

Feb. 17, 1970

O. H. VETTER

3,496,519

RELEASE CONNECTOR HAVING A SWIVELED LANYARD

Filed April 16, 1968

2 Sheets-Sheet 1

FIG. 1

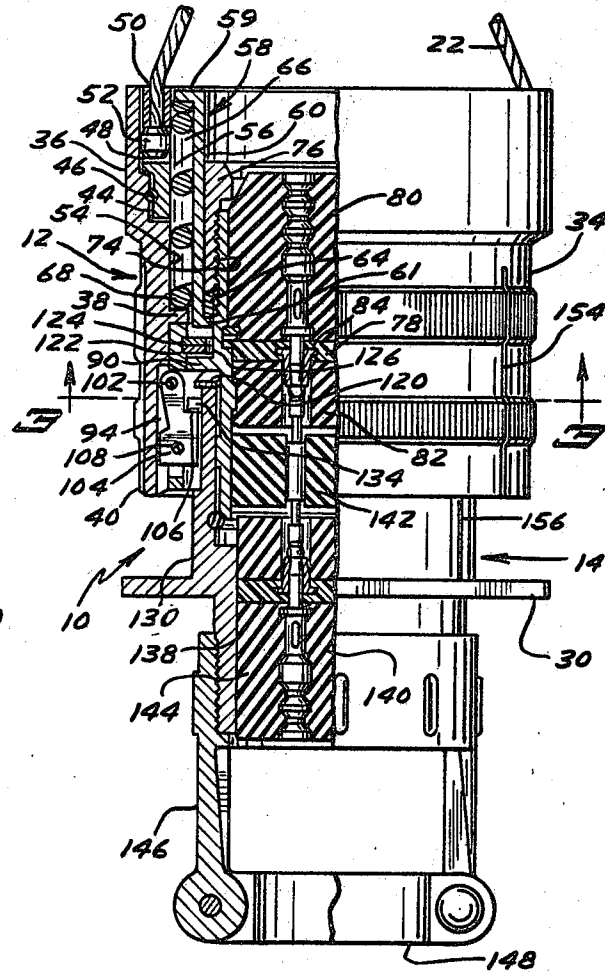
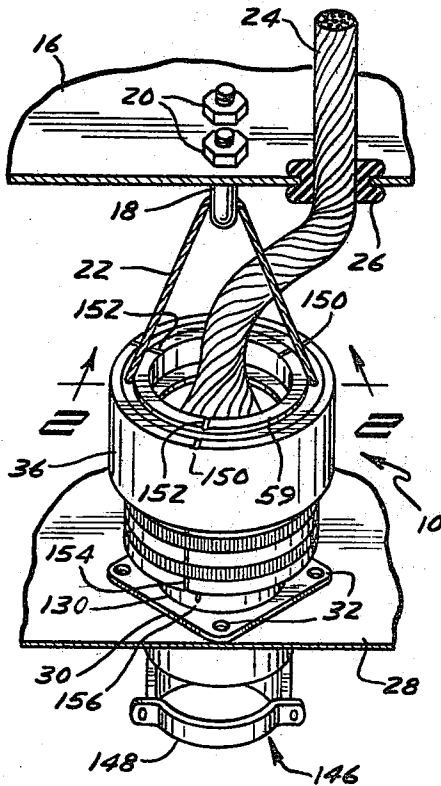


