Nov. 15, 1955 M. D. BERGAN 2,724,098

ELECTRIC CONNECTORS

Filed April 9, 1952

Fig. 1.

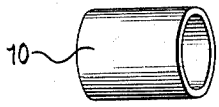


Fig. 2.

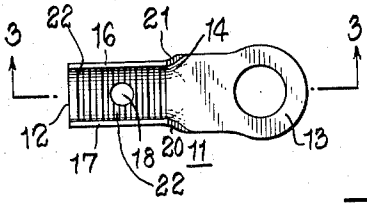


Fig. 3.

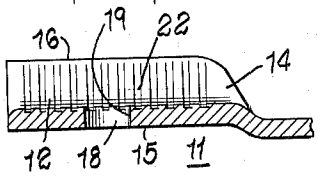


Fig. 4.

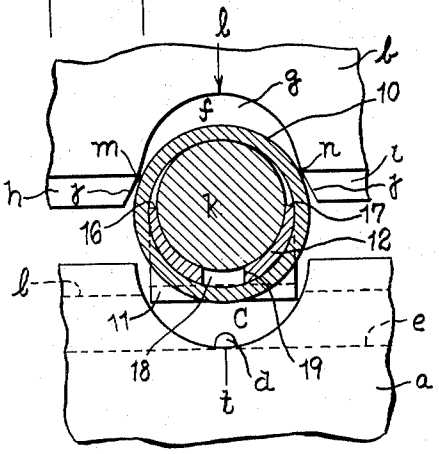


Fig. 5.

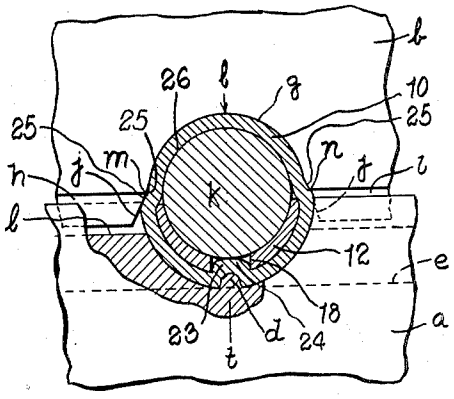


Fig. 6.

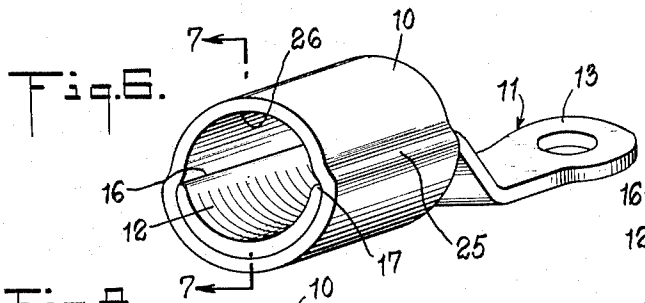


Fig. 7.

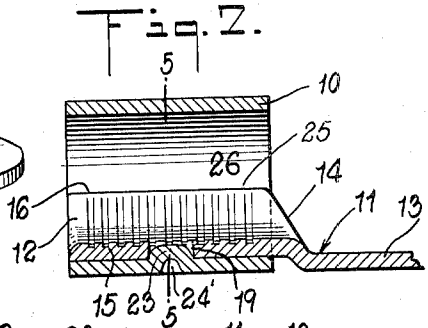


Fig. 8.

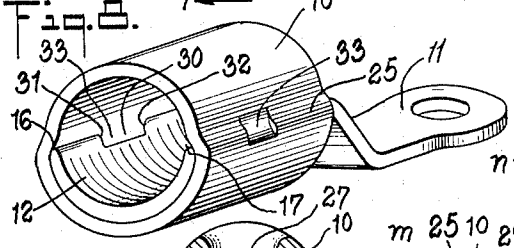


Fig. 10.

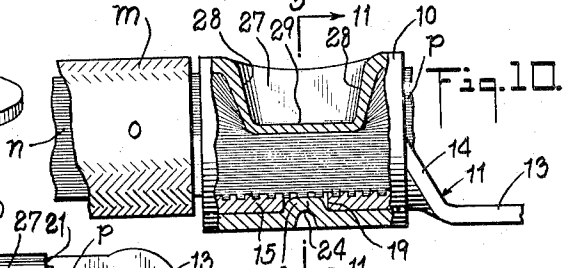


Fig. 11.

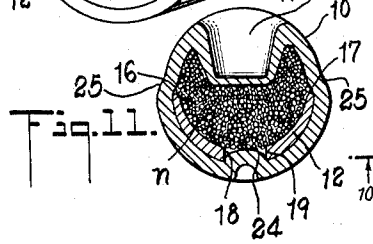
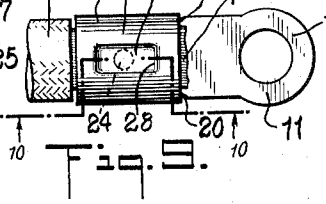


Fig. 9.



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2,724,098

ELECTRIC CONNECTORS

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Application April 9, 1952, Serial No. 281,342

5 Claims. (Cl. 339—276)

The invention relates in general to a tubular form of electric connector of the type which features two initially separated stock parts preferably formed of different metals assembled in telescopic relation and secured in their prefixed assembled relation.

It has been known in this art to form an electrical wire connector of an outer cylindrical sleeve into which a crescent-shaped contact tongue or ferrule is inserted with a press fit and in which the sleeve is subsequently crimped onto the end of a wire inserted within the connector. While these connectors are entirely satisfactory to use when made in small sizes for use with relatively small size wires, it has been found that, when constructed of relatively large sizes and when subjected to the pull-apart loads to which large size connectors are often subjected in use, any such pull-apart tension on the assembly of wire and connector pulls the contact tongue out of the sleeve.

The primary object of the invention is to provide a two-part electric connector complete as an article of manufacture before it is crimped and thus which can be manufactured with the parts permanently connected under factory controlled conditions and independent of the skill of the operator; in which the parts cannot be pulled apart; and which will resist deformation when subjected to such pull-apart tensions as may be encountered under usual operative conditions after the connector is crimped onto the cable.

It is an economic necessity in the manufacture of connectors and terminals of the type herein featured, especially when made in large sizes, that no more material be used in their construction than is necessary to permit them to conduct therethrough the current strength for which they are designed and to give the necessary structural strength to withstand the deformation necessary to deform the finished article into its required crimping engagement with the wire or cable to which it is to be connected and to do this without rupturing either the connector or the cable during use. This minimizing in the amount of material to that which must be used anyhow imposes a requirement that in designing of the connector herein featured there be avoided any necessity to provide additional material to obtain the required resistance to separating of the component parts of the connector.

With the intent of defeating separation of the parts by pull-apart forces and at the same time to avoid necessity of providing a rugged form of lock or keying connection and which, in turn, would require the use of additional metal for that purpose, the present disclosure features in its most simplified form the employment of a positive and permanent lock operative between the tongue and sleeve. In its more complicated form the invention features the inclusion of a plurality of relatively small and inconspicuous fastening means or locks operative between the component parts of the connector and which locks are spaced apart and specifically spaced apart circularly to distribute strains imposed thereon incidental to any pull-apart tensions on the parts, and in this way there is avoided

any necessity of providing additional structural strength or mass of metal and other features of ruggedness to any one of the locks.

The present disclosure features in its more complicated form the employment of three permanent forms of locks or keying fasteners between the ferrule and its enclosing sleeve, particularly designed to resist separation of sleeve and ferrule in an axial direction and one lock being located in the portion of greatest cross section of material in the two layers forming the side of the assembly, which two layers are not intended to be deformed during the subsequent crimping operation, and the other two locks forming on opposite sides of the assembly two long fasteners co-extensive with the entire length of the sleeve and utilizing in forming the side locks the two free edges of the arcuate portion of the ferrule for their entire lengths within the sleeve.

Still another object of the invention is to provide a form of two-part connector complete per se and ready for use, with the two component parts securely and permanently locked together in their preset factory-produced relation, which permanent prelocking will be maintained intact even though the connector in a part thereof is subsequently deformed into a crimping engagement with a cable inserted within the connector.

The ferrule-forming portions of such connectors are preferably formed of a metal of high conductive value and in the instant case the ferrule is formed of a fine grade of copper. This copper is expensive. It is an economic requirement, then, that the mass of this high grade copper be reduced to the least possible amount capable of transmitting therethrough from the conductors to the equipment engaging the tang the requisite current strength for which it was designed. In order to obtain this objective, among other things, the arc length of the crescent-shaped portion of the ferrule is reduced as far as practicable. Incidentally, this makes available more of the single layer and relatively cheaper metal of the sleeve for use in forming the extra large size crimping detent featured in this disclosure.

The disclosure features a structure wherein the crimping detent for securing the connector to the wire therein is confined to the single thickness portion of the connector. There being no intent to deform the area of double thickness of material and further considering that the squeezing action on the conductor by the detent bearing on the same is spread over a material area and with no movement of the rigid area of double thickness, it follows that the thickness or cross section of material in the expensive crescent part may be reduced over what has been necessary heretofore.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of two forms of connector forming physical embodiments of the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings—

Figs. 1–3 show the two initial stock parts which are to make up a connector forming a preferred embodiment of the invention in relatively exploded relation; Fig. 1 being a view in perspective of the outer stock sleeve and Figs. 2 and 3 showing the stock ferrule or tongue, respectively, in plan and in section in its longitudinal medial plane; and with Fig. 3 being a section taken on the line 3—3 of Fig. 2 and slightly enlarged;

Figs. 4 and 5 are each transverse sectional views of the outer sleeve and ferrule of Figs. 1–3 assembled with the ferrule in the sleeve and shown as formed in two succeeding positions of the squeeze jaws of a punch-and-squeeze

power press, with Fig. 5 showing in cross section on the line 5—5 of Fig. 7 a view of the finished connector before it is removed from the press;

Fig. 6 is a perspective view of the article of manufacture constituting the finished connector shown in Fig. 5, complete and ready to receive the conductor on which it is to be crimped;

Fig. 7 is a longitudinal sectional view of the connector taken on the medial longitudinal plane thereof indicated by the line 7—7 of Fig. 6;

Fig. 8 is a view similar to Fig. 6 showing a modified form of the invention;

Figs. 9–11 are views of the completed connector of either the Fig. 6 form or the Fig. 8 form shown crimped onto a cable; Fig. 9 being a view in plan on a reduced scale of the finished assembly of connector and cable; Fig. 10 being an enlarged longitudinal sectional view taken on the broken line 10—10 of Fig. 9; and Fig. 11 being a transverse sectional view taken on the line 11—11 of Fig. 10.

Referring, first, to the two basic stock parts which are utilized to form the preferred form of the connector herein featured, there is disclosed in Fig. 1 a section of a tube hereinafter referred to in its several shapes as an outer sleeve **10**. This sleeve as shown in Fig. 1 is a cut-off length of a stock size, hard copper or bronze tubing which can be purchased on the open market and requires no machining for use as herein indicated. In the instant case, the tube is of a size to receive therein a No. 2 American Wire Gage stranded conductor, but it is obviously within the scope of the disclosure to make the connector of any size required by market conditions.

The other stock part forms a tongue or ferrule **11** formed preferably of metal having high conductive capacity and in the showing is a soft, high grade, pure copper. The ferrule comprises at one end a crescent or trough-shaped arcuate end portion **12** whose outer perimeter is that of a cylinder and which is fashioned in its external perimeter for insertion snugly in the sleeve **10** with a freely running fit, and a flat apertured tang portion **13** at the other end fashioned to project beyond the sleeve. An intermediate bent portion **14** connects the curved end **12**, both bottom and side portions thereof, with the flat tang-forming end **13** as shown in Figs. 3 and 7.

The arcuate portion **12** as viewed in cross section in Figs. 4 and 5 has an arc distance of about 160 degrees. The portion **12** is of greatest thickness of material at its mid-width or bottom portion **15** to form a longitudinal line of maximum thickness and thus of maximum structural strength at the bottom of the end portion **12**. The crescent-shaped portion **12** gradually reduces circularly in thickness of material in opposite directions from its bottom part of maximum thickness and at its ends forms straight, parallel side edges **16** and **17** which are somewhat feathered or, rather, are slightly rounded and are of least width of material.

At mid-length of the curved portion **12** and in the thick portion forming the line **15** of maximum thickness of material, the ferrule **11** is provided with a punched-out circular hole **18** of relatively small cross section. It is a feature of this hole that it is of cylindrical contour and thus is outlined by a circular wall **19** extending perpendicular to the length of the bottom portion **18** and at right angles to any lengthwise-directed force which may be imposed on the connection when in use and which may tend to separate the sleeve and ferrule. The tang forming each portion **13** as viewed in Fig. 2 is wider than the arcuate end portion **12** and forms a pair of outstanding, sharply-angled stop shoulders **20** and **21**, for limiting the insertion of the ferrule axially into the sleeve. Incidentally, the inner and concave face of the arcuate portion **12** is provided with a series of parallel, transversely extending, deep grooves **22** forming a roughened surface for biting into the strands of the cable as shown in Fig. 10. In some cases the inner surface of the portion **12** is not intentionally roughened. It is suggested that the ferrule be punched out from a sheet of metal and contoured into the form illustrated in Figs. 2 and 3 by a method forming no part of this disclosure.

In forming the finished connector the crescent-shaped end portion **12** of the ferrule is inserted manually into the outer sleeve **10** until the ferrule stop shoulders **20, 21**, engage the adjacent end of the sleeve as shown in Fig. 9. This has the effect of locating the hole **18** about mid-length of the sleeve **10** or otherwise at the point where it is desired to locate relative to the die press of Figs. 4 and 5 the bottom key or lock featured in this disclosure and hereinafter described.

The portion **12** is not press-fitted in the sleeve as there is no frictional engagement intended between the ferrule and sleeve. This means that in the subsequent machine operations upon the assembly of sleeve and ferrule the deformations imposed on the sleeve by either the assembling machine or by the crimping tool or machine are not resisted by the ferrule therein and it is possible for the sleeve, particularly in its upper portion, to cold-flow freely about the arcuate end portion of the ferrule and in this way tend to minimize the setting up of internal or other localized strains in either the sleeve or ferrule.

The assembly of ferrule in sleeve thus manually formed is inserted into a combined locking and punching squeeze press, not fully shown but parts of the squeeze jaws or dies *a* and *b* of which are shown in Figs. 4 and 5.

The lower jaw or die *a* is fixed to the body of the press and is provided on its upper work face with a relatively large, upwardly-facing, concave recess or seat *c* of substantially semi-cylindrical form, whose center is in the plane of the work face defined by the upper surface of the die *a*. The recess *c* has the same diameter as the external diameter of the sleeve **10**, as there is no intent herein to deform or change in any way the lower half of the stock sleeve **10** as it existed when cut from the stock tube as shown in Fig. 1. The jaw is provided, centered at the bottom of its recess or seat *c*, with a short, rugged, upstanding, nipple-like punch *d* integral with the die *a* as shown in Figs. 4 and 5. The punch is approximately in the form of a hemisphere, and is circular in all planes perpendicular to its axis. Rearwardly of the recess *c* the jaw *a* is provided below its work surface as set by the bent portion **14** with a flat support or anvil *e* disposed on a level with the base of the punch *d* and fashioned to receive the tang portion **13** flatwise when lowered thereon. This anvil functions to resist rotary movement of the assembly of sleeve and ferrule as the assembly is squeezed between the jaws.

The upper jaw *b* is mounted for vertical movement to and from the lower jaw along a line of thrust 1–*t* which extends at right angles to the work faces of the two jaws *a* and *b*. Jaw *b* is provided on its under side with a relatively small, downwardly-facing concave recess *f* in opposing relation to the recess *c*. The entire recess in the case where the Figs. 1–7 form of the invention is involved is of semi-clyindrical form or, in the case where the Fig. 8 form of the invention is involved, the upper portion *g* is substantially semi-cylindrical. It is a feature of this disclosure that the entire recess *f*, or at least its upper portion *g*, has a diameter slightly smaller than the external diameter of the sleeve **10** and is dimensioned to give to the upper half of the sleeve a requisite smaller size than the lower half. The recesses *c* and *f* are disposed symmetrical with the line of thrust. The portion of the die *b* which forms the inverted recess *f* intersects the work surface of the die *b* at points *m* and *n* of initial contact with the sleeve.

A cylindrical steel mandrel *k* is located between the recesses *c* and *f* and at all times extends parallel thereto with its axis shiftable along the line of thrust. The mandrel is coupled to the jaw *b* to operate with a delayed action relative thereto by press mechanism forming no part of this disclosure.

The press is complete as thus far described for forming the Fig. 6 embodiment of the invention.

In operation the assembly of sleeve with the ferrule therein is slipped onto the mandrel while the mandrel and jaws are in their open position, even more widely open than is shown in Fig. 4. The press is operated to lower the upper jaw which after engaging the sleeve forces the assembly of sleeve, ferrule and mandrel downwardly against a return spring acting on the mandrel to resist the lowering of the same. The continued movement of the upper die towards the fixed die acts to squeeze the sleeve therebetween. The first part of the die action after contact causes the upper die at its advanced points *m* and *n* on opposite sides of the recess *f* to bear down on the upper portion of the sleeve to force the assembly downwardly from the position of initial engagement shown in Fig. 4 and thereafter to force the lower portion of the sleeve firmly and without binding into a fitted engagement with the concave seat provided by the recess *c* in the lower die. At the same time the tang portion **13** engages the anvil *e* and is held thereby from accidental rotary movement during the succeeding downward movement of the upper jaw.

As the sleeve becomes seated in the recess *c* the punch *d* in its located position opposite the hole **18** will be engaged by and will then deform the portion **12** of the ferrule facing the hole to cause said portion to extend as a dimple from the shell into the hole to form a rugged, keying button **23**. The button projects into the hole, more or less fills the same, and forms a positive and rugged keying connection **24** sometimes hereinafter referred to as the main or base interlock.

The forcing of the metal of the sleeve inwardly to form the projecting button **23** forms a socket **24'** at its outer side and which socket is open on the under side of the sleeve and is thus exposed for the engagement by any tool in subsequent uses of the device.

As the upper jaw continues its advance towards the lower jaw incidental to the forming of the button, and particularly as the jaws near their position of nearest approach as shown in Fig. 5, the upper portion of the sleeve **10** is squeezed radially inward and becomes shrunk and progressively of less and less diameter, both externally and internally, as it conforms to the configuration of the recess *f* into which it is forced. As the diametrically opposite sides of the sleeve are thus forced inwardly by reason of the smaller size of the recess *f* compared to the initial diameter of the sleeve, a pair of ribs or ridges **25** are eventually fully formed as indicated in Fig. 5. These ridges extend for the full length of the sleeve and from end to end thereof. The inner faces of the ridges are thus moved inwardly into position overlapping the feathered edges **16** and **17** and thus lock the sleeve and ferrule permanently against any relative rotary movement. The metal forming the button is worked as it is crowded into the hole and is thus made slightly harder than the balance of the sleeve from which it was displaced.

It is noted that the lock formed by the intrusion of the button into its hole is located within the outline of the crescent-shaped portion of the ferrule, in spaced relation to its outlining edges and is located specifically in the area of greatest cross section of the arcuate portion of the ferrule and thus in the area of greatest thickness of metal and where there is the least likelihood of the ferrule bending under stress. While the presence of the hole **18** does perhaps tend to introduce an element of weakness in the ferrule, the button intruding into the hole tends to reinforce the ferrule in the part thereof so perhaps weakened by the hole and, in effect, the arcuate portion of the ferrule is just about as strong as if the hole were not present. As the top of the button engages and bears against the rigid mandrel *k* and the inward movement of the button is arrested thereby, the buttton in turn tends to spread with its top flattened as shown in Figs. 5 and 7. The button then has a resulting tendency to fill the hole snugly and in its forced engagement with the wall **19** outlining the hole thus tends to resist frictionally any tendency of the button to escape from the hole even in the absence of the side locks hereinafter described. As the upper portion of the sleeve is held between the descending upper die *b* and the mandrel *k* during the time while the button **23** and the ridges **25** are being formed simultaneously, it follows that the arcuate end portion **17** is held clamped between the mandrel and lower die and thus resists what might otherwise be a tendency of the portion **17** and sleeve to separate or shift from their preset initial position.

It is a feature of this disclosure that the ridges **25** extend towards each other inwardly into the bore of the connector so that, even after the connector has finally been deformed into a crimping engagement with the cable as hereinafter described, the side projections formed by these ridges will still remain in their locking engagement with each of the side edges of the ferrule and the sleeve will not open back towards its original configuration. As the upper portion of the sleeve has been constricted from its original contour it follows that this portion has been worked and thus the upper half of the sleeve is made slightly harder than the lower and unworked portion of the sleeve.

It is the intent here to form the bore **26** of the connector, that is, the opening whose upper portion is defined by the constricted upper half of the sleeve **10** and whose lower portion is defined by the undeformed concave face of the crescent-shaped portion **12**, of a cylindrical form as best shown in Fig. 5 and of a size to permit the easy sliding therein with a running fit of the cable for which it is intended.

Making the bore **26** of cylindrical form and of a size just sufficient to permit the insertion therein of the size conductor for which the connector is designed means that in the subsequent crimping step there is very little clearance which need be taken up before the crimping operation becomes effective.

After the connector has been finished as shown in Fig. 5, the upper die *b* with the mandrel is elevated back past the position shown in Fig. 4 to provide the necessary extent of opening between the dies and the finished connector is stripped axially off the mandrel. This finishes the construction of the connector in its preferred form. It is complete as an article of manufacture and as so far described the connector is ready to receive a cable such as is used with such forms of connectors and to be secured thereto in any way following conventional practices in this respect.

One such cable *m* is shown in Figs. 9–11 and comprises a core *n* of stranded wires contained within an insulating jacket *o*. In preparing the cable for use with the connector the insulation is stripped back off one end of the cable to expose the core and the stripped-back end *p* is inserted within the bore **26** of the connector and within the end opposite its tang portion **13**.

By means of a crimping machine or tool forming no part of this disclosure, the connector with the end *p* of the cable therein is deformed solely in the relatively thin, single-layer part of the sleeve opposite the bottom lock to form an indent **27** biting deeply into the conductive core *n* as shown in Figs. 10 and 11.

It is noted that the indent **27** is somewhat rectangular in plan, is pan-shaped, and extends lengthwise of the connector for almost its entire length as shown in Fig. 10 to provide the maximum possible length to the crimping indent. Incidentally, the side walls **28** of the pressed detent tend to thin out as shown in Fig. 10, but this does not weaken the interlock between the detent and the conductor strands. The indent **27** extends rather deeply into the bore **26** almost to the axis thereof, and the intent here is to compress the strands of the conductor so that they become a solid mass as viewed in Figs. 10 and 11. The strands flaring outwardly in opposite directions from the ends of the pan-like indent as shown in

Fig. 10 tend to assist the keying effect. The bottom **29** of the crimping indent forms a pressure-applying surface of relatively large, flat area in its engagement with the strands forming the stripped-back end *p* of the cable. In this way the conductor strands are squeezed between two broad clamping surfaces, one provided by the broad bottom **29** of the indent and the other by the opposing corrugated face of the crescent-shaped portion **12**. The indent **27** and the keying connector are substantially symmetrical with reference to a common transverse line (numbered **11—11** in Fig. 10), and this line defines the loci of the lines of squeeze pressure imposed on the conductor incidental to the approach of the dies of the crimping tool or machine.

As the corners formed between the bottom **29** and the side walls are rounded there has been avoided any possibility of the indent cutting into the wire strands forming the conductive core.

Incidentally, any space in the hole **18** not occupied by the button provides an internal recess into which the adjacent strands of the wire conductor are pressed by the squeeze action of the indent **27**, so that the hole provides an additional roughened surface supplementing that produced by the grooving at **22** of the inner face of the crescent-shaped portion **12**.

It is suggested that the socket **24'** be utilized as a locating point fashioned to be engaged by an element of the crimping machine or tool to insure the proper locating of the indent **27** at the crown of the outer sleeve as the jaws of the crimping apparatus are brought together.

Referring to the modification shown in Fig. 8, it will be understood that for the most part the device is as above described and in addition thereto is provided with a pair of additional or side locks to supplement the resistance interposed by the main lock **24** to separation of the ferrule and sleeve in an axial direction.

For this purpose the edges **16** and **17** of the ferrule blank of Figs. 2 and 3 are each provided mid-length thereof with a long, shallow, cut-back recess **30**, one of which is shown in Fig. 8. Each of these recesses is outlined at its ends by a pair of upstanding, longitudinally spaced-apart stop shoulders **31** and **32**. As the recesses are of some material depth it follows that, while the shoulders are of least width at their upper free edges, the base portions of the shoulders are relatively wide and thus quite rugged in the parts intended to resist movement axially of the indents or projections engaging in the recesses as hereinafter described.

For the purpose of forming indentations in the sleeve for fitting in the two recesses **30** to form the side locks the above described dies are modified slightly, primarily by the addition thereto of indent-forming die elements at the work face of die *b* and slots for receiving the same in the work face of the die *a*. More specifically described, a pair of short, narrow bars *h* and *i* are formed depending integrally from the tower or work face of the upper jaw. These bars terminate at their inner ends on opposite sides of the recess *f* in sharply downwardly extending beveled punch faces *j* and whose bases contact respectively with the ridge-forming edges *m* and *n*. The upper face of the lower die is provided on opposite sides of the recess *c* with a pair of slots *l* for receiving the bars when the dies are in their position of nearest approach as shown in Fig. 5.

In operation the dies so equipped with the bars *h* and *i* operate exactly as previously described except that with the bars *h* and *i* present the final lowering movement of the die *b* causes the punch faces *j*, particularly in their upper portions, to engage the opposite sides of the sleeve in the region of the ridges **25** to form mid-length thereof a pair of indents or depressions **33**, each of which fits in the associated recess **33** with a snug fit between the shoulders **31**, **32**.

The connector herein disclosed, either the Fig. 6 or Fig. 8 form, is capable of resisting any pull-apart force to which it may be subjected, even before it is crimped onto the cable.

Any attempt to separate the sleeve and ferrule in an axial direction, even by a powerful force (see Fig. 7), would necessitate the lifting of the thick portion **17** up over the hump provided by the rigid button **23**. Any such transverse relative movement between ferrule and sleeve would be resisted by the two long ridges **25** overlapping the edges **16** and **17** for their entire length. Further, the configuration of the button in its snug, hole-fitting engagement with the upstanding wall **19** is particularly designed to resist any tendency of the ferrule overriding and in this way escaping from the button-and-hole form of keying connection.

It has been suggested that, in the act of crimping a connector somewhat similar to that herein disclosed onto the wires therein, the crimping tool acts on the sleeve and ferrule to form a non-positive interlocking groove form of temporary connection therebetween. However, the ends of such grooves are inclined at an angle to the direction of pull-apart forces and such forces cause the grooved parts to flatten and as they tend to assume their initial configurations thus permit the escape of the ferrule from the sleeve under forces which this invention is intended to resist.

With the positive and permanent form of button-and-hole type of interlock herein featured the ferrule and sleeve remain fixed in their factory-produced relation, both before and after the connector is crimped onto the cable. Further, the crimping operation enhances the security of the connection for the indent **27** (see Fig. 10), acts through the solid compacted wire beneath the bottom **29** to force the arcuate end of the ferrule in a downward direction, and thus more firmly into engagement with the sleeve than prior to being so crimped.

I claim:

1. An article of manufacture constituting a tubular connector having a bore adapted to have an electric cable slidably inserted therein, said connector including an outer sleeve of approximately cylindrical form, as viewed in cross section presenting an unbroken periphery including a semi-cylindrical portion of relatively large diameter extending for about one-half of the periphery and most of the balance of the periphery forming a semi-cylindrical portion of relatively smaller diameter, and the part of the periphery which joins the halves of large and smaller diameters forming inwardly bent indents extending lengthwise of the sleeve, and a ferrule crescent-shaped in cross section fitted in the portion of large diameter and whose free longitudinally extending edges are overlapped by and engaged by said indents and said indents operating to resist relative rotary movement between the sleeve and ferrule.

2. The article defined by claim 1, wherein the sleeve and ferrule are provided with a projection from one intruding into a recess in the other to form an interlock for resisting separation of the sleeve and ferrule in an axial direction.

3. The article defined in claim 2, wherein the projection is formed along one of the ridges of the sleeve and fits in a recess formed in the adjacent edge of the ferrule.

4. The article defined in claim 2, wherein the inner face of the ferrule and the inner face of the portion of smaller diameter coact to form the bore through the connector of cylindrical form fashioned to receive a conductor when slid axially therethrough.

5. The combination of a tubular connector and a conductor extending into one end of the bore of the connector, said connector comprising two main parts, one of the parts being an outer sleeve of malleable metal, as viewed in cross section presenting an unbroken perimeter with a half portion thereof of relatively large diameter and the other half portion of slightly less diameter than the first-named half portion and facing the same, the other of said two main parts forming a ferrule having an arcuate por-

tion fitted in the half portion of large diameter, the parts of the outer sleeve which connects the half portions of large and small diameters forming ridges along opposite sides of the connector, with the ridges overlapping the longitudinal edges of the ferrule and operative to resist relative rotary movement between the sleeve and the ferrule, said sleeve and ferrule provided with an interlock to resist relative axial movement of the ferrule and sleeve, and said sleeve in the portion thereof of small diameter being deformed inwardly into a pan-like indent intruding into and forming a crimping engagement with the conductor therein.

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