July 18, 1967 R. F. PIPPIN, JR., ETAL 3,332,051

TERMINAL PROTECTOR ARRANGEMENT

Filed Aug. 10, 1965

2 Sheets-Sheet 1

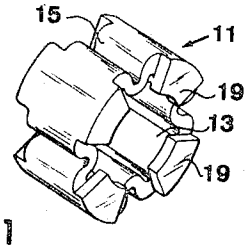


Fig. 1

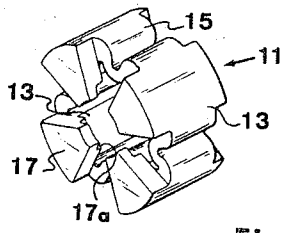


Fig. 2

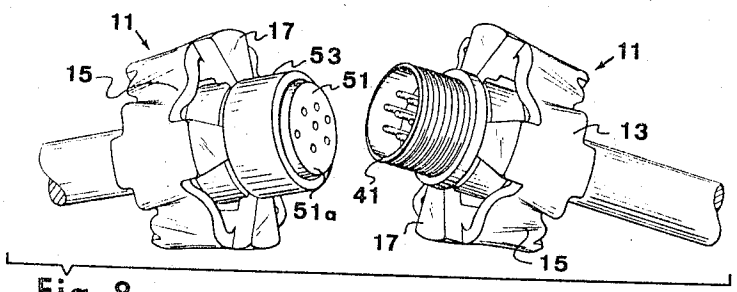


Fig. 8

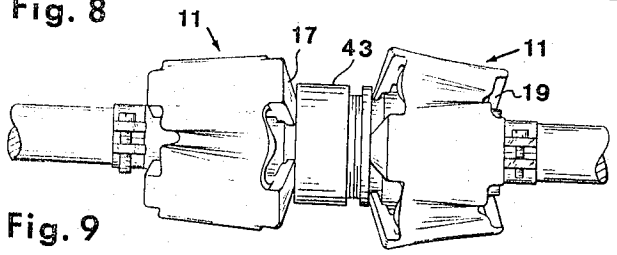


Fig. 9

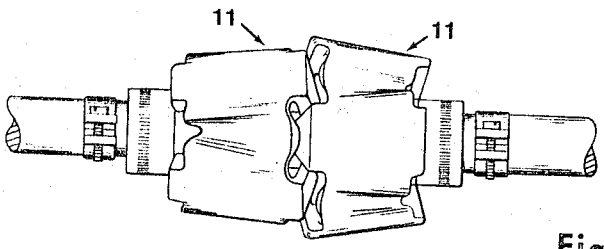


Fig. 10

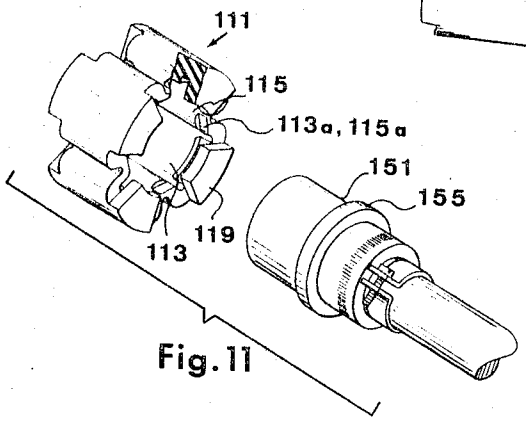


Fig. 11

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TERMINAL PROTECTOR ARRANGEMENT