FIG. 2

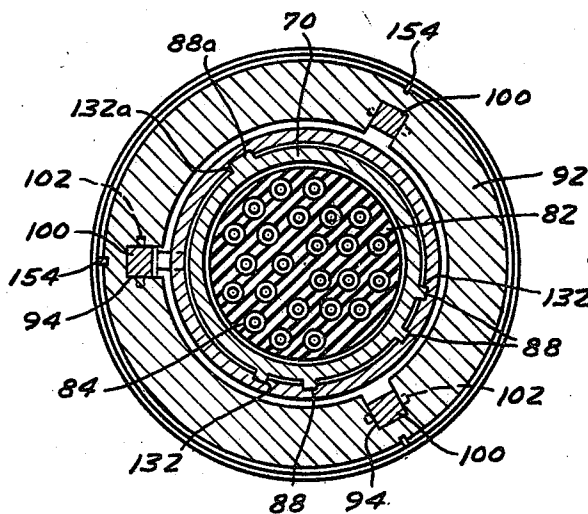


FIG. 3

INVENTOR.
OTTOMAR H. VETTER

BY
Alger Peterson Johnson & Westman
ATTORNEYS

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FIG. 4

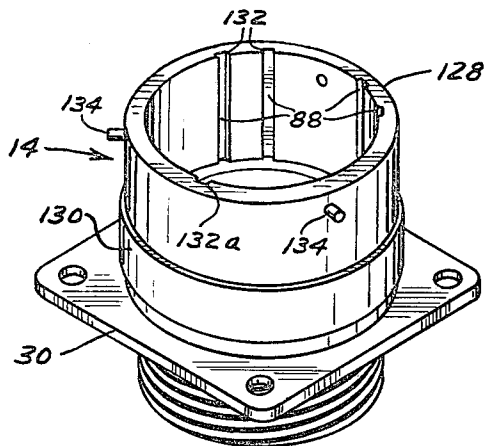
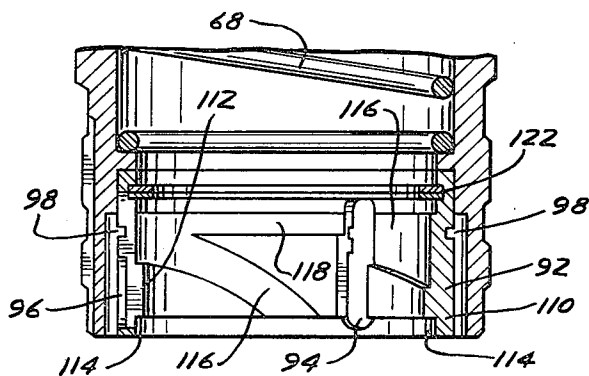
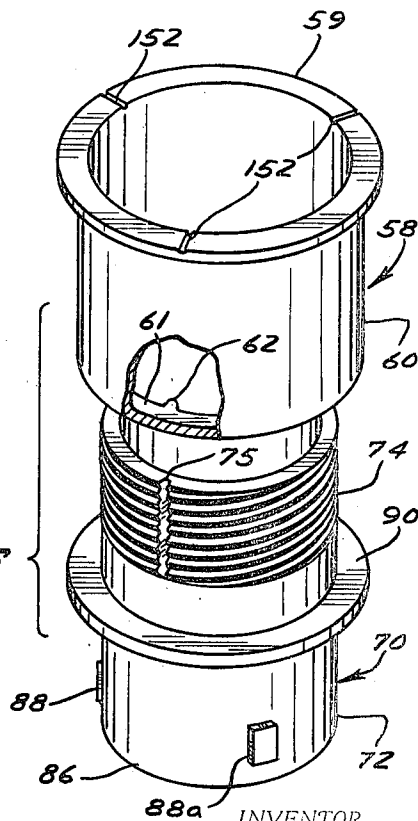


FIG. 6

FIG. 5



INVENTOR.
OTTOMAR H. VETTER

BY

Rugger Peterson Johnson & Westman
ATTORNEYS

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3,496,519

RELEASE CONNECTOR HAVING A SWIVELED LANYARD

Ottomar H. Vetter, Minneapolis, Minn., assignor to
United-Carr, Incorporated, Boston, Mass., a corporation of Delaware

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7 Claims

ABSTRACT OF THE DISCLOSURE

The two halves or components of an electrical connector are mated by insertion of one half into the other half. Helical slots or grooves guide one component into proper latching relationship with the other. When the latching engagement has been properly effected, external indicia on the two components is automatically brought into physical alignment to designate that the latching engagement has been fully made. A lanyard has its ends mounted in the inner race of a ball bearing assembly and a coil spring resists the pull exerted on the lanyard to a desired degree, a sufficient pull causing the spring to compress with the result that the bayonet pawls included in the latching mechanism are free to move outwardly and disengage the lugs that have been brought into latching engagement and which latching engagement is normally denoted by the aligned indicia.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates generally to electric connectors and pertains more particularly to an electrical connector that will separate when a predetermined amount of force is applied to the two halves or components.

Description of the prior art

Release-type connectors have been used in the past. However, such connectors have not clearly indicated when the parts have been properly mated. Also, no provision has been made for the twisting of the connector with respect to the objects between which it is attached.

