

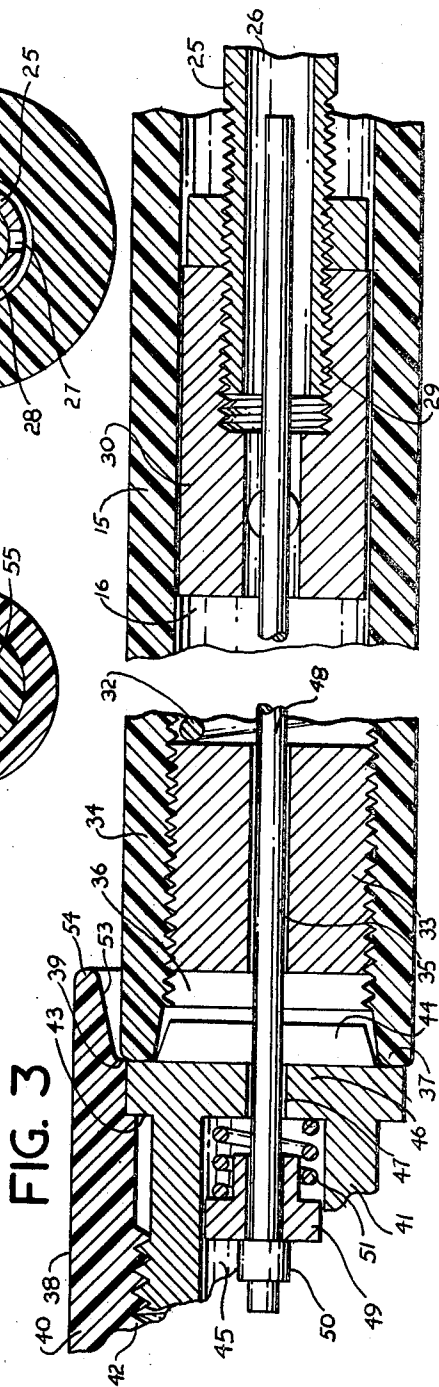
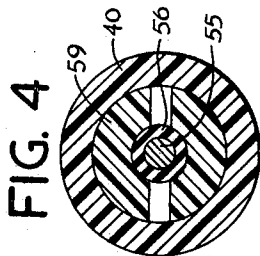
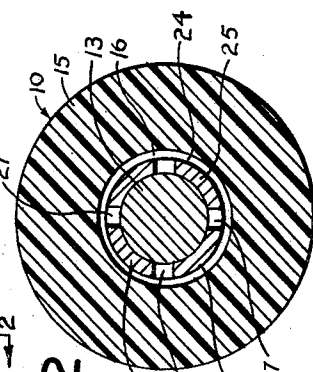
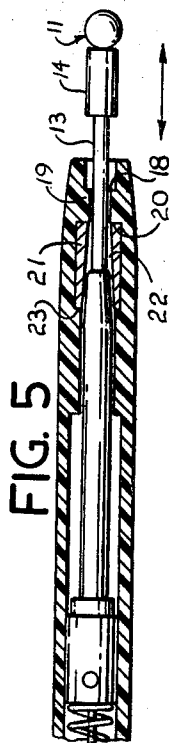
