of said single piece of wire, a proximal leg and a bight, 5
- (b) a second generally U-shaped portion including a distal leg formed from the other end of said single piece of wire, a proximal leg and a bight, 10
- (c) an intermediate wire portion connecting the proximal leg of each U-shaped portion and having parts which lie adjacent the free ends of said distal legs and which are of reduced thickness relative to the other

parts of said intermediate wire portion whereby said other parts provide shoulder portions engageable by the distal legs to limit the relative movement of said distal legs toward one another.

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