March 1, 1966 J. H. BATCHELDER 3,237,977

CONNECTOR

Filed May 15, 1963 2 Sheets-Sheet 1

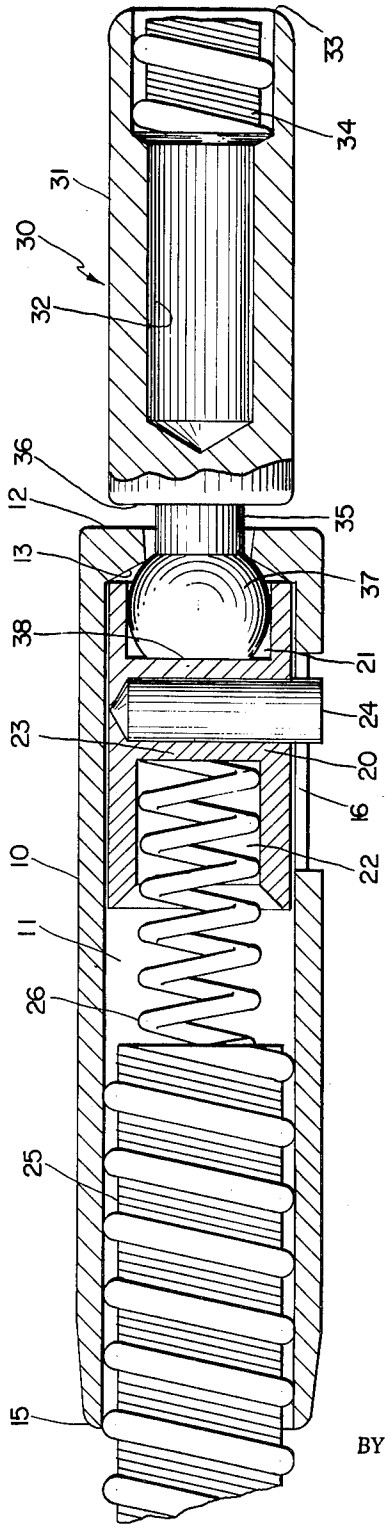


FIG. 1

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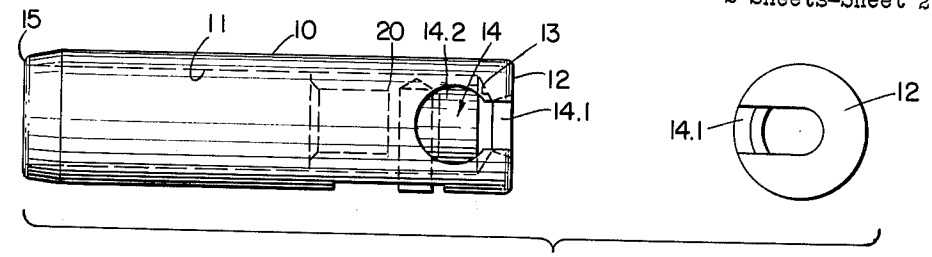


FIG. 2

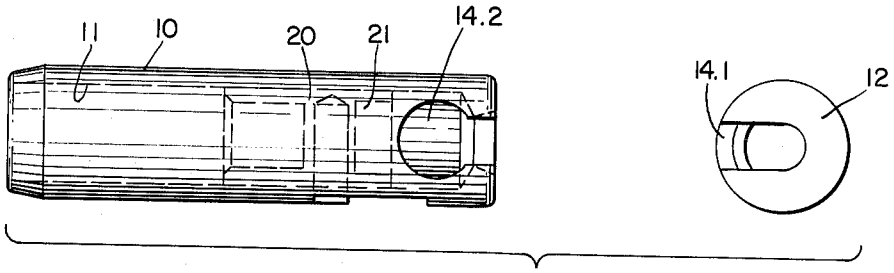


FIG. 3

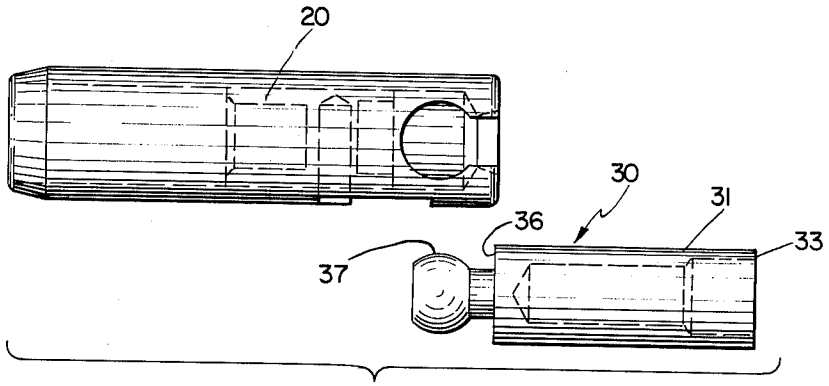


FIG. 4

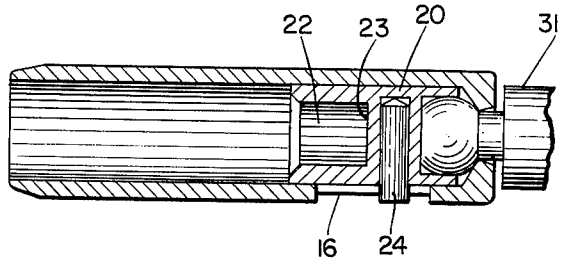


FIG. 5

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CONNECTOR

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2 Claims. (Cl. 287—119)

The present invention relates in general to mechanical connectors for detachably fastening two parts to each other, and more particularly to connector means for joining together two elongate members.

Connectors according to the present invention are particularly suitable for use in radiographic apparatus, as described, for example, in U.S. Patents Nos. 2,916,628 and 2,976,423. Such apparatus is of the type which employs an encapsulated source of radioactive energy, a shielding storage unit, an exposure unit, and the combination of flexible tubes and flexible cables for moving (e.g., pushing and/or pulling) the source between the storage unit and the exposure unit.

It is an object of the present invention to provide new and improved mechanical connectors for detachably fastening two elongate flexible members to each other. It is another object of the invention to provide such a connector which may be used to transmit pushing as well as pulling motion from one of said members to the other. General objects are to provide such connectors which are rugged, flexible, simple in design and positive in action, and which particularly will be suitable for use in the handling of radioactive material for radiographic purposes.

In general according to the invention there is provided connector means for joining together two elongate members comprising an elongated receptacle member having an axial bore therein opening at least through one end thereof and an internal converging shoulder at said one end reducing the size of said bore at said one end, an opening into said bore through the side of said receptacle member and said shoulder extending from said one end a distance toward the other end and being enlarged toward said other end, a slide member telescopically fitted within said receptacle member and axially slidable in said bore, said slide member being too large to pass through the part of said bore of reduced size defined by said shoulder, said slide member having a recess in the end thereof confronting said shoulder and opening substantially in register with said reduced-size part of said bore, said recess being of greater cross-section than said reduced-size part of said bore, the wall of said slide member bounding said recess substantially blocking the enlarged portion of said opening when said slide member substantialy abuts said shoulder, resilient means in said bore yieldingly urging said slide member toward said shoulder, means to move said slide member away from said shoulder against said resilient means to unblock said enlarged portion of said first opening, a plug member having a stem and an enlarged end, said stem being smaller in cross-section and said enlarged end being larger in cross-section than the reduced-size part of said bore, said stem being dimensioned to pass through said opening, and said enlarged end being dimensioned to pass through only the enlarged portion of said opening, and said recess in said slide member being dimensioned to receive said enlarged end, whereby said receptacle member and said plug member may be manipulated for engagement or disengagement through said first opening by moving said slide member away from said shoulder, and will be retained in engagement by said slide member abutting said shoulder.

The invention will now be described in connection with the embodiment illustrated in the accompanying drawings, wherein:

FIG. 1 is an axial section showing the receptacle member and the plug member connected together;

FIG. 2 diagrammatically shows a partial side view and an end view of the receptacle member in a first, or "closed" condition;

FIG. 3 diagrammatically shows similar views of the receptacle member in a second or "open" condition in which it is ready to receive or release the plug member;

FIG. 4 diagrammatically shows a side view of the receptacle member in the "open" condition and the plug member disposed to be engaged therewith; and

FIG. 5 is partly in sections and diagrammatically shows the two members joined as used.

Referring to FIG. 1, the receptacle member 10 has an axial bore 11 through it. The bore is reduced at a first end 12 to provide an internal converging shoulder 13. As shown in FIG. 2, there is a first opening 14 into the bore through the side of the receptacle member and through the shoulder 13, extending from the first end 12 a distance toward the second end 15. This opening has a narrow portion 14.1 opening to the first end 12 and passing through the shoulder 13, and an enlarged portion 14.2 toward the second end 15 of the receptacle member. A second opening 16 into the bore 11 is provided through the side of the receptacle member; this opening is elongated in the long or axial direction of the receptacle member and is closed at both ends.

A slide member 20 is telescopically fitted within the receptacle member 10 an is axially slidable in the bore 11. The slide member 20 is so dimensioned that it is too large to pass through the part of the bore of reduced size at the first end 12, defined by the shoulder 13. The slide member 20 has a first recess 21 in the end thereof confronting the shoulder 13 and opening substantially in register with the reduced-size part of the bore 11. The first recess 21 is of greater cross-section than the reduced-size part of the bore 11. The slide member 20 has a second recess 22 in the other end thereof, and the two recesses 21 and 22 are separated by a barrier part 23 of the slide member. An operator pin 24 is mounted in the barrier part and extends through the second opening 16 through the side of the receptacle member, terminating substantially flush with the outer periphery of the side of the receptacle member. A first cable member 25 is mounted in the bore 11 through the second end 15 of the receptacle member. A resilient coil spring 26 bears at one end on the inner end of the cable and at the other end on the bottom of the second recess 22 in the slide member 20. The spring 26 pushes the end of the slide member 20 bounding the first recess 21 toward the shoulder 13; in this position (which is diagrammatically shown in FIG. 2) the wall of the slide member 20 bounding the first recess 21 substantially blocks the enlarged portion 14.2 of the first opening 14.

By means of the operator pin 24, the slide member 20 may be forced back against the action of the spring 26 to open the enlarged portion 14.2 of the first opening 14, as is diagrammatically illustrated in FIG. 3.

The plug member 30 comprises a body portion 31 having a bore 32 in it opening through a first end 33 to receive a second cable member 34. A stem 35 is mounted

on the second end **36** of the body portion **31**, projecting axially therefrom. An enlarged end **37** is mounted on the stem; this end is generally spherical, but is flattened at the remote end **38**. The stem **35** is dimensioned to pass through the narrow portion **14.1** of the first opening **14** into the bore **11** of the receptacle member **10**; the enlarged end **37** can, however, pass only through the enlarged portion **14.2** of this opening. The first recess **21** in the slide member **20** is dimensioned to receive the enlarged portion **37** of the plug member, and when the enlarged portion **37** is located in this recess, the flattened end **38** rests on the bottom of the recess while the enlarged portion **37** bears on the shoulder **13**, as is shown in FIG. 1 and FIG. 5.

Referring to FIG. 1 or FIG. 5, if a pushing force tending to compress the spring **26** is imposed on the connector, the second end **36** of the body portion **31** of the plug member will act as a plug shoulder and will bear on the first end **12** of the receptacle member **10**. Thus, the connector is resiliently compressible under pushing action between the cable members **25** and **34**. Under pulling action, the plug member enlarged end **37** engages the shoulder **13**. Shock loading is prevented by virtue of the fact that the spring **26** continuously urges these two parts together.

The connector parts **10** and **30** are freely relatively axially rotatable. They are held in positive engagement and, due to the axially-symmetrical shape of the enlarged end **37** of the plug member, and the relative sizes and configurations of the stem **35** and the reduced-size part of the bore **11**, a degree of axial flexibility is imparted to the connector. The two connector parts can normally be separated only by positive manipulative steps, namely, the retraction of the slide member **20** to open the enlarged portion **14.2** of the first opening **14**, and the movement of the plug member **30** sidewise relative to the axis of the receptacle member **10**.

The embodiments of the invention which have been illustrated and described herein are but a few illustrations of the invention. Other embodiments and modifications will occur to those skilled in the art. No attempt has been made to illustrate all possible embodiments of the invention, but rather only to illustrate its principles and the best manner presently known to practice it. Therefore, while certain specific embodiments have been described as illustrative of the invention, such other forms as would occur to one skilled in this art on a reading of the foregoing specification are also within the spirit and scope of the invention, and it is intended that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

What is claimed is:

1. Connector means for joining together two elongate members comprising:

an elongated cylindrical receptacle member having an axial bore therein opening at least through one end thereof and an integral converging shoulder at said one end reducing the size of said bore at said one end;

a first opening into said bore through the side of said receptacle member and said shoulder extending from said one end a distance toward the other end and being slot-shaped at said one end and enlarged to a round shape toward said other end;

a second opening into said bore through the side of said receptacle member, said second opening being elongated in the axial direction of said receptacle member and closed at both ends;

a cylindrical slide member telescopically fitted within said receptacle member and axially slidable in said bore, said slide member being too large to pass through the part of said bore of reduced size defined by said shoulder;

said slide member having a substantially cylindrical recess in the end thereof confronting said shoulder and opening substantially in register with said reduced-size part of said bore;

said recess being of greater cross-section than said reduced-size part of said bore;

the wall of said slide member bounding said recess blocking the enlarged portion of said first opening with said slide member abutting said shoulder;

resilient means in said bore yieldingly urging said slide member toward said shoulder;

operator means extending from said slide member through said second opening whereby said slide member may be moved away from said shoulder against said resilient means to unblock said enlarged portion of said first opening;

a plug member having a body portion, a cylindrical stem and a ball-shaped enlarged end, said stem being smaller in cross section and said body portion and said enlarged end being larger in cross section than the reduced-size part of said bore with said ball-shaped enlarged end located in and contacting the bottom of said recess;

said stem being dimensioned to pass through said slot-shaped part of said first opening, and said enlarged end being dimensioned to pass through only the round enlarged portion of said first opening; and

said recess in said slide member being dimensioned to receive said enlarged end; whereby said receptacle member and said plug member may be manipulated for engagement or disengagement through said first opening by moving said slide member away from said shoulder, will be retained in engagement by said slide member abutting said shoulder under force from said resilient means and will be resisted in movement against said slide member first yieldingly against the resilience of said resilient member and then unyieldingly by contact between said body portion and said reduced-size part of said bore.

2. Connector means for joining together two elongate members comprising:

an elongated cylindrical receptacle member having an axial bore therein opening at least through one end thereof and an internal converging shoulder at said one end reducing the size of said bore at said one end;

a first opening into said bore through the side of said receptacle member and said shoulder extending from said one end a distance toward the other end and being slot-shaped at said one end enlarged to a round shape toward said other end;

a second opening into said bore through the side of said receptacle member, said second opening being elongated in the axial direction of said receptacle member and closed at both ends;

a cylindrical slide member telescopically fitted within said receptacle member and axially slidable in said bore, said slide member being too large to pass through the part of said bore of reduced size defined by said shoulder;

said slide member having a substantially cylindrical recess in the end thereof confronting said shoulder and opening substantially in register with said reduced-size part of said bore;

said recess being of greater cross-section than said reduced-size part of said bore;

the wall of said slide member bounding said recess blocking the enlarged portion of said first opening with said slide member abutting said shoulder;

resilient means in said bore yieldingly urging said slide member toward said shoulder;

operator means extending from said slide member through said second opening whereby said slide member may be moved away from said shoulder against said resilient means to unblock said enlarged portion of said first opening;

a plug member having a body portion, a cylindrical stem and a ball-shaped enlarged end, said stem being smaller in cross section and said body portion and said enlarged end being larger in cross section than the reduced-size part of said bore;

said ball-shaped enlarged end having a flattened surface confronting the bottom of said recess and in contact therewith;

said stem being dimensioned to pass through said slot-shaped part of said first opening, and said enlarged end being dimensioned to pass through only the round enlarged portion of said first opening; and,

said recess in said slide member being dimensioned to receive said enlarged end;

whereby said receptacle member and said plug member may be manipulated for engagement or disengagement through said first opening by moving said slide memger away from said shoulder, and will be retained in resiliently firm engagement by said slide member holding said ball-shaped enlarged end abutting said shoulder, and in contact with said bottom of said recess, such that said connector may be used for pushing, during which said resilient means tends to compress until said body portion comes to bear against said reduced-size part of said bore, as well as pulling, during which said resilient means tends to maintain said enlarged end firmly against said reduced-size part of said bore.

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