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(54) Kit of parts for a coaxial connector assembly.

(57) An electrical connector assembly for coaxial cable includes, a conductive outer shell (6) connected to a conductive sheath (16) of the cable, a conductive center contact (8) connected to a center conductor (12) of the cable, a hollow retention spring (2) carrying spring fingers (22) doubled back on themselves and distributed against the interior periphery of the shell (6), and a plug (4) surrounding the center contact with a composite dielectric of concentric, resilient dielectric sleeves (34, 36) separated by a dielectric air space (33).

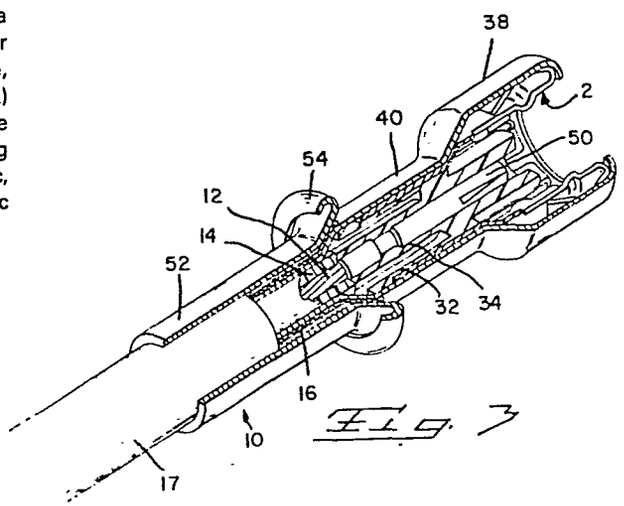

Fig. 3

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Kit of Parts for a Coaxial Connector Assembly

There is known in U.S. 3,745,514 a coaxial connector assembly including a conductive split sleeve which expands radially upon mated connection with a second coaxial connector assembly. An annular ring accompanies the second connector assembly and surrounds the split sleeve, limiting its radial expansion.

The present invention utilizes a tubular, unitary spring element carrying spring fingers that are reversely bent into U-shapes. The U-shapes flatten in compression in a space concentric and between the first and the second coaxial connector assemblies. The spring element is inherently self-limiting in deformation, providing an assembly functioning with fewer parts than a previous assembly.

There is known in U.S. 3,678,447 a coaxial connector assembly including a dielectric plug for supporting a conductive center contact of a coaxial connector assembly, and a projecting skirt on the contact for interference engagement within the plug. The plug is solid and provides only limited resiliency to facilitate force fit assembly with the center contact and skirt. Air space surrounds the plug and compensates for impedance mismatch, caused by junctures of the coaxial cable conductors with component parts of the coaxial connector.

In the present invention, a dielectric plug for a coaxial connector includes concentric cylinders or sleeves, that combine with an air space or gap concentrically between the sleeves to provide a composite dielectric compensating for impedance mismatch. The sleeves are made thin for resilient flexure into the air gap to facilitate press fit assembly of the outer sleeve into a connector shell and press fit assembly of a center contact into the inner sleeve of the plug. The resilient characteristics of the sleeves permit assembly without damage of the assembled parts.

A coaxial electrical connector assembly of the present invention includes, a solid dielectric plug with a forward portion and inner and outer concentric sleeves joined integrally with the forward portion, a passageway extending axially through the forward portion and through the inner sleeve and adapted for receiving the center contact, and a dielectric air space extending between the sleeves, the sleeves adapted for resilient flexure and deflection into the space upon force fit assembly, respectively, with a conductive outer shell and a conductive center contact of the coaxial electrical connector assembly,

a hollow spring element within the shell, the dielectric plug force fit within the spring element, a passageway extending axially through the plug, the conductive center contact force fit within the passageway and connected to a center conductor of the cable, and resilient spring fingers on the spring element, of the fingers being doubled back on themselves to provide inner and outer spring leaves distributed against the inner periphery of the shell at the mating end and adapted for resilient compression against the inner periphery of the shell upon surrounding and resiliently engaging a

complementary portion of another coaxial connector assembly mateably received in the shell, and the shell includes a radially inward lip overlying the spring fingers.

Accordingly an object of the present invention is to provide a kit of parts for a coaxial connector assembly of relatively few component parts.

An object of the present invention is to provide a kit of parts for a coaxial connector assembly which comprises economically produced, stamped and formed contacts and drawn body members.

A further object of the present invention is to provide a coaxial connector assembly kit of parts which provides for convenient assembly, and which comprises improved spring retention means and further means for protecting said spring retention means.

A further object of the present invention is to provide a coaxial connector assembly kit of parts which is economically and readily produced, and readily assembled.

A further object of the present invention is to provide a coaxial connector assembly kit of parts including a dielectric plug having means to facilitate resilient press fit of the plug with other component parts of a coaxial connector assembly.

It is a further object of the present invention to provide a coaxial connector assembly kit of parts including a plug of composite dielectric achieving impedance compensation for impedance mismatch caused by the cable termination.

A further object of the present invention is to provide a dielectric plug with improved means to facilitate resilient retention of a contact body therein.

Another object of the present invention is to provide a dielectric plug facilitating press fit into an outer connector shell, and press fit of a contact member

into the dielectric plug, and means compensating for impedance mismatch caused by cable termination with the shell and contact member.

The invention and other objects and advantages will be appreciated by way of example from the following description and accompanying drawings.

Figure 1 is an exploded perspective view of parts of a coaxial connector assembly.

Figure 2 is an exploded perspective view of the parts shown in Figure 1, illustrating assembly of some of the parts.

Figure 3 is a perspective view of the coaxial connector assembly previously shown in Figures 1 and 2 with all parts assembled and illustrated as partially cut away.

Figure 4 is an elevation view in section of a fragement of a forward end portion only of the assembly, previously shown in Figure 3, together with a fragment of a forward end portion only of another, complementary coaxial connector assembly to which the assembly shown in Figure 3 connects.

Figure 5 is a view similar to Figure 4 and illustrating the separate assemblies of Figure 4, intermated and in section.

Figure 6 is a fragmentary elevation view in section illustrating a pair of coaxial connector assemblies without the features of the invention and thereby are prevented from intermating.

Referring to Figure 1 the subject invention comprises coaxial connector components, including, a hollow tubular conductive spring element 2 having an axial passageway 3 extending therethrough, a dielectric body 4 having an axial passageway 5 extending therethrough, a conductive outer shell 6 having an axial passageway 7 extending therethrough, a conductive center contact 8,

and a conductive crimping ferrule 10. A coaxial transmission cable includes, a center conductor 12, surrounded by a dielectric layer 14, in turn, surrounded by an outer conductive shield 16 and an outer insulative sheath 17. The tubular spring element 2 includes a rearward cylindrical portion 18 of relatively smaller diameter, and a larger diameter, forward cylindrical portion 20 integrally joined to portion 18 by a shoulder 19. A plurality of annularly spaced apart spring fingers 22 are integral with the cylindrical portion 20, and project forwardly therefrom. Each spring finger 22 constitutes an inner leaf 24, integrally joined to the cylindrical portion 20, and is reversely curved to form a U-shaped forward end and an outer leaf 26. The inner leaf 24 is further provided with a radially projecting detent ridge 28. The spring element 2 is stamped and formed in a manner well known in the industry.

The dielectric body 4 is of unitary construction and includes a forward cylindrical sleeve 30 joining rearwardly disposed, coaxial, outer cylindrical sleeve 32 and inner cylindrical sleeve 34. The coaxial sleeves, 32, 34 are coaxially and radially spaced apart by an air space dielectric 33, as best seen in Figure 4. The inner cylindrical sleeve 34 also provides an annular detent ridge 35 which projects radially into the axial passageway 5. Also, as shown in Figure 1, a rearward end of the dielectric body 4 includes an annular external projecting flange 36.

The outer shell 6 is of a unitary drawn metal construction, and includes a forward, relatively large diameter hood 38, joined by an internal shoulder 44 to an intermediate cylindrical portion 40, and a rearward smaller diameter portion 42. The forward end of the hood 38 is provided with a rolled lip 66 projecting radially inward.

Returning to Figure 1, the center contact 8 is of

electrical receptacle type and includes, a rearward crimping barrel 46, and having a bore 9, an intermediate portion with an annular retention groove 48, and a forwardly extending female receptacle portion 50. The crimping ferrule 10 is provided at a rearward end with a crimp barrel 52, and at a forward end with an outwardly directed annular flange 54.

The dielectric body 4 is press fit into the spring element 2, with the flange 36 exposed from the rearward end of portion 18 of the spring element 2. The air space 33 allows the outer sleeve 32 to be thin and thereby possess resilient spring characteristics and to undergo resilient flexure and deflection into the air space when the sleeve 32 is press fit into the spring element.

As shown in Figure 4, the internal shoulder 19 of the spring element 2 abuts against the internal shoulder 44 of the shell body 6, and the outer leaf 26 of each spring finger 22 contacts the inner periphery of the hood 38.

The spring element and body 4 are assembled into the shell 6 from a forward end thereof. The spring element is press inserted into the forward end of the hood 38. Thereafter the radially inward lip 66 overlies the U-shaped portions of the spring element 2 and retains the spring element in the shell body 6.

As illustrated in Figures 1 and 2, the coaxial cable is extended through the crimping ferrule 10, and has its exposed conductor 12 forwardmost, followed, in turn, by the exposed dielectric layer 14, and an exposed forward length of the outer conductive shield 16. The center conductor 12 is inserted into the bore 9 of the crimp barrel 46 of contact 8, and connected by crimping in a conventional manner.

Collectively viewing Figures 2 and 4, the center contact 8 is inserted into the dielectric body passageway 5, and is retained therein as the ridge 35 snaps resiliently

into the groove 48 of the contact. It will be appreciated that the contact 8 causes resilient flexure and outward deflection of the inner sleeve 34, into the space 33. The air space 33 allows the inner sleeve 34 to be made thin and thereby possess resilient spring characteristics that provide resilient retention forces for retaining the center contact. Further, the air space 73 provides an air dielectric coacting with the solid dielectric sleeves 34, 36 compensating for impedance mismatch caused by the plurality of connections of the coaxial cable with the shell 6 and contact 8 of the connector assembly.

Referring now to Figure 3, the rearward portion 42 of the shell body 6 is inserted beneath the outer conductive shield 16 of the coaxial cable, and the crimping ferrule 10 is transported forwardly to entrap the exposed portion of the conductive shield radially against portion 42 of the shell. The crimping ferrule 52 is radially crimped in a conventional manner.

The above described coaxial connector assembly intermates with a complementary coaxial connector assembly 56, comprising a center contact of male pin form 58, an outer conductive shell 60, and a dielectric body electrically isolating the shell 60 from the center pin 58. The outer conductive shell 60 is provided with an annularly extending retention channel 64 spaced a prescribed distance rearwardly from the forward end of the assembly 56.

The separate assemblies shown in Figure 4 are shown intermated in Figure 5. The detent ridge 28 of the spring fingers 22, after riding over the forward end of the outer shell 60, resiliently registers in the retention channel 64. The forward end of the shell 60 is situated adjacent the inner end of the hood 38. The rolled lip 66 provides a lead-in for guiding the shell 60 centrally of the inner

spring leaves 24, and avoids stubbing of the shell 60 against ends of the spring fingers 22. The lip 66 also provides a stop against which the shell 60 engages to limit the degree to which the assembly 56 can be laterally manipulated during or after mating. Thus, the rolled lip 66 protects the spring fingers 22 from stubbing and excessive deflection by the assembly 56.

It is to be understood that the above description of the invention is merely illustrative within the scope and spirit of the invention. Figure 6 illustrates a pair of additional coaxial connector assemblies, similar to the assemblies previously disclosed, but with no lip 66 and thereby no protection for the spring finger portions 24 when the additional assemblies are intermated.

Claims:

1. A kit of parts for a coaxial connector assembly in which a conductive outer shell (6) is adapted for connection at one end to an outer conductor (16) of an electrical coaxial cable and at a second end mateably to another complementary coaxial connector assembly (56), a conductive center contact (8) is adapted for connection to a center conductor (12) of the cable, a hollow conductive spring element (2) is adapted for insertion within and contacting the outer shell (6), and a unitary dielectric plug (4) is adapted for press fit assembly with the spring element (6) and contains an air space dielectric (33), and the center contact (8) is adapted for press fit with the dielectric plug (4), characterized in that, the spring element (2) includes spring fingers (22) having portions doubled back on themselves and adapted for distribution against the inner periphery of the shell (6) at the second end, and the outer shell includes a radially inward lip (66) overlying at least partially the doubled back portions of the spring fingers (22).

2. The kit of parts according to Claim 1, further characterized in that; the plug (4) includes an outer resilient sleeve (36) of solid dielectric adapted for press fit in the shell (6), an inner resilient sleeve (34) of solid dielectric adapted for press fit with the center contact (8), and the air space dielectric (33) is coaxially positioned between the sleeves (34, 36).

3. A kit of parts for an electrical coaxial connector assembly as recited in Claim 1 or Claim 2, further characterized in that the second end of the outer shell (6) includes a radially inward projecting lip (66).

4. A kit of parts for an electrical coaxial connector assembly as recited in Claim 1 or Claim 2, further characterized in that, the dielectric plug (4) has an enlarged end portion (36) adapted for projection from the spring element (2) and for press fit in the shell (6).

5. A kit of parts for an electrical coaxial connector as recited in Claim 1 or Claim 2, further characterized in that the center contact (8) includes an external annular recess (48), and the inner resilient sleeve (34) includes a radially projecting internal ridge (35) adapted for registration in the annular recess (48) of the center contact.

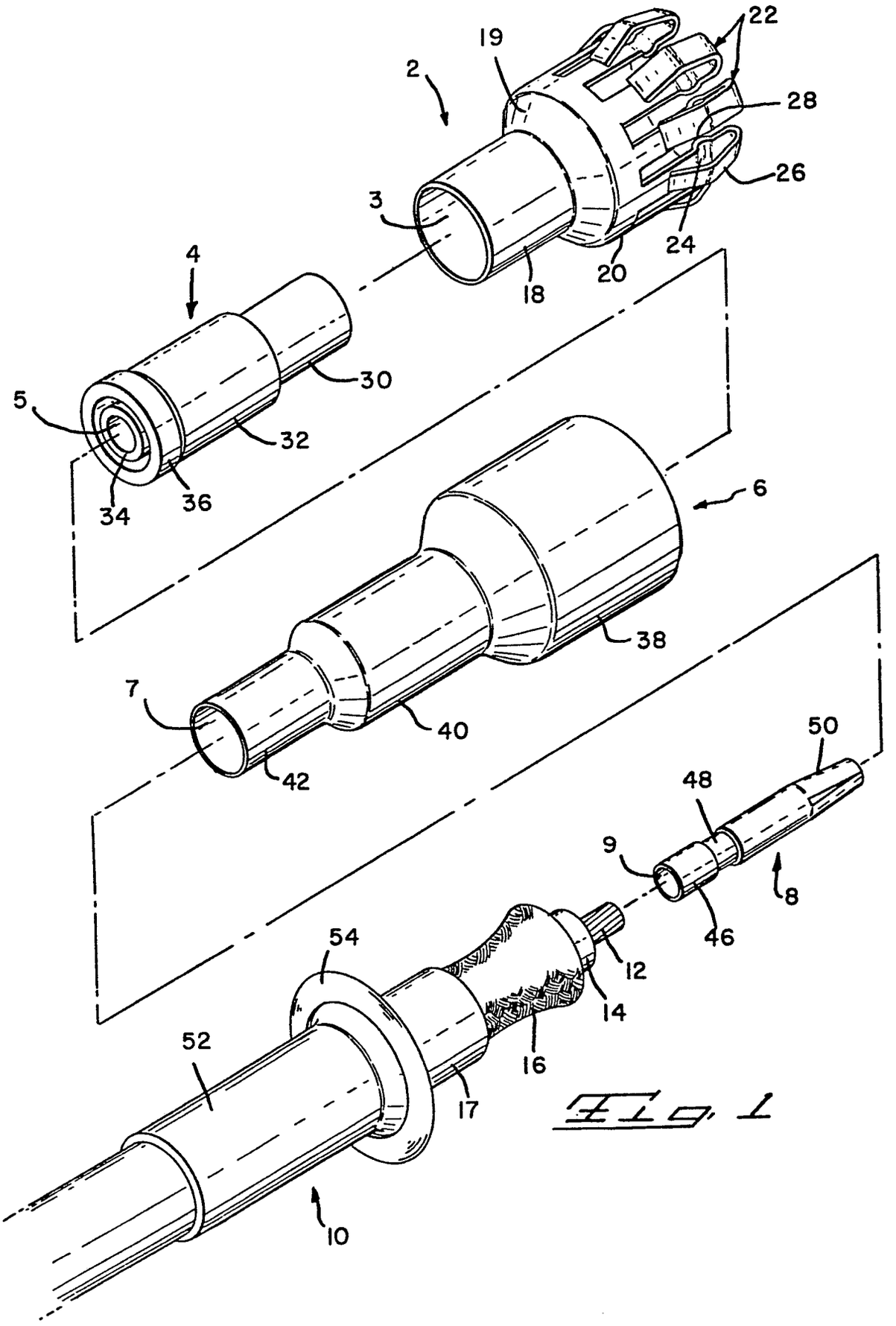
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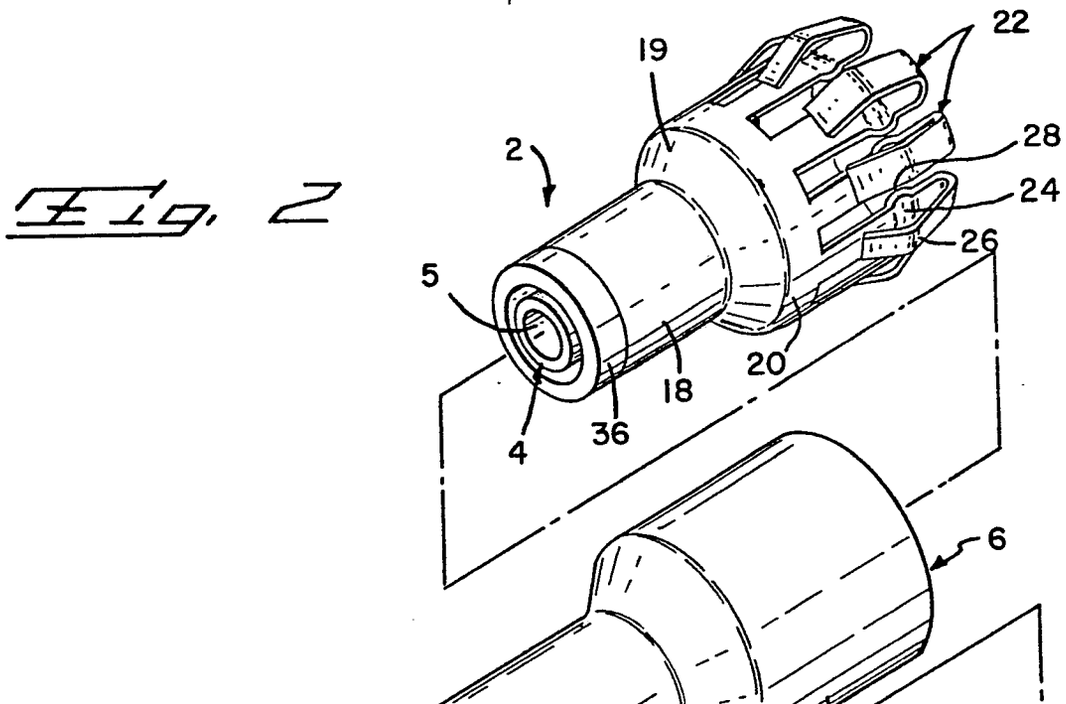
Fig. 1

Fig. 2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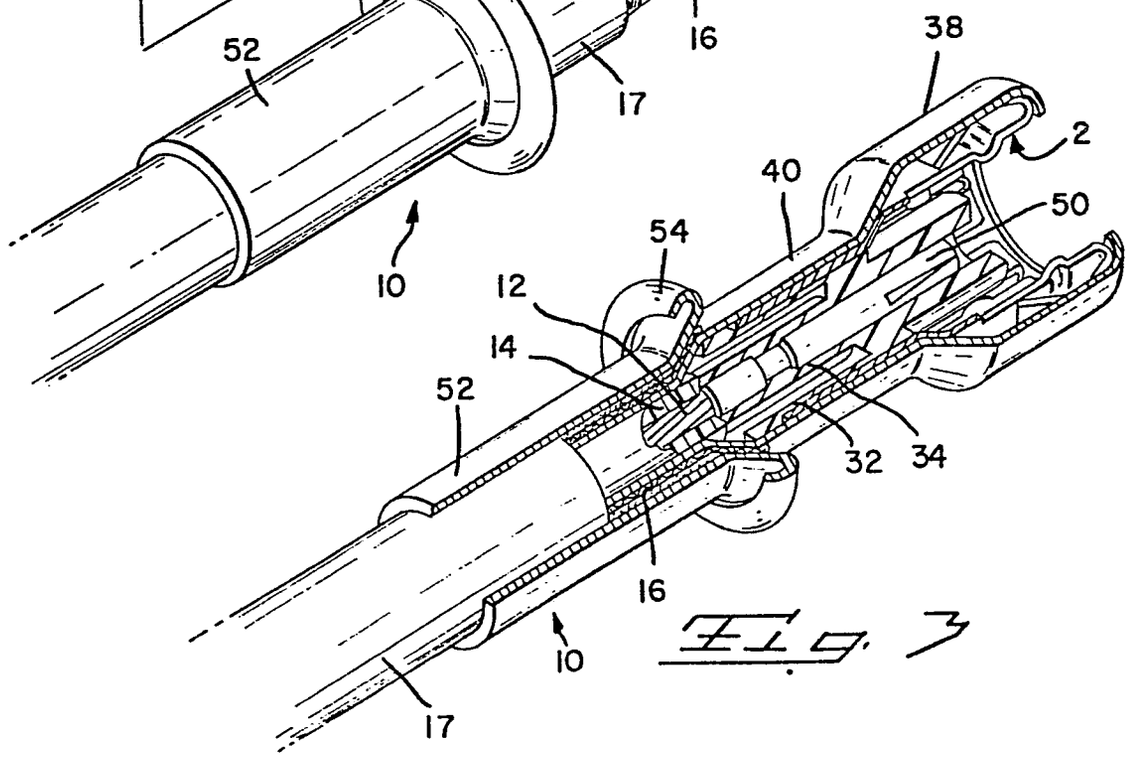
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Fig. 3

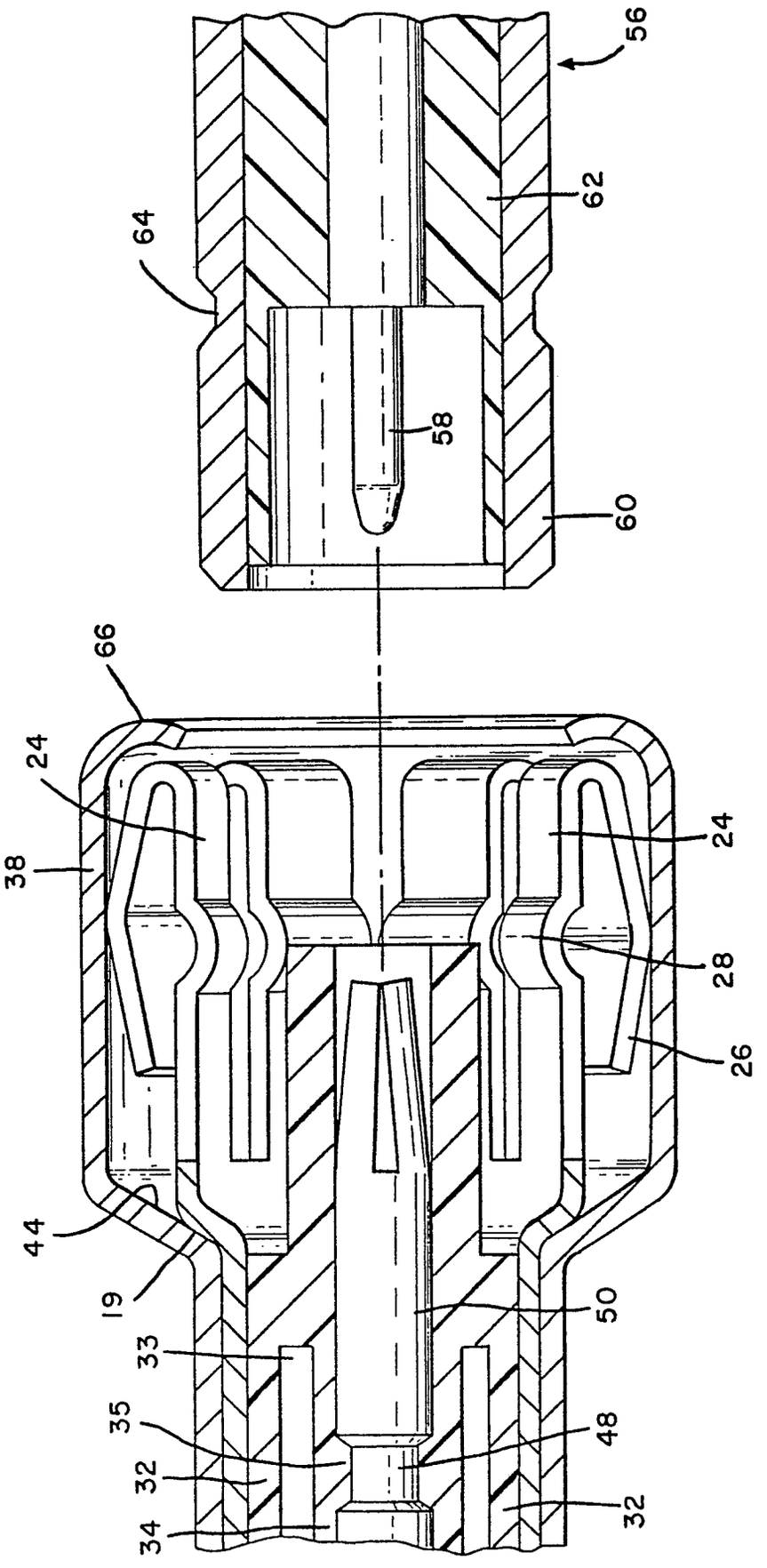

FIG. 4

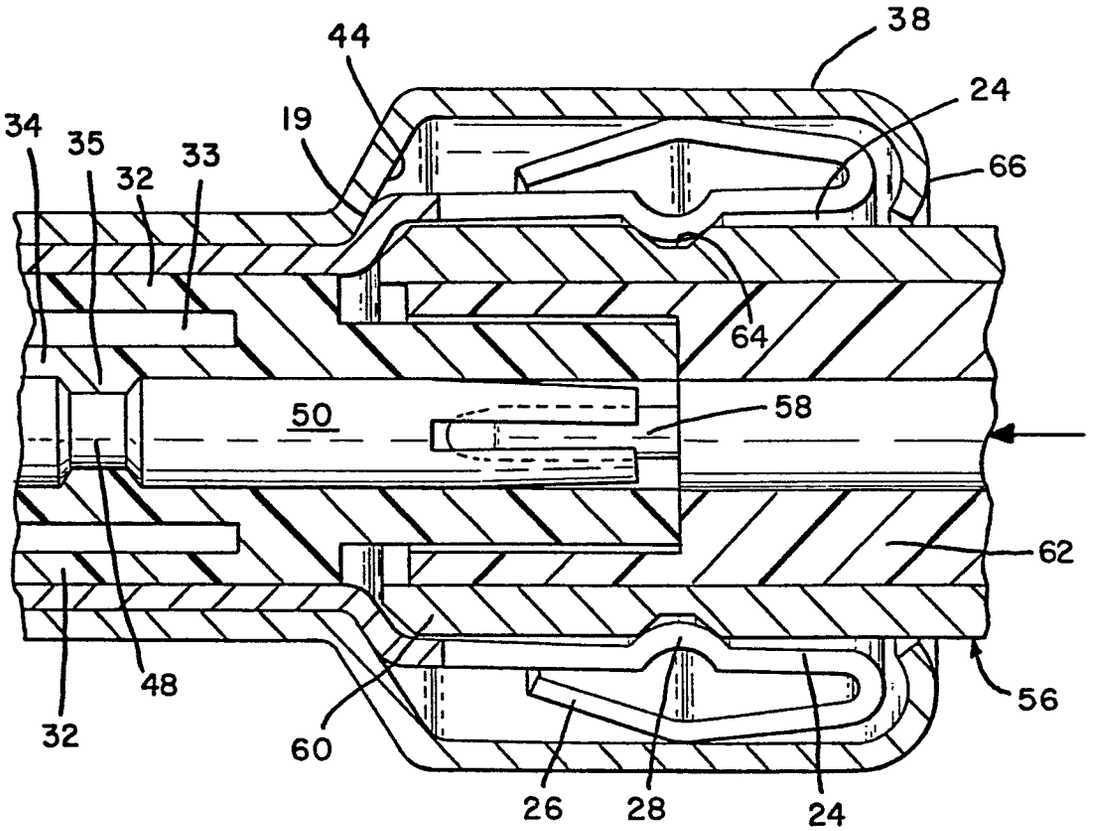
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Fig. 5

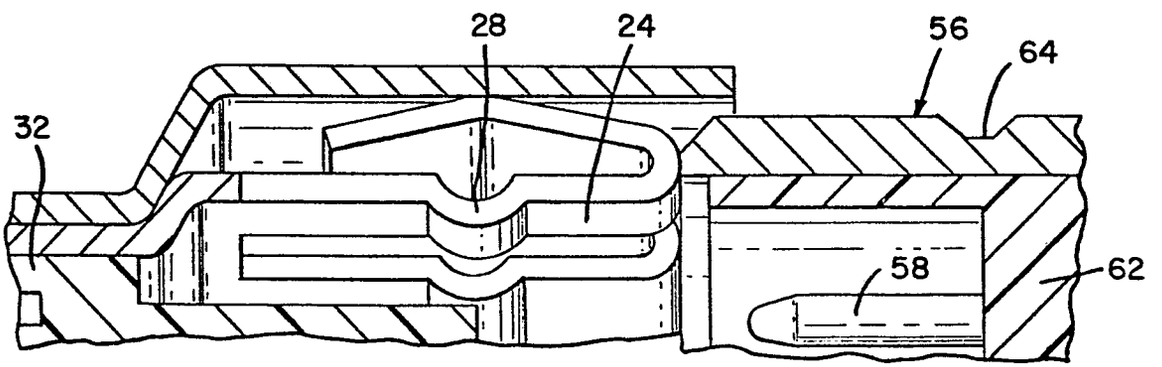
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Fig. 6