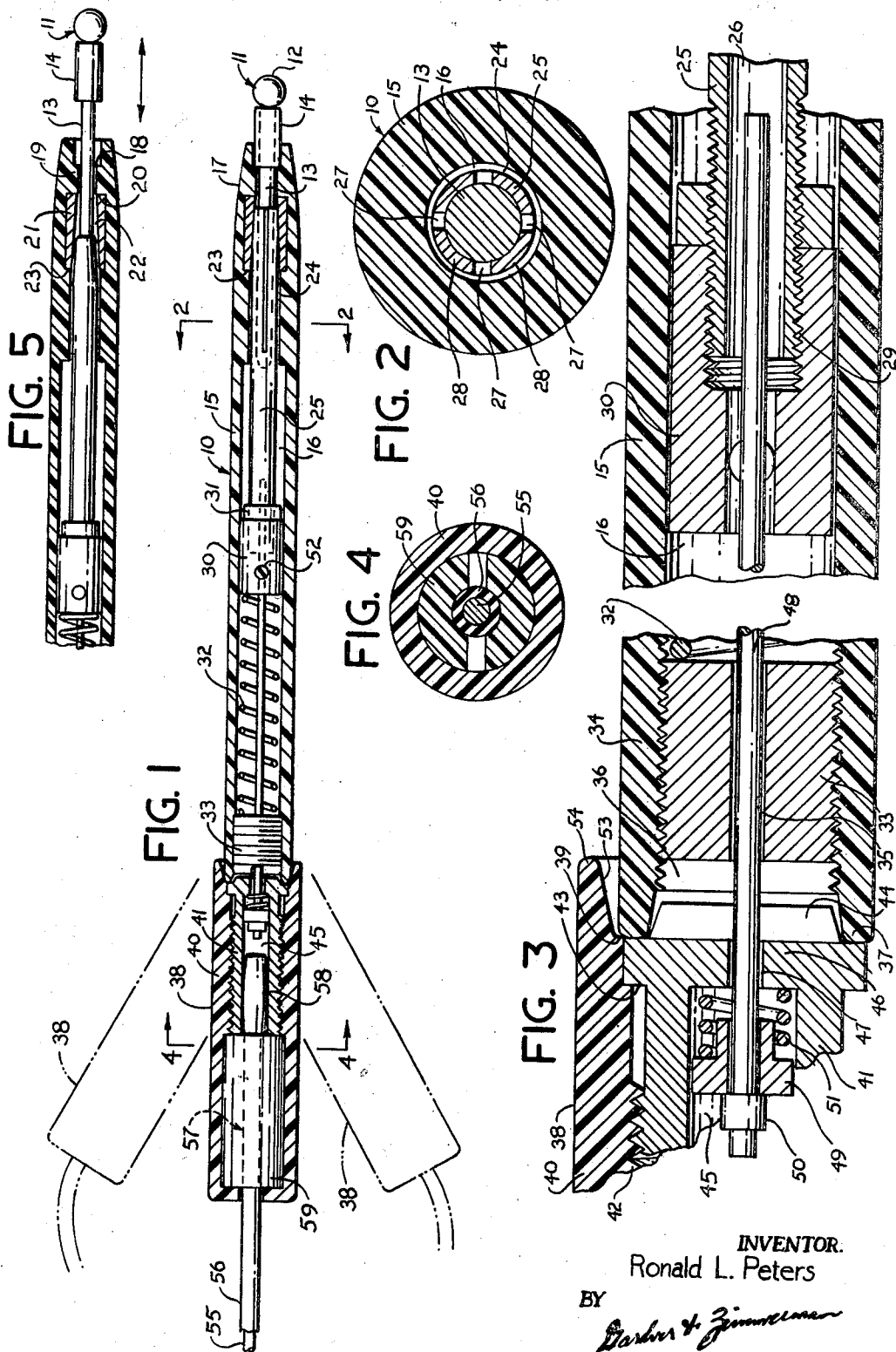
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HANDLE COMPONENT FOR ELECTRO-SURGICAL INSTRUMENT

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HANDLE COMPONENT FOR ELECTRO-SURGICAL INSTRUMENT

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11 Claims

ABSTRACT OF THE DISCLOSURE

A handle component for an electro-surgical instrument which includes both such handle component and a surgical electrode releasably carried thereby. The handle component comprises an elongated, hollow casing open at one end to receive the shank of such surgical electrode therein and terminating at its other end in a fulcrum. Within the hollow interior of the casing is a jaw-equipped chuck adapted to releasably receive the shank of an electrode therein, and also within the interior of the casing is a chuck tightener in the form of a collet disposed in circumjacent relation with the jaws of the chuck. The chuck is axially movable relative to the collet between a closed electrode-gripping position and an open electrode-releasing position, and it is biased toward the closed position thereof by a spring. A cap connected with the chuck is also biased by such spring toward a position in which it seats upon the fulcrum and in which position it is axially aligned with the casing. However, the cap is deflectible laterally about the fulcrum to displace the chuck into its open position to enable the shank of a surgical electrode to be removed from or inserted into the chuck.

This invention relates to an electro-surgical instrument comprising a handle component and a surgical electrode releasably carried thereby, and it relates more particularly to the handle component of such instrument.

Electro-surgical instruments are used rather extensively in many surgical procedures as, for example, in the cauterization of warts, moles, etc., and sometimes, especially with hemophiliacs, in making and cauterizing an incision simultaneously. Such instruments include a handle component and a tip or electrode carried thereby, and in the usual instance the electrode is removably carried by the handle component adjacent one end thereof. The electrode is connected through the interior of the handle component with a power cord attached to the handle at its opposite end, and the handle component both insulates the surgeon from the electrode and electrical connections thereto and provides him with a means for holding and manipulating the electrode.

The present invention is concerned with a handle component of the type that releasably supports surgical electrodes and has for an object, among others, the provision of an improved handle component enabling electrodes to be mounted within and removed from the handle quickly and easily, without tools, and upon the simple motion of deflecting an end portion of the handle component laterally from the position normally assumed thereby in which it is in alignment with the longitudinal axis of the handle. In this reference, the improved handle component includes an elongated, hollow casing or body open at one end so as to removably receive the shank of a surgical electrode or tip therein. Adjacent its other end, the casing is provided with a perimetricaly extending fulcrum and a cap or casing extension is normally seated thereon. Within the hollow interior of the casing is a chuck and also a chuck tightener in the form of a collet disposed in coaxial circumjacent relation with the jaws

of the chuck. The chuck is axially displaceable with respect to such tightener between a closed electrode-gripping position enforced on the jaws of the chuck by the tightener and an open electrode-releasing position in which the tightener permits the jaws of the chuck to relax their grip on the electrode.

A spring mounted within the interior of the casing resiliently biases the chuck toward the closed position thereof, and the cap is connected with the chuck through a strap or cable in a manner such that the cap is resiliently seated upon the fulcrum by the biasing force of such spring and tends to assume as a result thereof a condition of axial alignment with the casing. The cap is deflectible laterally about the fulcrum against the biasing force of such spring, and because of its connection with the chuck through the strap displaces the chuck into the open position thereof, whereupon an electrode can then be positioned within or removed from the chuck. Release of the cap enables the spring to return the cap to its in-line position with the casing and to displace the chuck into the closed position thereof.

Additional objects and advantages of the invention will become apparent as the discussion thereof proceeds through an explanation of the specific structural embodiment illustrated in the accompanying drawing, in which:

FIGURE 1 is a longitudinal sectional view of a surgical instrument embodying the invention with the chuck of the casing component being shown in its closed position, alternate positions of the deflection of the cap element being depicted by broken lines;

FIGURE 2 is an enlarged, transverse sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged, broken longitudinal sectional view of a segment of the casing component illustrated in FIGURE 1;

FIGURE 4 is a slightly enlarged, transverse sectional view taken along the line 4—4 of FIGURE 1;

FIGURE 5 is a broken longitudinal sectional view of the electrode-equipped end portion of the instrument shown in FIGURE 1 but with the chuck of the casing component being shown in the open position thereof.

The electro-surgical instrument shown in its entirety in FIGURE 1 comprises a handle component 10 and a surgical electrode or tip 11 releasably carried thereby. As respects the present invention, the electrode 11 may be conventional and in the form shown includes a generally spherical cauterizing point 12 and an elongated shank 13 adapted to be inserted into the interior of the handle component 10, as will be described in greater detail hereinafter. An insulating sleeve 14 slides over the shank 13 and is coaxially circumjacent the end portion thereof adjacent the point 12. The sleeve 14 serves as a stop to limit insertion of the electrode 11 into the handle 10 and it also insulates that portion of the shank 13 projecting outwardly from the handle 10.

The handle component 10 includes an elongated cylindrical casing or body 15 that is hollow and defines a passage 16 extending axially therethrough. The casing 15 is open along the forward end 17 thereof and is adapted to removably receive the shank 13 of the electrode 11 therein, and the casing is provided interiorly of the end 17 with a stop or abutment shoulder 18 (FIGURE 5) against which the sleeve 14 seats upon complete insertion of the electrode 11 into the handle. Accordingly, such seating of the sleeve 14 against the shoulder 18 defines the limit of maximum insertion of the electrode 11 into the handle, and it also identifies the condition of complete and proper insertion of the electrode.

The shoulder 18 is formed by one end of an inwardly extending restriction or neck 19 provided along the passage 16, and such restriction at its opposite end forms a stop or abutment shoulder 20 against which seats one

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edge of a chuck tightener 21 having the form of an annular collet providing an opening 22 therethrough converging inwardly toward a minimum diameter adjacent the restriction 19. At its opposite end, the collet or chuck tightener 21 seats against a shoulder 23 defined by a second restriction 24 along the passage 16 of lesser inward extent than the aforementioned restriction 19. Thus, the collet 21 is constrained against axial displacements relative to the casing 15 by being confined between the shoulders 20 and 23.

Various structural arrangements can be provided to enable the collet 21 to be positioned within the casing 15 as, for example, a segmented casing or a collapsible collet, but in the particular structure being considered, the casing is sufficiently elastic to expand or deform to the extent necessary to permit axial displacement of the collet through the restriction 24 and into position between the shoulders 20 and 23. In this respect, the casing is made from an insulating material such as polysulfone and the collet is formed from a rigid material such as brass.

Mounted within the passage 16 and axially displaceable relative thereto between open and closed positions is a chuck 25 in the form of an elongated, axially extending cylindrical tube having a passageway 26 therethrough, as shown best in FIGURE 3. Adjacent the forward end portion thereof, the chuck 25 is provided with a plurality of angularly spaced and longitudinally extending slits 27 respectively providing jaw or gripper elements 28 therebetween. The chuck 25 is made of a material having sufficient flexibility to enable the jaw elements 28 to be compressed tightly against the shank 13 of an electrode 11 so as to tightly grip the same and thereby frictionally constrain the electrode within the handle component 10 whenever the chuck is in its closed position and to enable the jaw elements to expand slightly and release the shank 13 when the chuck is in its open position. An example of a material suitable for this use is brass.

The chuck 25 along the opposite end thereof is threaded, as shown at 29, and threadedly receives thereon a hollow coupling 30 which is fixedly secured in any position of adjustment along the chuck by a lock nut 31. The coupling 30 is larger in diameter than the chuck 25 and is dimensioned so as to be freely slidable in axial directions along the casing passage 16 and is sufficiently long so as to provide a surface area adequate to prevent canting or binding of the chuck and coupling during axial displacements thereof. Seated at one of its ends against the coupling 30 is a helical compression spring 32, and at its opposite end it seats against an externally threaded plug or collar 33 received within the internally threaded end portion 34 of the casing 15. The collar has an opening 35 extending axially therethrough, and it is provided with a transversely extending slot 36 at one end defining a tool-receiving opening to facilitate rotation of the collar into the threaded end of the casing 15.

Evidently, since the collar 33 is fixedly located along the casing 15 and thereby constrained against axial displacements with respect thereto, the spring 32 resiliently biases the chuck 25 (through its connection with the coupling 30 and lock nut 31) toward the closed position thereof in which the collet 21 is effective to urge the jaw elements 28 inwardly and into frictional engagement with the shank 13 of an electrode 11 positioned therebetween. Therefore, the chuck 25 is continuously biased toward the closed electrode-gripping position thereof by the spring 32, but it is selectively displaceable against the biasing force of the spring into an open electrode-releasing position, as will be described subsequently.

In this respect, the casing 15 at the end thereof adjacent the collar 33 is equipped with a fulcrum 37 which in the form shown is perimetally extending, and since the casing 15 is cylindrical and the fulcrum is formed at one end thereof, the fulcrum is annular. The lever

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system used in conjunction with the fulcrum 37 to displace the chuck 25 into its open position includes a cap or casing extension 38 having a surface 39 that seats upon the fulcrum 37 and is formed in part by the hollow outer shell 40 of such cap and in part by an inner plug or closure 41 threadedly received within the shell. The shell 40 and inner plug 41 are respectively provided with cooperative threads, as shown at 42, to enable the shell and plug to be removably interconnected, and the precise location of the plug within the sleeve is determined by engagement of facing abutment shoulders respectively provided thereby, as shown at 43. The plug 41 may be provided with a tool-receiving slot 44 extending thereacross which can be used in threading the plug into the shell 40.

The plug 41 has a bore or chamber 45 therein which is open at its rear end and closed at its forward end by a transversely disposed closure wall 46 having a passageway 47 extending therethrough. The cap 38 is connected with the chuck 25 by a cable or strap 48 extending through the passageway 47 in the plug 41, through the passageway 35 in the collar 33, and through the coupling 30 and into the passageway 26 in the chuck 25. The end portion of the strap 48 extending into the bore 45 of the plug 41 projects through a spring seat or seating element 49 and has a clamp collar 50 fixedly attached thereto in any suitable manner as, for example, by being crimped about the strap so as to constrain relative movement therebetween. A helical compression spring 51 at one end thereof bears against the seating element 49 and at its opposite end seats against the closure wall 46 of the plug 41. Thus, the spring 51 resiliently biases the seating element 49 and strap 48 toward the left (as viewed in FIGURES 1 and 3), but permits limited displacements of the strap and seating element in the opposite direction against the biasing force of the spring.

Adjacent its opposite end, the strap 48 is attached to the coupling 30 in a manner preventing relative axial displacements therebetween, and such attachment may be effected by one or more set screws 52 that extend through openings provided therefor in the coupling and which bear against the strap. As explained hereinbefore, the helical spring 32 urges the coupling 30, lock nut 31 and chuck 25 toward the right (as viewed in FIGURES 1 and 3) so as to bias the chuck toward the closed position thereof; and since the strap 48 connects the coupling 30 with the plug 41, the spring 32 also biases the cap 38 comprising the plug 41 and shell 40 attached thereto toward the right so as to seat these elements, and especially the surface 39 thereof, upon the fulcrum 37. In this respect, the seating force is applied by the strap 48 to the cap 38 through the clamp collar 50, seating element 49, and spring 51 to the transverse closure wall 46 of the plug.

Since the fulcrum 37 and surface 39 seating thereon are substantially continuous and annular, the biasing force developed by the spring 32 seats the cap 38 firmly upon the fulcrum 37 in a position in which the cap is substantially aligned axially with the casing 15, and the magnitude of the force seating the cap upon the fulcrum and urging the chuck 25 into the closed position thereof can be adjusted, for any fixed location of the clamp collar 50 and set screws 52 relative to the strap 48, by changing the position of the collar 33. Thus, by screwing the collar 33 inwardly to a greater depth within the casing 15, the spring 32 will be compressed to a greater extent and will develop a larger biasing force. Contrarywise, displacing the collar 33 in an outward direction, or toward the left as viewed in FIGURES 1 and 3, will reduce the biasing force developed by the spring. Initial or gross adjustment of the spring force is determined by the location along the strap 48 at which the set screws 52 are tightened thereagainst.

The chuck 25 can be displaced axially into the open position thereof shown in FIGURE 5 by deflecting the

cap 38 in any lateral direction about the fulcrum 39, as indicated by the broken-line positions of the cap in FIGURE 1. That is to say, since the fulcrum is annular, the cap 38 can be deflected laterally at any position along the entire 360° circumference thereof. Deflection of the cap 38 about the pivot point defined along the fulcrum 37 displaces the closure wall 46 angularly in a direction away from the collar 33, and such movement of the cap imparts a tensile force to the strap 48 because of its connection with the cap 38 through the clamp collar 50, seating element 49 and spring 51. The tensile or pulling force imparted thereby to the strap 48 will be transmitted through the set screws 52 and coupling 30 to the chuck 25, with the result that the chuck will be displaced toward the left and into the open position thereof shown in FIGURE 5 at which time the jaw elements 28 are permitted to assume their relaxed or open position in which they are loosely circumjacent the shank 13 of the electrode 11, thereby permitting the shank to be withdrawn from the chuck or to be inserted thereinto. Release of the cap 38 enables the spring 32 to return it to its fully seated position upon the fulcrum 37 and to displace the chuck 25 into its closed position.

The spring 51 interposed between the seating element 49 and wall 46 of the plug permits limited displacements to be effected between the chuck 25 and cap 38, which permissible displacements enable the chuck 25 to be displaced into its fully closed position within the collet 21 after the cap 38 is completely seated upon the fulcrum 37. In this respect, the spring 41 is simply compressed slightly by the larger spring force being imparted to the chuck 25 by the spring 32.

It may be observed that once the chuck 25 has moved toward the fully closed position thereof to the extent that the inclined jaw surface 22 of the collet 21 has cammed the resilient jaw elements 28 of the chuck into firm engagement with the shank 13 of an electrode, the electrode will tend to be carried by the chuck as it continues to move into its fully closed position. In this event, the insulator 14 may not be firmly seated against the shoulder 18. Nevertheless, a condition of substantial seating will exist because the total movement of the chuck is relatively small; and to provide an order-of-magnitude indication of the size of a typical instrument of the type being considered, the over-all length of the handle component 10 may be about six inches, the outer diameter of the casing about three-eighths of an inch, the shank 13 of the electrode approximately $\frac{3}{32}$ of an inch, and the total permissible angular displacement of the cap 38 may approximate 15°. Such angular displacement of the cap is effectively limited by the angular disposition of an internal surface 53 provided by a skirt 54 extending axially along the casing 15 in overlying relation therewith adjacent the fulcrum 37.

The electrode 11 is necessarily connected with an electric power source, and such connection is effected through the chuck 25, coupling 30, set screws 52, and strap or cable 48 which in turn is connected through the clamp collar 50, seating element 49, and spring 51 with the plug 41. The plug, in turn, is electrically connected with the conductor 55 of a power cable 56 through a connector or joint generally denoted as 57. The connector 57 may take various forms and, for example, may take the direct form of being established through a terminal 58 soldered or otherwise electrically connected with the conductor 55 adjacent an end thereof and inserted into the bore 45 in the plug 41 so as to frictionally engage the walls of such bore. This arrangement is depicted in FIGURE 1, and it may be observed in this illustration that the terminal 58 and inner end of the plug 41 seat against a filler or support 59 confined within the end portion of the shell 40 and formed of an insulating material. Evidently, all of the elements connecting the terminal 58 with the electrode 11 must be made of electrically con-

ductive materials; and as explained heretofore, the chuck 25 and coupling 30 may be formed of brass and, similarly, the set screws 52 and plug 41 may be formed of brass. The strap or cable 38 may be stainless steel as may be the springs 32 and 51, and the spring seat 49 and clamp collar 50 can be of brass. The shell 40 is formed of an insulating material and can be made of the same material as the casing 15 which, as indicated hereinbefore, can be polysulfone.

In a typical sequence of assembly, the conductor 55 of the power cable 56 is connected with the terminal 58; and the terminal, filler 59, and cable are positioned within the shell 40 of the cap 38, as shown in FIGURE 1. The cable or strap 48 has a clamp collar 50 crimped thereto and is then threaded through the seating element 49, spring 51, plug 41, collar 33 and coupling 30, which at such time may be mounted upon the chuck 25 and secured thereto by the lock nut 31, and the set screws 52 are then tightened at an appropriate location along the strap 48. The plug 41 may then be screwed into the shell 40 to a position against the shoulder 43, at which time the plug will also bear against the filler 59, and the terminal 58 will be in frictional and electrical engagement with the circumjacent surfaces of the bore 45. The collet 21 having been inserted into the casing 15, the chuck 25 is pushed into the passage 17 in the casing and the collar 33 is then screwed into the threaded end portion 34 of the casing. This latter procedure may be effected by displacing the cap 38 and collar 33 in opposite directions along the strap 48, which will compress the spring 32 and provide sufficient space between the cap and collar to permit the collar to be rotated into the casing. When the collar 33 is properly located the cap is released, whereupon the spring 32 will displace it into firm engagement with the fulcrum 37 and will displace the chuck 25 into its closed position. The handle component 10 is then ready for use, and electrodes 11 are inserted thereinto and removed therefrom simply by deflecting the cap 38 laterally as heretofore explained.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making an adequate disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

What is claimed is:

1. An electro-surgical handle comprising an electrically insulating, elongated body adapted to be hand-held and being provided with a longitudinally extending passage therethrough open at one end and equipped adjacent its opposite end with a fulcrum, an electrode positioned in said passage, an electrically conductive chuck mounted within said passage and being longitudinally displaceable therealong relative to said body between a closed electrode-gripping position and an open electrode-releasing position, a chuck tightener constrained within said passage against longitudinal displacements therealong and being effective to tighten said chuck about such electrode upon displacement of the chuck into its closed position and to permit the chuck to release such electrode upon displacement of the chuck into its open position, a cap connected with said chuck and being normally seated upon said fulcrum in substantial longitudinal alignment with said body, an electric power cord extending into said cap and having a conductor electrically connected with said chuck through the interior of said body and spring structure mounted within said passage and resiliently biasing said chuck toward the closed position thereof and said cap into alignment with said body in seated engagement with said fulcrum, said cap being angularly displaceable about said fulcrum from such condition of alignment with said body to displace said chuck into the open position thereof against the biasing force of said spring.

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2. The electro-surgical handle of claim 1 in which said chuck tightener is a tapered collet coaxially circumjacent an end portion of said chuck.

3. The electro-surgical handle of claim 1 in which said chuck and cap are spaced apart longitudinally, and further comprising a strap extending between said chuck and cap and being connected with each to define the aforesaid connection therebetween.

4. The electro-surgical handle of claim 3 in which said strap is fixedly secured to said chuck and is slidably related to said cap for movement relative thereto in longitudinal directions, and further comprising spring means interconnecting said cap and strap to afford limited relative movement therebetween in longitudinal directions so as to enable the aforesaid spring structure to displace said chuck into the closed position thereof after said cap is firmly seated upon said fulcrum.

5. The electro-surgical handle of claim 1 in which said fulcrum is perimetricaly extending to enable said cap to be angularly displaced with respect thereto in any convenient direction.

6. The electro-surgical handle of claim 1 in which said chuck and cap are spaced apart longitudinally, and further comprising and electrically conductive strap extending between said chuck and cap and being connected with each to define the aforesaid connection therebetween, the conductor of said power cord being electrically connected with said strap.

7. The electro-surgical handle of claim 6 in which said cap is formed of an insulating material, and further comprising an electrically conductive coupling positioned within said cap and interconnecting the conductor of said power cord with said strap.

8. The electro-surgical handle of claim 6 in which said chuck is provided adjacent one end thereof with a plurality of jaw elements engageable with such electrode, and

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in which said chuck tightener is a tapered collet coaxially circumjacent the jaw-equipped end of said chuck.

9. The electro-surgical handle of claim 8 in which said strap is flexible and is secured to said chuck and is slidably related to said cap for movement relative thereto in longitudinal directions, and further comprising spring means interconnecting said cap and strap to afford limited relative movement therebetween in longitudinal directions so as to enable the aforesaid spring structure to displace said chuck into the closed position thereof in which said jaw elements tightly grip such electrode after said cap is firmly seated upon said fulcrum.

10. The electro-surgical handle of claim 9 in which said fulcrum is generally annular to enable said cap to be angularly displaced with respect thereto in any convenient direction.

11. The electro-surgical handle of claim 10 in which said cap is formed of an insulating material, and further comprising an electrically-conductive coupling positioned within said cap and through which the conductor of said power cord is connected with said strap.

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