

**March 28, 1939.**

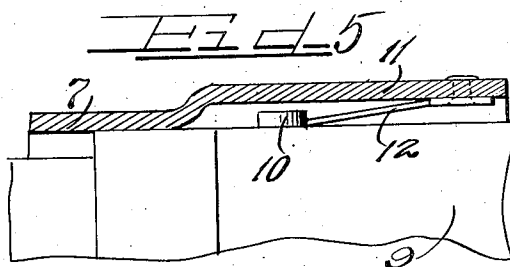
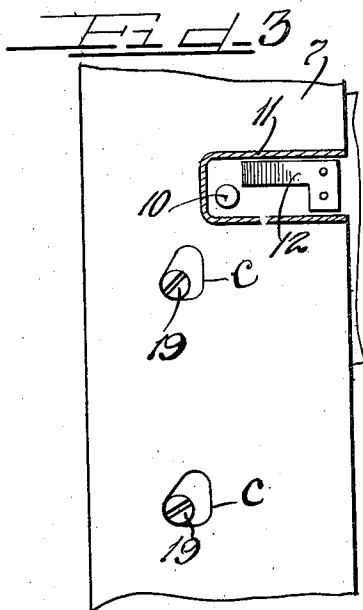
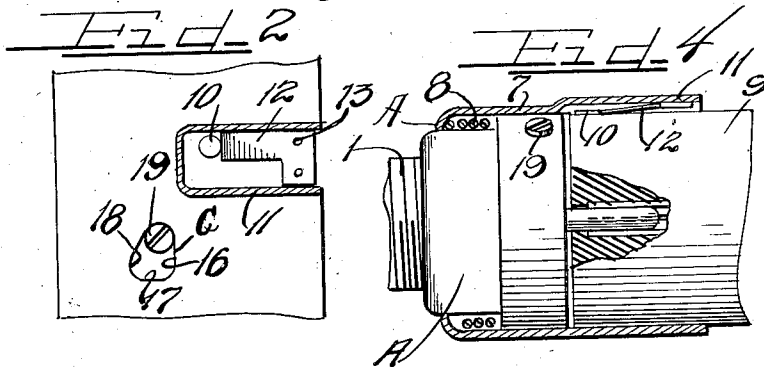
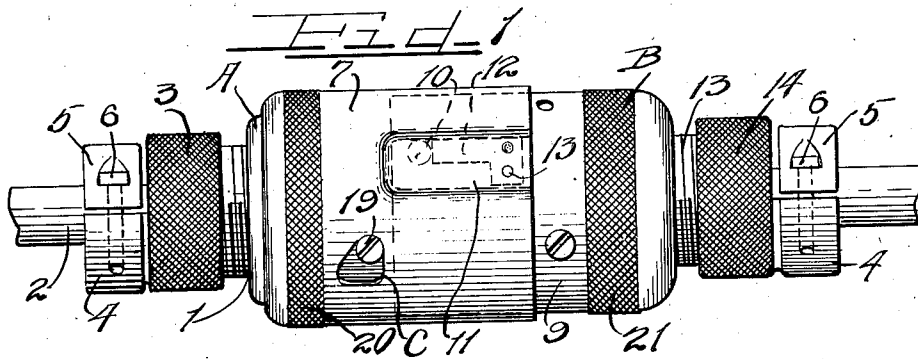
W. A. WULLE