Filed Aug. 10, 1965 2 Sheets-Sheet 2

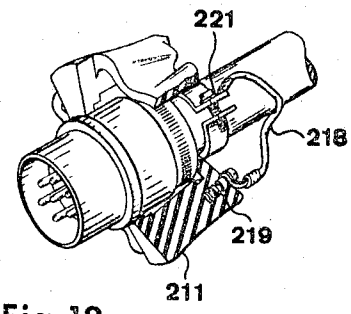


Fig. 12

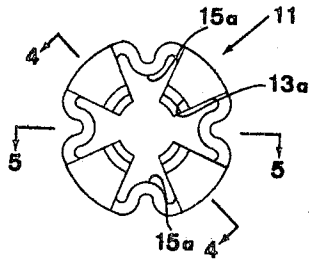


Fig. 3

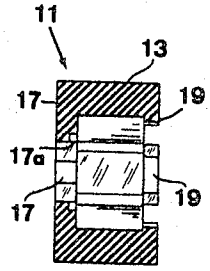


Fig. 4

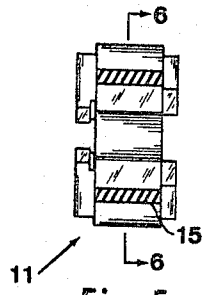


Fig. 5

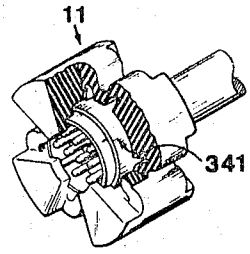


Fig. 7A

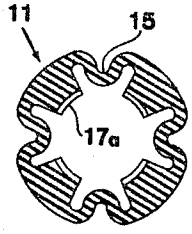


Fig. 6

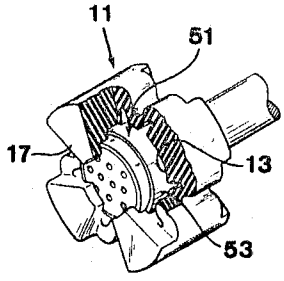


Fig. 7

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3,332,051

TERMINAL PROTECTOR ARRANGEMENT

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Filed Aug. 10, 1965, Ser. No. 478,635
11 Claims. (Cl. 339—93)

This invention relates to an improved terminal protector arrangement, and particularly to a terminal arrangement which permits protection of a relatively wide range of sizes of terminal members with a single protector arrangement, while also enabling selective intermating or joining of pairs of terminal members without necessitating removal of the associated protectors.

In the electrical and electronics arts it is common practice to employ a cable having a relatively large number of individual electrical wires and to connect the cable to a single terminal connector with each of the wires individually and separately connected to connection elements on the terminal connector. Many of these terminal connectors are very easily damaged when dropped or otherwise subjected to impact or abuse, and it is relatively expensive to replace such terminal connectors in view of the cost of the connectors and the labor involved.

It is therefore highly desirable to protect these terminal connectors from impact or other abuse insofar as possible, both while the terminal connectors are in the unmated state as well as in the mated state, protection in the mated state being particularly important when both mated terminal connectors are carried by a free electrical cable. It is therefore desirable to provide protection for the terminal connectors which will be compatible with facile connection of the connectors, while still giving protection whether the connectors are mated or unmated.

It is accordingly an object and feature of this invention to provide a terminal connector member protector arrangement which will afford protection against impact damage to terminal connector members such as electrical connectors, and which will enable the terminal members to be intermated while still enabling retention of the protectors in a protective position on their respective terminal connector members.

A further object and feature resides in the provision of an improved terminal member protector which for a given particular size protector is capable of being fitted to a multiple number of sizes of terminal members while still providing desired impact load protection to the terminal member on which used, and also enabling intermating connection of pairs of associated terminal members.

Still other objects, features and attendant advantages will become apparent to those skilled in the art from a reading of the following detailed description of several physical embodiments of the invention, taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a view in perspective taken from the rear side of a protector according to the invention,

FIGURE 2 is a view similar to FIGURE 1 taken from the front side of the protector of FIGURE 1,

FIGURE 3 is a rear face view of the protector of FIGURE 1,

FIGURES 4 and 5 are section views taken on lines 4—4 and 5—5 of FIGURE 3,

FIGURE 6 is a section view taken on line 6—6 of FIGURE 5,

FIGURE 7 is a perspective view illustrating the protector of FIGURE 1 in place on a female type electrical terminal connector of the type having a securing ring,

FIGURE 7A is a perspective view illustrating the protector of FIGURE 1 in place on a male type electrical terminal connector of the type having a securing ring,

FIGURE 8 is a perspective view illustrating male and female electrical terminal connectors each with protectors thereon and pushed back preparatory to mating of the connectors,

FIGURE 9 illustrates the connectors of FIGURE 8 after mating and before final positioning of the protectors for optimum protection,

FIGURE 10 illustrates the mated connectors of FIGURES 8 and 9 with the protectors moved into intermated position for optimum protection of the connectors,

FIGURE 11 illustrates a modified embodiment according to the invention.

FIGURE 12 illustrates a further modification according to the invention.

Referring now in detail to the figures of the drawings, in the illustrated embodiment as shown in FIGURES 1 and 2, there is provided a terminal member protector generally indicated by the numeral **11**, which is particularly adapted to protect electrical terminal connectors which require intermating. The protector **11** is formed of elastic material, such as rubber, neoprene, plastic, etc., it having been found that rubber or neoprene composition of approximately 40–50 durometer is quite satisfactory for producing desired shock-resistive action while also providing the desired elasticity to enable self-retaining action of the protector throughout a range of sizes of connectors.