SUMMARY OF THE INVENTION

Aircraft operations, particularly those of a military nature, involve the release of one object with respect to another object. Jettisonable fuel tanks normally held under the wings of an airplane is but one example where electrical signals must be transmitted from the tank itself to the instrument board. Another application requiring a releasable type of electrical connector is in conjunction with the separation of the nose cone from a missile body. Also, rockets are frequently held beneath the wing of a plane and must be appropriately controlled in order to effect a launching thereof. Other situations involve the flexible suspension of one object from another high-altitude balloon exploration activity being but one example, such a suspension involving a foreshortening of the cable or lanyard that is used if the lanyard cannot rotate or swivel through a complete circle.

Accordingly, the present invention has for an object the provision of a connector that will release when a predetermined load is applied thereto, yet which will per-

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mit the component parts to be easily mated together. More specifically, the invention has for an aim the provision of a ball bearing assembly to which the lanyard is attached so that the inner race thereof can be rotated relative to the outer race in order to allow initial connection of the components. Also, the invention enables the person effecting the connection to know when the parts have been properly latched together, appropriate indicia that is easily discernible, both visually and by touch, being employed. Also, the aforementioned ball bearing assembly allows the lanyard to remain in an untwisted and hence unshortened condition during the use when connecting two objects that twist or rotate with respect to each other.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a perspective view illustrating my connector in actual use, the upper component of which is connected to one fragmentarily depicted object and the lower component connected to another object which is also only fragmentarily depicted;

FIGURE 2 is a sectional view taken in the direction of line 2—2 of FIGURE 1 for the purpose of showing the internal construction of the connector;

FIGURE 3 is a sectional view taken in the direction of line 3—3 of FIGURE 2 which illustrates the latching arrangement and also certain keys and keyways that are embodied in the connector;

FIGURE 4 is a sectional view of the lower portion of the upper connector component, the view being similar to that pictured in FIGURE 2 but with the plug body removed so as to show the helical groove arrangement that is utilized in latching the two components together;

FIGURE 5 is an exploded perspective view of the plug body for the purpose of showing a keyway in the threaded portion thereof which receives an internal key on the spring retainer shell, a section of the shell wall being removed in order to expose said key, and

FIGURE 6 is a perspective view of the lower component for the purpose of showing still more clearly the means by way of which the latching engagement of the two components is accomplished but with its contacts removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIGURE 1, the connector exemplifying my invention has been generally denoted by the reference numeral 10. The connector comprises a first half or component 12 and a second half or component 14 which are separable or releasable with respect to each other. To illustrate the utility of the invention, a portion 16 of an airplane wing has been shown which has a U-bolt 18 mounted therein and for the sake of a simplified illustration held by nuts 20. It is the U-bolt 18 that serves as a mechanical connection for a lanyard 22 which is connected to the first component 12 in a manner presently to be described. It can be seen from FIGURE 1, though, that a plurality of conductors constituting a cable 24 lead upwardly through a grommet 26 in the wing 16 and continue on to the instrument board in the cockpit of the plane. A portion 28 of a fuel tank has been pictured, this being the object that is to be jettisoned in the present instance. As can be readily discerned from FIGURE 1, the second component 14 includes a flange 30 and mount-

ing screws 32 extend through this flange into the tank 28.

The first component 12 in addition to the lanyard 22 comprises a coupling ring or outer sleeve 34 forming an outer race portion 36. The outer sleeve 34 further includes an internal flange 38 intermediate the race portion 36 and a skirt portion 40. From FIGURE 3 it will be seen that the skirt portion 40 is formed with three keyways 42 for a purpose hereinafter explained. Actually, the internal flange 38 is formed by counterboring the sleeve 34 and the counterbored portion of the skirt 40 accommodates the latching mechanism referred to later herein. At this time, attention is directed to an inner sleeve or inner race 44 that is contained within the outer race 36. By means of a plurality of balls 46 the inner race 44 is made rotatable with respect to the outer race 36. Also, the inner race 44 is formed with diametrically located, radially directed apertures 48 which have in communication therewith axial passages 50, one of which appears in FIGURE 2.

