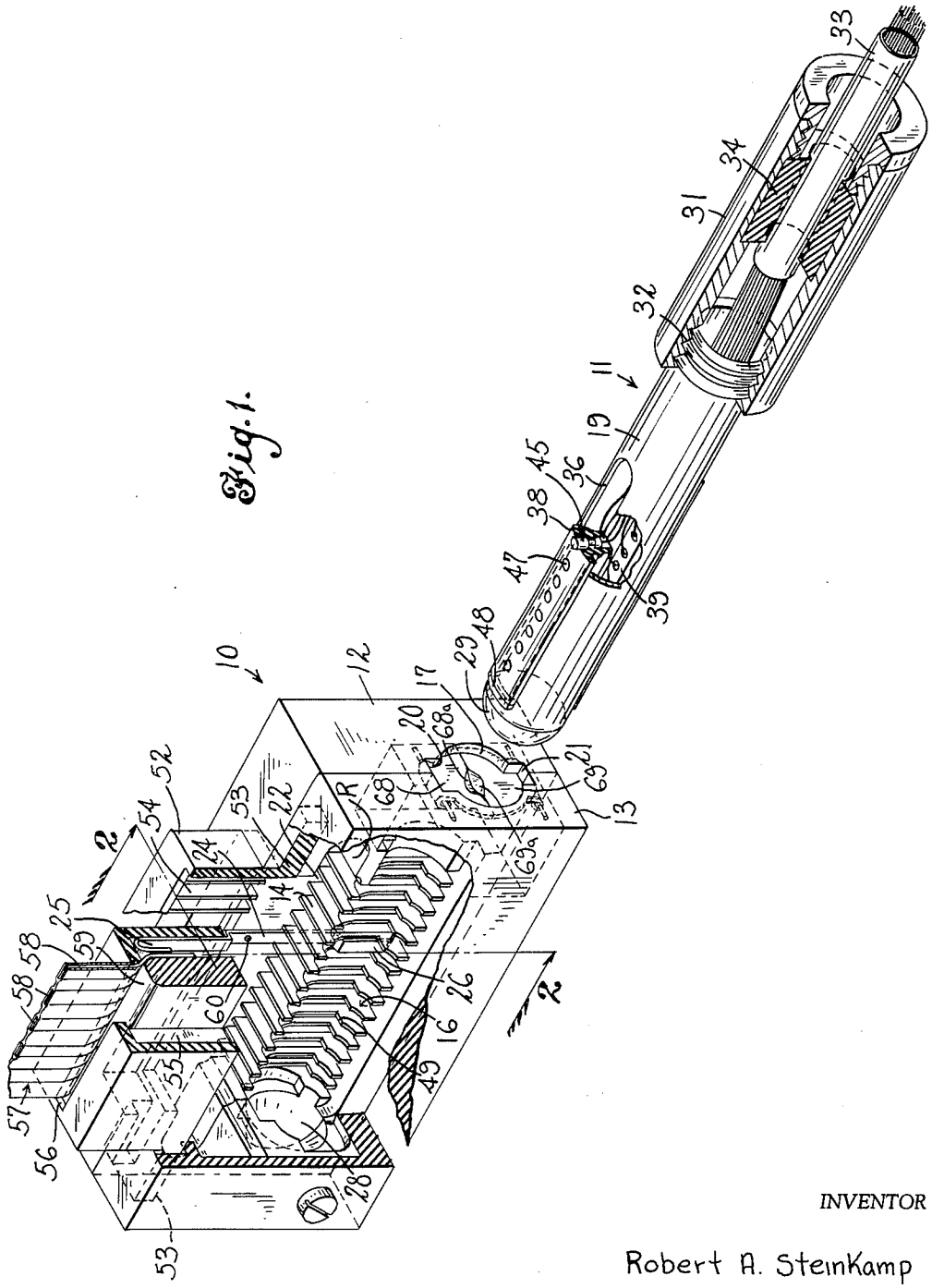
Dec. 7, 1965 R. A. STEINKAMP 3,222,471

MULTIPLE ELECTRICAL CONNECTOR WITH LONGITUDINAL SPACED CONTACTS CARRIED BY INSULATING KEY

Filed June 10, 1963 3 Sheets-Sheet 1

Fig. 1.



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Filed June 10, 1963 3 Sheets-Sheet 2

Fig. 2.

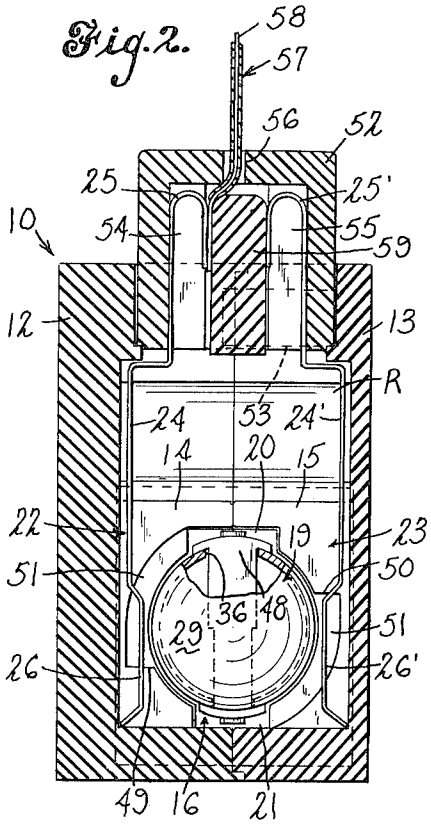


Fig. 3.

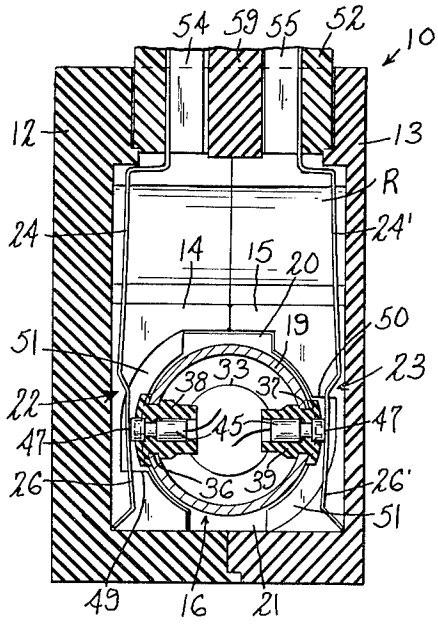


Fig. 5.

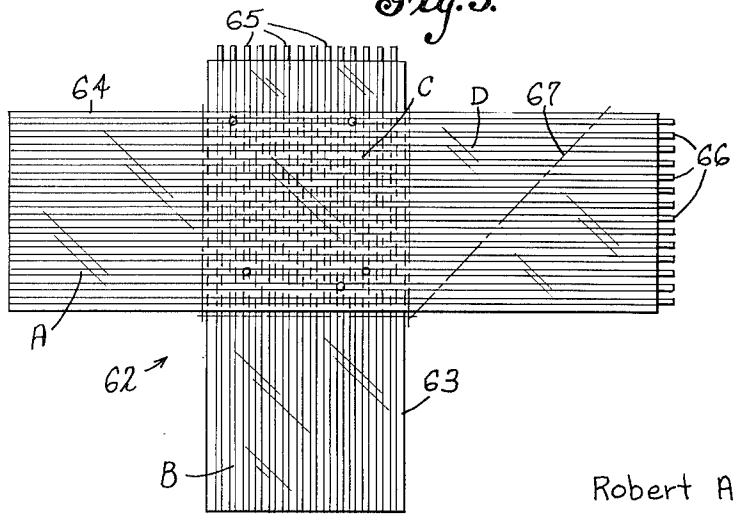
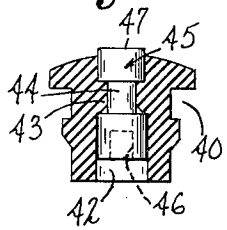


Fig. 4.



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Fig. 6.

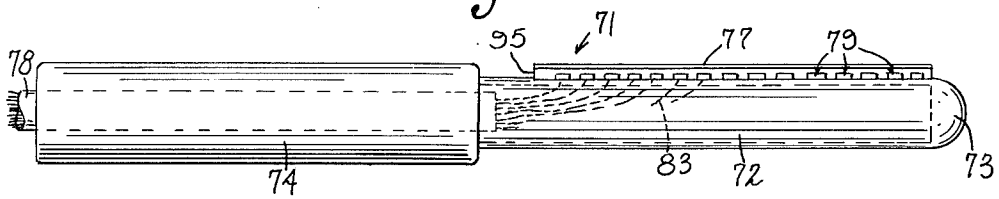


Fig. 7.

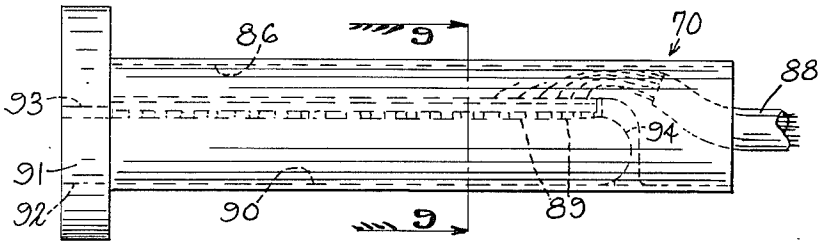


Fig. 8.

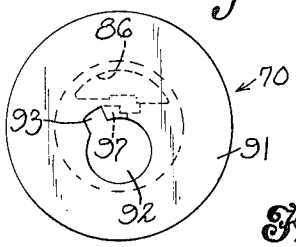


Fig. 9.

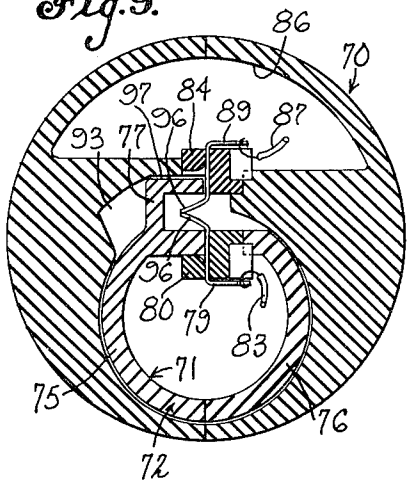
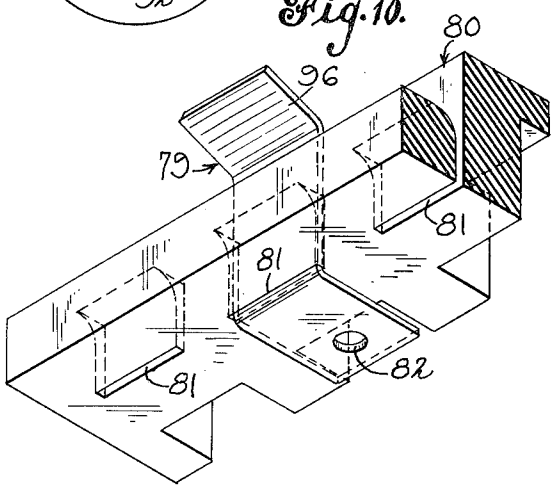


Fig. 10.



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United States Patent Office

3,222,471

Patented Dec. 7, 1965

3,222,471

MULTIPLE ELECTRICAL CONNECTOR WITH LONGITUDINAL SPACED CONTACTS CARRIED BY INSULATING KEY

Robert A. Steinkamp, Middletown, Conn., assignor to Ripley Company, Inc., Middletown, Conn.

Filed June 10, 1963, Ser. No. 286,775
12 Claims. (Cl. 200—51.07)

This invention relates to electrical connectors and more particularly relates to an arrangement for simultaneously acomplishing a multiplicity of electrical connections.

A device embodying the invention may be adapted for many applications. However, a connector embodying the invention is particularly adapted for use in making electrical connections between a plurality of electrical conductors which are energized in accordance with specific intelligence and a device adapted to read-out and record the encoded intelligence. In practice, the invention may be embodied in an electrical connecting apparatus comprising a first contact carrier having contacts thereon which are energized in accordance with recorded or metered intelligence and a second contact carrier having contacts thereon arranged to make electrical engagement with preselected contacts of the first contact carrier. The contacts of the second contact carrier may be connected to a device arranged to read-out and record the intelligence encoded on the contacts of the stationary contact carrier.

The contacts of the first contact carrier may be electrically connected to a utility meter such as disclosed in copending application Serial No. 276,839 fi'ed April 30, 1963, of Robert A. Steinkamp and assigned to the same assignee as the present application. In such application the first contact carrier would preferably be fixedly mounted on the exterior of a dwelling receiving electrical service and the contacts thereof would be energizable in accordance with the reading of the electric service recording meter. The second contact carrier is then carried by a service man having a read-out and/or recording device to determine the reading of a meter as encoded on the contacts of the first contact carrier. The second contact carrier is arranged to have the contacts thereon placed in predetermined electrical engagements with the contacts of the stationary contact carrier.

With such an arrangement the utility service man may simply and easily take a meter reading and have it recorded on the spot without entering the serviced structure or observing the dials on the meter.

As will be apparent the stationary contact carrier is subjected to atmospheric conditions and therefore must be resistant to weather and should simply and ruggedly be constructed. Additionally, and quite importantly, the stationary and portable contact carriers must be so arranged that only preselected electrical engagement is made by the contacts of each of the carriers, otherwise faulty and erroneous readings could result. Moreover, both the stationary and portable contact carriers must be ruggedly constructed to insure efficient operation thereof while being subjected to making and breaking of electrical connections therebetween many times.

Accordingly, the present invention provides a new and improved multiple electrical contact arrangement adaptable for the purposes described which is of simple, yet rugged construction and which is provided with means to insure that electrical engagement is made only between preselected contacts of the contact carriers. The present invention allows the contacts of each carrier to be brought into engagement only when the carriers are in a predetermined physical relation and the contacts are properly aligned, for predetermined engagement.

An object of this invention is to provide a new and improved apparatus for simultaneously making a plurality of electrical connections.

Another object of this invention is to provide a new and improved electrical connector comprising first and second contact carriers having contacts thereon wherein electrical engagement may be made between predetermined contacts of contact carriers only when the carriers and the contacts thereon are in a predetermined physical relationship and the contacts of each carrier are in a predetermined aligned relationship.

Another object of this invention is to provide a new and improved apparatus for simultaneously making electrical connections between a plurality of electrical contacts wherein the contact carrying members must be initially joined in a predetermined physical relationship and means are provided for preventing the making of electrical contacts between the contacts of the carrier members unless such physical relationship is first accomplished.

A further object of this invention is to provide new and improved apparatus for facilitating the transfer of intelligence stored on a plurality of electrical contacts in an encoded form to a read-out or recording device.

A still further object of this invention is to provide a new and improved electrical connecting apparatus of the type described which is simple and rugged in structure and which will withstand repeated making and breaking of electrical engagement between pluralities of electrical contact elements.

A still further object of this invention is to provide new and improved electrical connecting apparatus for making connections to a plurality of circuits at one location and then break the connection and use a portion of the apparatus to make connections to similar circuits at other locations without placing undue stress and wear on the connecting apparatus.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combinations of elements, and arrangements of parts will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which;

FIG. 1 is a perspective view of apparatus embodying the invention, showing first and second contact carriers which are cut away in part to further illustrate the structure thereof.

FIG. 2 is a sectional view seen at plane 2—2 of FIG. 1, with a portion of the contact carriers cut away.

FIG. 3 is a sectional view as seen at plane 2—2 of FIG. 1 with the contact carriers joined to effect electrical engagement of the contacts carried thereon.

FIG. 4 is an enlarged view of a contact mounting means shown in FIG. 3.

FIG. 5 illustrates an arrangement for making coded electrical connections between the contacts of a stationary contact carrier, as illustrated in FIGS. 1–4.

FIGS. 6–10 illustrate a second embodiment of the invention.

FIGS. 6 and 7 are side elevations of a set of contact carriers arranged to be physically joined to effect electrical engagement between contacts carried thereon.

FIG. 8 is an end view of the contact carrier of FIG. 7 seen from the left end.

FIG. 9 is a sectional view of the contact carrier of FIG. 7 seen along line 9—9 of FIG. 7 with the contact carrier of FIG. 6 inserted therein.

FIG. 10 is a perspective view, in part, of a contact and contact mounting means utilized in the contact carriers of FIGS. 6 and 7.

A first preferred embodiment of the invention comprises first and second contact carrying members **10** and **11**. Carrier member **10** will hereinafter be refrred to as a receptacle or stationary contact carrier and carrier member **11** will hereinafter be referred to as a plug or portable contact carrier. As will hereinafter be more fully described portable contact carrier **11** is in the shape of a probe arranged to be inserted into a passage defined in stationary contact carrier **10**, positioned therein and then rotated a predetermined angle to effect electrical engagement between the contacts carried by each of the carrier members **10** and **11** in a predetermined relationship.

Stationary contact carrier **10** is generally comprised of two parts, a mounting portion **12** and a cover portion **13**. The mounting and cover portions matingly fit together to provide a weather-tight seal therebetween, as shown in FIGS. 2 and 3. Contact separating fingers or ribs **14** extend from the side walls of portion **12** and contact separating fingers or ribs **15** extend from the side walls of portion **13**.

As more clearly shown in FIGS. 2 and 3 the contact separating fingers **14** and **15** are so formed as to define a passage **16** therethrough arranged to receive portable contact carrier or the probe portion of the portable contact carrier therein. Portions **12** and **13** define an aperture **17** in carrier member **10** aligned with the defined passage **16** to allow admittance of the probe portion **19** of portable contact carrier **11** into the passageway. To assure that probe **19** is inserted into the defined passage in a predetermined angular position aperture **17** is fromed with keyways **20** and **21** arranged to matingly receive keys formed on probe **11** as will hereinafter be more fully described.

The contact separating fingers or ribs **14** and **15** on each of the portions **12** and **13** are so dimensioned and spaced that each rib **14** is laterally aligned with a rib **15** with respect to the length of passage **16** and define contact receiving pockets therebetween. Therefore, contact receiving pockets **22** between the fingers **14** and pockets **23** between fingers **15** are in lateral alignment. Each of the pockets **22** and **23** is adapted to receive therein an electrical contact member **24** (only one shown) and **24**^{1}, respectively, having a portion thereof **25** or **25**^{1} adapted to be connected to an external circuit and another portion thereof **26** or **26**^{1} adapted to be electrically engaged by a predetermined contact on portable carrier member **11**. As more clearly shown in FIGS. 2 and 3 when portions **12** and **13** are joined the fingers or ribs **14** on cover portion **12** are aligned with a predetermined finger or rib **15** on cover portion **13** and therefore contact receiving pockets **22** and **23** are aligned laterally of the direction of passage **16**.

Provided in stationary contact carrier member **10** is a probe positioning means illustrated as a hemispherical seat **28** ararnged to receive therein the hemispherical nose **29** of probe **19** and halt insertion of probe **19** into passage **16** after it has traveled therein a predetermined distance such that it aligns contacts on probe **19** with contacts **24** and **24**^{1}, or more specifically portions **26** and **26**^{1} of contacts **24** and **24**^{1} laterally across passage **16**.

Portable contact carrier **11** comprises a cylindrical probe portion **19** terminating in hemispherical nose **29**. The other end of probe **19** is mounted to a handle **31** as by means of threads **32** or other suitable means. A multiconductor cable **33** extends through handle portion **31** and a sealing grommet **34** therein into probe member **19** where the individual conductors of cable **33** are selectively connected to contacts.

Defined in probe member **19** longitudinally thereof are slots **36** and **37** which in the illustrated embodiment of the invention are angularly displaced 180 degrees. Carried in slots **36** and **37** are contact mounting members **38** and **39**, respectively, which are of an elastomeric material such as rubber or the like. The contact mounting members, as more clearly shown in FIGS. 3 and 4, are formed with a groove **40** therein on either side thereof which receive the edges of probe **19** defining slots **36** and **37** and in this manner are secured to probe member **19**.

Contact mounting members **38** and **39** are provided with a plurality of contact receiving apertures **42** therethrough in linear predetermined spaced relation corresponding to the spacing between contacts **24** and contacts **24**^{1} along the length of passage **16**. The apertures **42** have a flange-like portion **43** intermediate the ends thereof adapted to fit into the necked down portions **44** of contacts **45**. In this manner contacts **45** are secured in mounting members **38** and **39** and through the mounting members carried on probe **19**.

Each of the contacts **45** at one end thereof is adapted to have connected thereto one of the conductors of the multi-conductor cable **33**. As illustrated the contacts **45** have a well **46** adapted to have one of the conductors soldered or otherwise joined thereto. The engaging surface **47** of contacts **45** extend beyond the upper surface of the mounting members **38** and **39**.

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The contact mounting members **38** and **39** extend beyond the peripheral surface of probe member **19**. The width of the contact mounting members **38** and **39** is selected such that mounting members **38** and **39** act as keys to allow insertion of probe member **19** into passage **16** through aperture **17** only when probe **19** is in a predetermined angular position with aperture **17** and therefore passage **16**. Mounting member **38** is selected to be of a width which will be matingly received by keyway **20** and mounting member **39** is selected to be of a width matingly received by keyway **21**. With this arrangement it will be evident that there is only one position in which probe **19** may be inserted through aperture **17**, one of the mounting members being of a greater width than the other.

Additionally a key member **48** is provided to form the leading portion of the keys. As shown in FIG. 2, member **48** is of generally I-shape cross section having upper and lower flanges of the same width as mounting members **38** and **39**, respectively. Member **48** is initially inserted in slots **36** and **37** and rotated therein to achieve the position shown in FIGS. 1 and 2.

The ribs **14** and **15** are further formed to define a continuation of keyways **20** and **21** as most clearly seen in FIGS. 2 and 3. However, ribs **14** are cut away on one side of keyway **20** adjacent the upper portion thereof and ribs **15** are cut away on one side of keyway **21** adjacent the lower portion thereof in order that probe **19** may be rotated in a predetermined direction (clockwise as illustrated) when it has been fully inserted into passage **16**.

When probe **19** has been properly inserted through aperture **17** and seated against seat **28** to properly align the two rows of contacts **42** with contacts **24** and **24**^{1} or more specifically portions **26** and **26**^{1} thereof, the portable contact carrier may be rotated ninety degrees clockwise to bring contacts **45** into electrical engagement with preselected contacts **24** and **24**^{1}. It will be noted that when the probe member **19** is rotated ninety degrees the contacts mounted on contact mounting member **38** will make electrical engagement with contact members **24** in mounting portion **12** and the contacts **45** mounted in mounting member **39** will make electrical engagement with contacts **24**^{1} carried in cover portion **13**. It will further be noted that the ribs or fingers **14** and **15** are formed with shoulders **49** and **50**, respectively, to prevent greater than a predetermined angular rotation of probe member **19**. It will further be noted that the keyways defined by the ribs or fingers **14** and **15** are cut away on opposite sides thereof and while allowing ninety degrees rotation in a clockwise direction to effect electrical engagement between the contacts **45** and **24**, **24**^{1} will prevent further than

a ninety degree rotation of probe 19. The shoulders 49 and 50 act as a stop by engaging the contact mounting members 38 and 39.

The contact carrier portions 12 and 13 are provided with mating collar portions 51 which define an aperture with keyways similar to aperture 17 with keyways 20 and 21. The collars 51 are so positioned and dimensioned that the probe 19 must be inserted into passage 16 a distance such that the mounting members 38 and 39 clear collars 51 before the probe 19 can be rotated. With this arrangement, the hemispherical seat 28 and the collars 51 act to position the probe member 19 in passage 16 such that the contacts carried thereon are laterally aligned with predetermined contacts 24 and 24^1 before the probe 19 can be rotated. Therefore the contacts on probe 19 and the contacts 24 and 24^1 are laterally aligned, with respect to passage 16 prior to contacts 45 being rotated into electrical engagement with contacts 24.

In the illustrated embodiment of the invention, the contacts 24 are arranged to be connected to conductors which are in parallel spaced-apart relation in an insulating medium. As illustrated the conductors to be connected to the contacts 24 are in a cable of ribbon or tape form. An adaptor member 52, having flanges 53 received in slots provided therefor by mounting and cover portions 12 and 13, respectively, is mounted on stationary contact carrier member 10 and has spaced contact separating ribs or fingers 54 and 55 on the sidewalls thereof on either side of a slot-like aperture 56. Ribs 54 and 55 are vertically aligned with ribs 14 and 15, respectively. The cable 57 is selected such that the spacing between the conductors 58 thereof is the same as the spacing between the pockets defined between the ribs 14, 54 and 15, 55. To effect a positive electrical connection between the conductors 58 and predetermined ones of contacts 24 the conductors 58 are laid bare at the end thereof inserted into slot 56. The cable 57 may be secured to an insulating spacing element 59 such as by eyeleting or riveting (not shown) the ends of the conductors 58 to spacer 59. When spacer 59 is wedged between ribs 54 and 55 the conductors 58 are positively held against the turned ends 25 of contacts 24.

The disclosed apparatus may be utilized so that two cables 57 may be brought into slot 56 on either side of spacer 59 and connection made to the contacts 24^1 in the same manner as described above.

Alternatively, selected ones of the contacts 24 and the conductors 58 connected thereto may be connected in a coding arrangement to contacts 24^1 in portion 13 as will hereinafter be described. While the invention is illustrated as being arranged to receive cables containing a plurality of conductors in flat or ribbon form it is to be understood that the contacts 24 or modifications thereof may be connected to more conventional type conductors such as round wire carried in round multiple conductor cable. For this reason the contacts 24 and 24^1 may be formed with an aperture 60 (FIG. 1) therein to facilitate connection of a wire thereto and the carrier member provided with an aperture to admit such conductors.

Where it is desired to connect selected ones of contacts 24 to selected ones of contacts 24^1 an encoder 62 (FIG. 5) may be utilized. Flat cables 63 and 64 having conductors 65 and 66, respectively, are crossed and selected ones of conductors 65 and 66 are eyeleted together or otherwise electrically connected. Portion A of cable 64 is then folded over one side of the contacting portions C of cables 63 and 64 and portion B of cable 63 is folded over the other side of contacting portions C of cables 63 and 64 to provide electrical insulation over the eyelets 66. Alternatively cable portions A and B could be eliminated and insulating sheets used. Portion D of cable 64 is then folded along a forty-five degree line 67 and portion D then folded over contacting portions C so that the bare ends of conductors 65 and 66 of each cable are in alignment. The bare ends of conductors 65 may then be placed on one side of spacer 59 in electrical engagement with conductors 58 and contacts 24 at portions 25 and the bare ends of conductors 66 placed on the other side of spacer 59 in electrical engagement with contacts 24^1. Portion C with overlapped portions A and B are then rolled up to fit into recess R in carrier member 10 above ribs 14 and 15.

In this manner selected ones of contacts 24 and the conductors 58 connected thereto are cross connected to selected ones of contacts 24^1. With this arrangement the contacts 24^1 dependent on the state of energization thereof may be encoded in a manner which identifies the contact carrier 10. Thus a single probe member 11 may be utilized in conjunction with a plurality of stationary members to effect connections to the contacts of the stationary carrier members to read-out intelligence encoded on one set of contacts 24 and an identifying code on another set of contacts 24^1. It will of course be understood that other techniques of effecting cross connections between contacts 24 and 24^1 may be utilized, such as conventional round conductors.

To further weathproof carrier member 10, doors 68 and 69 may be hinged in carrier member to cover aperture 17 and may further be provided with spring means (not shown) to bias doors 68 and 69 toward a closed position. To prevent doors 68 and 69 from blocking exit of probe 19 from passage 16 by engaging mounting members 38 and 39, lips 68*a* and 69*a* are provided on the doors so that the doors may ride over mounting members 38 and 39 as probe 19 is withdrawn from passage 16.

In operation, the probe 19 is inserted into passage 16 in the angular position determined by the keys and keyways until nose 29 is properly seated in seat 28 and mounting members 38 and 39 clear shoulders 51. At this point contacts 45 on mounting member are laterally aligned with contacts 24 and contacts 42 on mounting member 39 are laterally aligned with contacts 24^1. Probe 19 may now be rotated until shoulders 49 and 50 on ribs 14 and 15 are engaged by mounting members 38 and 39, all respectively. At this time the contacts 45 make electrical engagement with contacts 24 and 24^1. The elastic material forming the contact mounting members and the resiliency of contacts 24 and 24^1 due to the shape and mounting thereof minimize loading of the contacts when they are brought into electrical engagement. When electrical connections between the contacts of the carrier members have been made and the desired information derived, probe 19 is rotated counter-clockwise until the keyways defined by ribs 14 and 15 prevent further rotation, probe 19 is withdrawn from passage 16 and carrier member 10, and thereafter may be utilized to make electrical connections with other stationary contact carriers.

For economy in manufacture, it is preferred that mounting portion 12 and cover portion 13 be of molded insulating material as well as adaptor 52. Mounting portion 12 may be formed with a tapered rear surface to angle passage 16 away from a wall upon which carrier member 10 is mounted and thereby facilitate insertion of probe 19 into passage 16. Probe 19 is preferably formed of aluminum and contacts 24, 24^1 and 45 of any suitable electrically conductive material having a high degree of corrosion resistance. In assembly of carrier member 10 contacts 24 are placed in pockets 22 and the pockets defined between ribs 54. Mounting portion 12 may then be secured to a mounting surface by bolts or the like (not shown). Spacer 59 is then properly positioned to connect conductors 58 with contacts 24 and one set of encoder conductors, if an encoder is used. Cover portion 13 together with the other half of adapter 52 with contacts 24^1 therein is then matingly joined to mounting portion 12, with the second set of encoder conductors engaging contacts 24^1, and cover portion 13 is secured to mounting portion 10 by bolts or the like.

A second embodiment of the invention is illustrated in FIGS. 6–10. This embodiment comprises a stationary contact carrier member **70** (FIG. 7) and a portable contact carrier member **71** (FIG. 6). The portable contact carrier member comprises a probe portion **72** of generally cylindrical form having a hemispherical nose **73** and a handle **74**. The probe **72** as more clearly seen in FIG. 9 comprises two members **75** and **76** made of rigid insulating material and having an L-shaped key **77** along the length thereof. Probe member **72** is hollow to allow the conductors of a multi-conductor cable **78** to pass therethrough and be connected to preselected contacts **79**. The contacts **79** are aligned along the length of proble **72** on a mounting member or jig **80** which is carried by the members **75** and **76** forming the probe **72** parallel to a longitudinal axis of the probe. Key **77** is parallel to but offset from a longitudinal axis of the probe. Key **77** serves two functions, to align the probe with a receptacle therefor as hereinafter described and to shield the exposed portion of contacts **79**. The contacts **79** as more clearly shown in FIG. 10 are contoured so that they snap into place in pockets **81** in mounting jig **80**. Contacts **79** are provided with an aperture **82** to receive a conductor **83** therein and allow soldering of the conductor to the contact. Contacts **79** are formed of a resilient electrically conductive material which is non-corrosive.

The stationary contact carrier member or receptacle **70** is composed of two pieces made of rigid insulating material so designed that when assembled a contact mounting jig **84** identical to jig **80** is held in place parallel to the longitudinal axis thereof. The members **82** and **83** forming the receptacle define a conductor conduit **86** therein to allow passage of the conductors **87** of a multi-conductor cable **88** therethrough and connection of the conductors **87** to contacts **89** in mounting jig **84**. Contacts **89** are similar to the contacts **79**.

Receptacle **70** further defines therein a passage **90** arranged to admit probe **72** therein.

The receptacle is provided with a locking or mounting ring **91** having an aperture **92** with keyway **93** therethrough so that probe member **72** may be inserted into passage **90** in receptacle **70**. As will be seen from the drawings, when probe **72** is inserted into passage **90**, contacts **79** will be angularly offset from contacts **89** and electrical engagement therebetween cannot be effected until probe member **72** is rotated while in passage **90**. Keyway **93** is cut away on one side thereof within carrier member **70** to allow rotation of probe **72** therein when key **77** has cleared ring **91**. Means are provided to insure proper positioning of probe **72** in passage **90** prior to making electrical contacts between the contacts carried by the respective members. The contact carrier members are so formed and dimensioned that when hemispherical nose **73** seats in a hemispherical seat **94** at the end of passage **90** the trailing edge **95** of key **77** clears mounting ring **91** and the contacts **79** on mounting jig **80** are laterally aligned with preselected contacts **89** on mounting jib **84**. Thereafter to effect electrical engagements between contacts **79** and contacts **89**, probe member **72** through handle **74** is rotated clockwise at which time the free ends **96** of contacts **89** and **79** which are of resilient material make a wiping engagement. Key **77** abutting mounting jig **84** and contacts **89** limits rotation of probe **72** in passage **90** as it is rotated in lateral extension **97** of key way **93** in passage **90**. Thereafter, when it is desired to break the electrical connection between contacts **79** and **89**, probe member **72** through handle **74** is rotated counter-clockwise until key **77** is aligned with keyway **93** and probe **72** is withdrawn from passage **90**.

The apparatus of FIGS. 6–10 provides means for positively making a plurality of electrical connections between predetermined contacts in the same manner as the apparatus of FIGS. 1–4.

It may thus be seen that the objects set forth above as well as those made apparent from the preceding description are efficiently attained. While preferred embodiments of the invention have been illustrated and described, modifications to the disclosed embodiments of the invention as well as other embodiments thereof may occur to others skilled in the art. Accordingly, the appended claims are intended to cover all modifications to the disclosed embodiments of the invention as well as other embodiments thereof which do not depart from the spirit and scope of the invention.

What is claimed is:

1. A multiple connector arrangement comprising first and second contact carrier members, said first member having interior walls, a plurality of ribs extending transversely from opposite interior walls and defining contact-receiving pockets therebetween, said ribs defining a longitudinally extending passage in said first member transverse to said ribs, contacts in said pockets on either side of said passage, said second member comprising a probe portion having a generally cylindrical surface adapted to be received in said passage, said ribs defining longitudinal keyways therein, elongated elastomeric insulators carried by said probe portion on opposite sides thereof and extending along the length thereof, said insulators being elevated above said cylindrical surface and forming keys arranged to mate with the defined keyways, a plurality of electrical contacts carried in each of said insulators in spaced relation along the lengths thereof according to the spacing of said pockets, means in said first member for positioning said second member therein so that the contacts of said second member are in predetermined lateral alignment with contacts in said pockets, said ribs being recessed in part to permit rotation of said second member in said first member after positioning of said second member in said first member, so that said second member with said insulators thereon may be rotated to bring the contacts on one side of said probe into engagement with contacts on one side of said passage and contacts on the other side of said probe into engagement with contacts on the other side of said passage.

2. A multiple connector arrangement comprising first and second contact carrier members, said first member having interior walls, a plurality of contact separating ribs extending transversely from opposite interior walls thereof and defining contact receiving pockets between said ribs, said ribs defining a longitudinal passage in said first member transverse to said ribs, contacts in said pockets on either side of said passage, said second member comprising a probe portion having a generally cylindrical outer surface, said probe being arranged to be received in said passage, said probe portion having contacts mounted along the length thereof on opposite sides thereof and spaced apart according to the spacing of said pockets, said passage and said probe being so shaped as to allow admittance of said probe only in a predetermined angular relation with said passage wherein the contacts of said members are not in engagement, means in said first member for positioning said second member therein so that the contacts of said second member are in predetermined lateral alignment with contacts in said pockets, said second member being rotatable in said passage when so positioned to bring the contacts on one side of said second member into engagement with contacts on one side of said passage and contacts on the other side of said second member into engagement with contacts on the other side of said passage, and a cable connection adaptor having contact separating ribs thereon aligned with the ribs of said first member and defining contact receiving pockets aligned with said first mentioned pockets, said contacts extending between one of said first mentioned pockets and a pocket in said adaptor.

3. The connector arrangement of claim **2** further including a flat cable having parallel conductors therein spaced apart in accordance with the spacing of said contacts, and means in said adaptor for connecting conduc-

tors of said cable to the contacts on one side of said passage.

4. The connector arrangement of claim 3 including means for connecting contacts on one side of said passage to preselected contacts on the other side of said passage, said means for connecting comprising a pair of flat cables having a plurality of parallel conductors, said cables being disposed transverse to each other with preselected conductors of each being electrically connected, the conductors of each cable being arranged to be connected to contacts in pockets on one side of said adaptor.

5. A multiple connector arrangement comprising first and second contact carrier members, said first member defining a longitudinal passage therein, contact receiving pockets defined in said first member along the length of the passage, contacts in said pockets, said second member having a generally cylindrical probe portion adapted to be received in said passage, said probe portion having an elongated insulator of elastomeric material mounted thereon with contacts carried therein along the length thereof and spaced apart according to the spacing of said pockets, said first member defining a keyway along the length of the passage, said insulator extending above the surface of said probe portion and defining a longitudinally extending key arranged to be received in the keyway so as to allow admittance of said probe only in a predetermined angular relation with said passage in which the contacts of said members are not in engagement, and means in said first member for positioning said second member therein so that the contacts of said second member are in predetermined lateral alignment with contacts in said pockets, said second contact member being rotatable in said passage when so positioned to bring said contacts of each of said carriers into engagement.

6. For use in a multiple contact arrangement wherein contacts on a first contact carrier are adapted to be engaged by contacts on a second contact carrier insertable into the first contact carrier; a contact carrier member having interior walls and defining a longitudinal passage therein accessable through an aperture defined in said contact carrier, a plurality of contact separating ribs defining contact receiving pockets extending from said interior walls, contacts in said pockets along said passage adapted to be engaged by contacts on a contact carrier insertable in said passage, said aperture and said passage being shaped to allow insertion of an insertable contact carrier therein only in a predetermined position in which no engaging contact is made between said contacts and contacts on the insertable carrier, means in said contact carrier for preventing engaging contact between said contacts and contacts on the insertable contact carrier unless the insertable contact carrier is in a predetermined position in said passage, and a cable connection adaptor having contact separating ribs thereon aligned with the ribs of said contact carrier member, and defining contact receiving pockets aligned with said first mentioned pockets, each of said contacts extending between one of said first mentioned pockets and a pocket in said adaptor.

7. For use in a multiple contact arrangement wherein contacts on a first contact carrier are adapted to be engaged by contacts on a second contact carrier insertable into the first contact carrier, a contact carrier member having interior walls defining a longitudinal passage therein accessible through an aperture defined in said contact carrier, a plurality of contact separating ribs defining contact receiving pockets extending from said interior walls on opposite sides of the passage, contacts in said pockets along said passage adapted to be engaged by contacts on a contact carrier insertable in said passage, said aperture and said passage being shaped to allow insertion of an insertable contact carrier therein only in a predetermined position in which no engaging contact is made between said contacts and contacts on the insertable carrier, means in said contact carrier for preventing engaging contact between said contacts and contacts on the insertable contact carrier unless the insertable contact carrier is in a predetermined position in said passage, a cable connection adaptor having contact separating ribs thereon aligned with the ribs of said contact carrier member, and defining contact receiving pockets aligned with said first mentioned pockets, each of said contacts extending between one of said first mentioned pockets and a pocket in said adaptor, and a flat cable having parallel conductors therein spaced apart in accordance with the spacing of said contacts, and means in said adaptor for connecting conductors of said cable to the contacts on one side of said passage.

8. For use in a multiple contact arrangement wherein contacts on a first contact carrier are adapted to be engaged by contacts on a second contact carrier insertable into the first contact carrier; a contact carrier member having interior walls defining a longitudinal passage therein accessible through an aperture defined in said contact carrier, a plurality of contact separating ribs defining contact receiving pockets extending from said interior walls, contacts in said pockets along said passage adapted to be engaged by contacts on a contact carrier insertable in said passage, said aperture and said passage being shaped to allow insertion of an insertable contact carrier therein only in a predetermined position in which no engaging contact is made between said contacts and contacts on the insertable carrier, means in said contact carrier for preventing engaging contact between said contacts and contacts on the insertable contact carrier unless the insertable contact carrier is in a predetermined position in said passage, a cable connection adaptor having contact separating ribs thereon aligned with the ribs of said contact carrier member, and defining contact receiving pockets aligned with said first mentioned pockets, said contacts extending between one of said first mentioned pockets and a pocket in said adaptor, and means for connecting the contacts on one side of the passage to preselected contacts on the other side of the passage.

9. A multiple contact arrangement comprising a first contact carrier and a second contact carrier, one of said contact carriers being arranged for stationary mounting thereof, the other of said contact carriers having a plurality of contacts thereon in predetermined spaced relation, said one of said contact carriers defining a passage therein for receiving said other of said contact carrier and having a plurality of contacts therein in predetermined spaced relation, an aperture defined in said first contact carrier and so shaped as to allow entrance of said other of said contact carriers into said passage in only a predetermined angular relationship with the aperture so that upon initial insertion of said other of said contact carriers into the passage the contacts of said carriers are laterally displaced from one another along the passage and said other of said carriers must be rotated through a predetermined angle to bring the contacts of said carriers into engagement, said second carrier including an elongated elastomeric insulator which defines a key arranged to mate with the defined keyway and carrying therein the contacts of said other of said carriers, and means for preventing rotation of said other of said carriers in said passage until the contacts of each carrier are in a preselected laterally aligned relationship.

10. A multiple contact arrangement comprising a first contact carrier and a second contact carrier, said first contact carrier being arranged for stationary mounting thereof and defining a longitudinally extending passage therein, said first contact carrier having a plurality of electrical contacts along the length of said passage in predetermined spaced relation, said first contact carrier defining an aperture therein to allow communication with said passage, said second contact carrier comprising an elongated probe member adapted to be inserted through the aperture in predetermined angular relationship therewith into said passage, an elongated insulating member detachably mounted to said probe member and extending

along the length thereof, said insulating member carrying a plurality of electrical contacts, said contacts being spaced along the length of said insulator in accordance with the spacing of the contacts in said first contact carrier, and cooperative means on both of said carriers for preventing angular motion of said second contact carrier in said passage unless the contacts of each carrier are in a preselected laterally aligned relationship.

11. The arrangement of claim **10** wherein said insulator is of elastomeric material and the contacts of said second contact carrier are embedded therein.

12. The arrangement of claim **10** wherein contacts are aligned on opposite sides of said second contact carrier and contacts are aligned on either side of the passage in said first contact carrier, and means are provided in said first contact carrier allowing rotation of said second contact carrier in the passage in only one direction to effect engagement of the contacts of said carriers.

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