June 24, 1958 A. Y. WARNER ET AL 2,839,809

SEPARABLE LINK

Filed April 1, 1953

FIG. 1

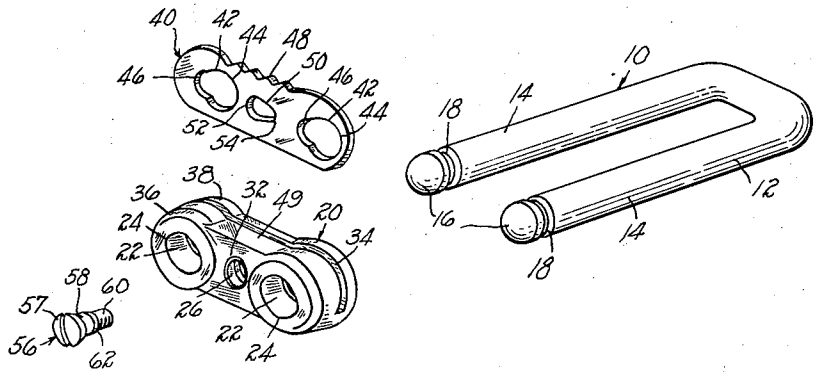


FIG. 2

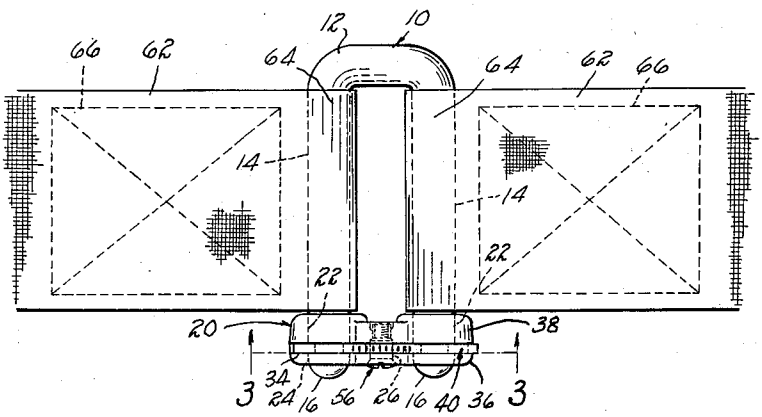


FIG. 3

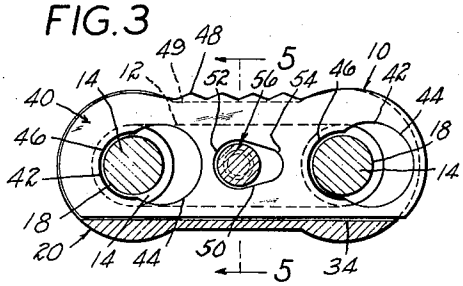


FIG. 4

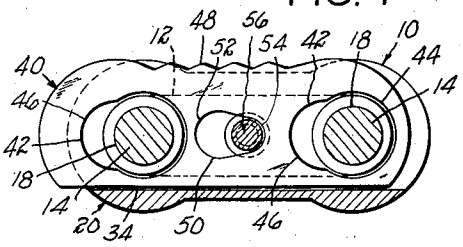
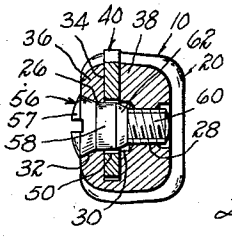


FIG. 5



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SEPARABLE LINK

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This invention relates to connecting devices and pertains more particularly to a separable link for connecting together straps, shroud lines and the like.

One object of the invention is to provide a separable link comprising only a few elements which may be assembled and disassembled with ease. In this connection, it is an aim of the invention to have several of the parts form a subassembly or unit which subassembly or unit need not be taken apart in order to connect or disconnect the straps, shroud lines or whatever members are to be connected with each other, thereby further facilitating the attaching or detaching operation. More specifically, it is within the contemplation of the invention to require the removal or separation of only one part or unit in effecting an attachment or detachment of the articles to be connected together.