It is through the agency of the diametrically located apertures 48 that a pair of beads or enlarged members 52 are held or accommodated, these beads 52 being fixedly attached to the ends of the lanyard 22. Thus, the bight of the lanyard 22 passes over the U-shaped bolt 18 and the beads 52 are anchored in the inner race 44 to attach the lanyard to the ball bearing assembly formed by the inner race 44 and the outer race 36. Inasmuch as the outer race 36 is integral with the outer sleeve 34, the lanyard 22 is connected via the inner race 44 and the balls 46 to the sleeve 34 which functions as a coupling ring as hereinbefore briefly mentioned and which hereinafter will become better understood. It will be perceived, though, that the bore labeled 54 of the outer sleeve 34 has a diameter equal to the diameter of the bore labeled 56 of the inner race 44.

A spring retainer shell 58, best seen in FIGURES 2 and 5 but visible at one end in FIGURE 1, is contained within the bores 54 and 56, the shell 58 having an outturned flange 59 and a cylindrical body 60 integral with the flange 59 and an inturned flange 61 integral with the other end of the body 60 remote from the flange 59. Although the keyway therefor will be mentioned later, attention is drawn to the presence of a key or lug 62 on the flange 61, the key 62 extending inwardly from the inturned flange 61, a portion of the body 60 in FIGURE 5 being broken away to expose the key 62. There is also a compression washer or ring 64 (FIGURE 2) that bears against the inturned flange 61.

The cylindrical body 60 has a diameter considerably less than the diameter of the previously mentioned bores 54 and 56, thereby forming an annular space 66 for the reception of a coil spring 68. It is this particular spring 68 that determines the force needed to effect the release or separation of the first component 12 with respect to the second component 14. The particular spring constant for the coil spring 68 can be selected so as to determine the amount of separation force that will be necessary.

The component 12 includes a plug body 70 having a barrel 72 provided with a threaded portion at 74. The previously mentioned key 62 is designed to fit within a keyway 75 formed in the threaded portion 74. A retaining nut 76 when placed on the threaded portion 74, and tightened sufficiently will engage the compression washer or ring 64. It will be appreciated that the washer 64 will in this way be forced against the inturned flange 61 of the shell 58 to thereby mechanically anchor the plug body 70 to the shell 58, the key 62 and keyway 75 assuring a desired angular orientation of these parts.

The plug body 70 further includes a dielectric disc 78, a first rubber insert 80 and a second rubber insert 82. It will be appreciated that the disc 78 is of rigid dielectric material and serves as a mounting means for a plurality of plug contacts 84. The plug contacts extend from opposite sides of the disc 78 and are embedded in the rubber inserts 80, 82. The barrel 72 includes an integral

shroud 86 thereon having four axially disposed and angularly spaced keys 88 plus a wider key 88a as can be seen in FIGURE 5. The barrel 72 also has an outer peripheral flange 90.

The means for coupling together the components 12 and 14 in a mated relationship includes a latch ring 92 provided in the illustrated instance with three slots 94 (all three appearing in FIGURE 3), each having an external indentation 96 (FIGURE 4) and communicating at one end with an external circumferential groove 98.

The coupling means further comprises three bayonet pawls 100 which are carried by the latch ring 92. More specifically, the pawls 100 are pivotally mounted on pins 102 that reside in the circumferential groove 98. Additional pins 104 function as limits or stops for the pawls 100, the pins 104 bearing against the bottom of the external indentations 96 when the pawls are pivoted inwardly toward each other. From FIGURE 2 it will be discerned that each pawl 100 is formed with a latch tooth at 106 and has a limit edge 108 which engages the interior of the coupling ring or outer sleeve 34. Thus, the pivotal movement of the pawls 100 is limited in one direction by its particular pin 104 and in the opposite direction by the sleeve 34 when said sleeve 34 circumscribes the pawls 100 so that the edges 108 can bear thereagainst.

From FIGURE 4 it will be seen that a lip 110 has a thickness approximately one-half of the thickness of the latch ring 92. This forms a bore 112 having a reduced diameter compared with the internal diameter of the lip 110, thereby forming a shoulder at 114. By reason of the reduced diameter bore 112 and the resulting shoulder 114 a sufficient thickness exists for the provision of helical slots or grooves 116 that form guide ramps or tracks leading to centrally disposed ends of the previously mentioned slots 94 in which the bayonet pawls 100 reside. Also, there is an internal annular groove 118 communicating with the same ends of the slots 94 into which the helical slots 116 terminate, the slots 116 also terminating in this same groove 118. A wave washer 120 (FIGURE 2) functions as a spring for a purpose presently to be referred to, the washer 120 being disposed in the internal groove 118.

