

Oct. 17, 1967

W. C. HARTMAN ETAL

3,348,190

TEST CLIP

Filed May 2, 1966

2 Sheets-Sheet 1

FIG. 1

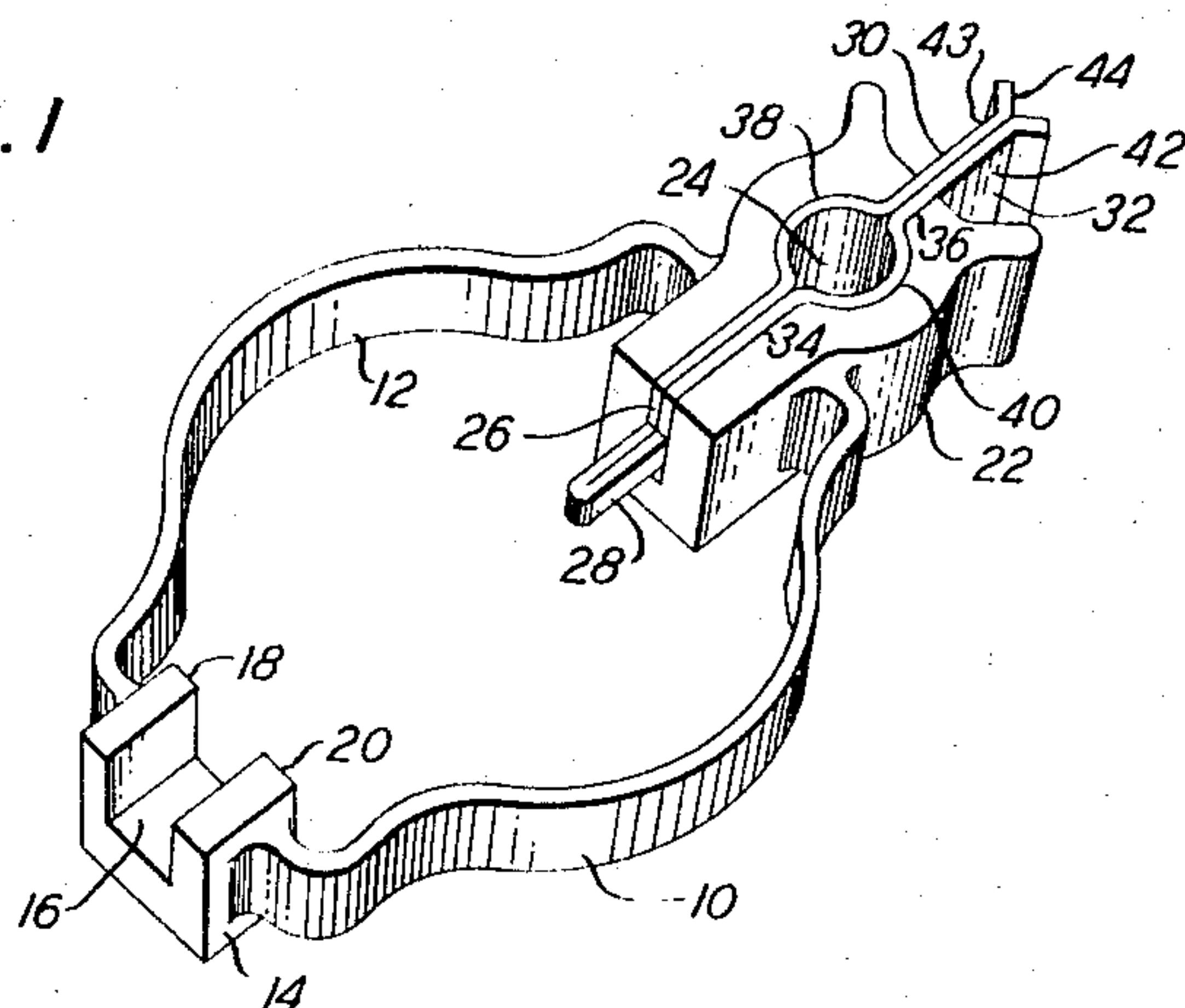


FIG. 2

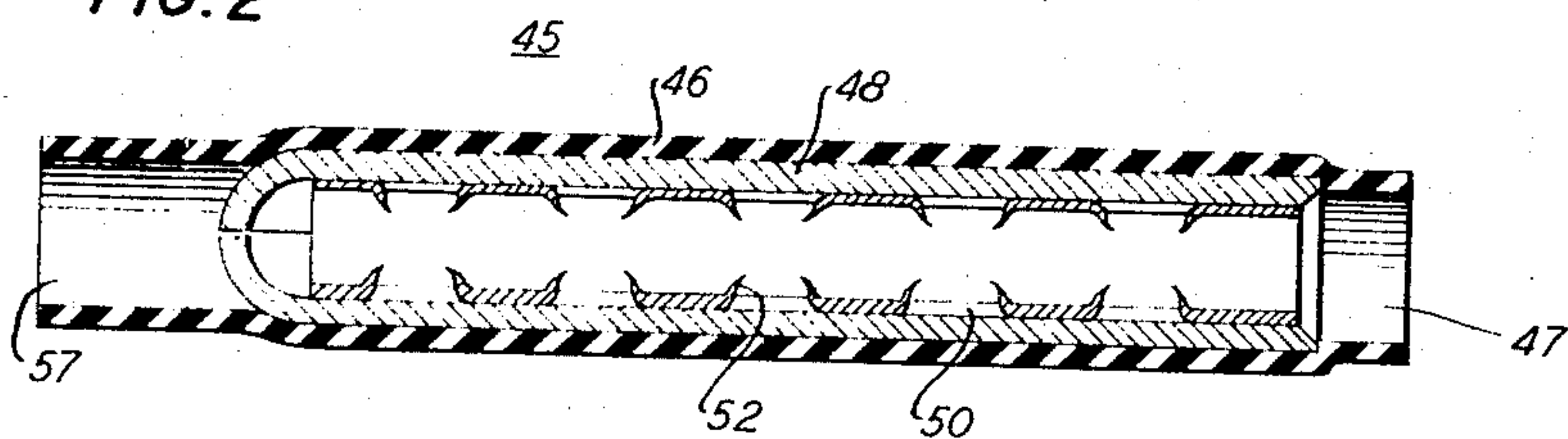


FIG. 3.

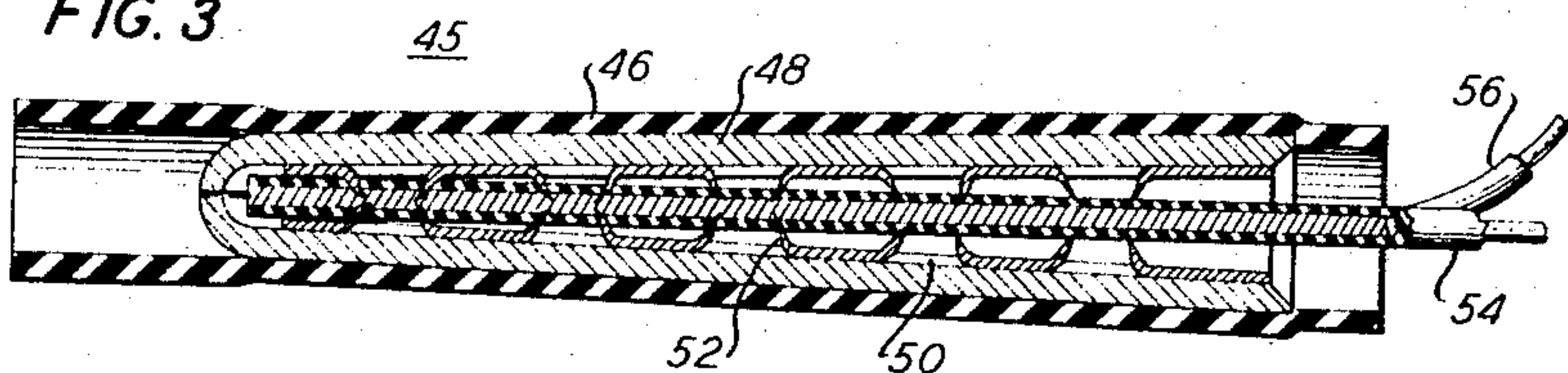
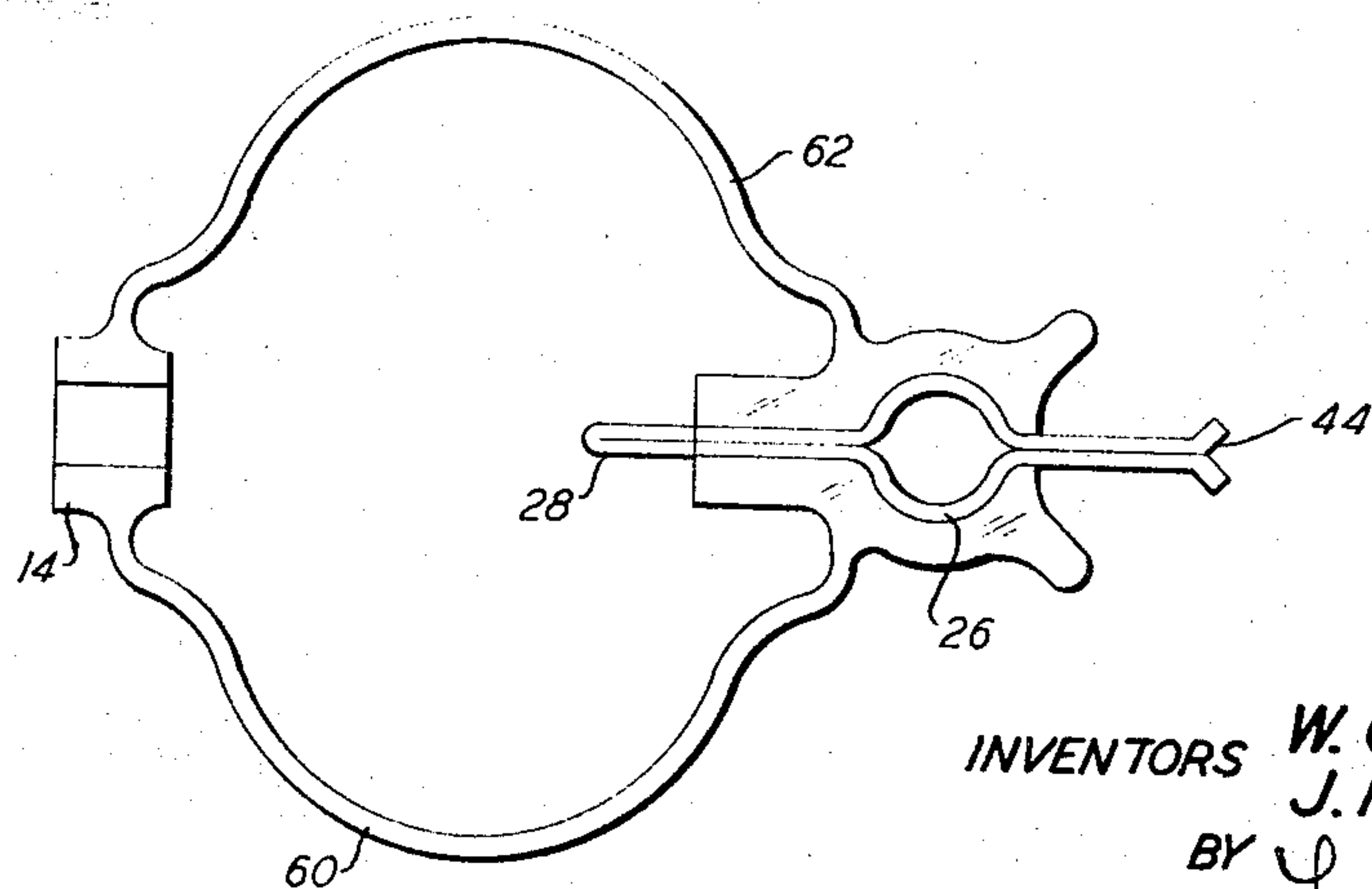


FIG. 5



INVENTORS **W. C. HARTMAN**
J. H. KING
BY *Leo Stanger*
ATTORNEY

Oct. 17, 1967

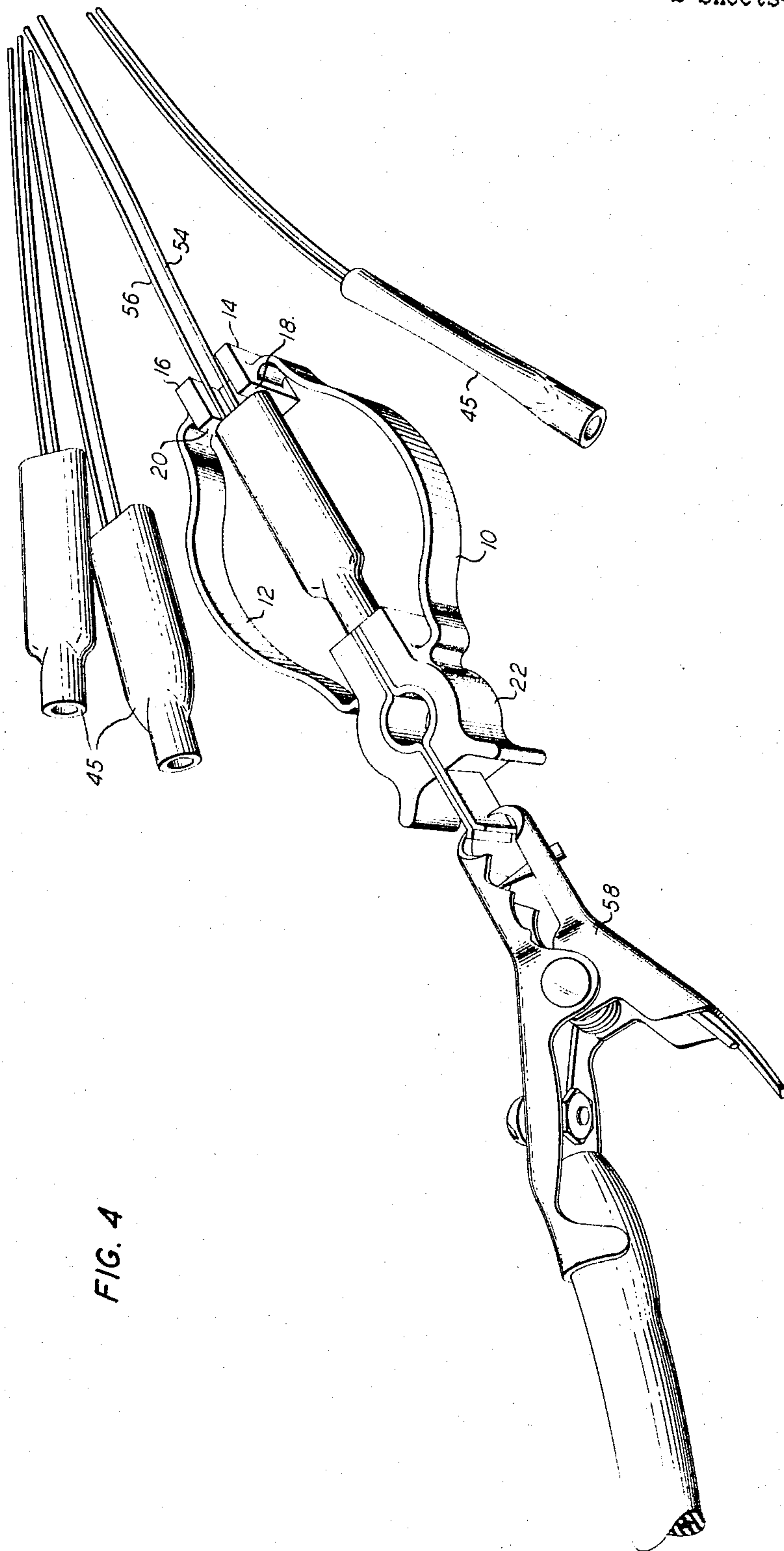
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3,348,190
TEST CLIP

William C. Hartman, South Plainfield, and John H. King, Chatham, N.J., assignors to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York

Filed May 2, 1966, Ser. No. 546,686
8 Claims. (Cl. 339-75)

This invention relates to electrical fastening clips, particularly for establishing and maintaining electrical contact with the conductive interior of a so-called B-wire connector whose exterior is insulated and whose basic structure is described in Patent No. 3,064,072, issued Nov. 13, 1962.

Such B-wire connectors are generally used for joining the individual wires that make up a multiconductor cable with the wires that make up another multiconductor cable so as to form a splice bundle. The individual B-wire connectors comprise an inner hard metal tube-shaped liner having inwardly-projecting tangs. A soft metal tube-shaped liner surrounds the hard metal liner. In present B-wire connector designs an outer insulating sleeve, open at both ends and shrunk-fit about the soft metal liner, protects the liners electrically. When two insulated wires, one from each cable, are inserted to an open end of the connector and the connector is squeezed radially by a vise-like tool, the inwardly-projecting tangs penetrate the wire insulation and enter the conductive surface of each wire so as to establish firm contact. The soft metal liner maintains this contact after the squeezing stops. To assure adequate insulation, the outer shrunk-fit insulating sleeve extends well beyond the liner end. Thus, a craftsman, in order to test the individual connections of a splice bundle, perhaps some years after the splice bundle is completed, must gain access to the connector's conductive interior despite the effect of the sleeve.

In the past, such contacts have been attempted by penetrating the outer insulating sleeve with a sharp clip, thereby impairing the sleeve's insulating effect. On the other hand, acquiring such electrical contact by inserting test probes into the open end of the sleeve has proven inconvenient because the cable wires to be connected are thin and flaccid. Therefore, long-time contact of the connector with probes requires the craftsman to hold the probe and the connector continuously and interferes with his ability to adjust test equipment. He thus finds it difficult to run tests on several connections simultaneously.

Other attempts at establishing these continuous contacts have been unsuccessful.

An object of this invention is to improve connector clips for contacting connectors of the above-mentioned type.

Another object of the invention is to establish such contact with a simple, easily-manufactured clip.

Still another object of the invention is to establish contact with a B-wire connector of the above-mentioned type by means of a clip requiring little or no attention once contact is made.

Still another object of the invention is to establish and maintain such contact as simply as possible while at the same time permitting simple release without complex tools.

Yet another object of the invention is to avoid destruction of any parts of the connector to which contact is made.

According to the invention these ends are achieved by holding a conductive prong in a block of insulating material and pointing it toward a wire-holding cradle that is joined to the block by a pair of spring-like outwardly-bowed arms whose resilience establishes a space between

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the cradle and block and also urges the prong into one end opening of the connector, while the cradle holds the wires emerging from the other end of the connector and abuts against that end of the connector. By furnishing a fin to the other end of the prong, a snap-type or alligator clip can grip and make contact with the conductive liners.

According to another feature of the invention the spring-like arms are bowed-out sufficiently so that when they are squeezed inwardly from the relaxed position the prong travels from the cradle a distance greater than the distance between the open end of the connector and the interior conductive liners. By virtue of this feature a craftsman can establish a connection to the connector with one hand. He simply grasps the bowed arms between his thumb and middle finger while holding the cradle opening toward his forefinger. He then slips the wires to be connected into the cradle opening with the aid of his forefinger and draws back until the cradle abuts against the end of the connector from which the wires emerge. He then squeezes the arms, and by manipulating the wire connector, arranges the prong so that upon releasing the arms the prong enters the end of the connector and establishes the desired contact.

These and other features of the invention are pointed out in the claims. Other objects and advantages of the invention will become obvious from the following detailed description when read in light of the accompanying drawing wherein:

FIG. 1 is a perspective view of the clip embodying features of the invention;

FIG. 2 is a cross-sectional view of the connector to which the clip of FIG. 1 is to be attached;

FIG. 3 is a cross-sectional view of the connector in FIG. 2 joining two wires;

FIG. 4 is a perspective view of a clip embodying features of the invention and engaged to a connector forming part of a splice bundle; and

FIG. 5 is a plan view of a connector embodying those features of the invention which permit single-hand operation.

In FIG. 1, showing a connector clip according to the invention in an unstressed condition, a pair of outwardly-bowed opposing arms 10 and 12 terminate at the sides of a block-shaped cradle 14 having a rectangular depression or cutout 16. The cradle 14 exhibits two inwardly-directed faces 18 and 20 merging at their bottoms. Connected integrally to the other ends of the bowed arms 12 and 13 is a clamp 22 whose Φ -shaped opening 24 holds a contact member 26. The latter comprises a shaped ribbon folded at a prong 28 between the bowed arms 10 and 12. Its two fold-over portions 30 and 32 are force-fitted into the slots 34 and 36 of the opening 24 and exhibit symmetrical arcuate portions 38 and 40 that are force-fitted into the round portion of the Φ -shaped opening 24. The ends 42 and 43 of the fold-over portions 30 and 32 project together beyond the block 22 to form a bifurcated fin 44.

The block 22, the arms 10 and 12 and the cradle 14 are molded integrally from a plastic material available from the E. I. du Pont de Nemours and Company of Wilmington, Del., under the name Delrin or from the Celanese Corporation under the mark Celcon. The contact member 26 is composed of a conductive material such as a copper alloy.

The clip shown in FIG. 1 grasps and connects to the interior portion of a connector 45 such as shown in FIGS. 2 and 3. This connector structure is based upon the connector described in Patent No. 3,064,072, issued Nov. 13, 1962 to H. J. Graff et al. Here, an outer insulating sleeve 46 is shrunk-fit about a soft metal liner 48 closed

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on one end embracing a hard metal liner 50 having inwardly-projecting tangs 52. Such a connector is used by inserting two insulated wires to be connected into the open end 47 of the liners 48 and 50 and then squeezing the entire assembly so that the tangs 52 penetrate the wire insulation and contact the conductors as shown in FIG. 3. Here, the wires to be connected are designated 54 and 56. The connector now has one open end 57 and one end 47 from which the wires 54 and 56 emerge.

The connectors of FIGS. 2 and 3 are generally used for connecting the wires in two or multiconductor cables so as to form a splice bundle having perhaps one hundred or more connections of the type shown in FIG. 4. It is with the connectors 45 of such a splice bundle that the clip of FIG. 1 is most useful.

Applying the clips of FIG. 1 to a connector 45 is a simple operation. A craftsman merely slips the prong 28 into the opening 57 and then squeezes the arms 10 and 12 until the cradle 14 travels far enough from the block 22 for the cutout 16 to receive the wires 54 and 56. The resilience of the arms 10 and 12 urges the block faces 18 and 20 against the end 47 while urging the prong 28 into contact with the liner 48. A suitable spring clip 58 can then simply grasp the connector 26 near the fin 44 for electrical engagement.

Often the splice bundles are found in comparatively inconvenient locations below ground. Frequently, they are sufficiently inaccessible so that it is desirable to apply the clip of FIG. 1 to a connector 45 illustrated in FIG. 4, with one hand. This can be done by using the clip shown in FIG. 5 where the arms 60 and 62 bow out further than in FIG. 1. When the arms 60 and 62 of FIG. 5 are squeezed, the block 22 retracts from the cradle 14 much further than in FIG. 1. However, the block 22, when the arms 60 and 62 are unstressed, returns to a position whose distance from the cradle is the same as that of FIG. 1. To apply the clip of FIG. 5 with one hand a craftsman need merely grasp the arms 60 and 62 with the thumb and middle finger so that the opening 16 is opposite his forefinger and the prong 28 points outwardly from his hand. With the connector 45 pointing at him, he pushes the wires 54 and 56 emerging from the connector 45 into the opening 16 with his forefinger and draws back the entire clip of FIG. 1 until the faces 18 and 20 hit the sleeve 46 at opening 47 from which the wires 54 and 56 emerge. Squeezing the arms 60 and 62 moves the block 22 away from the cradle 14 until the prong 28 can enter the open end 57 of the connector 45. Slight manipulation of the wires with the forefinger will align the prong 28 and connector end 57. By releasing the arms 60 and 62 the prong makes contact with the interior liner 48 of the connector 45.

By virtue of the invention, a craftsman can electrically engage and maintain contact with any of the connected wires in the splice bundle without creating the danger of short circuits and without any destructive effects upon the connectors. Several such clips can be applied to a number of connectors and various snap clips can then be connected to the clips of FIG. 5 for running any number of tests.

Removing each of the clips of both FIGS. 1 and 5 is a one-hand operation. A craftsman need merely squeeze the arms 10 and 12, and 60 and 62 lightly between his thumb and middle finger and then push the connector 45 with his forefinger so that the wires 54 and 56 come out of the cradle 14.

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While an embodiment of the invention has been described in detail, it will be obvious to those skilled in the art that the invention may be embodied otherwise without departing from its spirit and scope.

What is claimed is:

1. A test clip for contacting an insulated connector from which wires protrude at one end and which has an opening at the other end, comprising insulating cradle means for receiving the wires emerging from one end of the connector and for abutting against the one end of said connector, insulating block means made of the same material as said cradle means, conductive prong means projecting from said block means toward said cradle means, variable means for establishing a predetermined spacing between said cradle means and said block means when said variable means are unstressed, said variable means including a pair of outwardly-bowing resilient insulating arms extending from said cradle means to said block means and being integral with both of said last-named means, said prong means being retractable from said cradle means by squeezing said arms inwardly, said spacing being small enough so that when said cradle means abuts against the end of the connector to be contacted said arms resiliently urge said prong means into said opening.

2. A clip as in claim 1 further comprising conductive fin means integral with said prong means and projecting away from said cradle means so as to be graspable by a snap clip.

3. A clip as in claim 1 wherein said cradle means include a pair of flat surfaces for abutting against the one end of the connector to be contacted.

4. A clip as in claim 1 wherein said block means, said cradle means and said variable means are composed integrally of the same resilient insulating material.

5. A clip as in claim 1 wherein said block means include a Φ shape depression for force-fit holding said prong means and said fin means.

6. A clip as in claim 1 wherein said prong means and said fin means comprise two sheet metal portions in face-to-face relation having outwardly-curved center portions and exhibiting a Φ shape.

7. A clip as in claim 1 wherein said cradle means include an insulating mass having a longitudinal recess from one end thereof to the other aligned with the direction of said prong means.

8. A clip as in claim 1 wherein said arms are bowed sufficiently so that when squeezed said prong means retract from said block means a distance greater than the length of prong means needed to enter said connector to make contact.

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MARVIN A. CHAMPION, *Primary Examiner.*

65 R. E. MOORE, *Assistant Examiner.*