**2,152,125**

AUTOMATIC UNLOCKING SEPARABLE CONNECTOR

Filed Aug. 2, 1937

2 Sheets-Sheet 1



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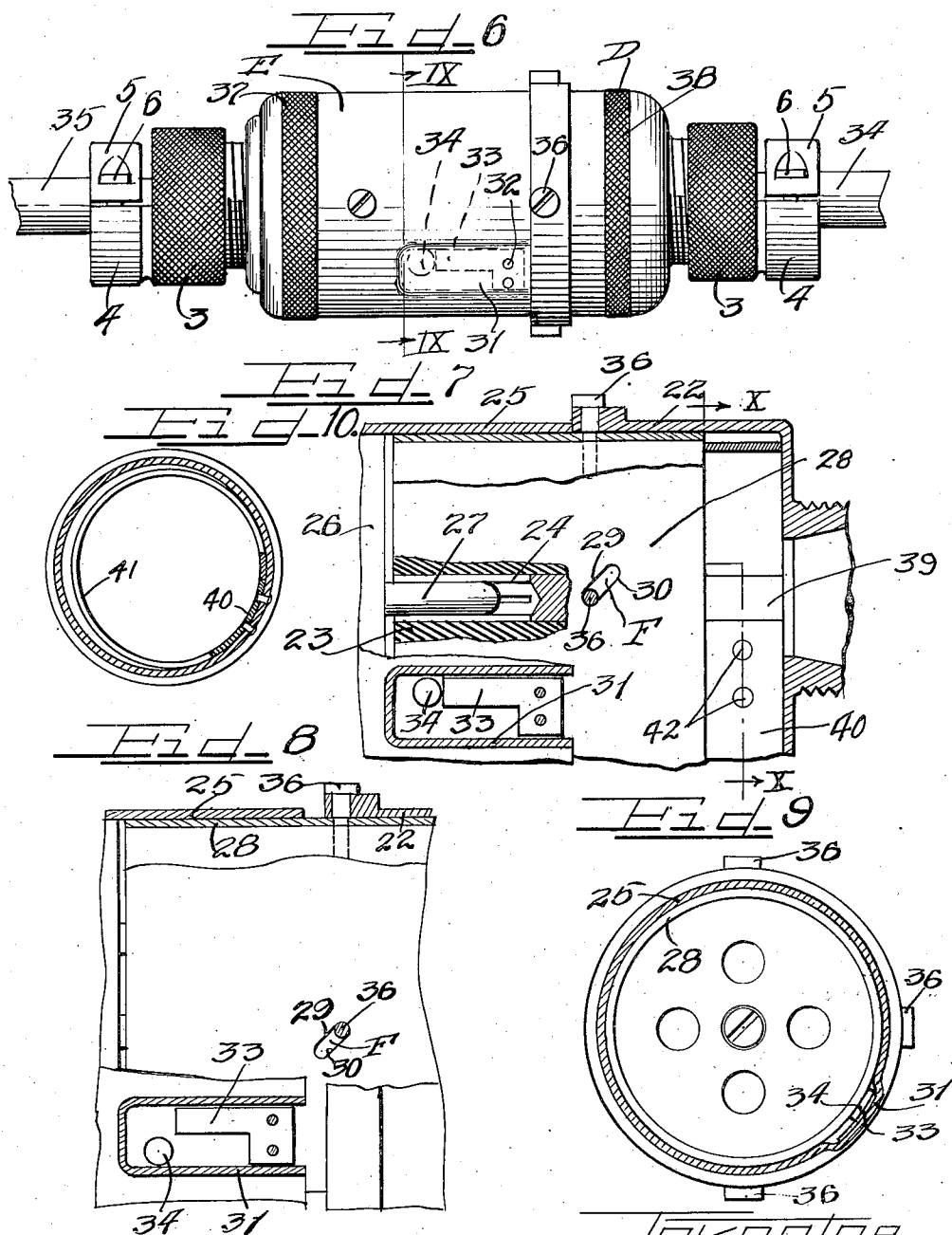
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AUTOMATIC UNLOCKING SEPARABLE CONNECTOR

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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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AUTOMATIC UNLOCKING SEPARABLE  
CONNECTOR

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8 Claims. (Cl. 173—328)

The present invention relates to an automatic unlocking separable connector and has more particular reference to two-part separable electrical connectors which are coupled and uncoupled by relative endwise movement and relates to means for automatically uncoupling the members when abnormal pull is applied to the cables connected to said members.

The separable connectors of the present invention are particularly useful in making electrical connections between trucks and trailers, in connecting electrical apparatus to main lines, also for use with thermal couplings, ignition equipment, remote control, lighting, and motor fixtures.

The connectors of the present invention are small, of light weight, and are positive locking, and so constructed as to prevent accidental disengagement of the parts, under any normal pulling strains imposed on the cables connected to the members of the connector.

An object of the present invention is to provide an improved construction for such separable connectors whereby disengagement of the parts is prevented, under normal conditions of use, and whereby the parts may be automatically disconnected when subjected to severe pulling strains.

Another object of the present invention is to provide an improved construction for two-part electric separable connectors, which are normally connected together against endwise separation by locking means, one of which is carried by a sleeve mounted for limited rotative movement on its member and which construction enables automatic uncoupling of the members on occurrence of abnormal pull imposed on the cables to such members before the pulling force builds up to a point where the cables might be torn loose from the members of the connectors.

A further object of the present invention is to provide in a separable electric connector provided with means for automatically locking together of the parts, with means for automatically unlocking the parts when abnormal pull is imposed in a direction tending to separate the parts.

A still further object of the present invention is to provide, in a separable electrical connector of the type utilizing a sleeve arranged for limited rotative movement for locking purposes, means for automatically moving the sleeve in unlocking direction on the occurrence of abnormal pull applied to the cables connected to the parts of the connector.

The above, other, and further objects of the present invention will be apparent from the following description and accompanying drawings.

The accompanying drawings illustrate embodiments of the present invention, and the views thereof are as follows:

Figure 1 is an elevational view of a separable connector made in accordance with the principles of the present invention and showing the two parts of the connector in coupled or engaged position, and illustrating in dotted lines the means for locking the members together in such position.

Figure 2 is a fragmental developed elevational view, with parts in section, of the members as illustrated in Figure 1, with the parts in locked engagement.

Figure 3 is a view similar to Figure 2 with the parts appearing as when automatically unlocked.

Figure 4 is a view, partially in axial section, and partially in elevation, of the arrangement of Figure 1, the section being taken substantially through the hood of Figure 1.

Figure 5 is an enlarged fragmental sectional view, with parts in elevation, showing the manner of locking the members of a connector together.

Figure 6 is a view similar to Figure 1, in which the sleeve capable of limited rotative movement is carried by the receptacle end of the connector.

Figure 7 is a fragmental view, partially in axial section and partially in horizontal section, showing the relationship of the parts of the connector of Figure 6 when in locked position and with the sleeve in one position.

Figure 8 is a view similar to Figure 7 with the sleeve moved to automatic unlocking position.

Figure 9 is a transverse sectional view taken substantially in the plane indicated by line IX—IX of Figure 6.

Figure 10 is a section taken along line X—X of Figure 7, showing a spring for holding the sleeve in normal or locking position.

The drawings will now be explained.

In the form of the invention illustrated in Figures 1 to 5 inclusive, the sleeve capable of limited rotative movement is on the plug member, whereas the form of the invention illustrated in Figures 6 to 9 inclusive has the sleeve capable of limited rotative movement on the receptacle member.

For convenience in terminology, the receptacle member is herein used to designate that member carrying the female contacts, while the plug member is the one carrying the plug contacts.

In the main, the present invention is described and illustrated with the separable electric con-

nectors of the type illustrated in T. E. McDowell Patent No. 2,015,953, dated October 1, 1935.

The plug member A includes an insulating body of suitable shape and form carrying the necessary number of plug contacts as may be desired.

The receptacle member B is provided with an insulating body carrying the requisite number of female contacts.

The plug A is provided with a neck 1 through which a cable 2 passes to the interior of the plug to the plug contacts, in the usual manner. The neck is exteriorly threaded to receive a strain relief clamp 3 which is shaped to bear against a wedge-shaped rubber washer within the neck and surrounding the cable to clamp the cable to the neck. In addition, there is a semi-circular portion 4, integral with the part 3, for surrounding a portion of the cable 2, with which cooperates a yoke 5 secured to the part 4 by means of bolts 6, as an additional clamping means for the cable, so that any endwise pull applied to the cable will be absorbed by the strain relief fittings at the neck and removed from the contact connections within the plug.

About the body of the plug A is a sleeve 7 which is adapted for limited rotative movement on the body of the plug. The right hand end of the sleeve 7 is adapted to telescopically receive the receptacle member B, when the members are forced by relative endwise movement to effect electrical connection between their contacts. A spring 8 surrounds the body of the plug A, and is so connected to the sleeve 7 as to urge the sleeve in one direction of rotative movement. This direction of rotative movement is such as to normally align the locking members to maintain the connector members in coupled relation.

The receptacle B includes, as before stated, a suitably shaped insulating core carrying the female contacts within a metallic shell 9. Adjacent the entering end of the shell 9 is a pin 10, constituting one of the locking members.

The sleeve 7 is formed with an axially extending hood 11 open at its entering end, within which is secured a springy tongue 12 having one end secured to the inner surface of the top of the hood 11 as by rivets 13 and its other end normally bent away from the top of the hood and lying in the path of the pin 10.

The receptacle B is provided with a neck 13 and strain relief clamps 4 and 5 of the same general character as described with reference to the plug.

The sleeve 7 is provided with a plurality of triangularly shaped slots C formed with similar margins 16 extending circumferentially of the sleeve, other margins 17 extending axially of the sleeve, and inclined margins 18 which are inclined with respect to the axis of the sleeve. Secured to the bodies of the plugs are screws 19 so disposed that the heads thereof, when the sleeve is in normal position, lie in the angles between the margins 16 and 18 of the slots.

The plug and receptacle, A and B, of the form of the invention illustrated in Figure 1, are connected together by relative endwise movement with the pin 10 moving underneath the springy tongue 12 until the parts are in connected position, whereupon the end of the spring snaps behind the pin to thus lock the two parts together in coupled relation. This coupling is achieved without any rotative movement of the sleeve.

To uncouple, the operator grasps the receptacle in one hand and the sleeve in the other hand and gives the sleeve a slight twist, circumferentially of the plug, which thereby moves the

engaging end of the springy tongue 12 away from against the pin, whereupon the parts or members may be then separated by relative endwise movements. During such rotative movement of the sleeve, as described, the margins 16 of the several slots C move along the screws 19 in circumferential direction.

The tension of the spring 8 is sufficient to prevent rotative movement of the sleeve 7 under normal use of the connector and to prevent separation of the parts under pulling strains imparted to the cables incidental to normal uses of the extension line.

However, should an abnormal pulling force be applied to the cables, if the plug and receptacle parts were positively connected together against endwise separation, the chances are that one of the cables would be pulled out of its part causing fireworks and attendant shutting down of the line until repairs were made.

The construction of the present invention is such that whenever abnormal pull is applied to the cables, greater than that ordinarily attendant on the normal use of any branch electrical lines, and less than that which would result in pulling the cables out of the connector parts, such abnormal pull tends to pull the sleeve 7 to the right, as viewed in Figures 1 to 3 inclusive, thus creating pressure between the inclined margins 18 of the slots C and the screws 19. Such pressure causes rotative movement of the sleeve in reverse direction, or in unlocking direction, such that the locking parts are automatically disengaged thereby allowing automatic uncoupling of the parts of the connector.

Figure 3 shows the relationship of the parts when the sleeve 7 has been moved axially, and also circumferentially, as occasioned by engagement of the inclined margins 18 of the slots C against the screws 19. As soon as the pin 10 is freed from engagement with the springy tongue 12, the receptacle and plug members will separate, and the spring 8 will then normally rotate the sleeve to its normal position, which is that shown in Figures 1 and 2.

Preferably, although not necessarily, there are three of the triangular slots C per sleeve, as it has been found that the provision of three such slots enables ready disconnection of the connector parts by abnormal pull imposed on the cables.

In order to facilitate hand rotation of the sleeve 7, the sleeve may be knurled as at 20, and the receptacle may be knurled as at 21.

In the form of the invention illustrated in Figures 6 to 9 inclusive, the receptacle D is provided with a metallic casing 22 surrounding the insulating body 23 which carries the female contacts 24. The plug E is provided with a metallic casing 25 surrounding the insulating core 26 which carries the male contacts 27.

Supported within the casing 22 of the receptacle D, is a sleeve 28 adapted for limited rotative movement. The sleeve 28 is provided with a plurality of slots F shown as having inclined margins 29 and 30, which are illustrated as parallel. These slots are inclined to the axis of the sleeve.

The sleeve E of the plug is provided with an axially extending hood 31, open at its outer end, and within which is riveted as at 32 a springy tongue 33. The sleeve 28 of the receptacle is provided with a pin 34 for cooperating with the extremity of the springy tongue 33 to latch the plug and receptacle E and D together in coupled relation.

The sleeve E of the plug may be mounted on 75

the plug body for limited rotation, relatively to the same, or else may be fixed against rotation.

The receptacle and plug, D and E, are connected together by endwise movement with the pin 34 on the receptacle riding underneath the springy tongue 33 until the parts are in fully engaged position, whereupon the free end of the spring will snap behind the pin thus locking the two parts together in coupled relation.

In this form of the invention the plug and receptacle are connected by endwise movement, and during such movement the sleeve 28 does not rotate.

In the event abnormal force should be imposed on the cables 34 and 35 connected respectively to the receptacle D and the plug E, the pull thus occasioned will cause the inclined margins of the slots F of the sleeve 28 to so bear against the pins 36, riding in the slots, as to impart rotative movement to the sleeve in unlocking direction, moving the sleeve from the locking position of Figure 7 to the unlocked position of Figure 8.

With the sleeve 28 thus automatically rotated, the plug and receptacle become automatically disconnected or uncoupled.

In order to uncouple the plug and receptacle, E and D, by hand, the operator grasps the sleeve E in one hand and the receptacle D in the other and rotates the same to move the pin 34 out of engagement with the springy tongue 33, whereupon the parts may be then separated by endwise movement. To assist in uncoupling the parts D and E by hand, the part E may be knurled as at 37, and the part D at 38.

The receptacle D and the plug E may be provided with the similar strain relief fittings as described with respect to Figure 1, for securing the cables 34 and 35 against displacement due to abnormal pull.

In some automobile assembly plants, where cars are assembled on moving lines, electrical tools are employed and usually are connected to trolleys which carry the live conductors. Experience has demonstrated that workmen, using tools attached to such trolleys, normally yank the cables between the tools and the trolleys to move the trolleys along the tracks so that the tools may follow the work. Some times a tool may be left in an automobile as it leaves the production line. As the car is pushed off the line the trolley reaches the end of the overhead track, and stops. In such event, as the connected tool is still moving with the car, either the cables must be pulled out of the plug or damage be done to the trolley system. When a cable is pulled out of a plug, fireworks and short circuit occur, something the industry desires to avoid, as production is curtailed until repairs are made.

The connectors of the present invention lend themselves very readily to such uses, as because of the automatic uncoupling means of the present invention whenever an abnormal pulling strain is imposed on the cables, the members of a connector automatically separate without destruction to the cables or the connections to the contacts of the connectors.

Referring to the form of the invention shown in Figures 6 to 10 inclusive, the inner end of the sleeve 28 is provided with a tail piece or lug 39 extending between it and the adjacent end of the casing 22. One end 40 of a flat, curled spring 41 is riveted at 42 to the casing shell. The spring is curled within the casing between the sleeve 28 and the casing end, as may be observed in Figure 10, and with its other end against the lug 39.

normally urging the sleeve 28 in clockwise direction (Figure 10), so that the lug 39 abuts the one end 40 of the spring, as a stop. The spring normally holds the sleeve 28 in the position shown in Figure 7.

When endwise pull is applied to the cables, and is of abnormal amount, the sleeve 28 will rotate on the casing 22 to the position of Figure 8. Such movement would be counterclockwise as viewed in Figure 10, expanding the spring 41 slightly. As soon as the pin 34 is, by such sleeve movement, moved out of engagement with the tongue 33, the connector members separate, whereupon the spring 41 functions to return the sleeve 28 to its normal or locking position.

The present invention has been described herein in more or less precisely as to details, yet it is to be understood that the invention is not to be limited thereby, as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted, without departing from the spirit and scope of the invention.

The invention is claimed as follows:

1. A separable electric connector comprising a plug member and a receptacle member, a sleeve on one of said members capable of limited rotative and axial movement with respect to said one member, locking means including a pin and a springy tongue, one of said locking means being carried by said sleeve, spring means normally urging said sleeve in one direction of rotation and one direction of axial movement to maintain said tongue and pin in aligned relation when said members are in assembled and connected relation and while they are being moved into assembled relation, said sleeve being rotatable in reverse rotative direction to unlock said members, and means effective when pull is applied to said members in a direction to separate them for causing rotative movement of said sleeve in the reverse rotative direction to automatically unlock said members to permit separation of the same when a pull is applied to said members to separate them.

2. A separable electric connector comprising two connectable members adapted to be coupled and uncoupled by relative endwise movement, plug and socket contacts carried by said members, a sleeve on one of said members capable of limited rotative movement with respect to its member, said sleeve and the other of said members having cooperating locking elements for holding said members in coupled relation, said members being adapted to be assembled in coupled relation without rotative movement of said sleeve and adapted to be uncoupled by rotative movement of said sleeve, a spring urging said sleeve in rotative direction to maintain it in locked coupled relation when said members are in assembled position, and means including a pin and an inclined slot margin for causing rotative movement of the sleeve in the opposite direction of rotation to automatically unlock said members when said members are subjected to a pulling force tending to separate them.

3. A separable electrical connector comprising plug and receptacle members connectible and disconnectible by relative endwise movement, means to normally lock said members in assembled relation, said means including a sleeve mounted on one of said members and arranged for limited rotative movement thereon to move it out of locking position, spring means normally urging said sleeve to locking position, a pin on said one member, said sleeve being provided with

means defining a slot having an inclined margin working against said pin, said margin being forced against said pin to automatically rotate said sleeve to unlocking position when endwise pull is applied to the connected members to overcome the effect of said spring.

4. A separable connector including a plug member and a receptacle member adapted to be connected and disconnected by relative endwise movement, means for normally locking said members together and including a sleeve carried by one of said members and arranged thereon for limited rotative movement in one direction of movement to unlock said members, means carried by said one of said members normally urging said sleeve in an opposite direction of movement, and means carried by said members co-operable to rotate said sleeve to unlocking position when an abnormal endwise pull is applied to separate the connected members.

5. A separable electric connector including a pair of members carrying plug and socket contacts, respectively, and adapted for connection and disconnection by relative endwise movement, a sleeve on one of said members, means to normally lock said members in assembled relation, said locking means including an element carried by said sleeve, said sleeve being arranged for limited rotative movement in one direction of movement on that member to unlock said members, means normally urging said sleeve in an opposite direction of movement, and means carried by said members arranged to move said sleeve in said one direction to unlock said members in response to abnormal force applied to separate said members.

6. A separable electric connector comprising a pair of members carrying plug and socket contacts, respectively, and adapted for connection and disconnection by endwise relative movement, an elongated sleeve on one of said members, means to normally lock said members in assembled relation and comprising co-operable locking elements, one of said elements being carried by said elongated sleeve, said sleeve being arranged for limited rotative movement in one direction of movement on said one member to unlock said pair of members, means normally urging said

sleeve in an opposite direction of movement, said sleeve being provided with means defining a slot having a margin inclined to the longitudinal axis of the sleeve, and a pin on said one of said members and engageable by said inclined margin to compel rotation of said sleeve to unlock said pair of members in response to abnormal force applied to separate said members.

7. A plug and receptacle type of connector comprising a pair of members adapted to be connected and disconnected by relative endwise movement, means carried by said pair of members to normally lock them together in assembled relation, the locking means carried by one of said members being arranged for limited rotative and axial movement on that member, means normally urging the locking means carried by said one member in one direction of rotative movement and also in one direction of axial movement, said locking means carried by said one member being arranged movable in an opposite direction of axial movement in response to an abnormal force applied to said pair of members to separate them, and means effective when said locking means on said one member moves axially in response to the applied force to rotate said locking means in an opposite direction of rotative movement and cause release of said pair of members.

8. A separable electric connector comprising an elongated plug member and an elongated receptacle member adapted to be coupled and uncoupled by relative endwise movement, means to normally hold said members in locked assembled relation and arranged to effect release of said members when an abnormal pull is applied in use to said members to separate them, said means including a locking element on one of said members and arranged for limited rotative movement about the longitudinal axis thereof, means normally urging said element in one direction of rotative movement, and means to compel movement of said element in an opposite direction of rotative movement to unlock said members upon relative endwise movement of said members, while in locked relation, due to an abnormal pull applied to said members.

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