

SPECIFICATION **Connector**

This invention relates to loop type connectors to be used securely to connect articles such as the shoes of a pair with each other and with a price tag or the like.

Connectors formed of synthetic resin for connecting articles with each other have previously been integrally molded in large quantities and have been extensively used in place of string or cord connectors. Examples of known devices are disclosed in Japanese Patent Publication No. 11373/1971, Japanese Patent Laid Open No. 117268/1976 and Japanese Utility Model Publications Nos. 39739/1972, 4947/1975 and 6373/1976.

Known connector devices comprise a first type which can be unlocked after being locked and a second type which cannot be unlocked after being locked. The second type of connector cannot be unlocked unless the connector is broken and destroyed and is therefore utilized for various uses that dictate the essential need of non-separation or articles from each other or from price tags or identifying tags.

It is necessary that such connectors can be positively and easily locked without being disconnected after being locked; moreover, such articles must be easy to lock without requiring any excessive force or dexterity.

However, the conventional connectors have not always been satisfactory with respect to the need for locking ease and workability.

These difficulties are overcome according to the present invention by the provision of a connector consisting of a flexible rod-like connecting member having at one end a female connector head provided with opposed elongated pivotal locking lugs within a socket aperture, a male locking head on the opposite end of the flexible rod-like connector having a flexible radial flange adjacent its outer end and a bulbous stopper spaced inboard of said male locking head a distance greater than the approximate length of said elongated pivotal locking lugs wherein said opposed pivotal locking lugs are connected and held respectively in the middle portions of the wall surfaces of the socket aperture so as to be positioned in the centre of the socket aperture and including an inserting space for the male locking head formed between opposed facing internal segmental cylindrical surface of the male locking lugs segmentally delimited and held by flexible pillars of width substantially the same as that of the chord of said segmental delimitation spaced so that the male locking head can be inserted to a locking position past the elongated pivotal locking lugs which remain parallel during such insertion, said flexible radial flange being dimensioned to engage the pivotal locking lugs when in the locking position in response to reverse movement of the connecting member to pivot the locking lugs beneath the flexible radial flange member to preclude further outward movement of the male

locking head and a bulbous stopper of greater diameter than that of the inserting space separated from said male locking head by a relatively small diameter rod portion of the connecting member of a length approximately equal the length of said elongated pivotal locking lugs.

The invention will be more fully understood from the following description given by way of example only with reference to the figures of the accompanying drawings in which:—

Figure 1 is an elevation of the preferred embodiment with a portion removed;

Figure 2A is an enlarged vertically sectioned view of end means providing a locking socket aperture of the preferred embodiment;

Figure 2B is a plan view of the locking socket aperture shown in Figure 2A;

Figure 3 is an enlarged view of a male locking head on an opposite end of the preferred embodiment;

Figures 4, 5 and 6 show the *modus operandi* in the engagement and attempted removal of the parts shown in Figures 2, 2A and 3.

Figure 4 is an explanatory bisecting sectional view of the locking socket aperture showing the male locking head in an intermediate position during insertion;

Figure 5 is similar to Figure 4 but shows the parts in position following insertion; and

Figure 6 is an explanatory view showing the positions assumed by the parts upon attempted removal of the male locking head.

The preferred embodiment of the present invention comprises a flexible rod-like connecting member 20 having a female connector head 10 at one end which includes a socket aperture 14 in which two opposed pivotal locking lugs 16 are mounted on opposed sides by means of flexible pillars 18 as shown in Figure 2A. Socket aperture 14 has open ends 12 with an axial passageway 13 extending between the opposed cylindrical curved faces 15 of the pivotal locking lugs 16. It should be observed that the pivotal locking lugs 16 are equidistantly spaced from the side walls of the socket aperture 14 and the axis of the socket aperture 14 as will be evident from inspection of Figures 2A and 2B. The ends 17 of the pivotal locking lugs are canted with respect to the axis of passage 13.

The end of the flexible rod-like connector 20 opposite the female head 10 is provided with male connector means which is insertable into the female head 10 but cannot be withdrawn therefrom. More specifically, a male locking head 30 is frusto conical with a spherical cap at its outer end and a radial rim flange 31 at its inner end and can be inserted through the axial passageway 13 between the pivotal locking lugs 16 as shown in Figure 4. A bulbous stopper 40 is spaced inboard of the male head 30 on a thin relatively small diameter rod 21 from the male locking head 30. Rod 21 is of approximately the same length (l_1) as lugs 16 (Figures 1, 2A and 5). Stopper 40 has a spherical surface with a

diameter that is greater than the width of the space between inwardly facing cylindrical surface 15 of the pivotal lugs 16.

It is of substantial importance that the ends 17 of the pivotal lugs 16 are canted so that their inner extent is closer to the end of opening 12 than is their rear surface as will be apparent from inspection of Figure 2A. It should also be noted that the flexible pillars 18 are of the same width as chord delimited by points a, b, Figure 2B the pivotal lugs 16 so that the pivotal lugs cannot twist within the opening 12 with their movement being limited to pivotal movement about an axis extending through the flexible pillar 18 in a direction perpendicular to the drawing in Figures 4, 5 and 6.

A pusher protrusion grip 50 is spaced from the stopper 40 a sufficient distance and is of sufficient size to be easily gripped by the user for forcing the male inserting and locking head 30 upwardly through the axial passageway 30 in the direction of the arrow in Figure 4. It will be observed that a large relatively thick connector portion 60 extends between the pusher protrusion grip 50 and the bulbous stopper 40 so as to provide sufficient rigidity for permitting the parts to be interconnected by the pushing movement which must force the male inserting and locking head 30 upwardly through the passageway 13 until it reaches the position of Figure 5. The radial rim flange 31 on the locking head is of greater diameter than the width of passage 13 so that any withdrawal movement of means 50, 60, 40, 30 will result in engagement of the lower face of the radial rim flange with the upper most ends of the canted surfaces 17 of the pivotal lugs 16 to pivot the lugs to the position of Figure 6 to prevent removal of the locking head from within the female head member 10. Moreover, inward (upward in Figure 5) pushing movement of the stopper 40 will pivot the lugs 16 in the same direction as they are pivoted by outward movement of male locking head 30. The diameter of member 40 is of sufficient size as to prevent it from passing through the axial passageway 13. The shape of member 40 is such that it engages the surface of the pivotal lug members so that the lug members are consequently pivoted to the same position illustrated in Figure 6 when member 40 is pushed upwardly.

Another significant aspect of the invention resides in the symmetrical nature of the female locking head which permits the male locking member 30 to be inserted from either direction into the socket opening 12.

It has been found that good results are achieved when the diameter of the inserting space 13 is 1.5 millimeters, the diameter of the outer edge radial rim flange 31 is 1.6 millimeters and the diameter of the spherical end head of the male locking member 30 is 1.45 millimeters. Since the diameter of the head 30 is smaller than the diameter of space 13 and the protrusion is of flexible nature, the parts can be easily inserted through the opening 13 as demonstrated in

Figure 4.

The bulbous stopper member 40 is spaced from the lower surface of radial rim flange 31 by a distance approximately the same as the height of the pivotal locking lugs so that there is a minimum amount of free play of the parts once they have been inserted to the position of Figure 5. When the stopper is moved upwardly beyond the position of Figure 5, it engages the pivotal lugs to pivot the end which it engages outwardly to the open position of Figure 6 in the same manner as is resultant from attempted removal of the locking means in the direction of the dotted arrow of Figure 6. Thus, the parts are held in the position of Figure 5 and the elements 30, 40 etc. cannot be moved upwardly or downwardly through the space 13. In some instances, it may be desirable to make the connecting portion of the device between the elements 40 and 30 relatively thin so that it can be broken in the event it is desired to disconnect the components.

The entire connector device of the present invention can be manufactured by integral molding of synthetic resin, such as polyethylene or other suitable plastic, so as to be easily mass produced at a minimum of expense. Moreover, the device is extremely easy to use and provides a reliable juncture which cannot be disconnected without destroying the connector.

95 CLAIMS

1. A connector consisting of a flexible rod-like connecting member having at one end a female connector head provided with opposed elongated pivotal locking lugs within a socket aperture, a male locking head on the opposite end of the flexible rod-like connector having a flexible radial flange adjacent its outer end and a bulbous stopper spaced inboard of said male locking head a distance greater than the approximate length of said elongated pivotal locking lugs wherein said opposed pivotal locking lugs are connected and held respectively in the middle portions of the wall surfaces of the socket aperture so as to be positioned in the centre of the socket aperture and including an inserting space for the male locking head formed between opposed facing internal segmental cylindrical surfaces of the male locking lugs segmentally delimited and held by flexible pillars of width substantially the same as that of the chord of said segmental delimitation spaced so that the male locking head can be inserted to a locking position past the elongated pivotal locking lugs which remain parallel during such insertion, said flexible radial flange being dimensioned to engage the pivotal locking lugs when in the locking position in response to reverse movement of the connecting member to pivot the locking lugs beneath the flexible radial flange member to preclude further outward movement of the male locking head and a bulbous stopper of greater diameter than that of the inserting space separated from said male locking head by a relatively small diameter rod portion of the connecting member of a length approximately



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diameter that is greater than the width of the space between inwardly facing cylindrical surface 15 of the pivotal lugs 16.

It is of substantial importance that the ends 17 of the pivotal lugs 16 are canted so that their inner extent is closer to the end of opening 12 than is their rear surface as will be apparent from inspection of Figure 2A. It should also be noted that the flexible pillars 18 are of the same width as chord delimited by points a, b, Figure 2B the pivotal lugs 16 so that the pivotal lugs cannot twist within the opening 12 with their movement being limited to pivotal movement about an axis extending through the flexible pillar 18 in a direction perpendicular to the drawing in Figures 4, 5 and 6.

A pusher protrusion grip 50 is spaced from the stopper 40 a sufficient distance and is of sufficient size to be easily gripped by the user for forcing the male inserting and locking head 30 upwardly through the axial passageway 30 in the direction of the arrow in Figure 4. It will be observed that a large relatively thick connector portion 60 extends between the pusher protrusion grip 50 and the bulbous stopper 40 so as to provide sufficient rigidity for permitting the parts to be interconnected by the pushing movement which must force the male inserting and locking head 30 upwardly through the passageway 13 until it reaches the position of Figure 5. The radial rim flange 31 on the locking head is of greater diameter than the width of passage 13 so that any withdrawal movement of means 50, 60, 40, 30 will result in engagement of the lower face of the radial rim flange with the upper most ends of the canted surfaces 17 of the pivotal lugs 16 to pivot the lugs to the position of Figure 6 to prevent removal of the locking head from within the female head member 10. Moreover, inward (upward in Figure 5) pushing movement of the stopper 40 will pivot the lugs 16 in the same direction as they are pivoted by outward movement of male locking head 30. The diameter of member 40 is of sufficient size as to prevent it from passing through the axial passageway 13. The shape of member 40 is such that it engages the surface of the pivotal lug members so that the lug members are consequently pivoted to the same position illustrated in Figure 6 when member 40 is pushed upwardly.

Another significant aspect of the invention resides in the symmetrical nature of the female locking head which permits the male locking member 30 to be inserted from either direction into the socket opening 12.

It has been found that good results are achieved when the diameter of the inserting space 13 is 1.5 millimeters, the diameter of the outer edge radial rim flange 31 is 1.6 millimeters and the diameter of the spherical end head of the male locking member 30 is 1.45 millimeters. Since the diameter of the head 30 is smaller than the diameter of space 13 and the protrusion is of flexible nature, the parts can be easily inserted through the opening 13 as demonstrated in

Figure 4.

The bulbous stopper member 40 is spaced from the lower surface of radial rim flange 31 by a distance approximately the same as the height of the pivotal locking lugs so that there is a minimum amount of free play of the parts once they have been inserted to the position of Figure 5. When the stopper is moved upwardly beyond the position of Figure 5, it engages the pivotal lugs to pivot the end which it engages outwardly to the open position of Figure 6 in the same manner as is resultant from attempted removal of the locking means in the direction of the dotted arrow of Figure 6. Thus, the parts are held in the position of Figure 5 and the elements 30, 40 etc. cannot be moved upwardly or downwardly through the space 13. In some instances, it may be desirable to make the connecting portion of the device between the elements 40 and 30 relatively thin so that it can be broken in the event it is desired to disconnect the components.

The entire connector device of the present invention can be manufactured by integral molding of synthetic resin, such as polyethylene or other suitable plastic, so as to be easily mass produced at a minimum of expense. Moreover, the device is extremely easy to use and provides a reliable juncture which cannot be disconnected without destroying the connector.

95 CLAIMS

1. A connector consisting of a flexible rod-like connecting member having at one end a female connector head provided with opposed elongated pivotal locking lugs within a socket aperture, a male locking head on the opposite end of the flexible rod-like connector having a flexible radial flange adjacent its outer end and a bulbous stopper spaced inboard of said male locking head a distance greater than the approximate length of said elongated pivotal locking lugs wherein said opposed pivotal locking lugs are connected and held respectively in the middle portions of the wall surfaces of the socket aperture so as to be positioned in the centre of the socket aperture and including an inserting space for the male locking head formed between opposed facing internal segmental cylindrical surfaces of the male locking lugs segmentally delimited and held by flexible pillars of width substantially the same as that of the chord of said segmental delimitation spaced so that the male locking head can be inserted to a locking position past the elongated pivotal locking lugs which remain parallel during such insertion, said flexible radial flange being dimensioned to engage the pivotal locking lugs when in the locking position in response to reverse movement of the connecting member to pivot the locking lugs beneath the flexible radial flange member to preclude further outward movement of the male locking head and a bulbous stopper of greater diameter than that of the inserting space separated from said male locking head by a relatively small diameter rod portion of the connecting member of a length approximately



equal the length of said elongated pivotal locking lugs.

2. The connector as claimed in Claim 1 wherein said socket aperture is of rectangular shape and the opposed pivotal locking lugs are connected to end walls of said socket aperture by flexible pillar members extending in cantilever manner from said end walls.

3. The connector as claimed in Claim 2 wherein opposite ends of said pivotal locking lugs are canted so that their inner extent away from the said walls is closer to the end of the nearest socket aperture than is their outer extent adjacent said end walls.

4. The connector as claimed in Claim 3 wherein said male locking head is the frustum of a cone having a spherical cap at its outer end with the diameter of the bottom surface of the male locking head being smaller than the diameter of the inserting space and the diameter of the flexible radial flange is larger than that of the inserting space.

5. The connector as claimed in Claim 4 wherein said bulbous stopper has a size and shape which

causes the opposed pivotal locking lugs to pivot against the rod portion when the bulbous stopper is moved inwardly against the pivotal locking lugs to preclude further inward movement of the bulbous stopper.

6. The connector as claimed in Claim 1 wherein said bulbous stopper has a size and shape which causes the opposed pivotal locking lugs to pivot against the rod portion when the bulbous stopper is moved inwardly against the pivotal locking lugs to preclude further inward movement of the bulbous stopper.

7. The connector as claimed in Claim 6 wherein said male locking head is a cone having a spherical top with the diameter of the bottom surface of the male locking head being smaller than the diameter of the inserting space and the diameter of the flexible radial flange is larger than that of the inserting space.

8. A connector constructed and arranged substantially as hereinbefore described and as shown in the figures of the accompanying drawings.