Dec. 28, 1948. J. M. WHITE 2,457,796

METHOD OF FORMING AND ASSEMBLING CONNECTING SLEEVES

Filed Oct. 10, 1944

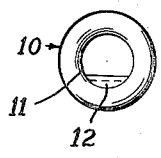


FIG. 3.

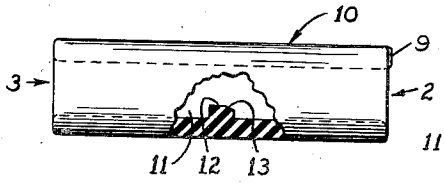


FIG. 1.

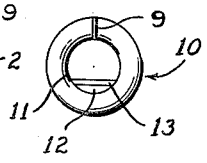


FIG. 2.

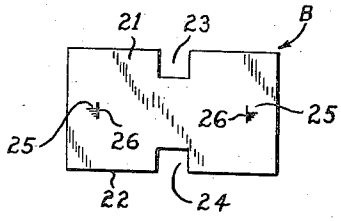


FIG. 4.

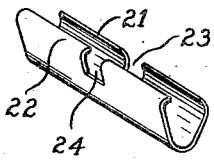


FIG. 5.

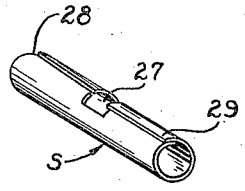


FIG. 6.

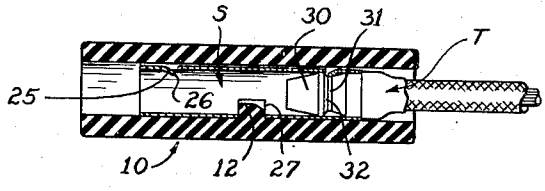


FIG. 7.

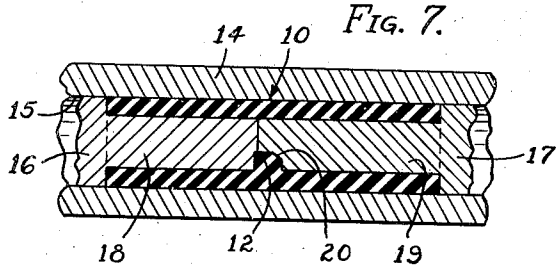


FIG. 8.

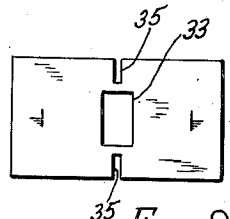


FIG. 9.

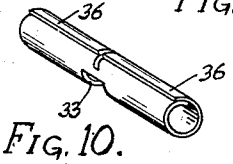


FIG. 10.

JESSE M. WHITE INVENTOR.

BY Charles S. Penfield

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METHOD OF FORMING AND ASSEMBLING CONNECTING SLEEVES

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Application October 10, 1944, Serial No. 558,097

9 Claims. (Cl. 29—155.55)

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This invention relates to harnesses such as are employed in conjunction with the wiring of motor vehicles and is concerned primarily with the construction and assembly of the connecting sleeves included in such harnesses.

This application is a continuation in part of application Serial No. 481,639, filed April 2, 1943 (now abandoned) which is a division of my application Serial No. 199,579, filed April 2, 1938, now Patent No. 2,318,647, which issued under date of May 11, 1943.

At the present time it is common practice in this art to utilize a connecting sleeve which comprises an outer sleeve member of appropriate insulating material, and within which is assembled an inner sleeve of conducting material. This inner sleeve carries, adjacent each extremity, an inwardly extending protuberance designed for cooperation with a groove on a terminal which may be inserted into the sleeve, and the inner sleeve is anchored to the outer insulating sleeve in a manner which is not meeting with complete satisfaction in this art, and which is intended to be improved by the present invention.

Accordingly, this invention has in view, as its foremost objective, the provision of a connecting sleeve of the character above noted which embodies improved means for assembling the inner conducting sleeve with the outer insulating sleeve.

More in detail this invention contemplates an arrangement wherein the insulating sleeve is maintained uniform and even so far as the outer cylindrical walls thereof are concerned, but which includes on the wall of the bore extending therethrough an inwardly projecting lug. The inner conducting sleeve is of a split construction, and intermediate its extremities is cut away to provide a recess for receiving the lug.

A particularly important object of the invention is the provision of a novel method of assembling an inner conducting sleeve of the character above noted with the outer insulating sleeve. This method essentially involves the formation of the split sleeve construction with the edge at each side of the split notched to ultimately provide a recess for receiving the lug. The blank or metal from which the sleeve is formed is then deformed into a sleeve-like formation, with one end compressed to a greater degree than the other end, to cause the edges of the split to overlap, whereupon the sleeve may be inserted with the constricted portion riding over the lug in the outer insulating sleeve. Subsequent expansion of the split sleeve by an appropriate tool insures

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of a firm anchorage of the inner sleeve within the outer insulating sleeve.

Another highly important object of the present invention is to provide, in a connecting sleeve of the character above noted, an inner conducting sleeve which includes novel and improved projections designed to cooperate with terminals which may be inserted thereinto.

More in detail this invention has as an object the provision of an inner conducting sleeve which is formed at each end with a projection extending into the bore thereof, and which projection is characterized as including a gradually inclined surface extending toward the open end of the sleeve, and which terminates in a sharp shoulder. These protuberances may be formed by being struck from the blank of metal prior to the latter being deformed into the sleeve formation.

Various other more detailed objects and advantages such as arise in connection with forming the outer insulating and inner conducting sleeves respectively, and assembling the same in accordance with this invention, will in part become apparent and in part be hereinafter stated.

The invention, therefore, comprises a connecting sleeve which consists of an outer insulating sleeve having a bore which is interrupted by an inwardly extending lug. Received within the bore is an inner conducting sleeve of a split construction, and having a recess for receiving the said lug. The inner conducting sleeve is also formed adjacent each extremity with an inwardly extending protuberance which presents a gradually inclined surface extending towards the open end of the sleeve, and which terminates in an abrupt shoulder. A particularly important part of the invention is the method of assembling the inner conducting sleeve with the outer insulated sleeve.

For a full and more complete understanding of the invention reference may be had to the following description and accompanying drawings, wherein

Figure 1 is a side view of an outer insulating sleeve made in accordance with the precepts of this invention. In this view a part of the sleeve has been broken away to bring out the construction of the inwardly extending lug;

Figure 2 is a view in end elevation of the sleeve shown in Figure 1, and is taken in the direction indicated by the arrow 2 of Figure 1;

Figure 3 is a similar view taken from the other end looking in the direction of the arrow 3;

Figure 4 is a plan view of a blank of metal prior to being deformed into the sleeve-like formation;

Figure 5 shows the blank of metal after it has been partially deformed, while

Figure 6 develops the inner sleeve in condition for being inserted into the outer sleeve;

Figure 7 is an elevational showing through the connecting sleeve as an entirety developing a terminal as assembled therewithin;

Figure 8 is a sectional view of certain die pressing apparatus which may be employed in the manufacture of the outer insulating sleeve;

Figure 9 is a plan view of a modified form of conductor means or insert means; and

Figure 10 is a perspective view showing the conductor means or insert means illustrated in Figure 9 in a contracted state ready for insertion into the insulator housing.

Referring now to the drawings, wherein like reference characters denote corresponding parts, and more particularly to Figures 1, 2 and 3, an outer insulating sleeve intended to constitute an essential part of the connecting sleeve of this invention is identified by the reference character **10**, and is shown as having a substantially smooth even outer cylindrical wall. This sleeve **10** may be made from any appropriate insulating material, but the invention has particularly in mind a phenol condensation product which is susceptible, while in a plastic state, to being formed by die pressing operations into the construction hereinafter described in detail.

The sleeve **10** has an inner cylindrical bore **11** which is interrupted by a lug designated **12**. The term "bore" as herein used may be considered to be a cavity aperture, chamber or pocket. The lug **12** is formed in the bore **11** substantially equi-distant the ends thereof, and one edge thereof is cut away to provide a bevel designated **13**, this for a purpose to be hereinafter described.

The end of the sleeve **10** towards which the beveled edge **13** is disposed is provided with suitable indicia, such as the nick shown at **9** in Figure 2, this for the purpose of indicating which end is to be used in inserting the inner connecting sleeve into this outer insulating sleeve.

It is particularly notable that the lug **12** extends only a short distance into the bore **11**, as depicted in Figures 2 and 3, leaving sufficient room for the insertion of the inner sleeve, as will be hereinafter pointed out.

Inasmuch as the invention has in view the formation of the outer insulating sleeve **10** by a die pressing operation, reference is now made to Figure 8 which shows an outer containing mold element **14** formed with a bore **15** in which operate dies **16** and **17**. The die **16** carries a core **18** of cylindrical formation, while the die **17** carries a core **19**, one end of which is cut away, as shown at **20** to define a space in which the lug **12** is formed. It is evident that when the dies **16** and **17** are brought towards each other, and with the insulating material in a plastic state positioned about the cores **18** and **19**, the insulating material will be worked into the sleeve-like formation illustrated.

Referring now more particularly to Figure 4, a blank of metal from which the inner conducting sleeve is formed is identified in its entirety by the reference character B. The metal employed in the manufacture of the inner conducting sleeve should obviously be a good conducting material such as an appropriate copper alloy which has the desired properties of springiness and resiliency.

The blank B is of a general rectangular formation presenting edges **21** and **22** which are formed

substantially equi-distantly between their extremities with notches **23** and **24**. At one end the blank B is formed with a projection defined by a gradually inclined wall **25**, and a sharp abrupt shoulder **26**, and this projection is duplicated at the other extremity of the blank. It will be noted that the inclined walls **25** extend towards the free edge of the blank B, while the abrupt shoulder **26** is disposed towards the central portion of the blank B.

The blank B with the notches **23** and **24** and the projections defined by the surfaces **25** and **26** may be formed in a single stamping operation by employing appropriate dies in a well-known manner.

After the blank B has been fashioned, as shown in Figure 4, it is bent into the formation depicted in Figure 5, in which it will be noted that the edges **21** and **22** are spaced apart. This deforming of the blank B is continued further until the blank assumes the sleeve-like formation identified in Figure 6, and the inner connecting sleeve is now identified by the reference character S.

It will be noted that the notches **23** and **24** cooperate to define a recess designated **27**, and that at one end the edges **21** and **22** are slightly spaced apart, as indicated at **28**. At the other end, however, the deformation has been carried further to provide an overlap between the edges **21** and **22**, as shown at **29**. It is evident that the portion of the sleeve S formed with the overlap has a smaller diametrical dimension than the remainder of the sleeve.

With the sleeve S in the formation depicted in Figure 6 it is inserted into the outer sleeve **10** with the end carrying the overlap **29** being inserted into the end of the sleeve **10** which bears the indicating nick **9**. The constricted diametrical dimension of the overlap **29** provides for the latter riding over the lug **12** with the bevel **13** cooperating in this action.

When the sleeve S has been inserted an appropriate distance the lug **12** will be received in the recess **27**, and an appropriate tool may now be availed of to expand that portion of the sleeve carrying the overlap **29**. The other extremity of the sleeve S may also be expanded by a tool to provide a noticeable advantage. This advantage is tied up with the fact that the material employed in the formation of the inner connecting sleeve S has the property of resiliency and springiness to a required extent. When once formed into the constricted formation shown, and later expanded, the metal always exerts a tendency to return to its constricted condition. Thus when a terminal such as shown at T is inserted into the bore of the sleeve S the conical formation of the nose of the terminal which is indicated at **30** will cause the terminals to ride past the inclined surfaces **25**, exerting a slight expanding action on the sleeve S.

However, when the projection defined by the surfaces **25** and **26** is positioned in the groove **31** formed in the terminal T, the metal of the sleeve S will exert a marked tendency to grip the terminal T to insure of a firm anchorage of the terminal T in the connecting sleeve.

It is notable that the groove **31** may include a sharply inclined shoulder such as shown at **32**, which is designed for cooperation with the abrupt shoulder **26**, so as to more positively prevent withdrawal of the terminal T from the sleeve.

The modified form of the invention illustrated in Figures 9 and 10 is similar to the construction above described, except for three important fea-

tures. The modified form of insert means is provided with a centrally disposed generally rectangular cutout 33 of a size to receive the lug 12. The longitudinal sides of the cutout are preferably disposed parallel to the end margins of the insert and the transverse ends of the cutout generally parallel to the longitudinal edges of the insert means. The longitudinal edges of the insert means are preferably interrupted by a pair of transverse notches 35 opposite the end margins of the cutout 33. By providing a relatively large cutout or recess 33 and the notches or slits 35, the blank may be easily rolled or formed, preferably into the desired shape illustrated in Figure 10 so as to provide substantially corresponding terminal receptacles 36, which are more or less independently operable of each other. In this modification or embodiment of the invention both of the terminal receptacles are preferably contracted. By this arrangement either end or extremity of the insert means may be inserted into an end of the insulator housing so that the recess formed by the cutout receives the lug 12, whereupon both of the receptacles 36 are expanded separately or simultaneously, thus locking the parts in assembly.

Accordingly, it will be apparent that in the modification of the invention illustrated in Figures 9 and 10, the recess is disposed in a different place, that both of the receptacles are contracted and subsequently expanded; and that either end of the insert means may be inserted into one end of the insulator housing.

The above described methods and construction of the parts provides a highly simplified construction of outer insulating sleeve and inner conducting sleeve respectively, together with a method for assembling these parts so as to positively insure of the parts maintaining their assembled position.

Obviously slight changes might be made in the several steps of the method and formation of the particular parts without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. The method of assembling a connecting sleeve of the character described which consists in forming an outer insulating sleeve having a bore and carrying a lug extending into said bore, forming an inner conducting sleeve of a split construction with a recess intermediate the extremities thereof, constricting said inner sleeve at one end to a greater extent than at the other, and then inserting said constricted end into said outer sleeve, and passing the constricted end past the said lug to cause the latter to be received in said recess.

2. The method of assembling a connecting sleeve of the character described which consists in forming an outer insulating sleeve having a bore and carrying a lug extending into said bore, forming an inner conducting sleeve of a split construction with a recess itnermediate the extremities thereof, constricting said inner sleeve at one end to a greater extent than at the other, and then inserting said constricted end into said outer sleeve, passing the constricted end past the said lug to cause the latter to be received in said recess, and then expanding said constricted end portion.

3. The method of assembling an inner conducting sleeve with an outer insulating sleeve having a bore and carrying a lug extending into said bore which consists in first stamping a blank of metal into substantially a rectangular formation with a notch in each side thereof, deforming said blank into a sleeve-like formation with the said notches defining a recess, constricting one end of said sleeve-like formation to cause the meeting edges to overlap, and then passing said portion having the overlapping edges into said outer insulating sleeve past said lug to cause the lug to be received in said recess.

4. The method of assembling an inner conducting sleeve with an outer insulating sleeve having a bore and carrying a lug extending into said bore which consists in first stamping a blank of metal into substantially a rectangular formation with a notch in each side thereof, deforming said blank into a sleeve-like formation with the said notches defining a recess, constricting one end of said sleeve-like formation to cause the meeting edges to overlap, then passing said portion having the overlapping edges into said outer insulating sleeve past said lug to cause the lug to be received in said recess, and then expanding that portion of the sleeve having the overlapped edges.

5. The method of forming and assembling an inner conducting member with an outer insulating body having a cavity and carrying abutment means extending into said cavity which consists in providing notches in a blank of metal, deforming said blank into a pair of terminal receptacles with the said notches defining a recess, compressing a portion of one of the receptacles so that the portion overlaps another portion of the receptacle, and then passing said overlapped portion into said outer insulating body past said abutment means to cause the abutment means to be received in said recess.

6. The method of forming and assembling an inner conducting member with an outer insulating body having a chamber and carrying abutment means extending into said chamber which consists in providing notches in a blank of metal, deforming said blank into a pair of terminal receptacles with the said notches defining a recess, compressing at least a portion of one receptacle so that the portion overlaps another portion thereof, then passing said overlapped portion into said outer insulating body past said abutment means to cause the abutment means to be received in said recess and so that the overlapped portion may be expanded to lock the parts together.

7. The method of forming and assembling a contact with a chambered body of insulating material provided with a pair of abutment means, which consists in forming a blank of metal into a wire holding part and terminal receiving means and making a notch between the part and receiving means with the notch and an adjacent edge of the contact forming a recess, compressing at least a portion of the receiving means, and then inserting the contact into the chamber to a point substantially entirely within the confines of the body of insulating material so that at least a portion of the part and a portion of the receiving means are disposed side by side in offset overlapped relation in the chamber and the recess will receive one of the abutment means whereby to assist in holding the contact against movement in one direction and so that the compressed portion when expanded will engage the other abutment means to hold the contact against movement in another direction.

8. The method of forming and assembling conductor means with a tubular open-ended body of

insulating material of which a portion thereof may form locking means, which consists in forming a cut-out in a blank of metal, shaping the blank into a pair of receptacles adapted to receive conductors with the cut-out and an adjacent edge of the conductor means forming a recess between the receptacles, and then inserting the conductor means substantially entirely into the body of insulating material to engage the recess with the locking portion of said body.

9. A method of forming and assembling conductor means with a body of insulating material having an opening therein of which a portion of the body may constitute locking means, which consists in forming a cut-out in a blank of material, shaping the blank into a pair of conductor

engaging portions with the cut-out disposed between the engaging portions, and then inserting the conductor means into the opening of the body of insulating material so that a portion of the body is received in the cut-out whereby to lock the parts in assembly.

JESSE M. WHITE.

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The following references are of record in the file of this patent:

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