The protector **11** includes a plurality of spaced-apart ribs **13** which are adapted to engage the circumferential periphery of a connector **41**, or **51**, as illustrated in FIGURE 7. Interconnecting the rib portions **13** are a corresponding plurality of web portions **15** which have an excess of effective length of material between adjacent ribs to enable a desired expansion of the ribs **13** to accommodate various sizes of terminal members. In the preferred embodiment these web portions **15** are formed in an undulating corrugated shape as viewed in cross-section, there being one or more undulating folds to provide the desired total length for expansion while still affording elastic strength sufficient to afford a sufficient stability to the protector body. Also, the webs are preferably formed with the inner surface **15***a* of the inwardly protruding undulation or undulations disposed at approximately the same radial distance as the inner terminal member-engaging surface **13***a* from the center of the cavity formed by the ribs **13** and webs **15**, so as to provide for circumferential peripheral engagement of the terminal member outer surface by both the ribs **13** and the corrugated webs **15**, thus giving in most instances the most advantageous securing and protective action. While only a single inner corrugation and associated surface **15***a* is shown, and four ribs and webs are shown it will be apparent that more various numbers of ribs, connecting webs, and web corrugations may be employed. For instance, in very small sizes of protectors **11** it may be advantageous to employ a construction with three ribs and connecting webs, and in which the webs are double corrugated to afford two spaced innermost corrugation surfaces **15***a* for contact with the terminal member **41** or **51** between the associated contacting ribs.

Disposed at the outer or front face end of the protector **11** are a plurality of inwardly-extending protective lips **17** which are formed as extensions of and in alignment with ribs **13**. In some instances it is desirable to provide an intermediate step in the lips as shown at **17***a*, in order to accommodate a stepped-down end portion of the terminal member, such as in those male or female terminal members having a rotatable securing ring **53** which has its longitudinal end portion stepped back from the radial-

ly inner end body portion of the terminal connector. Thus, with this stepped construction **17**, **17***a* the axial ends of the connector ring are protected, as well as the protruding smaller diameter end of the main portion of the connector.

While the protectors **11** according to this invention may be removed from the connectors in order to mate the connectors if so desired, it is often desirable to mate the connectors and still afford protection against impact damage to the connectors while so mated, and the present invention enables this additional protective advantage. To this end, the protectors **11** on associated male and female electrical terminal members **41** and **51** may be manually pushed rearwardly back from the ends of the respective connectors **41**, **51**, the front end portion elastically spreading to accommodate this movement, as shown in FIGURE 8, to enable the two connectors to be joined in the usual manner as by a threaded securing ring **53** on the female member **51** engaging with the threads on the male terminal member **41**, as shown in FIGURE 9. While the protector units **11** may be left in this position as shown in FIGURE 9 and afford a considerable degree of protection in such position, the optimum protection is normally afforded by thereupon sliding the protector units **11** toward one another into an intermated position as shown in FIGURE 10. In order to afford this intermated condition the free ends of the ribs **13** and the root ends of the lips **19** are spaced apart a distance sufficient to permit ease of endwise mating by the end-abutted terminal member protectors **11** when the outer face ends of the protectors **11** are in the raised or spread position as shown in FIGURES 8–10. Such intermating can be assured by spacing the lips **17** apart a distance at each radial point at least as great as the corresponding width of the lips **17**, although it will be apparent that in the raised position as shown in FIGURES 8–10 there is a natural spreading which will enable the intermating when the space between the lips is somewhat less than the width of the lips in the full seated quiescent condition. It will also be appreciated that as the protectors are used on larger and larger oversize connectors this initial spacing will become less critical as the natural extension of the web portions will easily provide sufficient space to accommodate the lips therebetween.

In order to aid in securing of the protective units **11** on their respective terminal members **41** or **51** or the like there are provided securing lips **19** at the rear end face of the protector **11**, these securing lips **19** protruding radially inwardly as an extension of the ribs **13** in a manner similar to the securing and protective lips **17** at the front face of the protector **11**. However, in the preferred embodiment the securing lips **19** are of less radial depth than the protective and securing lips **17**, since the securing lips **19** are only required for securing purposes about an annular stepped-down portion such as is formed by the threaded securing ring **53** of the female terminal member or the rear face end of male terminal member **41**, while the protective and securing lips **17** not only step down to secure the protector about the ring **53** but also provide for protection against damage of the radially inwardly disposed main body portion **51***a* which extends axially out beyond the securing ring **53**. In any event, even in those instances where the step **17***a* is not necessary in the protective and securing lips **17** it is nevertheless normally preferred to extend the protective lips **17** radially inwardly beyond the securing lips **19**, as the undue extension of the securing lips **19** will cause undesirable canting of the protector on the surface of the connector, while radially inward extension of the protective lips **17** sufficiently to cover protruding portions of the connector body **41** or **51** is desirable.

In some connector embodiments there is formed an annular ridge on the outer portion of the connector at a distance from the axial end of the connector **151** as shown in FIGURE 11, at **155**. In such instances it is desirable to provide a modified connector protector **111**, which includes a groove recess **113***a*, **115***a*, formed in the radially inner connector-engaging portions of the ribs **113** and webs **115** adjacent the securing lips **119**, as shown in FIGURE 11, or at such other axial position of the protector unit as is necessary to accommodate the particular annular ridge. In the embodiment of FIGURE 11, the securing lips **119** also engage with the annular ridge **155** to aid in securing the protector unit **111** against undesired slipping of the protector unit off the connector.

While it is normally not necessary or desirable to remove the connector protector units **111** from the body of the associated connectors in order to enable mating and use of the connectors, there may be instances where it is necessary or desirable to remove the protector units temporarily from their terminal connectors, and in such instances a modified arrangement as shown in FIGURE 12 may be employed, to insure against loss of the protector units. In this modified embodiment a securing line of flexible material such as chain or cord **218** may be suitably secured to the protector unit **211** as by moulding a terminal connection **219** into the body of the protector unit **211**, preferably in a rib portion at the rear end of the unit **211**. The cord **218** may in turn be suitably connected to a fixed connection on the electrical terminal connector, such as indicated at **221**.

While the invention has been shown and described as applied to several illustrative physical embodiments, it will be readily apparent to those skilled in the art that various modifications and improvements may be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific illustrated embodiments, but only by the scope of the appended claims.

That which is claimed is:

1. A terminal member protector comprising:
an annular body of elastic material open at both longitudinal ends,
said body having a plurality of longitudinal terminal-member-engaging circumferentially-spaced ribs,
a corresponding plurality of arcuate curved web portions thinner than said ribs and connecting adjacent said ribs,
the linear arcuate length in cross-section of at least one of said arcuately-curved webs being greater than the distance between said ribs and the respective points of intersection of the respective web with the respective adjoining said ribs,
said body having a plurality of inwardly extending protective and securing lips formed at each end.

2. Apparatus according to claim **1**, said ribs being substantially equally spaced from the longitudinal center of said body along the longitudinal extent of said ribs.

3. Apparatus according to claim **1**, said lips being in longitudinal alignment with and extending from the opposite ends of said ribs.

4. Apparatus according to claim **1**, the free ends of said ribs and the root ends of said lips being spaced apart a distance to permit ease of endwise mating by the end-abutted terminal member protectors during interconnection of the respective protected terminal members.

5. Apparatus according to claim **4** wherein said spacing distance is approximately as great as the tip width of said lips.

6. Apparatus according to claim **1**, said web portions being all formed in corrugated undulating cross-sectional shape.

7. Apparatus according to claim **6** wherein the radially innermost surface of the radially inner corrugations of said webs is at a radial distance approximately the same as the radial distance of the major terminal-member-contacting radially inner surface of said ribs.

8. Apparatus according to claim **6**, the amplitude of said web corrugations in unflexed position being approximately as great as the full radial thickness of said ribs

as measured between the radial inner surface of the rib and the radial outer surface of the annular body.

9. In combination a pair of terminal members adapted to be intermated,

two terminal member protectors,

a respective one of said protectors being disposed in circumferential wrap-around engagement about a respective one of said terminal members,

each of said terminal member protectors comprising an annular body of elastic material and having a central body cavity open at both ends,

said cavity being defined by a plurality of longitudinal terminal-member-engaging circumferentially-spaced ribs, and

a corresponding plurality of arcuate curved web portions thinner than said ribs and connecting adjacent said ribs,

the linear arcuate length in cross-section of at least one of said arcuately-curved webs being greater than the distance between said ribs and the respective points of intersection of the respective web with the respective adjoining said ribs,

said body having a plurality of inwardly-extending protective lips formed at one end of said cavity,

said protective lips being disposed across a portion of the free end of the respective said terminal member, and being adapted to be pulled back over the main

body portion of said terminal member for mating connection of said terminal members.

10. Apparatus according to claim 9, said lips being spaced apart a distance to permit ease of endwise mating by the end-abutted terminal member protectors during interconnection of the respective protected terminal members.

11. Apparatus according to claim 9,

said web portions being all formed in corrugated undulating cross-sectional shape,

the amplitude of said web corrugations in unflexed position being approximately as great as the full radial thickness of said ribs as measured between the radial inner surface of the rib and the radial outer surface of the annular body,

a portion of said web portions of each of said protectors engaging the respective said terminal member to aid in the protective action afforded by said protectors.

References Cited

UNITED STATES PATENTS

1,798,859	3/1931	Woodruff	174—138.4
3,258,731	6/1966	Still et al.	339—36

MARVIN A. CHAMPION, *Primary Examiner.*

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