Close inspection of FIGURE 2 will demonstrate that an internal shoulder at 122 abuts the barrel flange 90 at one side thereof, whereas a groove 124 disposed circumferentially around the interior of the latch ring 92 accommodates a spring washer 126 having two revolutions in the illustrated situation; this washer may be a SpiraloX washer but any locking washer having the requisite spring action can be utilized.

At this time reference will be made to the construction of the other component 14 which when mated with the component 12 constitutes the connector 10. The component 14 includes a receptacle body 128. Part of the body 128 is a sleeve 130 that is integral with the earlier-mentioned mounting flange 30, the sleeve 130 functioning to effect the mating of the component 14 with the component 12. The sleeve 130 has four internal longitudinal keyways 132 that are angularly spaced so as to receive therein the previously mentioned keys 88 and a wider keyway 132a for accommodating the key 88a.

Of importance in effecting the mating of the two components 12 and 14 are radially projecting lugs 134 which are of a size so as to be received readily in the helical slots or grooves 116. In this way, when the sleeve 130 is twisted with respect to the latch ring 92, the lugs 134 will be helically advanced toward the internal groove 118 and will bear against the wave washer 120.

While the specific number of individual contacts is unimportant to a practicing of the invention, nonetheless the number of receptacle or socket contacts labeled 136 will correspond with the number of plug contacts 84 contained in the first connector component 12. A rigid di-

electric disc 138 which corresponds to the disc 78 is employed and carries the various receptacle contacts 136. The disc 138 is disposed between a first rubber insert 140 and a second rubber insert 142. It is important, quite obviously, that these receptacle contacts 136 be properly oriented so as to receive therein the various plug contacts 84 when the two components 12, 14 are fully mated with each other. The keys 88 or 88a, together with the keyways 132 and 132a, assure the correct orientation and hence the proper engagement of the contacts 84 and 134.

The receptacle body 128 in addition to having the flange 30 has a projecting threaded end 144 which allows a conductor or cable clamp 146 to be attached thereto. The clamp 146 has a split ring end at 148 which can be tightened against the bundle of conductors or cable that will be electrically connected to the various receptacle contacts 136 and which function so as to provide a continuation of the electrical paths provided by the previously mentioned conductors 24.

Inasmuch as it is planned that the connector components 12 and 14 will separate when a predetermined amount of force is applied to the lanyard 22, such as by the release of the fuel tank 28 by a mechanical release mechanism not shown, it is extremely critical that the various contacts 84 be engaged properly with the contacts 136. This can only be done when the two components 12 and 14 are angularly oriented with each other. Hence, if the radially projecting lugs 134 are not fully advanced so that they reside in axial alignment with the bayonet pawls 100, more specifically the latching teeth 106 thereof, the desired electrical connections will not be made.

With the foregoing in mind, the present invention incorporates therein visible notches 150 on the outer sleeve 34. These notches can not only be felt but can also be readily seen, especially where a brightly colored paint is applied thereto. Additional notches 152, there being three such notches 152 because three notches 150 have been illustrated, are disposed on the outturned flange 59 of the spring retainer shell 58. The alignment or registry of these notches 150 and 152 with each other can be seen in FIGURE 1. Additionally, lines or shallow grooves 154 on the outer sleeve 34 are employed and these lines become registered with further lines or grooves 156 on the sleeve 34 of the second component 14. Consequently, the person coupling the components 12 and 14 together will be apprised of the fully latched or mated relationship of these components when the end notches 150, 152 are aligned and also when the lines or grooves 154, 156 are in registry with each other.

It should be obvious from the information given herein that antifouling properties or characteristics are imparted to the lanyard 22. More specifically, if the objects 16 and 28 are such that they would rotate relative to each other (not in a situation where one is an airplane wing and one is a fuel tank but likely in balloon explorations) the lanyard 22 would become shorter by virtue of the twisting action. However, this objectionable result is obviated when practicing the instant invention because the inner race 44 can readily rotate relative to the outer race 36 owing to the ball bearings 46 disposed therebetween. A considerable amount of thrust or load can be carried without the balls binding which would prevent further rotative movement. Hence, a full circle can be achieved as far as the swiveling action is concerned in this instance.

