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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Attachment arrangement for high voltage electrical connector.**

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FR-A-2 438 930
US-A-3 191 486
US-A-3 959 869

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Description

The present invention relates generally to the connection and disconnection of high voltage electrical connector elements in the field and pertains, more specifically, to an attachment arrangement which assures the appropriate attachment and securing of a bushing assembly within an electrical connector, and the subsequent attachment and securing of the electrical connector to a terminal of a high voltage electrical apparatus.

US—A—4202591 describes a high voltage electrical connector of a type employed to connect a high voltage cable to a terminal of electrical apparatus such as a transformer, in a power distribution circuit. The terminal, which is in the form of a lug having a threaded aperture, is received in a recess in the connector so that it may be bolted to a bushing assembly which enables a ground connection to be made for grounding the terminal without disconnecting the electrical connector. The bushing assembly has a tapered body portion complementary to a tapered portion of the recess in the connector in order to provide an interface fit. A tubular member, with an internal thread, is received in the bushing assembly and an externally threaded coupling member engages the threaded lug and the tubular member. The coupling member has a bore in which is received a threaded bolt for engaging another terminal.

Against the background of the above prior art connector, the objects of the invention are to provide:—

(a) an attachment arrangement which facilitates attachment and securing of a bushing assembly within an electrical connector of the above;

(b) an attachment arrangement which assures complete and appropriate attachment and securing of the bushing assembly within the electrical connector;

(c) an attachment arrangement which facilitates the appropriate attachment and securing of the bushing assembly within the electrical connector in the field;

(d) an attachment arrangement which eases attachment and securing of the electrical connector to the terminal of a high voltage electrical apparatus subsequent to the appropriate attachment and securing of the bushing assembly within the electrical conductor;

(e) an attachment arrangement which assures the appropriate proper attachment and securing of the bushing assembly within the electrical connector prior to the attachment and securing of the electrical connector to the terminal;

(f) an attachment arrangement of the type described and which is incorporated readily into a bushing assembly fully compatible with present electrical connectors of the above-mentioned type; and

(g) an attachment arrangement which is operated easily, in the field, without the necessity for elaborate and extensive special tools.

The invention is characterised in that minimum torque responsive means are provided for precluding relative movement between the tubular member and the coupling member below a predetermined torque exerted by the tubular member upon the coupling member, such that the coupling member initially rotates with the bushing assembly to enable sufficient threaded engagement between the coupling member and the lug before the predetermined torque is exceeded. Stop means are also provided to limit entry of the coupling member into the threaded aperture of the lug.

The stop means is preferably a shoulder located on the coupling member.

In the preferred arrangement, wherein the coupling member has a bore in which is received a threaded bolt for threadably engaging a terminal received in the connector, and in which wrenching means are provided in the bolt, further minimum torque responsive means are provided to couple the bolt to the tubular member for initially precluding relative rotation between the bolt and the tubular member until a given torque is exceeded. The latter given torque is large enough to ensure that the tapered body portion of the bushing assembly is properly seated within the tapered portion of the axially extending recess and that an excessive torque is not exceeded when the stop shoulder engages with the lug.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a fragmentary elevational cross-sectional view of a portion of a bushing assembly carrying an attachment arrangement constructed in accordance with an embodiment of the invention and showing the bushing assembly about to be connected to a terminal of an electrical apparatus;

Fig. 2 is a fragmentary elevational cross-sectional view similar to Fig. 1, but with the component parts in another position;

Fig. 3 is a fragmentary elevational cross-sectional view similar to Fig. 2, but with the component parts in still another position;

Fig. 4 is another similar fragmentary elevational cross-sectional view with the component parts in yet another position; and

Fig. 5 is still another fragmentary elevational cross-sectional view showing all of the component parts fully connected.

Referring now to the drawings, and especially to Fig. 1 thereof, the component parts depicted are similar to corresponding component parts illustrated and described in the aforementioned patent no. 4,202,591, in that the component parts include an electrical connector in the form of a T-shaped receptacle 10, and a terminal 12 of an electrical apparatus (not shown). The receptacle 10 is affixed to the terminus of a high voltage cable, in the manner illustrated in the aforesaid patent, and an electrical terminal contact 20 having an integral lug 22 is attached to the conductor of the cable. Lug 22 is to be connected

to the terminal 12 to complete a distribution circuit.

A composite body 24 surrounds the contact 20 and provides an axially extending receptacle recess 26 within which terminal 12 is to be received. A second axially extending recess 28, opposite to first recess 26, is to receive interface bushing assembly 30 which is constructed to enable direct connection between the terminal 12 and a commonly available electrical connector, such as an elbow receptacle (not shown).

Bushing assembly 30 includes a generally tubular housing 34 having a body member 36 of dielectric material, such as an insulating elastomer, and a central tubular member 38 of conductive material, such as copper or aluminum. The upper end of the bushing assembly 30 is not illustrated, but is essentially the same as that shown in the aforesaid patent. Suffice it to say that a female contact assembly is located adjacent the upper end of the tubular member 38 and includes a female contact element which can receive a complementary male contact element for completing an electrical circuit to tubular member 38. In the present bushing assembly 30, tubular member 38 is provided with an extension in the form of an axially extending tubular extension member 40 of conductive material, such as copper or aluminum, affixed to tubular member 38 by means of a threaded connection 42 at the upper end 44 of tubular extension member 40. The lower end 46 of tubular extension member 40 includes a land 48 for the purposes which will be described in greater detail below.

A coupling member 50, also constructed of conductive material such as copper or aluminum, is received within extension member 40, adjacent lower end 46, and is coupled to extension member 40 by means of an external thread 52 which extends axially to upper end 54 of coupling member 50 and engages a complementary internal thread 56 in extension member 40. A further external thread 58 extends along the coupling member 50 adjacent the lower end 60 thereof, and stop means in the form of a collar 62 is located axially between the external threads 52 and 58.

Prior to the installation of bushing assembly 30 within the recess 28 of receptacle 10, coupling member 50 projects beyond the lower end 46 of extension member 40, and the lower end 64 of body member 36 of bushing assembly 30, with collar 62 spaced axially from lower ends 46 and 64, as illustrated in Fig. 1. In this manner, at least a portion of external thread 58 is spaced far enough downwardly from the tapered portion 66 of the body member 36 of bushing assembly 30 to enable external thread 58 to be engaged with a complementary threaded aperture 68 in lug 22 of contact 20, as seen in Fig. 2, without resistance which might otherwise occur if the tapered portion 66 of the body member 36 were to contact the corresponding tapered portion 70 of recess 28. Thus, at least a portion of external thread 58 of coupling member 50 may be threaded into threaded aperture 68 merely by turning bushing assembly 30 manually to advance external thread 58 into threaded aperture 68. Such advancement is continued until a sufficient axial length of external thread 58 is engaged within threaded aperture 68 to provide the holding strength necessary to complete the installation of the bushing assembly 30 within the receptacle 10, as described below, and preferably until a stop shoulder 72 on collar 62 is seated against lug 22, as seen in Fig. 3.

Preferably, manual turning of bushing assembly 30 will advance the coupling member 50 into threaded aperture 68 until stop shoulder 72 is seated properly against lug 22. A locking means is provided between the external thread 52 and the internal thread 56 to lock the coupling member 50 and the tubular extension member 40 against movement relative to one another during threading of the coupling member 50 into the lug 22, at least until the aforesaid sufficient axial length of thread 58 is engaged within threaded aperture 68. The locking means is in the form of a pellet 74 of synthetic resin material, such as nylon, placed within a recess 76 in the wall 78 of coupling member 50 and compressed against internal thread 56 of tubular extension member 40 to establish a prevailing torque great enough to preclude the unwanted relative movement, preferably until stop shoulder 72 is seated against lug 22. In order to effect continued rotation of the bushing assembly 30, and preferably after stop shoulder 72 is seated against lug 22, the prevailing torque provided by pellet 74 is overcome so that downward movement of the tapered body portion 66 into complementary tapered portion 70 of recess 28 can be continued. Thus, the pellet 74 provides a locking means which is responsive to a minimum torque, the minimum torque being of a predetermined value which will assure that the coupling member 50 is sufficiently engaged with lug 22, and preferably is engaged up to the position where stop shoulder 72 is seated against the lug 22, before tubular extension member 40 will move relative to coupling member 50. Pellet 74 assures that the minimum torque necessary to engage coupling member 50 sufficiently in lug 22 and preferably to seat coupling member 50 properly against lug 22 will be reached before extension member 40 moves relative to coupling member 50.

Upon proper seating of coupling member 50 within lug 22, as seen in Fig. 3, further rotation of bushing assembly 30 will overcome the lock provided by pellet 74 and the tapered body portion 66 of the bushing assembly 30 will begin to engage complementary tapered portion 70 of recess 28. Continued downward movement of the bushing assembly 30 will seat the bushing assembly 30 within the receptacle 10; however, such continued downward movement will meet with considerable resistance as a result of the interference fit which must be established between the complementary tapered portions 66 and 70 in order to attain the desired watertight seal and di-

electric properties along the interface between the engaged tapered portions. Since the body member 36 of bushing assembly 30 is constructed of elastomeric materials, it becomes impractical to grip the bushing assembly externally to exert the forces necessary to continue turning the bushing assembly as the resistance to turning increases with downward movement. The attachment arrangement of the present invention further provides an internal wrenching means for facilitating the continued rotation of the bushing assembly 30, as follows.

Turning now to Figs. 3 and 4, coupling member 50 has a central bore 80 passing through the coupling member 50 from end 54 to end 60. A threaded fastener in the form of a bolt 82 extends axially within the bore 80 and has a head 84 and a thread 86. A pin 90 extends radially through an aperture 92 in the wall of tubular member 38 and into a corresponding hole 94 in the head 84 of bolt 82, the pin 90 having a flanged end 96 which serves to locate the pin 90 radially within aperture 92. Tubular extension member 40 overlaps the aperture 92 thereby capturing flanged end 96 of pin 90 within aperture 92. Bolt 82 thus is fixed in the retracted position illustrated in Figs. 3 and 4.

A socket 98 in head 84 of bolt 82 provides a hexagonal wrenching configuration located along the central axis A of the bushing assembly 30. A tool 100, having a complementary hexagonal driving element 102 is lowered through the tubular member 38, along axis A, as seen in Fig. 3, and is inserted into socket 98, as seen in Fig. 4. The details of tool 100 are more fully disclosed in EP—A—0092615. For the purposes of the present disclosure, it is sufficient to understand that rotation of tool 100 about axis A, once the tool 100 is coupled with the head 84 of bolt 82, will impart concomitant rotation to bushing assembly 30 by virtue of the fact that head 84 is secured to tubular member 38 by pin 90. Wrenching forces then are applied and transmitted to move bushing assembly 30 downwardly until the land 48 at the lower end 46 of the tubular extension member 40 is seared against lug 22, as shown in Fig. 4, the collar 62 fitting within a corresponding recess 104 at the lower end 46 of extension member 40. If stop shoulder 72 of collar 62 has not yet been seated properly against lug 22, downward movement of extension member 40 now will carry coupling member 50 downwardly to assure proper seating of the coupling member 50 with lug 22. Once the land 48 is seated properly, the bushing assembly 30 will be seated within the receptacle 10 with the appropriate interference fit and land 48 will assure proper electrical contact between extension member 40 and lug 22 as well as an appropriate mechanical connection.

It is important that the bushing assembly 30 not be overtightened; that is, the land 48 must not foul the lug 22 and excessive forces should not be developed along the interface between the complementary tapered portions 66 and 70. At the same time, it is important that at least a minimum torque is applied sufficient to assure proper seating of bushing assembly 30 within receptacle 10. In order to preclude the application of excessive wrenching forces upon the bushing assembly 30, while assuring that the necessary minimum wrenching forces are applied, the shear strength of pin 90 is chosen so that pin 90 will shear in response to the application by tool 100 of a torque in excess of a given value determined by the minimum torque required for the appropriate seating of bushing assembly 30 within receptacle 10 and the maximum torque which can be tolerated. Thus, pin 90 serves as a further minimum torque responsive means which includes securing means for securing the head 84 of bolt 82 to tubular member 38 for applying wrenching torque, and the securing means releases in response to exceeding a given torque to preclude the application of an excessive torque to the connection between the bushing assembly 30 and the lug 22 while assuring that the necessary minimum torque is applied.

Once the pin 90 is sheared, bolt 82 is free to move axially downwardly within tubular extension member 40 and coupling member 50, until the head 84 of bolt 82 rests upon washers 105 located at the upper end 54 of coupling member 50. It is noted that axially upward movement of bolt 82 is restricted by a lip 106 which projects radially inwardly to preclude movement of bolt 82 upwardly into tubular member 38 beyond lip 106. The receptacle 10, with bushing assembly 30 in place therein, ordinarily will be placed upon terminal 12 with the bolt 82 aligned axially with a threaded aperture 108 in terminal 12. Upon freeing of the bolt 82 by shearing of the pin 90, the bolt 82 may be advanced and threaded into the terminal 12, by rotation of tool 100, to complete the connection to the terminal 12, as shown in Fig. 5. In the completed connection, bolt 82 clamps lug 22 in place upon the terminal 12 and secures receptacle 10 upon terminal 12 with the appropriate interference fit at the interface between the recess 26 of the receptacle 10 and the corresponding outer surface 110 of the terminal 12 and the proper electrical contact between the lug 22 and the conductor 111 of terminal 12. It is noted that stop shoulder 72 of collar 62 is seated against lug 22 to preclude the projection of end 60 of coupling member 50 downwardly beyond lug 22 so as to assure proper contact between lug 22 and conductor 111 of terminal 12. Fragment 112 of sheared pin 90 is retained within aperture 92 in the wall of tubular member 38 by virtue of flanged end 96 so as to prevent the fragment from dropping freely into the bushing assembly 30 and possibly causing problems, such as falling into socket 98 and interfering with the appropriate engagement of hexagonal element 102 of tool 100. Likewise, fragment 114 of sheared pin 90 is confined within hole 94 of bolt head 84, by the wall of tubular extension member 40. Thus, the location of fragments 112 and 114 is controlled. Tool 100 then is withdrawn, as shown.

Thus, the attachment arrangement of the present invention facilitates the appropriate

installation of the bushing assembly 30 within the receptacle 10 and then enables connection of the receptacle 10 to the terminal 12 in simplified operations performed readily in the field without complex tools.

It is to be understood that the above detailed description of an embodiment of the invention is provided by way of example only. Various details of design and construction may be modified without departing from the scope of the invention as set forth in the appended claims.

Claims

1. Apparatus to facilitate attaching and securing a bushing assembly (30) to an electrical connector (10) of a high voltage electrical distribution system, the electrical connector (10) having an axially extending recess (28) with a tapered portion (70) and receiving a terminal contact (20) of a high voltage cable, said contact (20) having a lug (22) with a threaded aperture (68), the threaded aperture (68) being coaxial with the axially extending recess (28); the bushing assembly (30) including an axially extending tapered body portion (66) which is complementary to the tapered portion (70) of the axially extending recess (28) in order to provide an interference fit; the apparatus further including a tubular member (40) which is adapted to be received in the bushing assembly (30) and which has an axially extending internal thread (56) and a coupling member (50) with externally threaded portions (52, 58) for respectively engaging the threaded aperture (68) of said lug (22) and the internal thread (56) of said tubular member (40), characterised in that minimum torque responsive means (74, 76) are provided for precluding relative movement between the tubular member (40) and the coupling member (50) below a predetermined torque exerted by the tubular member (40) upon the coupling member (50), such that the coupling member (50) initially rotates with the bushing assembly (30) to enable sufficient threaded engagement between the coupling member (50) and said lug (22) before the predetermined torque is exceeded, stop means (72) also being provided to limit entry of the coupling member (50) into the threaded aperture (68) of said lug (22).

2. Apparatus according to Claim 1, characterised in that the stop means is a shoulder (72) located on the coupling member (50).

3. Apparatus according to Claim 2, wherein the coupling member (50) has a bore (80) in which is received a threaded bolt (82), wrenching means (98) being provided in said bolt (82) and said bolt (82) being provided for threadably engaging a terminal (12) received in said connector (10), characterised in that further minimum torque responsive means (90—96) couples said bolt (82) to said tubular member (40) for initially precluding relative rotation between said bolt (82) and said tubular member (40) until a given torque is exceeded, said given torque being large enough to ensure that the tapered body portion (66) of the bushing assembly (30) is properly seated within the tapered portion (70) of the axially extending recess (26) and that an excessive torque is not exceeded when the stop shoulder (72) engages with said lug (22).

4. Apparatus according to Claim 3, characterised in that said further minimum torque responsive means (90—96) comprises a pin (90) capable of being sheared by relative rotation between said bolt (82) and said tubular member (40).

5. Apparatus according to Claim 4, characterised in that means (92, 94, 96) are provided for retaining fragments of the pin (90) subsequent to shearing of the pin (90).

6. Apparatus according to any one of Claims 3—5, characterised by further stop means (105) to limit entry of said bolt (82) into said terminal (12).

7. Apparatus according to any one of the preceding claims, characterised in that said first mentioned minimum torque responsive means (74, 76) comprises an element of synthetic resin material.

8. Apparatus according to Claim 7, characterised in that said element of synthetic resin material is located in a recess (76) in said coupling member (50), said element bearing against an internally threaded portion (56) of said tubular member (40).

Patentansprüche

1. Vorrichtung zur Erleichterung der Befestigung und Arretierung einer Muffeneinheit (30) an einem elektrischen Verbindungsteil (10) eines elektrischen Hochspannungsverteilungssystems, wobei das elektrische Verbindungsteil (10) eine sich axial erstreckende Ausnehmung (28) mit einem konischen Teil (70) aufweist und einen Anschlußkontakt (20) eines Hochspannungskabels aufnimmt, wobei der Kontakt (20) einen Ansatz (22) mit einem Gewindeloch (68) hat, welches koaxial mit der sich axial erstreckenden Ausnehmung (28) ist; wobei die Muffeneinheit (30) einen sich axial erstreckenden konischen Körperteil (66) enthält, welcher komplementär zu dem konischen Teil (70) der sich axial erstreckenden Ausnehmung (28) ist, um einen Festsitz zu schaffen; wobei die Vorrichtung ferner eine rohrförmiges Glied (40) enthält, welches in die Muffeneinheit (30) einsetzbar ist und eine sich axial erstreckendes Innengewinde (56) hat sowie ein Kupplungsglied (50) mit Außengewindeteilen (52, 58) zum Eingriff mit dem Gewindeloch (68) des Ansatzes (22) bzw. mit dem Innengewinde (56) des rohrförmigen Gliedes (40), dadurch gekennzeichnet, daß eine auf ein Mindestdrehmoment ansprechende Einrichtung (74, 76) vorgesehen ist zur Verhinderung einer Relativbewegung zwischen dem rohrförmigen Glied (40) und dem Kupplungsglied (50) unterhalb eines von dem rohrförmigen Glied (40) auf das Kupplungsglied (50) ausgeübten vorbestimmten Drehmoments, derart, daß sich das Kupplungsglied (50) zunächst mit der Muffeneinheit (30) dreht, um

ausreichende Verschraubung zwischen dem Kupplungsglied (50) und dem Ansatz (22) zu ermöglichen, bevor das vorbestimmte Drehmoment überschritten wird, und daß ferner eine Anschlageinrichtung (72) vorgesehen ist, um das Eindringen des Kupplungsgliedes (50) in das Gewindeloch (68) des Ansatzes (22) zu begrenzen.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Anschlageinrichtung eine auf dem Kupplungsglied (50) befindliche Schulter (72) ist.

3. Vorrichtung nach Anspruch 2, in welcher das Kupplungsglied (50) eine Bohrung (80) hat, die einen Schraubbolzen (82) aufnimmt, wobei in dem Bolzen (82) eine Schlüsseldreheinrichtung (98) vorgesehen ist und der Bolzen (82) zur Verschraubung mit einem in dem Verbindungsteil (10) aufgenommenen Anschluß (12) dient, dadurch gekennzeichnet, daß eine weitere auf ein Mindestdrehmoment ansprechende Einrichtung (90—96) den Bolzen (82) mit dem rohrförmigen Glied (40) kuppelt, damit anfänglich eine Relativdrehung zwischen dem Bolzen (82) und dem rohrförmigen Glied (40) verhindert wird, bis ein gegebenes Drehmoment überschritten wird, wobei das gegebene Drehmoment genügend groß ist, um zu gewährleisten, daß der konische Körperteil (66) der Muffeneinheit (30) richtig in dem konischen Teil (70) der sich axial erstreckenden Ausnehmung (26) sitzt und nicht ein übermäßiges Drehmoment überschritten wird, wenn die Anschlagschulter (72) gegen den Ansatz (22) stößt.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die weitere auf ein Mindestdrehmoment ansprechende Einrichtung (90—96) einen Stift (90) enthält, der durch Relativdrehung zwischen dem Bolzen (82) und dem rohrförmigen Glied (40) abscherbar ist.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß Mittel (92, 94, 96) zum Festhalten von Bruhstücken des Stiftes (90) nach dem Abscheren des Stiftes (90) vorgesehen sind.

6. Vorrichtung nach einem der Ansprüche 3 bis 5, gekennzeichnet durch weitere Anschlagmittel (105) zum Begrenzen des Eindringens des Bolzens (82) in den Anschluß (12).

7. Vorrichtung nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die ersterwähnte auf ein Mindestdrehmoment ansprechende Einrichtung (74, 76) ein Element aus Kunstharzmaterial enthält.

8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß das Element aus Kunstharzmaterial sich in einer Ausnehmung (76) in dem Kupplungsglied (50) befindet, wobei dieses Element gegen einen Innengewindeteil (56) des rohrförmigen Gliedes (40) stößt.

Revendications

1. Dispositif pour faciliter la fixation et la retenue d'un ensemble formant manchon (30) à un connecteur électrique (10) d'un système de distribution électrique haute tension, le connecteur électrique (10) comprenant un évidement (28) s'étendant axialement, ayant une partie évasée (70) et recevant une borne de contact (20) d'un câble haute tension, ledit contact (20) ayant un doigt (22) muni d'un trou taraudé (68) coaxial à l'évidement axial (28); l'ensemble formant manchon (30) comportant une partie de corps conique (66) s'étendant axialement et complémentaire de la partie évasée de l'évidement axial (28) de façon à constituer un assemblage à force; le dispositif comprenant de plus un organe tubulaire (40), prévu pour être reçu dans l'ensemble formant manchon (30) et ayant un taraudage axial interne (56) et un organe d'accouplement (50) ayant des parties munies d'un filetage extérieur (52, 58) pour s'engager respectivement dans l'ouverture taraudée (68) dudit doigt (22) et dans le taraudage (56) dudit organe tubulaire (40), caractérisé en ce que des moyens sensibles à un couple minimal (74, 76) sont prévus pour éviter un mouvement relatif entre l'organe tubulaire (40) et l'organe d'accouplement (50) au-dessous d'un couple prédéterminé exercé par l'organe tubulaire (40) sur l'organe d'accouplement (50), de sorte que l'organe d'accouplement (50) tourne tout d'abord avec l'ensemble formant manchon (30) pour qu'une liaison filetée suffisante s'établisse entre l'organe d'accouplement (50) et ledit doigt (22) avant que le couple prédéterminé ne soit dépassé, des moyens d'arrêt (72) étant également prévus pour limiter la pénétration de l'organe d'accouplement (50) dans l'ouverture taraudée (68) dudit doigt (22).

2. Dispositif selon la revendication 1, caractérisé en ce que les moyens d'arrêt comprennent un épaulement (72) situé sur l'organe d'accouplement (50).

3. Dispositif selon la revendication 2, caractérisé en ce que l'organe d'accouplement (50) comporte un alésage (80) qui reçoit un boulon fileté (82), des moyens de serrage (98) étant prévus dans le boulon (82), et ledit boulon étant prévu pour se visser dans une borne (12) montée dans ledit connecteur (10), caractérisé en ce que d'autres moyens sensibles à un couple minimal accouplent ledit boulon (82) audit organe tubulaire (40) pour éviter initialement une rotation relative entre le boulon (82) et l'organe tubulaire (40) jusqu'à ce qu'un couple donné soit dépassé, ledit couple donné étant suffisamment élevé pour garantir que la partie de corps conique (66) de l'ensemble formant manchon (30) s'appuie de façon correcte dans la partie évasée (70) de l'évidement axial (26) et qu'on ne dépasse pas un couple excessif lorsque l'épaulement d'arrêt (72) entre en contact avec le doigt (22).

4. Dispositif selon la revendication 3, caractérisé en ce que les moyens supplémentaires sensibles à un couple minimal (99, 96) comprennent une tige (90) susceptible d'être cisaillée par rotation relative entre le boulon (82) et l'organe tubulaire (40).

5. Dispositif selon la revendication 4, caractérisé en ce qu'il comprend des moyens (92, 94,

96) pour retenir les fragments de la tige (90) à la suite du cisaillement de la tige (90).

6. Dispositif selon l'une quelconque des revendications 3 à 5, caractérisé par des moyens d'arrêt supplémentaires (105) pour limiter la pénétration dudit boulon (82) dans la borne (12).

7. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce que lesdits moyens mentionnés en premier (74, 76) sensibles à un couple minimal comprennent un élément en matière résineuse synthétique.

8. Dispositif selon la revendication 7, caractérisé en ce que l'élément en matière résineuse synthétique est disposé dans un évidement (76) dudit organe d'accouplement (50), ledit élément portant contre une partie taraudage (56) dudit organe tubulaire (40).

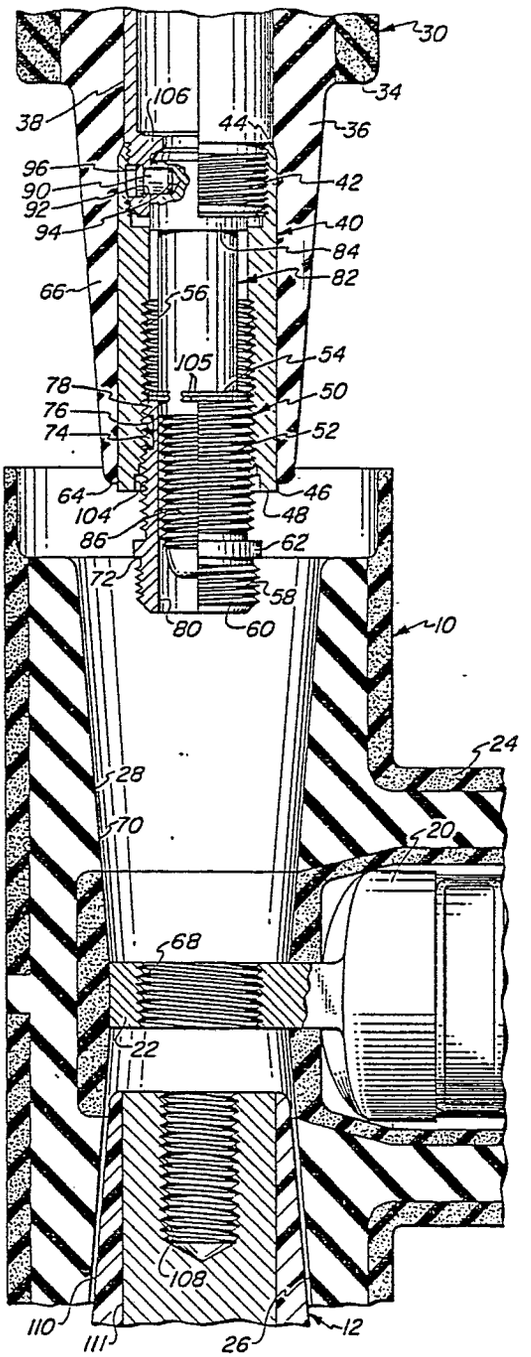
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FIG. 1

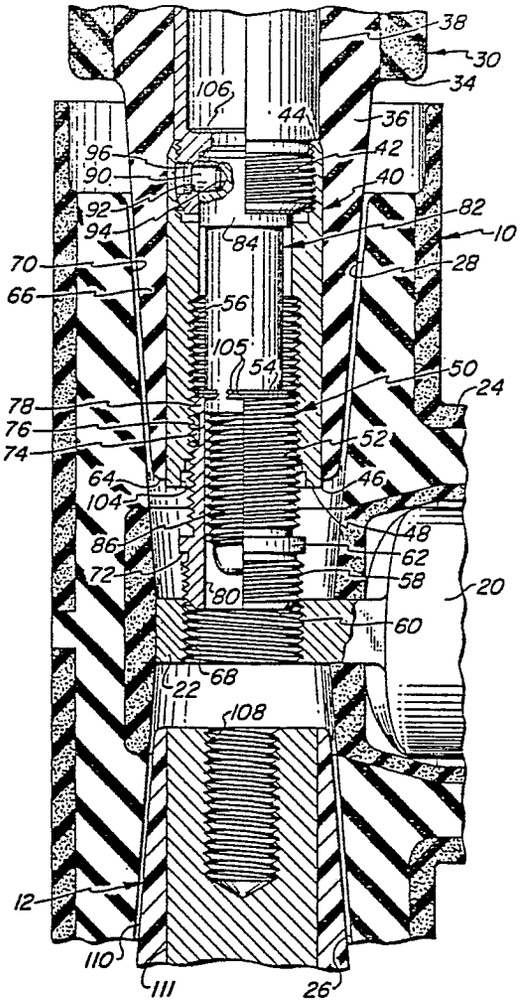
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FIG. 2

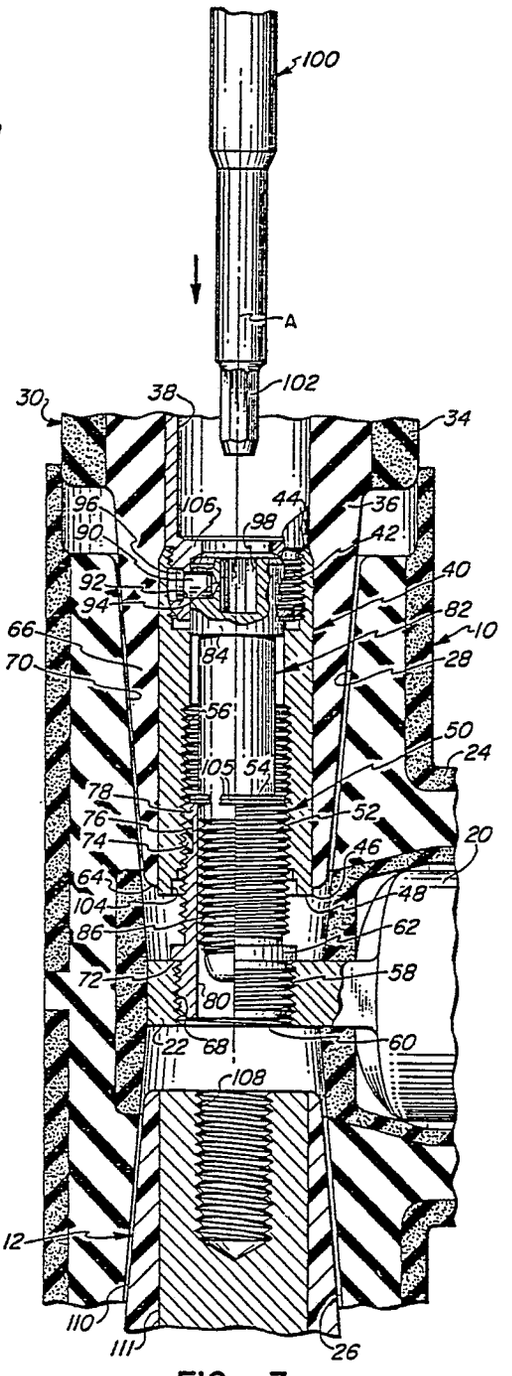
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FIG. 3

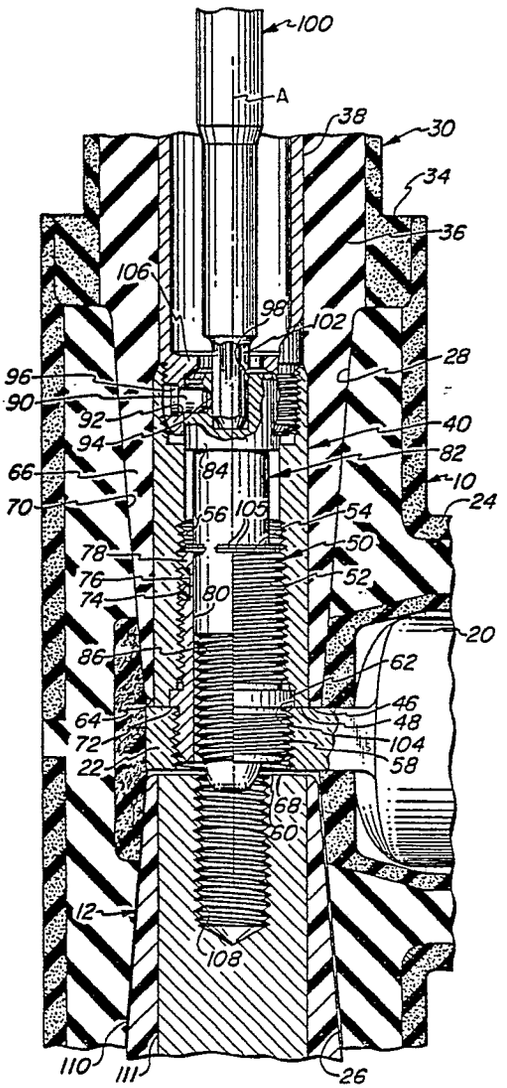
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FIG. 4

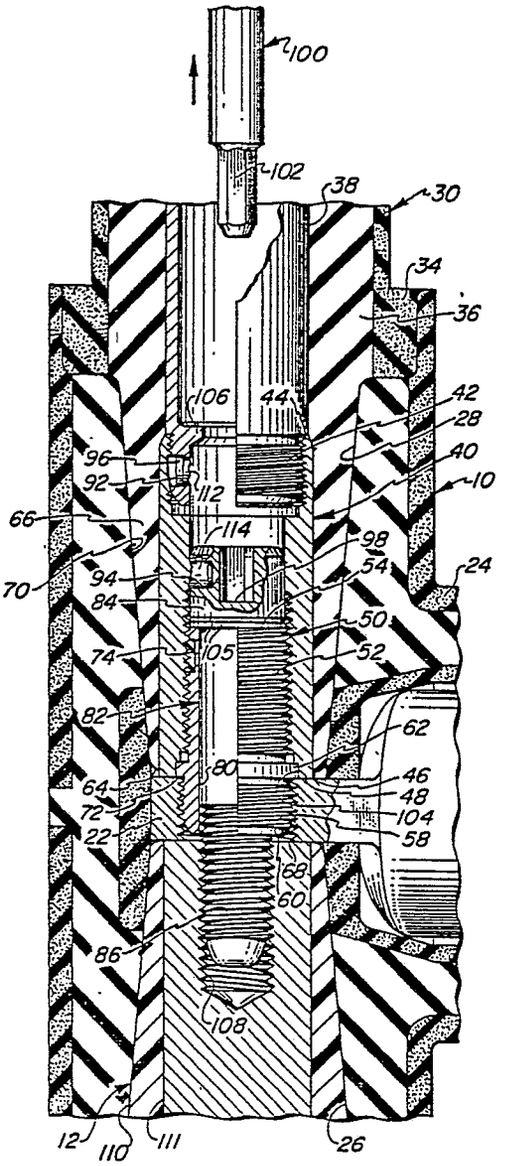
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FIG. 5