Another object of the invention is to provide a device of the foregoing character which is light-weight in construction and which can be produced at a relatively low cost, although possessing a high degree of strength and reliability. With respect to the strength characteristics, it is to be noted that a link is provided having an exceptionally high strength to weight ratio which, of course, enhances its use for making parachute harness connections.

From a safety standpoint, a further object of the invention resides in the provision of a link of the above type, the parts of which are not apt to become accidentally separated. With especial reference to the strength attributes, it will become apparent from the ensuing detailed description that separation will not occur even when the link is subjected to such excessive loading that deformation results. Also from a strength viewpoint, the invention provides a link having a vastly improved degree of end strength by which is meant a high resistance to load applied at right angles or diagonally to the direction normally applied.

A further feature of the instant invention resides in the provision of link elements acting in concert to position accurately the various parts for a locking operation without the exercise of care on the part of the user when the link is assembled, and when so positioned permitting the locking action to be readily achieved by the simple turning of a single member, the link then being conditioned so that it will not inadvertently become separated.

A still further object of the invention is to provide a separable link capable of being easily threaded through relatively small loops or openings without the utilization of auxiliary equipment. Also, it is within the purview of the invention, where webbed articles are to be connected together, to prevent fraying of same through continued and repeated use by eliminating any sharp corners or abrupt edges on the link elements which engage such articles.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement

of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawing:

Figure 1 is an exploded perspective view showing the relative position of the various link parts during the initial assembly thereof;

Figure 2 is a plan view depicting the link in an assembled condition, the link illustratively connecting the ends of two belts or straps together;

Figure 3 is a sectional view taken in the direction of line 3—3 of Figure 2, the link in this figure being locked against inadvertent separation;

Figure 4 is a view similar to Figure 3, but with the parts shown in the position they assume during the initial disassembly of the link; and

Figure 5 is a sectional view taken in the direction of line 5—5 of Figure 3.

Referring in detail to the drawing, the exemplified embodiment has been indicated in its entirety by the reference numeral **10**, the link including a generally U-shaped cylindrical member **12** equipped with a pair of substantially parallel legs **14** of identical construction. For a purpose presently to be discussed, the free ends of the legs **14** are rounded or semispherically configured at the locus designated by the numeral **16** and near each rounded extremity is disposed a circumferential groove **18**. By reason of the rounded shape of the ends **16**, these ends may be readily inserted through small-sized loops or other openings, such as will hereinaftter be explained in more detail.

Also included as part of the link assemblage **10** is a yoke **20** having a pair of spaced throughbores **22**, these throughbores being of a size to receive the legs **14** therein. For the purpose of governing the extent to which the ends **16** may be inserted into these throughbores **22**, one end of each throughbore is narrowed or constricted at the locus labeled **24**. Owing to such a constriction, it will be readily apparent that the semispherical ends **16** will firmly seat against the constricted portions **24** and in this way the yoke will be positioned accurately each time relative to the U-shaped member **12**. Not only will constricted portions **24** properly align the yoke **20** relative to the U-shaped member **12**, but the yoke is precluded from being placed on the U-shaped member at all if the yoke is reversed, thus insuring that the device will be properly assembled.

Intermediate the throughbores **22** is formed a third throughbore **26** which has a threaded section **28**, an unthreaded counterbore **30** of slightly larger diameter than the threaded section **28** and a countersunk portion **32**. In addition to the several bores **22** and **26**, the yoke **20** also is provided with a transverse slot **34** intersecting or communicating with each of the above alluded to bores **22** and **26**. By disposing the slot **34** nearer one face of the yoke **20** than the other, a pair of flanges **36** and **38** is produced, the flange **36** being of less thickness than the other flange **38**, for the express purpose of rendering the flange **36** slightly resilient and deflectable. The exact reason for such a relation will be more fully described hereinafter.

In addition to the foregoing parts or elements constituting the link **10**, the link further comprises a slidable locking plate **40** having a pair of elongated apertures **42**, one end of which has a radius of curvature **44** corresponding to the surface curvature of the legs **14** and the other end of each aperture having a radius of curvature **46** commensurate with the curvature of the neck or reduced diameter portions of the legs **14** formed by the peripheral grooves **18**. To enable the user to shift the locking plate transversely so that the marginal or bordering edge portions of the apertures **42** engage

within the confines of the grooves 18, the locking plate is serrated at 48, these serrations being disposed outwardly of the yoke 20 so as to be easily engaged by one's fingers to achieve such movement. Preferably, the vertical height of the yoke 20 is reduced centrally as shown in the drawing at 49 to expose the serrated portion 48 while at the same time shielding the same and enhancing the general appearance of the link. While it is desirable to have the serrations 48, it is of prime importance that the locking piece 40 be retained in a shifted position and toward this end a third aperture 50 is disposed centrally between the pair of apertures 42, one end of the aperture 50 having one radius of curvature indicated by the numeral 52 and the other end of said aperture having a lesser radius of curvature as represented by the numeral 54. It might be pointed out at this time that the larger end of the last-mentioned aperture 50 is oppositely disposed relative to the larger ends of the earlier described apertures 42, the reason for which will presently be made manifest.

Coming now to the member which coacts with the aperture 50 to retain the locking plate or piece 40 in a transversely shifted position, it will be seen that such member takes the form of an oval head shoulder screw 56, this screw being equipped with a head 57 beveled on its underside to fit in the countersunk portion 32 of the throughbore 26. Also forming a part of the screw 56 is a cylindrical shoulder 58, a threaded shank 60 and a beveled or tapered section 62 intermediate the sections 58 and 60. The shoulder 58 is designed to fit within the counterbore 30 when the threaded shank 60 has been fully threaded into the threaded portion 28 of the bore 26. Owing to the shoulder 58 which has a diameter corresponding to the circular configuration of the enlarged end 52 of the aperture 50, the locking piece 40 will be retained in a shifted position to the right as viewed in Figure 3, whereas by reason of the threaded shank 60 having a size commensurate with the smaller end 54 of the aperture 50, the locking piece 40 may be moved to the left as shown in Figure 4. When in the position pictured in Figure 3, the marginal edges adjacent the smaller radius of curvature of end 46 of the aperture 42 will fit within the circumferential grooves 18 disposed on the legs 14 of the U-shaped member, and, by virtue of such interfitting relation, the locking plate precludes axial movement or withdrawal from the U-shaped member 10. As already stated the shoulder 58 is instrumental in holding the locking piece 40 in such a position. On the other hand, when the screw 56 is retracted sufficiently to bring a portion of the threaded shank 60 into engagement with the aperture 50, a shifting of the locking piece is made possible to the extent of having the shank abut the smaller end 54 of the aperture 50, the serrations 48 facilitating such a shifting of said locking piece. While the serrations 48 can be used to move the locking plate 40 in a locking direction, it should be understood that the beveled section 58 of the screw 56 will cause the locking plate to be automatically shifted in a locking direction, the inclined or beveled section 62 acting to cam the plate in such a direction as the screw 56 is tightened to bring the shoulder 58 into juxtaposition with the large end 52 of the aperture 50.

From the foregoing it will be appreciated that our separable link is susceptible to a number of uses. In order to illustrate one possible use of the device, there is fragmentarily shown in Figure 2 a pair of straps 62 having loops 64 formed by reversely bending portions of said straps about themselves and then stitching the reversely turned regions at 66. It will be seen, especially from Figure 1, that the rounded ends 16 of the link are shaped so that they may be readily inserted through the loops 64, there being no obstructions which encumber such an operation and therefore no auxiliary attachments or implements are required. Also, since the grooves 18 are relatively narrow in width, there are no sharp edges

which would damage or fray, after continued use, any straps constructed of webbing or other woven material. Due to the ease with which the link can be both assembled and disassembled and also because of its great strength and reliability, the link will find especial utility in making parachute harness connections, although as hereinbefore indicated, the link is perfectly suitable for connecting various articles or items together such as belts and the like as well as shroud lines and the mentioned harness which latter connections are usually encountered in parachute preparations.

In view of the preceding description, it is thought that it will be readily apparent how practical use may be made of our link, but to make sure that the invention is fully understood it is to be observed that in the suggested use the rounded ends 16 are first threaded through the loops 64, such action being readily accomplished due to the convex configuration of these ends. By rounding or curving the ends as shown, it will be recognized that the invention requires no auxiliary equipment in achieving the initial threading of the legs 14 into the loops 64 or other openings that might be encountered in actual use, certain prior art devices requiring, it might be pointed out, auxiliary equipment in order to produce the desired threading, particularly with respect to limited or small-sized loops.

Upon completion of the threading action, a preliminary step, the locking plate 40 is inserted into the slot 34 of the yoke 20 and with the aperture 50 in registry with the bore 26, the screw 56 may be placed within the bore 26 and upon turning or tightening of the screw the threaded shank 60 will enter the threaded portion of the bore 26. Before the screw 56 is tightened sufficiently to move the shoulder 58 into axial alignment with the counterbore 30, the yoke 20 with the plate 40 in the slot 34 are placed over the ends of the legs 14, the constricted portions or seats 24 of the throughbores 22 limiting the extent the yoke can be moved onto the U-shaped member 10. By properly disposing the seats 24, it will be recognized that the slot 34 of the yoke will be brought into true alignment with the peripheral grooves 18 each time so that, when the screw 56 is fully tightened, such action bringing the shoulder 58 within the confines of the aperture 50, the plate 40 will be moved laterally into the locked position pictured in Figure 3. In this connection it is to be observed that the serrations 48 provide a ready means for manipulating the plate 40 into such a position but by virtue of the beveled section 62 on the screw 56, such a position will be reached automatically due to the camming action of said beveled section 62. In this way a locked condition will always be assured when the screw is tightened. If it were not for the beveled section 62, a careless person, assuming that there was an abrupt change from the shoulder 58 to the shank 60, might tighten the screw so that the abrupt portion would engage the marginal or bordering edge of the plate 40 adjacent the smaller end 54 of the aperture 50, the abrupt portion acting under these assumed conditions as a flange which would prematurely arrest the threaded movement of the screw 56 as it is advanced within the bore 26 and the yoke then would not be locked against axial withdrawal.

By making the slot 34 in the yoke 20 of slightly greater width than the thickness of the plate 40 and owing to the resiliency of the flange 36, it will be observed that the flange 36 can be deflected sufficiently to exert enough pressure against the underside of the head of the screw 57 to cause the threads of the shank 60 to bear tightly against the threads of the section 28 and thus aid in the preventing of accidental dislodgement of the screw. Also, if desired, the screw 56 may be of sufficient length so that it can be enlarged, such as by peening, at the end opposite the head 58 after once inserting the screw into the bore 26 so that the screw cannot be fully withdrawn from the bore 26, instead

being movable between two extreme positions to either bring the shoulder **58** into juxtaposition with the aperture **50** in the plate **40**, or the portion of the shank **60** nearest the shoulder **58** into juxtaposition with said aperture **50**. Under these latter conditions it will be recognized that the plate **40** cannot be completely removed from the slot **34** but, since it can be shifted into either of two transverse positions, one to permit removal of the yoke **20** from the U-shaped member **12** and the other to prevent such removal, there is no real need for complete disassembly of the parts **20**, **40** and **56** with respect to each other, it only being necessary for the U-shaped member to be removed from the subassembly or unit consituted of these parts **20**, **40** and **56**. On the other hand, even when the screw **56** is removable as shown in the drawing, its removal is not necessary in order to effect a detachment of the straps **62** from the U-shaped member **10**, for the parts **20**, **40** and **56** may be retained in an assembled relation with each other, the locking piece **40** merely requiring shifting the position illustrated in Figure 4.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

We claim:

1. A separable link comprising a U-shaped member including a pair of leg portions each provided with a groove extending at least partially therearound, a yoke member having a pair of spaced apertures into which said leg portions are adapted to extend, a third aperture disposed intermediate said pair of apertures and a transverse slot communicating with the three apertures, a transversely slidable locking plate in said slot extending between said spaced apertures and provided with a pair of elongated apertures through which said leg portions are extendable, said elongated apertures being sufficiently small adjacent one end to form bordering edge portions engageable with said grooves thereby to prevent removal of said plate and yoke from said U-shaped member and large enough adjacent their other ends to permit removal thereof, said locking plate having a third elongated aperture registrable with the third aperture of said yoke which is larger at one end than the other, and a longitudinally positionable member received by the yoke third aperture and extending through the plate third aperture, said longitudinally positionable member having one axial portion of a size commensurate with the size of the enlarged end of said yoke third aperture and another axial portion of a size commensurate with the smaller end of said yoke third aperture, whereby said locking plate may be retained in transversely shifted positions to prevent removal of said plate and yoke or may be shifted to permit removal thereof from said U-shaped member depending upon the longitudinal position of said last-named member.

2. A separable link in accordance with claim 1 in which said longitudinally positionable member constitutes a screw having one end threadedly received in said yoke member and in which the different size axial portions are spaced apart with an intermediate inclined portion so that said plate will be automatically shifted into locking position upon tightening of said screw to prevent removal of said plate and yoke from said U-shaped member.

3. A separable link comprising a U-shaped generally cylindrical member including a pair of legs each having a rounded end and a circumferential groove near said end forming a neck portion of reduced diameter, a yoke member having a pair of spaced bores into which said legs are adapted to extend, a third bore including a counterbored portion and a threaded portion, and a transverse slot communicating with said pair of bores and the counterbored portion of said third bore to form a pair of integral, parallel flanges, said pair of bores narrowing within one flange to produce seats for the rounded ends of said legs thereby aligning said slot with said circumferential grooves when said U-shaped member is inserted into said pair of bores, a locking plate receivable in said slot and provided with a pair of spaced, elongated apertures through which said leg portions are extendable, said elongated apertures having a radius of curvature at one end approximately that of the cylindrical legs and a radius of curvature at the other end approximating that of the neck portions, said locking plate being provided with a third elongated aperture between said pair of apertures registrable with said third bore having a radius of curvature at one end approximateing that of said counterbored portion and a smaller radius of curvature at the other end approximating that of the threaded portion of said third bore, and a screw element equipped with a shoulder of a size approximating said counterbored portion and a threaded shank of a size approximating the threaded portion of said third bore, whereby axial movement of said screw element in one direction will place said shoulder within the confines of said third aperture and movement in the opposite direction will place a portion of said shank therewithin.

4. A separable link in accordance with claim 3 in which said shoulder and shank on said screw element have therebetween a bevel portion for automatically shifting said plate into locking position upon tightening of said screw to prevent removal of said plate and yoke from said U-shaped member.

5. A separable link comprising a U-shaped member including a pair of leg portions each provided with a groove extending at least partially therearound, a yoke member having a pair of spaced apertures in which said leg portions are respectively received and being provided with a slot disposed transversely of said leg portions in communication with said spaced apertures, said grooves being in registry with said slot, a single locking plate separate from said yoke movably mounted in the slot and provided with a pair of elongated apertures through which the leg portions extend, each of said elongated apertures having rigid bordering edge portions at one end thereof movable into engagement within said grooves as said plate is moved relative to said slot in one direction to prevent the removal of the yoke from the leg portions, the other end of said elongated apertures being respectively registrable with said spaced apertures and being sufficiently large to permit removal of the yoke and the plate as a unit from the leg portions when the other ends of said elongated apertures are in registry with said spaced apertures, said plate being manually movable in said one and the opposite directions in said slot to either simultaneously position both of said bordering edge portions in the respective grooves or simultaneously position both of said other ends of said elongated apertures in respective registry with said spaced apertures, and means to retain said plate in the position corresponding to reception of said bordering edge portions in said grooves.

6. A separable link comprising a U-shaped member including a pair of leg portions each provided with a groove extending at least partially therearound, a yoke member having a pair of spaced apertures in which said leg portions are received and having a slot disposed transversely of said leg portions in communication with said spaced apertures, a single locking plate separate from said yoke movably disposed in said slot for movement longitudinally thereof and having a pair of elongated

apertures through which said leg portions extend, said elongated apertures each having a rigid bordering edge portion adjacent one end respectively receivable in one of said grooves to prevent removal of said yoke from said U-shaped member and each having another end respectively registrable with one of said spaced apertures and being sufficiently large to permit removal of said yoke and said plate member as a unit from said U-shaped member, said elongated apertures extending in the same direction, retaining means mounted on said yoke for movement relative thereto and to said plate for retaining said plate in a position corresponding to reception of said bordering edge portions in said grooves, and means on the locking plate cooperable with the retaining means to move the plate relative to the yoke and into the position corresponding to reception of said bordering edge portions in said grooves as said retaining means is moved relative to said yoke.

7. A separable link comprising a U-shaped member including a pair of leg portions each provided with a groove extending at least partially therearound, a yoke member having a pair of spaced apertures in which said leg portions are respectively received, a third aperture disposed intermediate said pair of spaced apertures and a transverse slot communicating with the three apertures, a single locking plate slidably mounted in said slot and being provided with an elongated aperture in registry with said third aperture and a pair of elongated apertures through which said leg portions extend, said pair of elongated apertures being sufficiently small adjacent one end to form bordering edge portions respectively receivable in said grooves thereby to prevent removal of said plate and yoke from said U-shaped member and having other ends respectively registrable with said pair of spaced apertures and being large enough to permit removal of the yoke from the leg portions, said pair of elongated apertures extending in the same direction, a screw element threadably received in the third aperture of said yoke and extending through the first named elongated aperture of said plate, said plate being shiftable relative to said screw element between positions corresponding to reception of said bordering edge portions in said grooves and registry of said other ends of said elongated apertures with said spaced apertures, and means on said screw element engageable with the locking plate to retain said plate in a transversely shifted direction corresponding to reception of said bordering edge portions in said grooves.

8. A separable link comprising a U-shaped member including a pair of leg portions each provided with a groove extending at least partially therearound, a yoke member

having a pair of spaced apertures in which said leg portions are received and having a slot communicating with said spaced apertures, said slot being disposed sufficiently close to one face of said yoke member to form a resilient flange, a single locking plate movably received in said slot and being provided with a pair of elongated apertures through which said leg portions extend, each of said elongated apertures having a bordering edge portion at one end respectively receivable within the grooves on said leg portions to prevent removal of said plate and yoke from the U-shaped member and each having another end respectively registrable with one of said spaced apertures and being sufficiently large to permit removal of said yoke member and said plate as a unit from said U-shaped member, said elongated apertures extending in the same direction, said plate being movable between positions corresponding to reception of the bordering edge portions of said elongated apertures in said grooves and registry of the other ends of said elongated apertures with said pair of spaced apertures, a retaining element extending through said resilient flange of the yoke member, through the plate and into the portion of the yoke opposite said resilient flange and constructed for selective engagement with said plate member to retain said plate in the position corresponding to reception of said bordering edge portions in said grooves, said retaining element being movable relative to said yoke member and said plate into and out of retaining engagement with said plate, and means on said plate member cooperable with said retaining element to move said plate member into said position corresponding to reception of said bordering edge portions in said grooves as said retaining element is moved into retaining engagement with the plate, said retaining element being engageable with said resilient flange to flex said flange inwardly of said yoke subsequent to reception of said edge portion in said grooves.

References Cited in the file of this patent

UNITED STATES PATENTS

624,679	Plant	May 9, 1899
735,618	Tannewitz	Aug. 4, 1903
1,176,205	Cutlip	Mar. 21, 1916
1,694,746	Landahl	Dec. 11, 1928
1,862,623	Harrington	June 14, 1932
2,229,106	Lomando	Jan. 21, 1941
2,487,509	Baker	Nov. 8, 1949
2,631,465	Cordis	Mar. 17, 1953
2,636,235	Nygard	Apr. 28, 1953
2,648,989	Cordis	Aug. 18, 1953