Not only is the swivel action provided during actual use of the connector 10 but the swivel action facilitates the mating of the two components 12, 14. Assuming now that the objects 16 and 28 are fixedly oriented with respect to each other, such as when one constitutes an airplane wing and the other a fuel tank, then the person connecting the two components cannot adjust or orient the objects themselves. All that he need do, though, is to twist one component with respect to the other and thereby effect the alignment. It will be recognized that a pylon usually houses the connector 10 when it serves as a connecting means be-

tween the electrical circuitry that extends into the wing of the plane and the subjacent fuel tank that is to be released or jettisoned when it becomes empty. Very little space is available for effecting the mating of the two components 12, 14 in such a situation and the present invention has particular value in such an environment.

What is claimed is:

1. A release connector having a swiveled lanyard comprising a first connector component including an outer sleeve member forming an outer race adjacent one end and an inwardly directed shoulder between said one end and the other end thereof, a shoulder inner sleeve member forming an inner race, a plurality of ball bearings disposed between said races so that said inner sleeve member is rotatable within said outer sleeve member, a lanyard having an intermediate bight portion for attaching said first component to one object, said lanyard having its ends anchored to said inner sleeve member at diametrically opposite locations which lie axially between said ball bearings and said one end of said outer sleeve to thereby mount said lanyard for swivel movement with respect to said outer sleeve, a shell within said sleeve members having an outwardly directed shoulder at the end thereof lying adjacent the said one end of said outer sleeve member and a cylindrical body portion of a size to form an annular space between said body portion and said sleeve members, a coil spring contained in said annular space having its ends abutting said shoulders, contact means fixedly carried within said shell member, and coupling means mounted in a fixed relation with the contact means and normally residing within said outer shell member near the other end thereof; a second connector component including a shell member, a contact means fixedly carried within said second shell member, coupling means on said second shell member releasably engageable with the coupling means of said first component, means on said second shell for attaching said second component to a second object, whereby said outer sleeve member, said shell member and first contact means can be rotatively oriented to effectuate proper mating of said respective contact means.

2. A connector in accordance with claim 1 including enlarged elements on said lanyard ends, said inner sleeve member having radially directed apertures at said diametrically opposite locations of a size to receive therein said enlarged elements and said inner sleeve further having axial passages leading into said radially directed apertures from the end of said inner sleeve member that is adjacent said one end of the outer sleeve member, said passages being of a size large enough to accommodate said lanyard and small enough to prevent escape of said enlarged elements to thereby anchor said lanyard ends.

3. A connector in accordance with claim 2 in which said first coupling means includes a ring member retained in a fixed relationship with said first shell member and said first contact means, a plurality of bayonet pawls pivotally mounted to said ring member, said ring member having an axially directed slot for each of said pawls so that said pawls normally pivot outwardly against the interior of said outer sleeve and are thus limited thereby, and a plurality of radially projecting lugs on the shell member of said second component engageable with said pawls, there being a lug for each of said pawls.

4. A connector in accordance with claim 3 in which said outer sleeve member has indicia thereon and said first shell member also has indicia thereon, said respective indicia being in registry when said lugs are in latched engagement with said pawls.

5. A connector in accordance with claim 4 in which the indicia on said outer sleeve member constitutes at least one notch formed in the end thereof adjacent said lanyard and the indicia on said first shell member constitutes a corresponding number of notches formed in the shoulder of said shell member.

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6. A connector in accordance with claim 3 in which said outer sleeve member has indicia thereon adjacent the end thereof opposite said lanyard and said second shell member also has indicia thereon near the end thereof having said lugs, said respective indicia being in registry 5 when said lugs are in latched engagement with said pawls.

7. A connector in accordance with claim 6 in which the indicia on the outer sleeve member constitutes at least one longitudinal line and in which the indicia on said second shell member constitutes a corresponding number 10 of lines.

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RICHARD E. MOORE, Primary Examiner

U.S. Cl. X.R.

89—1.811; 339—113, 186

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(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,496,519 Dated February 17, 1970

Inventor(s) Ottomar H. Vetter

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 12, "shoulder" should be --shorter--;
line 33, delete "a" (second occurrence).

SIGNED AND
SEALED
JUL 14 1970

(SEAL)

Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents