

[54] **DEVICE FOR CLAMPING AND TIGHTENING CABLES AND THE LIKE**

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Related U.S. Application Data

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[52] **U.S. Cl.** 254/73

[51] **Int. Cl.** **B66f 7/06**

[58] **Field of Search** 254/51, 68, 69, 70, 73, 254/74, 77-82, 130, 131; 306/2, 19, 28, 40; 287/101; 74/527, 548; 52/148; 51/393; 81/177 R, 177 CT, 177 ST

References Cited

UNITED STATES PATENTS

206,076	7/1878	Blossom.....	254/79
846,389	3/1907	Blackburn.....	306/28
1,473,150	11/1923	Johnson.....	254/73
1,537,070	5/1925	Dixon.....	254/74
2,049,710	8/1936	Livingston.....	254/74
2,516,642	7/1950	Murphy.....	74/527 X

3,455,081 7/1969 Lund..... 254/77 X

FOREIGN PATENTS OR APPLICATIONS

163,424 5/1921 Great Britain..... 254/77
643,564 4/1937 Germany..... 254/74

Primary Examiner—Othell M. Simpson
Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

The invention relates to a device for detachably connecting, fixing and tightening connecting elements, particularly electric cables, wire ropes, chains, belts and the like. The device consists of a housing equipped with a recess with wedge shaped clamping surfaces against which at least one spring-loaded clamping member tightens at least one associated connecting element. The connecting element passes rectilinearly through the housing and may be fitted thereinto from the side. A sleeve or bush is provided for releasing the clamping effect, is displaceable on the housing and surrounds the same wholly or partially. The clamping device may be constructed as a closure in which case the connecting element has a pan-shaped configuration.

12 Claims, 27 Drawing Figures

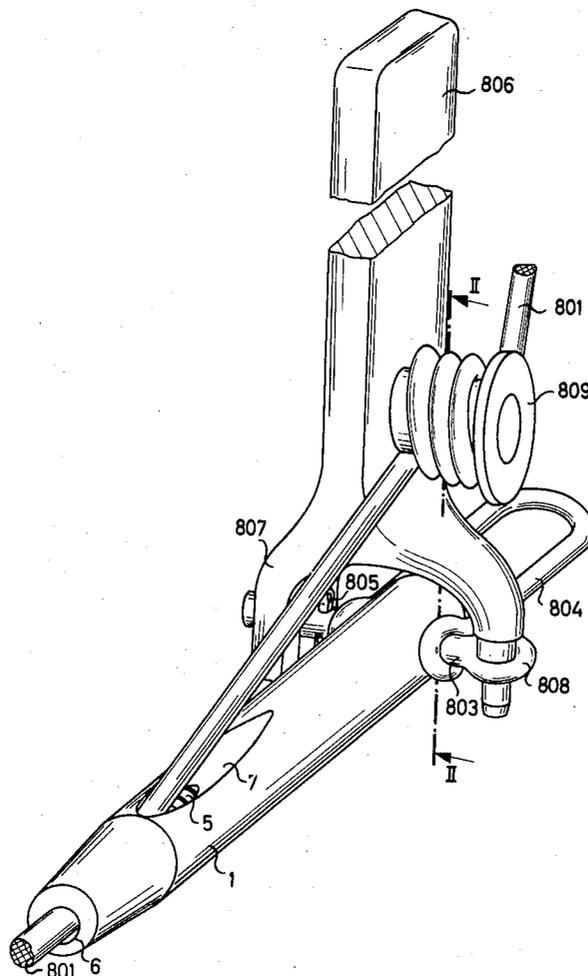


Fig. 1

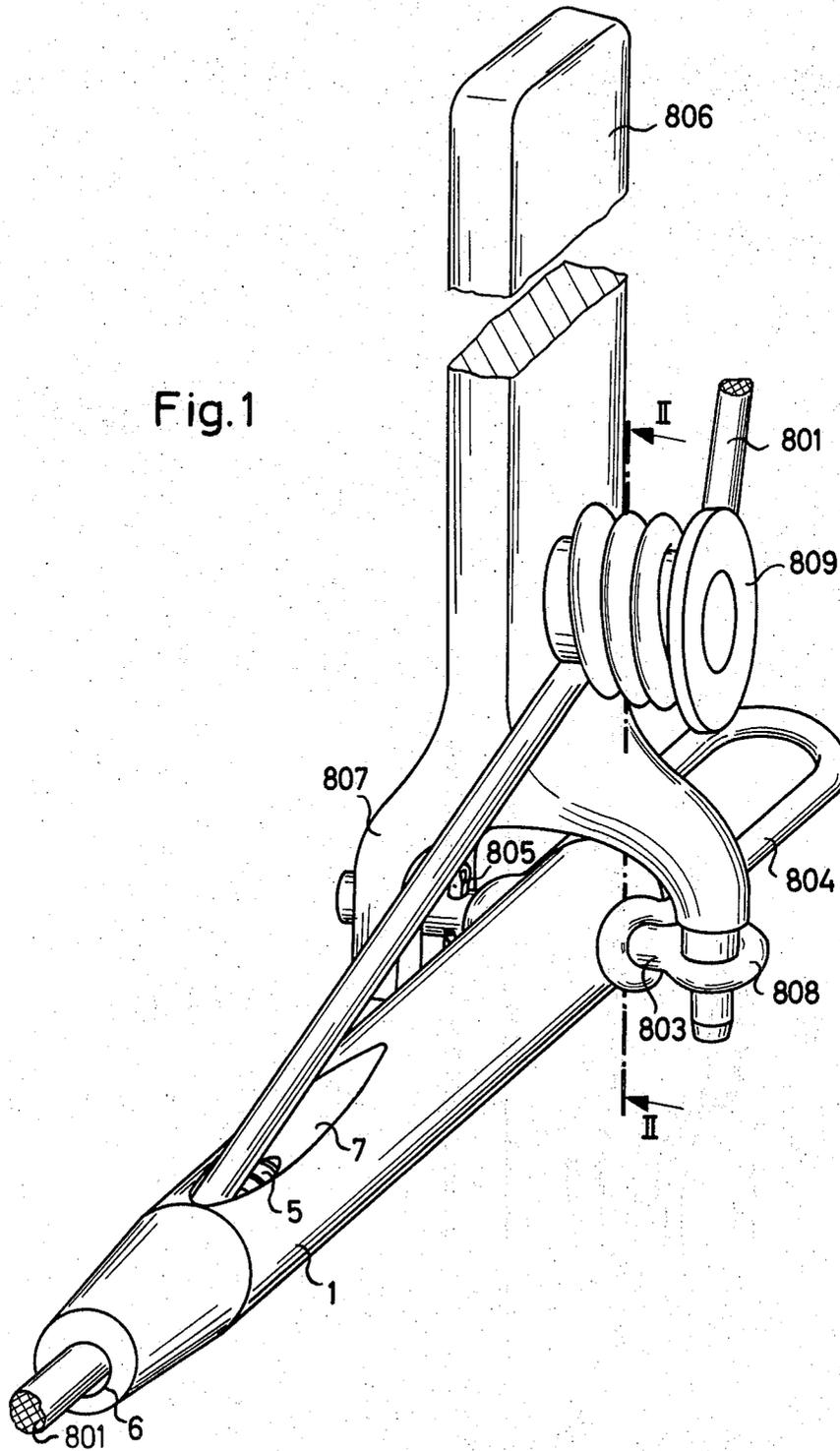


Fig.2

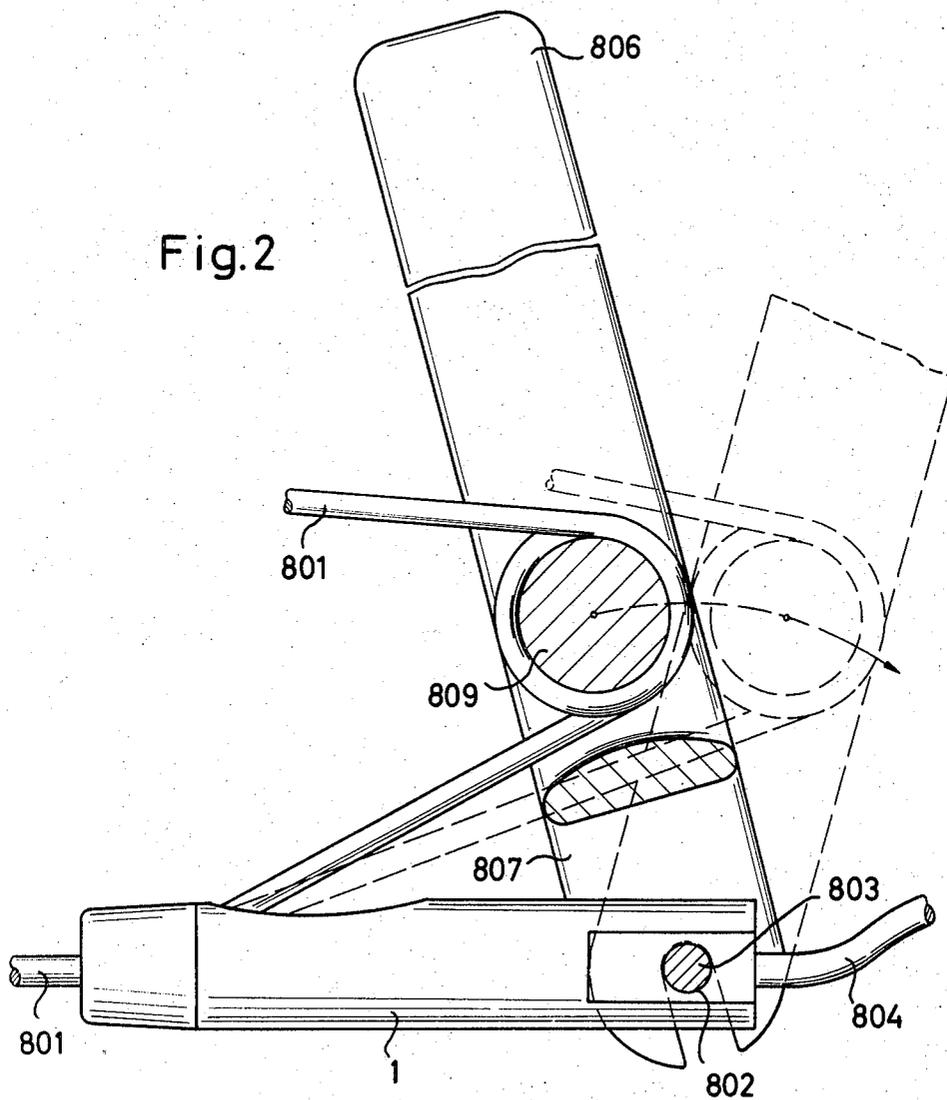


Fig. 3

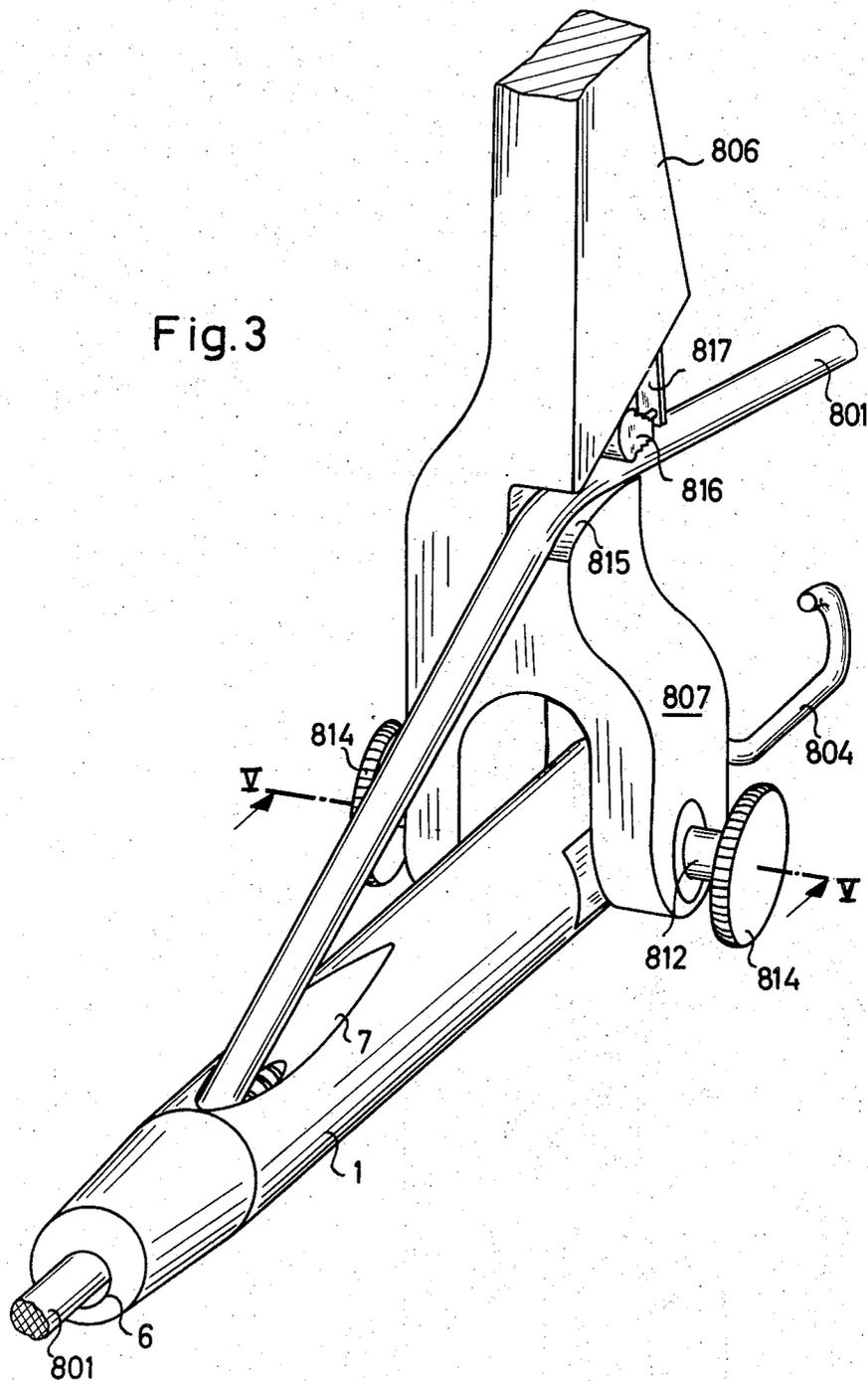


Fig. 4

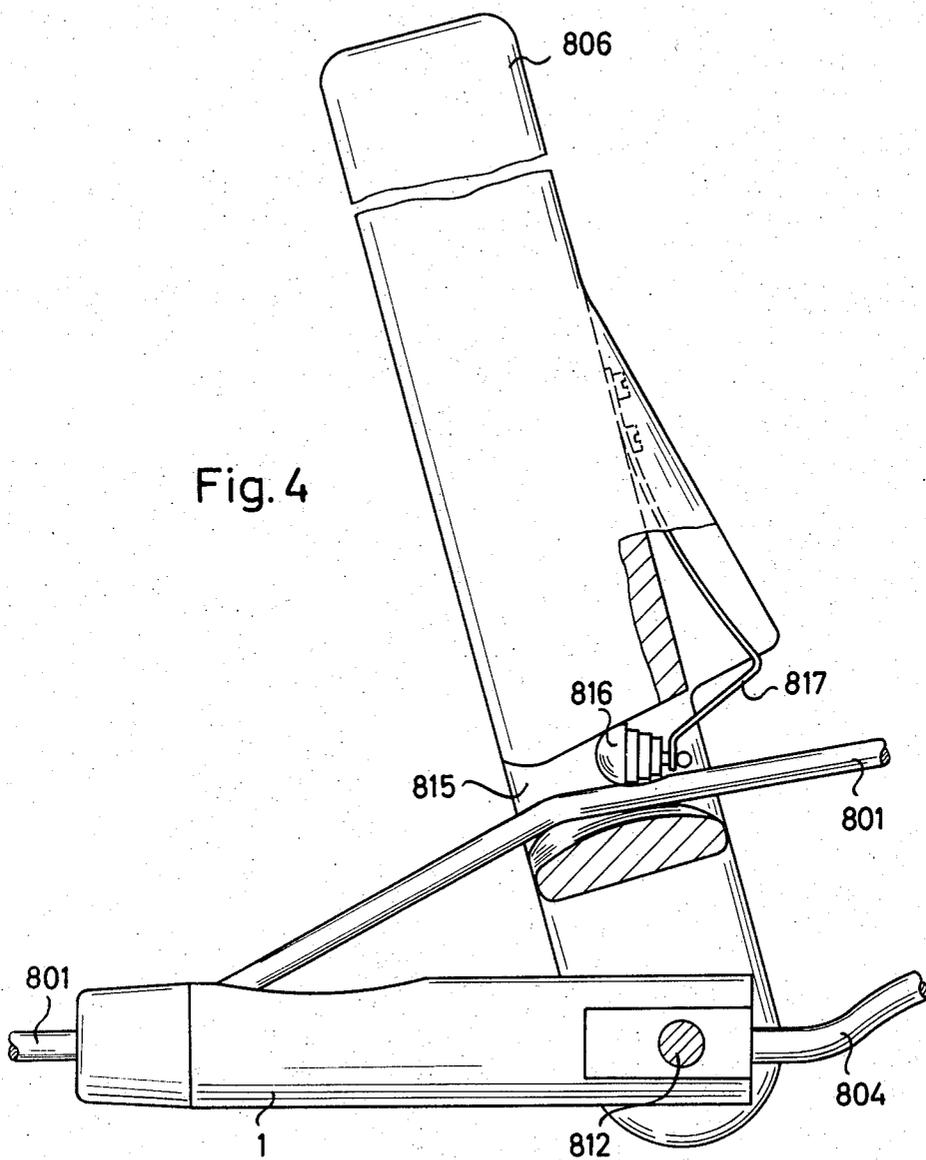


Fig. 5

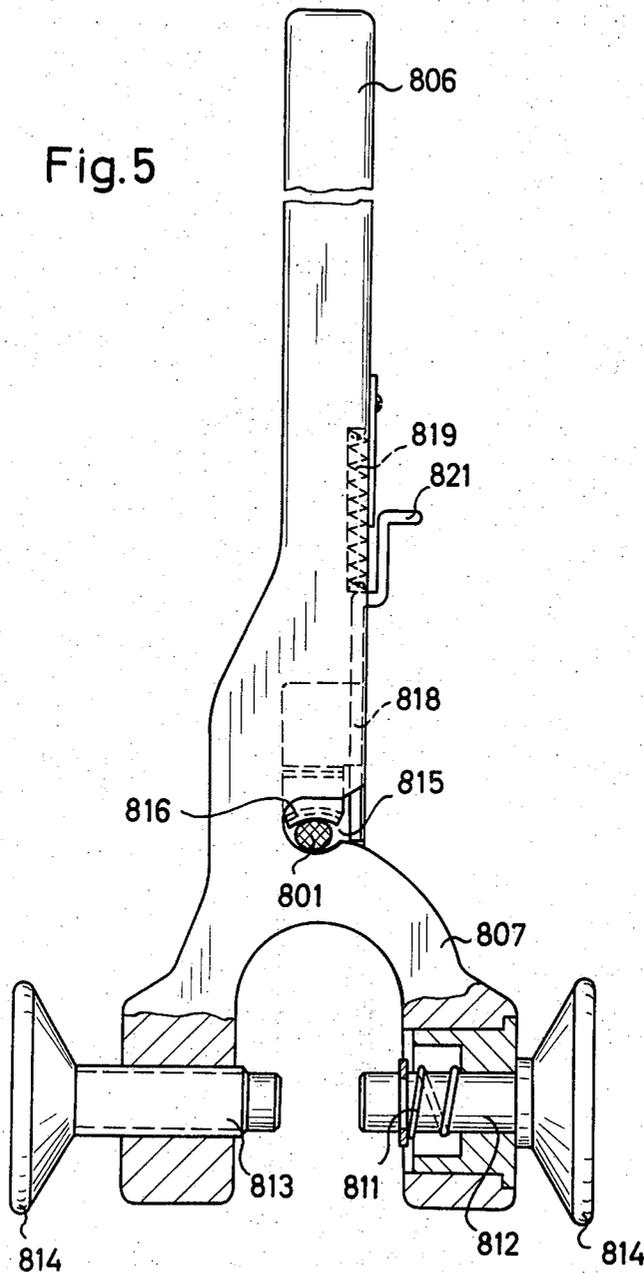


Fig. 6

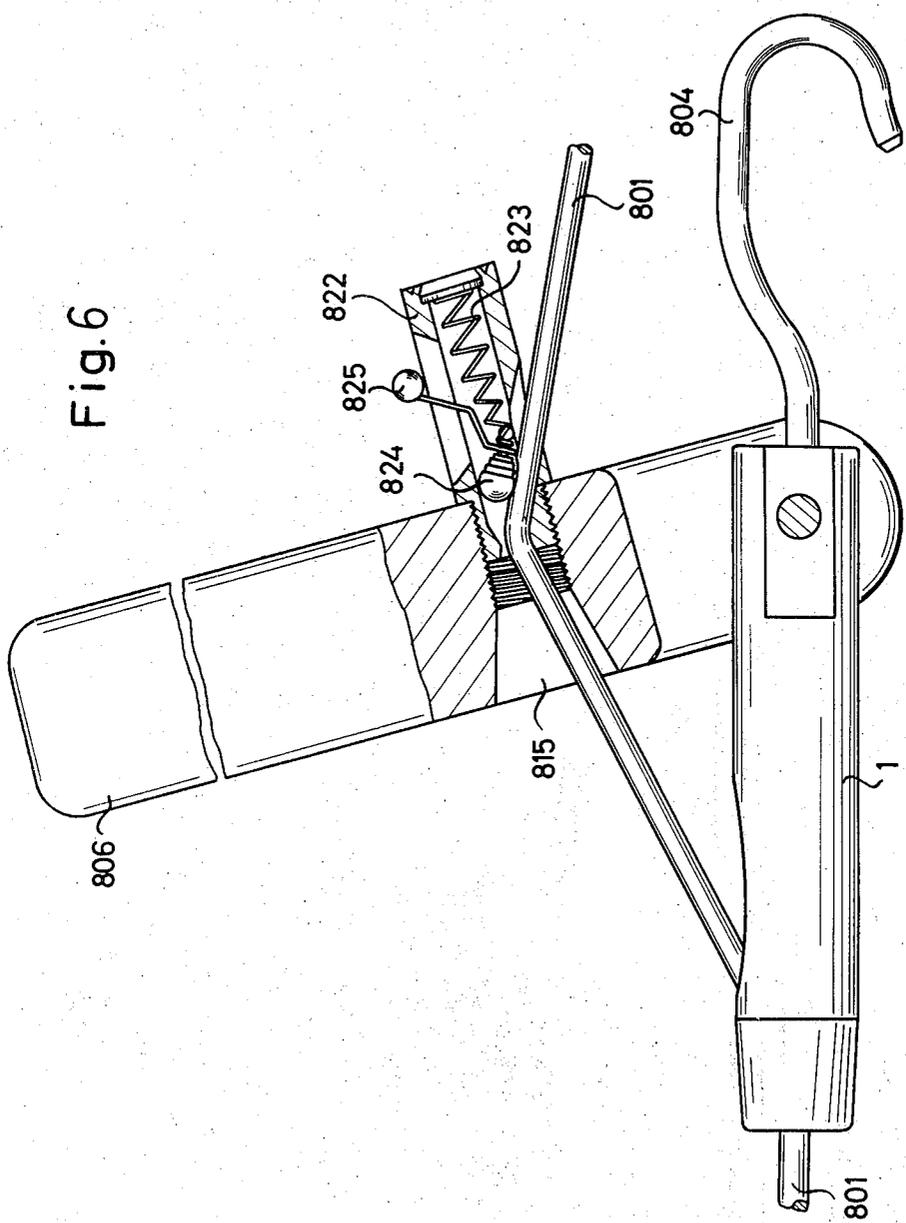


Fig. 7

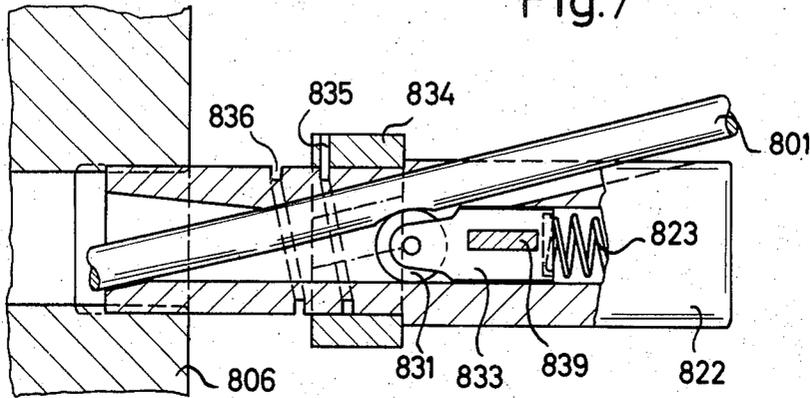


Fig. 8

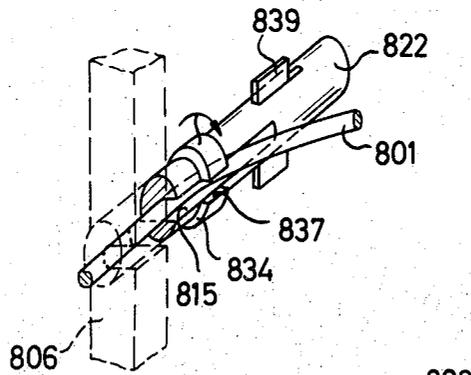
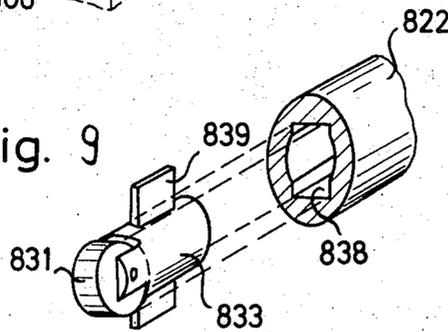


Fig. 9



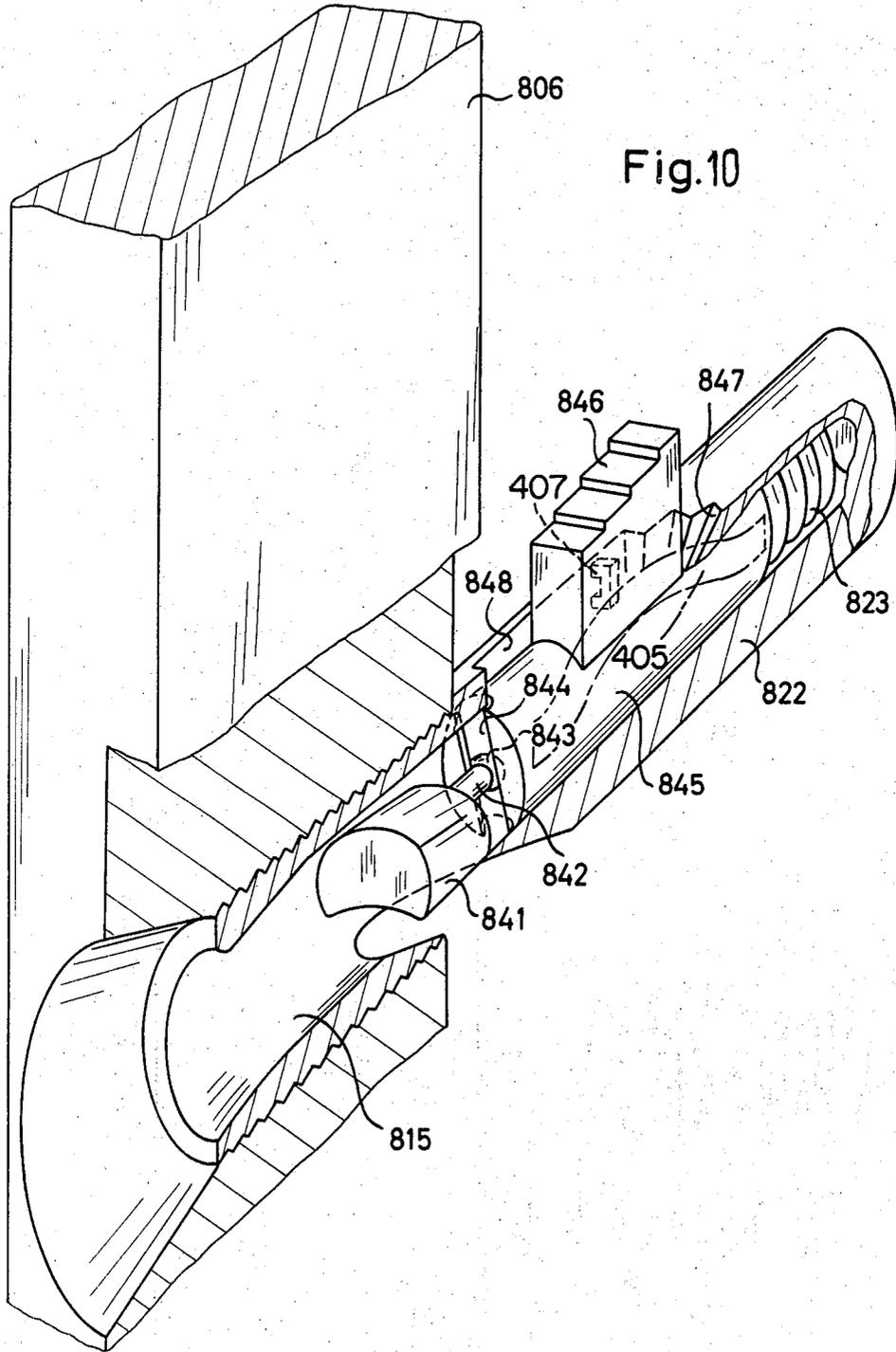


Fig. 11

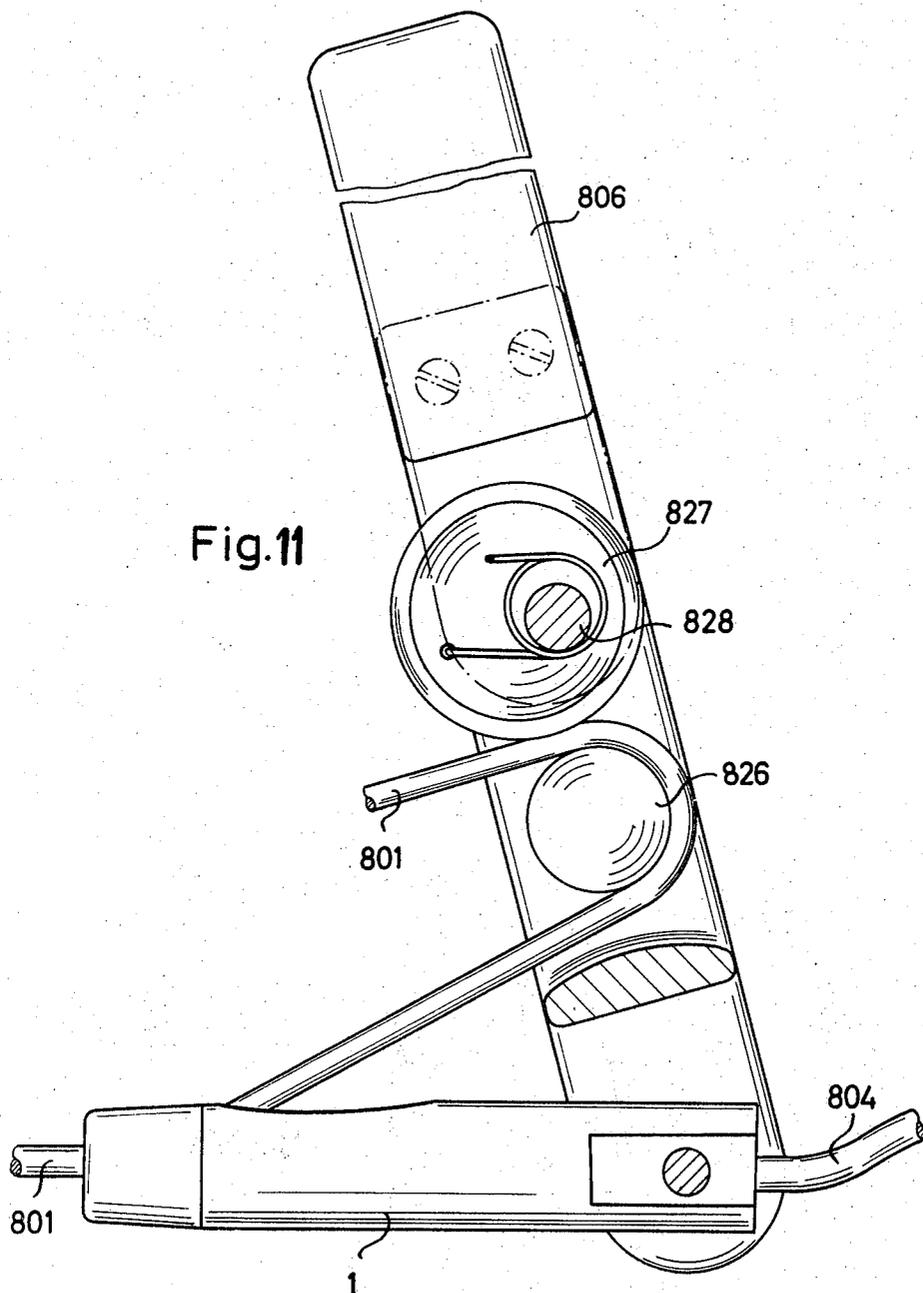


Fig. 12

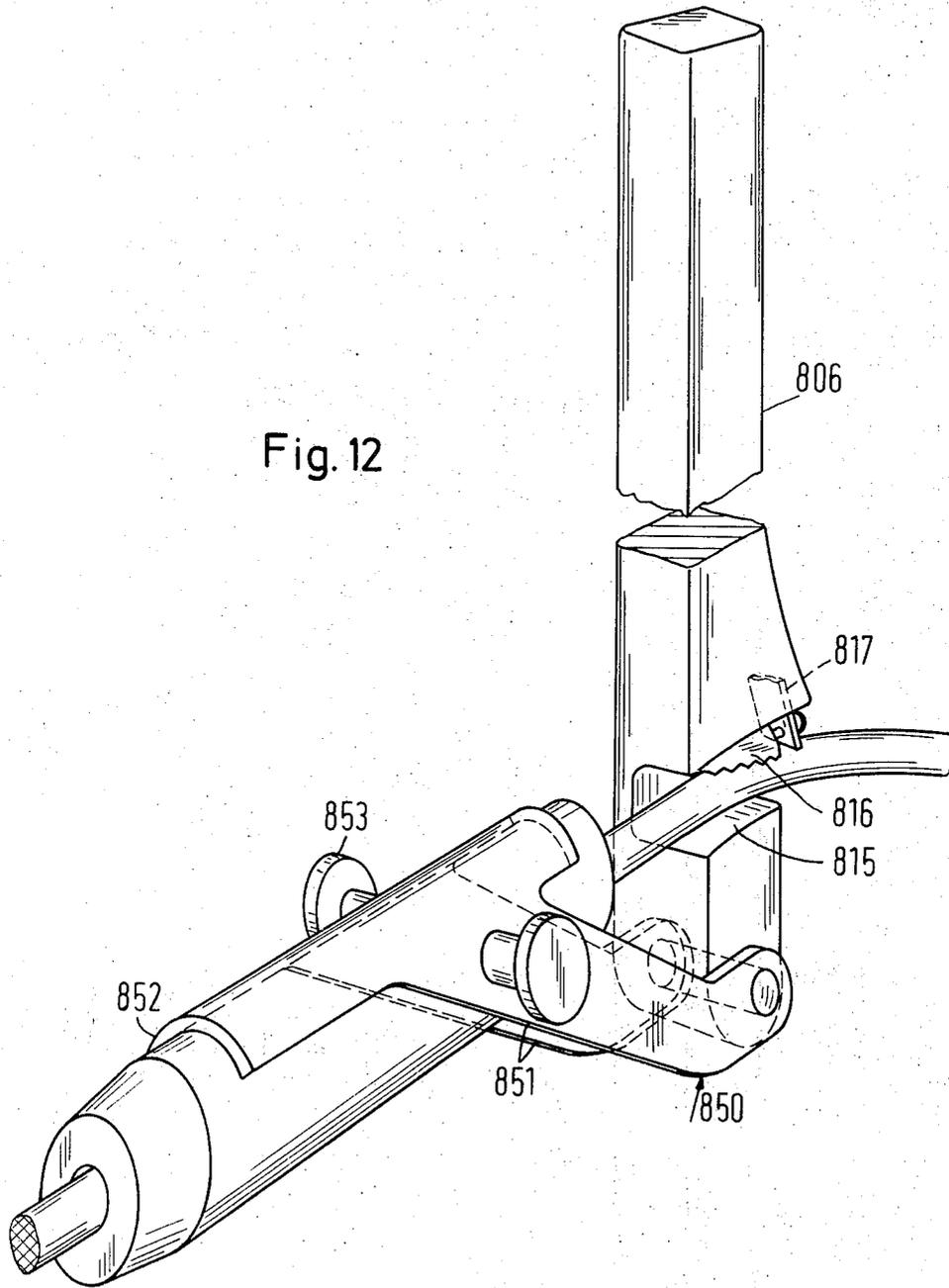


Fig. 13

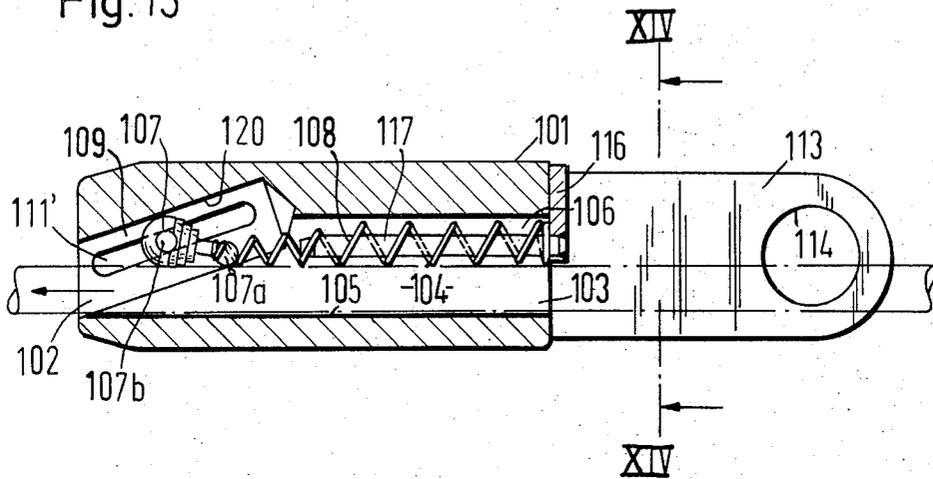


Fig. 14

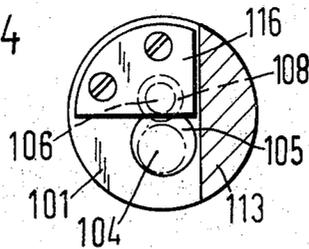


Fig. 15

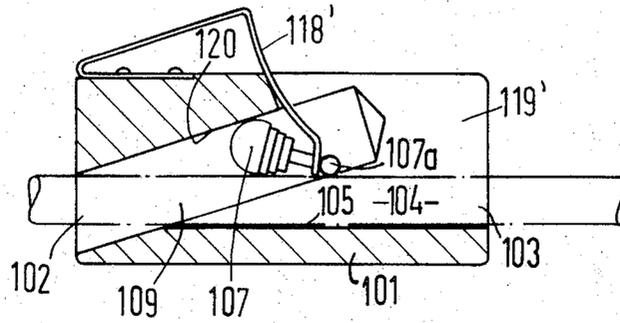


Fig. 16

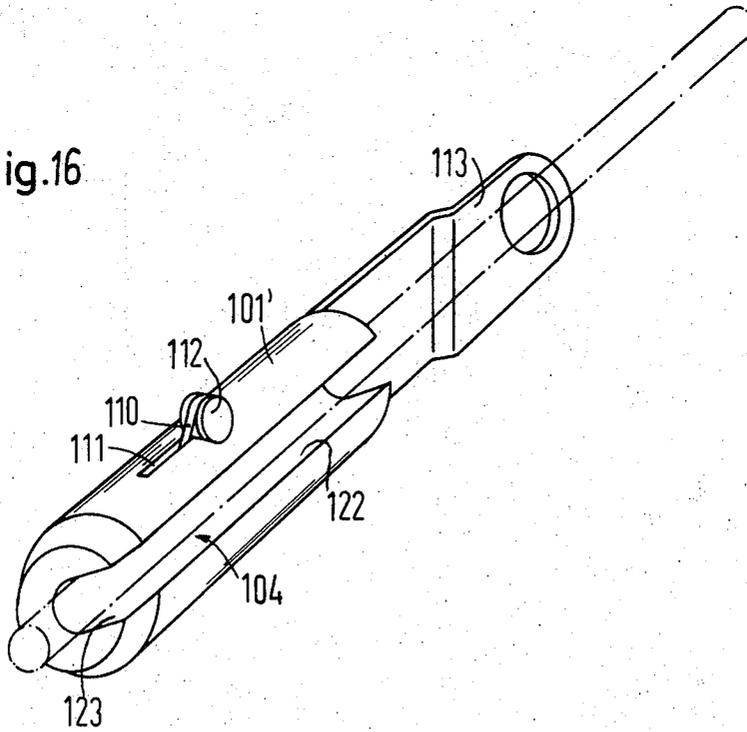


Fig. 17

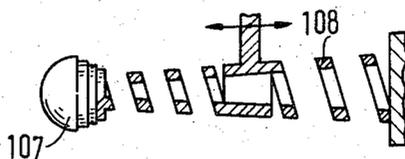


Fig. 18

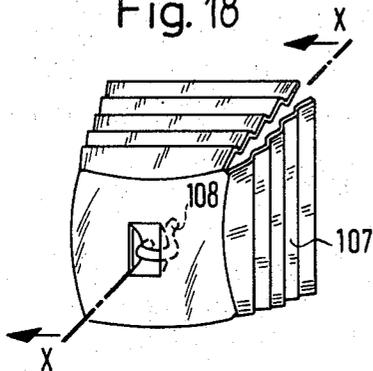


Fig. 19

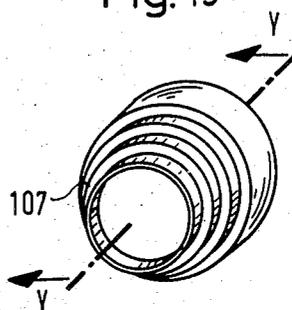


Fig. 20

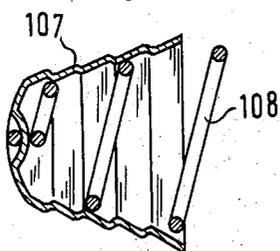


Fig. 21

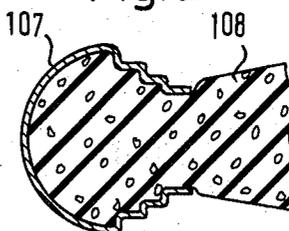


Fig. 22

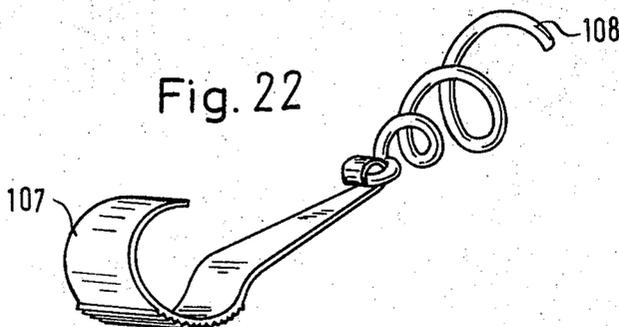


Fig. 23

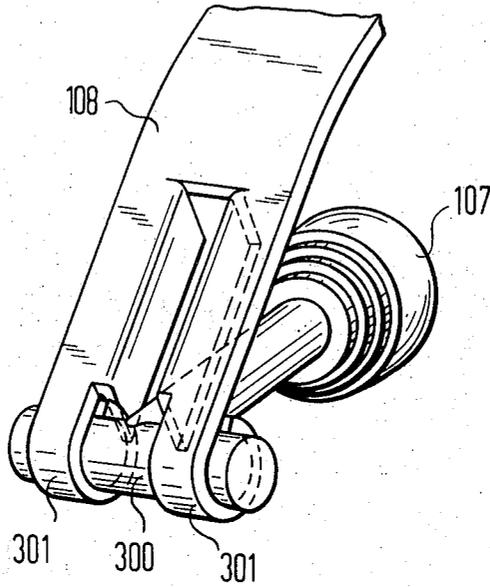


Fig. 26

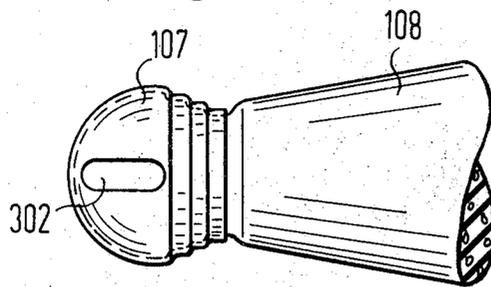


Fig. 25

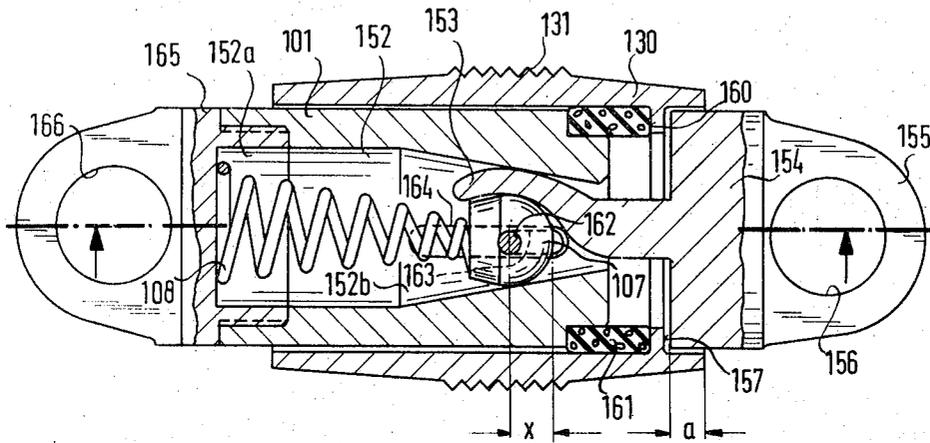


Fig. 24

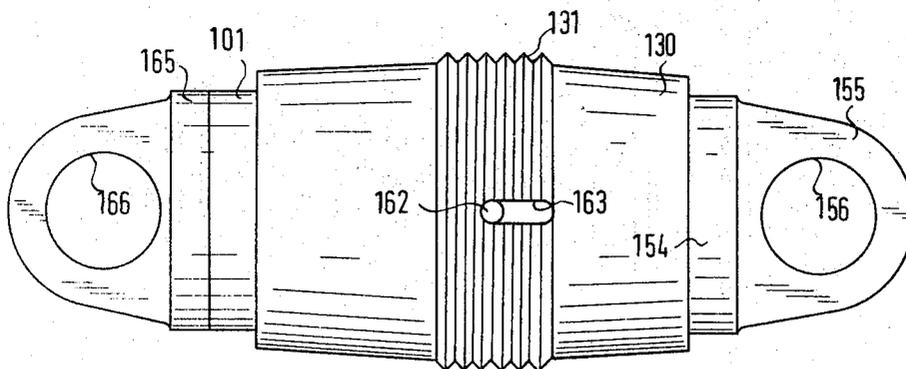
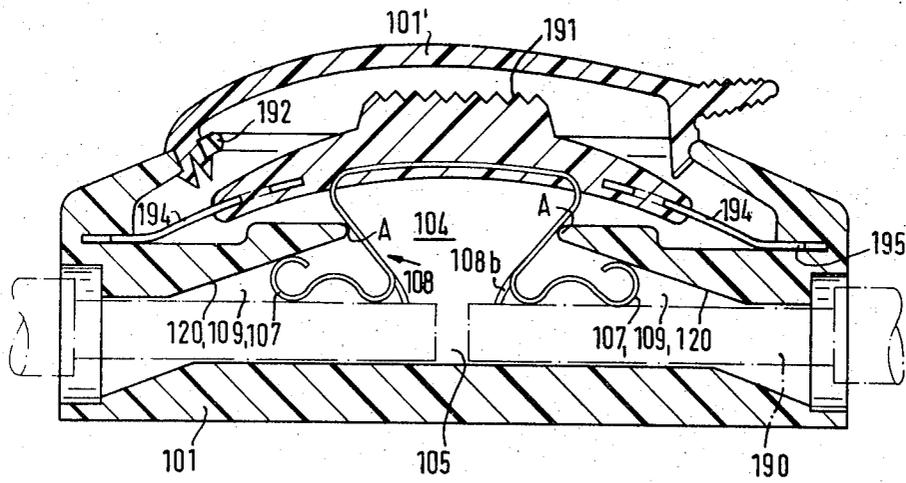


Fig. 27



DEVICE FOR CLAMPING AND TIGHTENING CABLES AND THE LIKE

RELATED APPLICATIONS

This application is a division of my co-pending U.S. Pat. application Ser. No. 820,410 filed Apr. 30, 1969, now U.S. Pat. No. 3,628,221.

The application's prior U.S. Pat. application Ser. No. 700,933 filed Jan. 26, 1968, now U.S. Pat. No. 3,551,883 describes a device for detachably clamping connecting elements, in which a connecting element is releasably clamped in a recess of the housing by wedge action exerted by an associated drop-shaped clamping member. An associated compression spring presses the clamping member against the connecting element. A tensile force acting on the connecting element tilts the clamping member and presses it into wedge-shaped clamping surfaces of the housing, thereby increasing the clamping effect. This has the advantage that the clamping effect increases in proportion to the tensile force acting on the connecting element, providing complete security against slipping. The tilting of the clamping body into the clamping position increases the contact surface between the clamping body and the connecting element and this contributes further to preventing slipping thereof.

Another prior application (U.S. Pat. Ser. No. 785,921 filed Dec. 23, 1968, now U.S. Pat. No. 3,604,876) of the present applicant describes an electric clamping and contact device, comprising one or more spring-loaded clamping elements in a housing. Electric conductors introduced through one or several openings in the housing are retained in a self-locking manner by the associated clamping elements which are tilted into the clamping position when the conductor is affected by tensile forces.

DESCRIPTION

The invention has the object of improving the clamping devices according to the pre-cited prior applications, particularly in the following points:

The connecting element or elements should pass rectilinearly through the housing;

the housing should be such that an endless connecting element can be fitted thereinto from one side;

a tensioning mechanism should be so associated with the clamping device that large tensioning forces can be applied by hand in an effortless manner, enabling, more particularly, tensioning towards both sides;

the handle serving to release the clamping action should be improved, comprising particularly a complete cover of the whole clamping connection towards the outside and the provision of a security against accidental release.

According to this invention, the recess adapted to receive the connecting element and the spring-loaded clamping element, consists of a continuous cylindrical bore for the connecting element, and a lateral, and more particularly oblique cavity for the spring-loaded clamping body.

In a preferred embodiment, the said continuous bore for receiving the connecting element has a lateral, continuous slot, making possible the insertion of a continuous connecting element from the side.

The cavity for receiving and guiding the spring-loaded clamping body may be a blind bore extending obliquely relative to the continuous cylindrical bore.

Preferably, the slot for fitting the endless connecting element from the side is adapted to be closed or is equipped with a labyrinth-like wall.

According to yet another feature of the invention, the actuation, i.e., the release of the clamping body, is effected by means of a bush wholly or partially surrounding the housing, and connecting by connecting means with the clamping body or the compression spring associated therewith. The connecting means may consist of a pin.

In another preferred embodiment of the invention, the bush is adapted to be shifted on the housing between two positions, in one of which a spoon-shaped connecting element, clamped by the clamping body, is released, while in the other position the bush secures this connecting element against being tilted out of the clamping position. Preferably, the compression spring associated with the clamping element consists of an elastic solid material, such as sponge rubber.

In yet another preferred embodiment, clamping body and associated compression spring (helical spring) are made integrally of plastic and more particularly of polyvinyl chloride.

Preferably, the clamping body consists of a hollow pressure and/or bending element. The clamping body may be connected integrally with the compression spring, having the form of a leaf spring, which is of special advantage for electrical plug-in connections. Advantageously, locking and securing hooks are connected to the leaf spring.

In yet a further preferred embodiment there are provided two facing clamping bodies, mounted with a symmetrical, substantially U-shaped, electrically conducting leaf spring movably in the housing, wherein the ends of the leaf spring locate the clamping bodies tiltably about a housing abutment and make contact through a hook and/or other element each with an electric conductor.

Further features and advantages of the invention will become apparent from the following description of preferred embodiment with reference to the accompanying drawings, and from the appended claims. In the drawings:

FIG. 1 is a perspective view of a first embodiment with a re-tensioning device;

FIG. 2 is a side elevation partially in section showing two operating positions, including the re-tensioning device;

FIG. 3 is a view of a second embodiment of the invention with a re-tensioning device;

FIG. 4 is a side elevation partially in section of the embodiment of FIG. 3;

FIG. 5 is a side elevation partially in section of the embodiment of FIG. 3, cut along another plane;

FIG. 6 shows in partial cross-section a clamping device with a third embodiment of a re-tensioning device;

FIG. 7 shows a modification of FIG. 6;

FIG. 8 shows a further modification of FIG. 6 in perspective;

FIG. 9 shows a roller-shaped clamping element in perspective;

FIG. 10 shows a fourth embodiment of a re-tensioning device;

FIG. 11 shows a fifth embodiment of a re-tensioning device, partially in cross-section;

FIG. 12 shows a sixth embodiment of a re-tensioning device;

FIG. 13 is a cross-section of yet another embodiment of the device according to the invention;

FIG. 14 is a sectional view in the direction of the arrow XIV in FIG. 14;

FIG. 15 is a longitudinal cross-section of another embodiment of the invention;

FIG. 16 is a perspective view of yet another embodiment of the invention;

FIG. 17 is a partly sectioned and opened preferred embodiment of a clamping element made integrally with the compression spring of synthetic resin;

FIGS. 18 to 22 are perspective views and cross-sections of further preferred embodiments of clamping elements according to the invention;

FIG. 23 shows a movable connection between the clamping body and the compression spring (leaf spring);

FIG. 24 is a plan view of a further preferred embodiment;

FIG. 25 is a longitudinal cross-section of the embodiment in FIG. 24;

FIG. 26 shows a slotted clamping body;

FIG. 27 is a longitudinal cross-section of a further preferred embodiment.

The clamping device of FIGS. 1 and 2 consists of a thick walled sleeve 1 forming the housing, and having in one end face 6 an opening for inserting a cable 801 which leaves through a bore 7 extending obliquely in the shell of the sleeve 1. The cable 801 is retained by a clamping member, not shown, located inside the sleeve 1 and affected by a spring 5. The end of the sleeve 1, remote from the end 6 has two aligned bores 802 (FIG. 2) through which extends a pin 803. A hook or crank 804 may be mounted rotatably on the pin 803 and may serve for tensioning the thick walled sleeve 1 on a fixed brickwork, a mast or a supporting device. A split pin 805 prevents the pin 803 and the hook 804 from being separated from the sleeve 1.

A cocking lever 806 with a forked end 807 collaborates with the pin 803. In the embodiment shown, one prong of the forked end 807 is pushed through an eyelet 808 of the pin 804, while the other prong embraces the shank of the pin 803.

The width between the prongs of the forked end 807 is much larger than the diameter of the thick-walled sleeve 1, and the same cocking lever 806 may therefore be used for sleeves with different thicknesses.

For tensioning or re-tensioning the rope or cable 801, the cocking lever 806 is moved into the position shown in the drawing. The free end of the cable 801 is looped several times about a sleeve or flange-shaped lug 809 of the lever 806. There results a force transmission in the ratio of the distance between the axis of the pin 803 and the axis of the lug 809 to the total length of the cocking lever 806. Since the lever may be very long, transmission ratios of 1:10 to 1:50 are possible. Thus, if a force of, say, 20 kg is exerted on the lever 806 towards the right, as viewed in the drawings, the tension affecting the cable 801 is of the order of magnitude of 400 to 1,000 kg. The friction produced by the multiple looping of the cable about the lug 809 is sufficient to prevent the cable from slipping, even if the pull exerted on the free end of the cable is comparatively

small. When the lever 806 has reached its extreme position, it is moved back, causing the cable to be pulled or hauled in. The clamping device inside the thick-walled sleeve 1 prevents the cable from slipping through the sleeve.

In this way, a very accurate re-tensioning of the cable may be achieved and the correct choice of the length of the cocking lever 806 prevents excessive tensile forces from being applied to the cable 801.

In the embodiment shown in FIGS. 3 to 5, one prong of the forked end 807 of the lever cocking 806 has a pin 812 adapted to be displaced against the force of a spring 811 (FIG. 5). In order to facilitate the operation, both the pin 812 and the screw 813 have knurled disks 814.

The screw 813 is adjusted to match a certain diameter of a thick-walled sleeve 1. After withdrawing the pin 812, the forked end 807 of the lever 806 is placed over the sleeve and the end of the screw 813 and the end of the pin 812 are allowed to engage into the corresponding bores in the surface of the sleeve 1.

The cable 801 is fitted into a slot 815 of the lever 806. For the self-locking clamping, there is provided a clamping member 816, biased by a leaf spring 817. The clamping device formed by the member 816 and the spring 817 operates in exact opposition to the clamping device located in the sleeve 1, i.e., during the to and fro movement of the lever 806 one clamping device is in engagement while the other is released.

To prevent the cable 801 from sliding out of the slot 805 and for protecting the member 816 with its spring 817, there may be provided a slide 818, biased by a spring 819. Prior to fitting the cable 801 into the slot 815, the slide 818 is lifted by a handle 821 out of its closing position.

In the embodiment of FIG. 6, a bush 822 is screwed into a slot or bore 815 of the lever 806; the bush contains a helical spring 823, a clamping member 824 and an actuating handle 825. The self-locking device formed by the elements 823, 824 and 825 operates again in opposition to the clamping device in the sleeve 1.

FIG. 7 shows a modified clamping element in which the cable 801 is held by roller 831 with a knurled circumference. The roller 831 is located in a moveable mounting 833 which can be moved by a handle 839. A cover ring 834, guided by a pin 835 in a helical groove 836 serves to cover the insertion slot for the cable 801.

FIG. 8 shows the arrangement of FIG. 7 in perspective and on a reduced scale, indicating clearly the function of the cover ring 834. In this position the slot 837 of the ring 834 and the insertion slot 815 of the sleeve 822 are in alignment. FIG. 24 shows that the bore 838 receiving the clamping member 831 and the mounting 833 has the cross-section of the latter.

FIG. 10 shows a further modification of the cable clamping mechanism. This arrangement consists of a flat clamping member 841 with a neck 842 and a spherical part 843. The spherical part 843 is guided in a substantially vertical slot 844 of the slide 845, providing a large tilting range of the clamping member 841 in the opening 815. Securing edges 847 are provided in the sleeve 822 by way of safety against unauthorised release. The operating handle 846, adapted to be moved in a recess 848 rests against these edges. The cable is released by turning the handle 846 first about the axis

of the arrangement and then pushing it back against the action of the spring 823.

To prevent accidental release, a wire spring 405 or a corresponding leaf spring is fitted into the recess 848. The ends of the spring are located in bores in the side wall of the recess. The wall of the recess 848 facing the spring 405 is offset by means of the safety edges 847. To release the self-locking action, the lever 846 must first be pivoted against the action of the spring 823 and is then pushed back.

The action of the spring 405 may be supported by a permanent magnet 407 with U-shaped cross-section, embedded in the handle 846 so that its force flux closes to one side wall of the edges 847.

The combination of spring and magnetic force is particularly advantageous because the force of the spring moves the lever so as to reduce the air gap. If the force flux of the magnet is closed without an air gap, the handle lever "sticks" so strongly to the wall that in large constructions, e.g., for ropeways, release is possible only by means of a knocking tool or a lever.

In the embodiment of FIG. 11, the lever 806 has an eccentric clamp for the cable 801 in the form of two disks 826 and 827, wherein the disk 827 is mounted eccentrically and rotatively on a pivot 828. Also here, the eccentric clamping reduced by the two disks 826 and 827 acts again in the direction opposite to that of the self-locking device in the sleeve 1.

The re-tensioning device of FIG. 12 is used in a sleeve-shaped clamping device in which the rope or cable passes rectilinearly through the inner bore of the sleeve, leaving the same at the rear end and not through an oblique bore. The device consists of the lever 806; a link 850 is hinged to the lower end and is pushed with its forked end 851 with a support pan 852 over the clamping device and retained by spring-loaded pivots 853. The means for fixing the rope end comprise a leaf spring 817 retaining a clamping member 816 within the opening accessible through the lateral slot 815, as shown in FIGS. 3 and 4.

The embodiment of FIGS. 13 and 14 has a bore 107b in the clamping element 107 co-operating with a slot 111'. A tool can be inserted through the slot 111' and the bore 107b to release the clamping element 107. This reliably ensures the prevention of accidental release.

The embodiment of FIGS. 13 and 14 also comprises a separate guide pin 117 for the compression spring 108, mounted on a support 116 fixed to the housing 101.

The embodiment of FIG. 15 comprises a clamping element 107 held by a leaf spring 108' and guided in a slot 119'. The slot 119' starts from the rear end of the oblong housing 101 which has a cylindrical configuration. However, the leaf spring 118' is substantially L-shaped and fixed with one angled end of one leg to the housing 101, while the clamping element 107 is pivotably mounted on the end of the other leg. The leg of the leaf spring 118' holding the clamping element 107 slides along the front end wall of the slot 119' under the action of a force on the corner of the leaf spring, moving the clamping element into the release position.

FIG. 16 shows an embodiment which permits the fitting from the side of endless cables, ropes and the like. To this end, a cylindrical housing 101', containing in its recess 104 a compression spring and a clamping element has a lateral slot, through which the cable can be

inserted. This slot continues in a wedge-shaped, oblique surface 123 leading into the recess 104. When an uncut cable is fitted into the slot 122, it slides along the surface 123 into the cavity 104 and is lodged under the clamping element, which has been withdrawn by means of the actuating handle 112. To prevent the cable from sliding out, the slot 122 may either be closed by a slide member or may be curved, have a zig-zag configuration or the like.

FIG. 17 shows a particularly preferred embodiment of the clamping element and compression spring, made in one piece and consisting of a plastic, for example, of polyvinyl chloride. Obviously, this integral construction is very economical, and can be used in all preceding embodiments in which a helical spring is provided.

FIGS. 18 through 22 show preferred embodiments of the clamping element 107.

All these clamping elements are hollow and drop-shaped. The element of FIG. 18 is a stamped component, formed by subsequent bending. FIG. 20 shows a cross section of this clamping element 107 along the line X—X in FIG. 18.

FIG. 19 shows perspective a hollow clamping element 107, produced by pressing.

The tapering open end of the clamping element has the advantage that the compression spring 108 is connected with the clamping element 108 in a very simple manner. The helical spring 108 shown may also be replaced by any other elastic material, e.g., by sponge rubber, with solid cross-section, tapering conically towards the clamping element. If the hollow clamping element is used together with a spring of solid elastic material, e.g., a sponge rubber spring, the clamping element has preferably a bore, containing a pin, permitting the clamping element to pivot, and serving also as actuating element and/or guide. It also improves the strength and stiffness of the clamping element. The conical taper of the elastic material towards the clamping element permits the easy tilting thereof.

FIG. 22 shows a particularly simple construction of a preferably metal clamping element 107, produced by bending and/or pressing. This embodiment is used preferably in the clamping device according to FIG. 51; a further simplification may be achieved in that the clamping element 107 and the leaf spring 118' are made in one piece. Preferably, the surface of the clamping element producing the clamping action is serrated to increase the friction. The leaf spring is to make contact with the connecting element at two points, namely where it forms the clamping element and where the rounded portion clamps the connecting element and tightens it against tension. Accordingly, the leaf spring is curved, as shown in FIG. 57.

Obviously, the embodiment described in FIGS. 17 through 22 can be used at choice in all described clamping mechanisms. Furthermore, in all these devices, the helical spring can always be replaced by a solid material spring, and the particular advantages and features of the various devices may be combined so as to give further advantageous embodiments and constructions.

The plastic compression springs for the clamping element have also the further advantage of acting as insulators and preventing the flow of currents in the case of electric cables.

Where leaf springs are used as compression springs, care must be taken of connecting the clamping element with the leaf spring so that it can pivot and tilt, while being well retained and guided by the spring. After the connecting element has been fitted, the same should not be withdrawable by more than about 1/20th to 1/10th on an inch. This requirement is met, according to FIG. 23, in that the shank of the clamping element 107 is provided with a cylindrical pin 300, extending vertically across the shank, and engaging into a forked end of the leaf spring, and mounted pivotably and tiltably in the two bent-over legs 301 of the forked end. In this manner, the clamping element 107 and its shank cannot move relative to the leaf spring 108, e.g., during the insertion of the connecting element.

The embodiment of FIGS. 24 and 25 is shown to illustrate a further type of release means for the clamping element 107. The element 107 is pivotally connected to the compression spring 108, which urges the element 107 against the wedge-shaped clamping surfaces of conical bore portion 152b.

A cylindrical bush 130, surrounding the housing 101 completely, is arranged thereon, and is adapted to be moved between two positions. A compression spring 161, arranged between the housing 101 and a flange 161 of the bush 130, secures the bush in the clamping and coupling position. As shown, the spring 161 consists of a solid material, e.g., sponge rubber, but may also be a helical spring. According to the invention, springs made of synthetic resins may also be used.

A pin 162 passes through the clamping element 107 so that the latter may pivot and tilt thereabout. Both ends of the pin 162 pass outside the housing 101 and communicate with slots 163 with the length x of the bush 130. Two slots 164 at opposite sides of the housing permit these pins to pass therethrough.

As shown in FIG. 25, the slot 164 in the housing 101 is somewhat longer than the slot 163 in the bush 130, to enable the clamping element 107 to be fully disengaged from the spoon-shaped connecting element 153 by shifting the bush 130 to the left.

FIG. 27 shows a clamping device for electrical cables, with a further type of clamping element. The clamping elements 107 include integral leaf springs 108, the clamping elements being serrated along the clamping surface.

In order to provide double safety and double contact, each leaf spring 108 is provided with a locking and safety hook 108b, resting in the clamping position firmly on the connecting element. Preferably, the hooks 108b are also made in one piece with the leaf springs 108 and with the clamping elements 107.

As already mentioned, the locking hook 108b gives the additional advantage of double safety, as well as double contact; the latter is important in view of the fact that safety regulations frequently specify double contacts for currents exceeding 16 amperes. If the connecting element is exposed to a tensile stress, the clamping element is pulled further into its wedge-shaped seating, and simultaneously, the leaf springs and hooks 108, 108b are pressed more strongly on to the connecting element, i.e., the stronger is the tension, the stronger is also the locking effect.

I claim:

1. A device for releasably locking at least one flexible connecting element, comprising:

a housing having a recess therein, said recess having at least one inlet opening and at least one outlet opening through which a flexible connecting element may pass,

a releasable locking body mounted inside said housing for fixing a flexible connecting element already within said recess against movement back toward said inlet, while permitting a flexible connecting element to move forward through said recess toward said outlet,

a cocking lever pivotally and detachably mounted on said housing about an axis which is substantially perpendicular to the axis of said housing, and mounted on said housing forward of said outlet,

holding means for a flexible connecting element exiting from said outlet, said holding means located on said cocking lever and spaced apart from the axis about which said cocking lever is pivotally mounted, and

a fastening means connected to said housing at its forward end for fastening the device to an external object.

2. The device of claim 1 wherein said cocking lever has a fork-shaped end portion and provided with support elements connected to the prongs of the fork-shaped portion thereof for pivotally mounting said lever on said housing.

3. The device of claim 2 having a rotational bolt along the axis about which said cocking lever is pivotally mounted, said bolt passing through said housing and substantially perpendicular to the axis of said housing, one end of said bolt having an eyelet therein for receiving one prong of the fork-shaped portion of said lever, the other prong thereof being attached to the other end of said bolt.

4. The device of claim 2 wherein said support elements comprise spring biased, movable rotational bolts located in boreholes located on opposite sides of said housing.

5. The device of claim 1, wherein said holding means comprises a locking device located in a laterally open slot in the cocking lever, for receiving a connecting element.

6. The device of claim 5 wherein said laterally open slot is provided with a closeable gate means.

7. The device of claim 1 wherein said holding means comprises a sleeve having a spring loaded fastening element therein and a handle attached to said fastening element for releasing pressure on a connecting element which may be contacted by said fastening element.

8. The device of claim 1 wherein said holding means comprises an eccentric lock for holding a connecting element.

9. The device of claim 1 wherein said holding means comprises a capstan attached to said cocking lever.

10. The device of claim 5 wherein said locking device comprises a sleeve into one end of which a connecting element may enter and having an oblique exit aperture through which a connecting element may leave said sleeve, a spring loaded slider-roller within said sleeve biased toward said one end of said sleeve, and a cover ring on the outside of said sleeve and partially covering the exit aperture thereof.

11. The device of claim 5 wherein said locking device comprises a sleeve into one end of which a connecting element may enter and having an oblique exit aperture through which a connecting element may leave said

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sleeve, a spring-loaded slider element within said sleeve biased toward said one end of said sleeve, a groove in the end of said slider element facing said one end, said groove extending in a direction toward said exit aperture and a clamping body within said sleeve slidably attached to said slider element at said groove.

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12. The device of claim 5, wherein said locking device comprises a clamping body and a leaf spring for biasing said clamping body against a connecting element within the slot in the cocking lever.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,827,674 Dated August 6, 1974

Inventor(s) Max Pasbrig

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

The above-identified patent claims the benefit of foreign applications identified by the following Foreign

Application Priority Data:

German Patent Appln. P 12 80 369.9-34
filed May 2, 1968

German Patent Appln. P 17 65 781.7
filed July 17, 1968

German Patent Appln. P 17 65 784.0
filed July 17, 1968

German Patent Appln. P 17 65 782.8
filed July 17, 1968

German Utility Model 6 751 (P 32 119/47d Gbm)
filed September 25, 1968

British Patent Appln. 24 444/68
filed May 22, 1968

Signed and sealed this 24th day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents