June 6, 1961 J. I. ROSS 2,987,691

QUICK-COUPLING HERMAPHRODITIC CONNECTORS

Filed Oct. 20, 1958 3 Sheets-Sheet 1

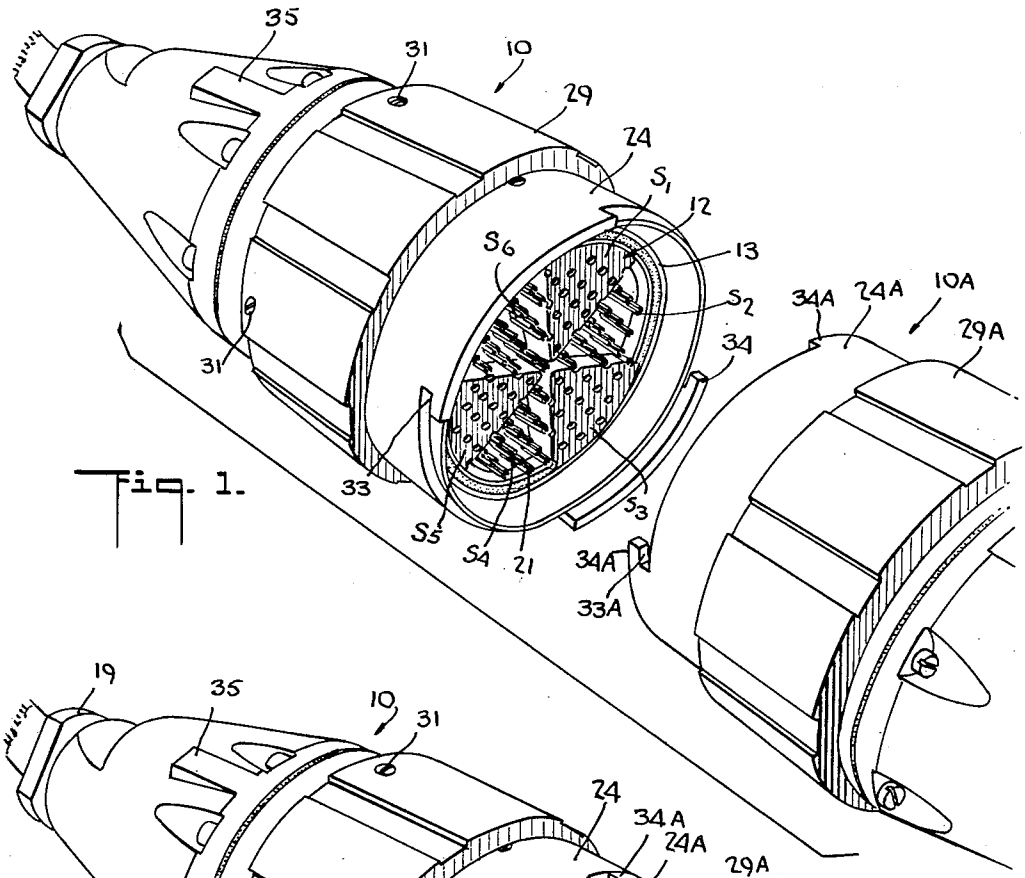

Fig. 1.

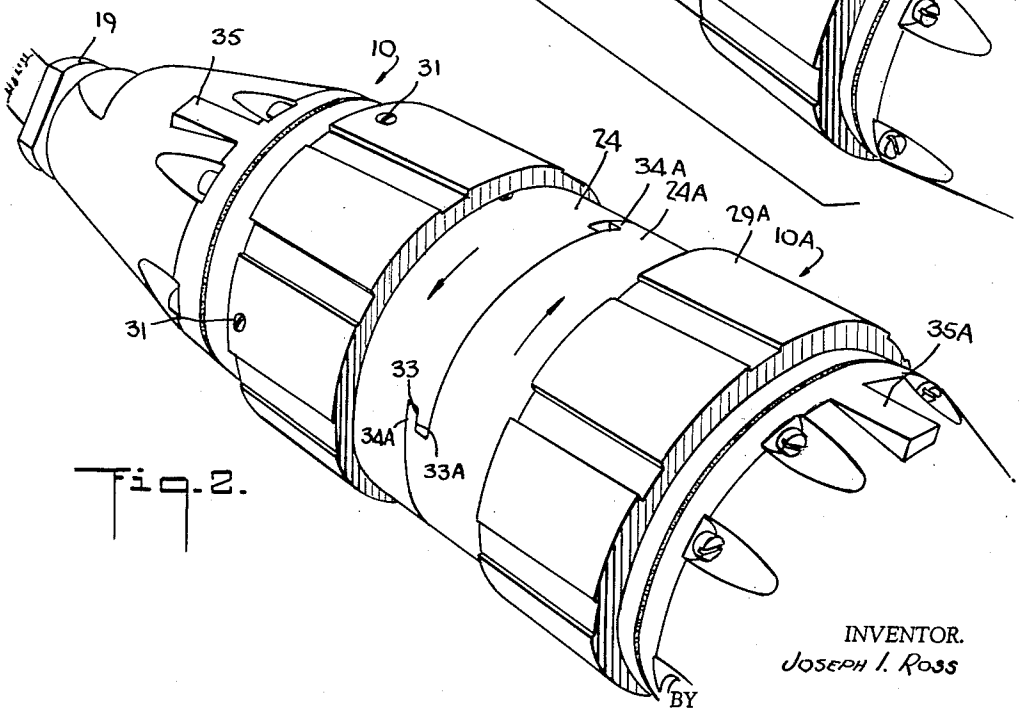

Fig. 2.

INVENTOR.
JOSEPH I. ROSS

BY

Kenyon & Kenyon
ATTORNEYS

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Fig. 3.

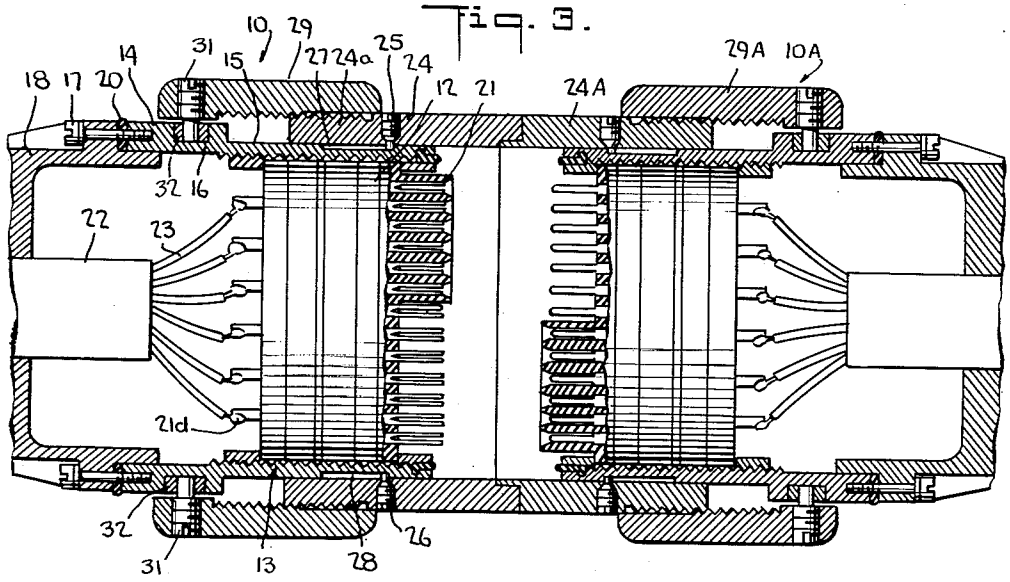
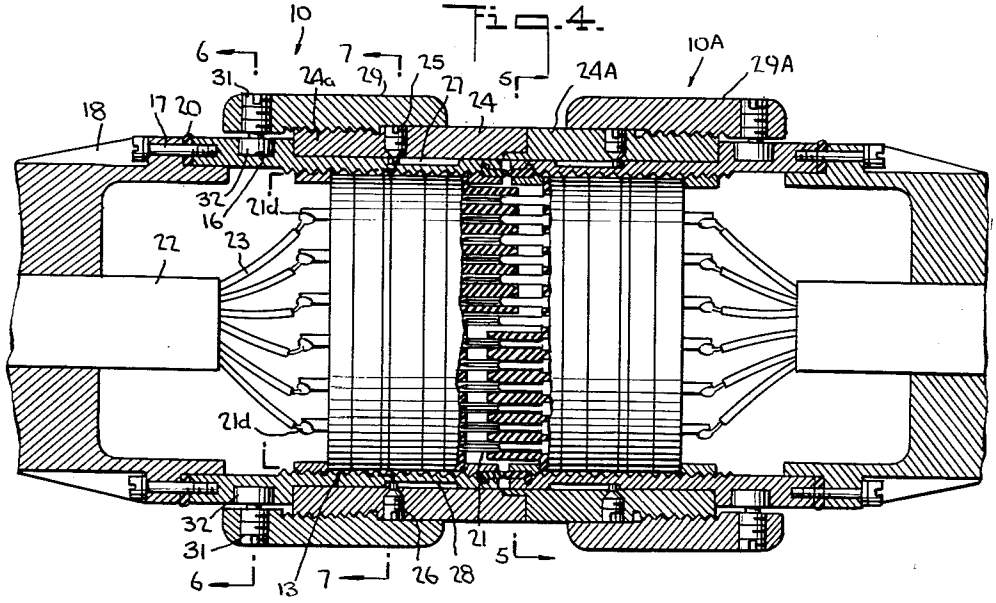


Fig. 4.



INVENTOR.
JOSEPH I. ROSS
BY
Kenyon & Kenyon
ATTORNEYS

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Fig. 5.

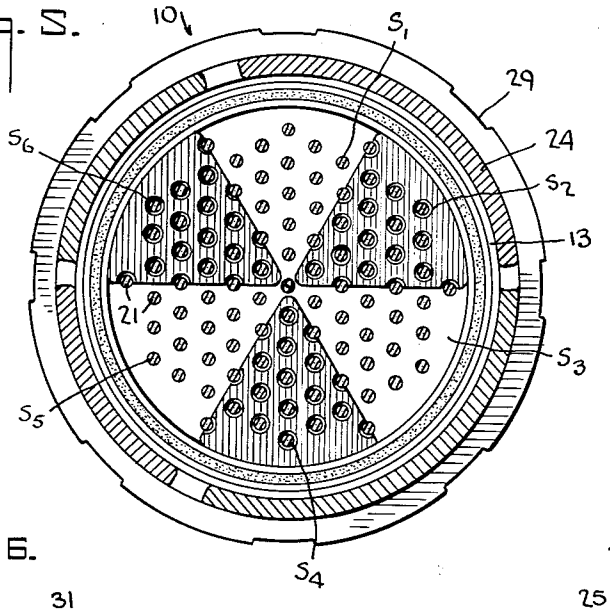


Fig. 6.

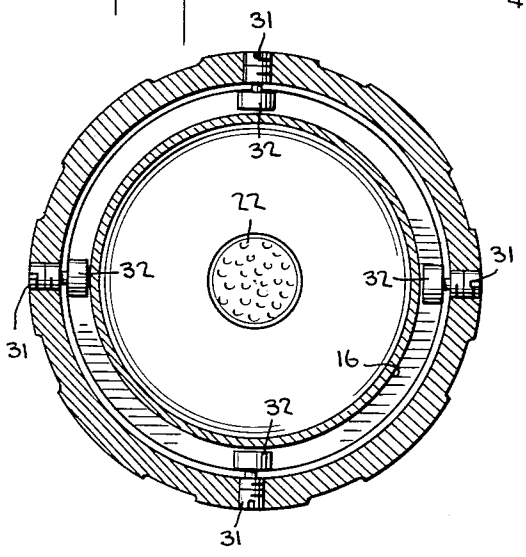


Fig. 7.

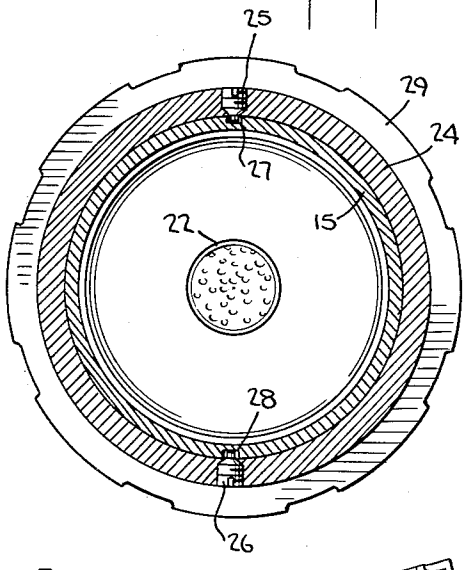
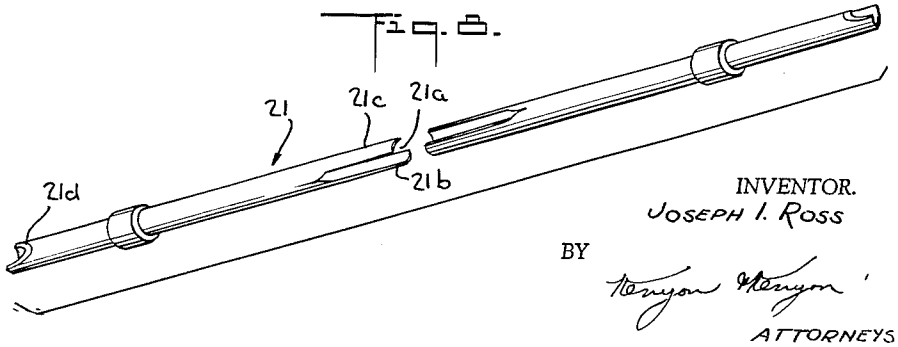


Fig. 8.



INVENTOR.
JOSEPH I. ROSS

BY

Kenyon & Kenyon

ATTORNEYS

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QUICK-COUPLING HERMAPHRODITIC CONNECTORS

Joseph I. Ross, East Norwich, N.Y., assignor to Specialty Engineering & Electronics Company, Brooklyn, N.Y., a partnership

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3 Claims. (Cl. 339—49)

The present invention relates generally to hermaphroditic connectors for multiple-conductor cables, and more particularly to connectors of this type which may be manually intercoupled without the use of axial pressure.

In order to link the operating units or components of an electrical installation, it is known to make use of multi-wire cables which are intercoupled by means of terminal connectors. Such coupling devices are usually of the male and female type, the cable interconnections being made by properly mating male and female connectors.

In mobile military communications systems, such as field radio transmitters, field telephone networks or portable radar installations, it is vitally important that connections between the various elements of the system be made rapidly and without undue stress. It is essential, therefore, that the connectors be adapted for quick coupling under varying field conditions, such as under cover of darkness or at extremely low temperatures. The use of standard male and female connectors in conjunction with cables is a decided drawback, for valuable time is lost in matching male connectors to appropriate female connectors.

To obviate the drawback inherent in conventional male-female connectors, hermaphroditic connectors have recently been developed whereby the connectors at the ends of a multiple cable are identical with each other. Such connectors act either as a male or female element and are intended to simplify the hook-up of complex field equipment.

There is one difficulty, however, which is characteristic of male and female connectors which is not overcome by hermaphroditic connectors of known design. In order to bring together such hermaphroditic connectors, it is necessary for the operator to use a strong axial thrust motion. Thus, in the case of male-female connectors, the operator must axially insert the male element into the female member, while in the case of hermaphroditic connectors a similar movement is necessary to join the hermaphroditic pins. And to decouple such connectors they must be pulled apart.

The amount of axial pressure necessary to join or decouple hermaphroditic connectors is considerable, particularly when a great number of pins are involved. This can be a strenuous and difficult operation under conditions encountered in the field. However, unless adequate pressure is used, effective electrical contacts will not be made. The axial pressure requirement militates against quick coupling and is a major disadvantage in hermaphroditic connectors of known design.

In view of the foregoing, it is the principal object of this invention to provide hermaphroditic connectors which may be quickly and effectively intercoupled without the use of axial pressure.

More particularly, it is an object of the invention to provide hermaphroditic connectors which may be positively intercoupled by a twist lock operation followed by a simple rotary motion of coupling rings.

Briefly stated, in a hermaphroditic connector in accordance with the invention there is provided a tubular sleeve whose front end is cut out to define tongue and grooves effecting a twist-lock coupling with a complementary sleeve. A tubular casing is telescoped within said sleeve

and is axially slideable therein. The rear portion of the casing extends beyond the rear portion of the sleeve, the two portions being bridged by a coupling ring which threadably engages the rear portion of the sleeve and is so keyed to the rear portion of the casing as to permit the ring to rotate but not to move axially.

Thus, upon rotation of the ring, the casing is caused to advance or retract axially in the sleeve depending on the direction of rotation. A hermaphroditic pin block is housed within the casing and moves axially therewith. In a coupling operation between the two connectors, the sleeve ends thereof are first interlocked and the coupling rings are turned in opposing directions to cause the associated casings and blocks therein to advance toward each other until engagement is effected between the hermaphroditic pins.

For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description to be read in connection with the accompanying drawings wherein like components in the several views are identified by like reference numerals.

In the drawings:

FIG. 1 is a perspective view of a pair of hermaphroditic connectors in accordance with the invention, the connectors being shown before they are intercoupled;

FIG. 2 is a perspective view of the intercoupled connectors;

FIG. 3 is a longitudinal sectional view of the hermaphroditic connectors after they are joined together but before the coupling rings are turned to effect interlinking of the connector pins;

FIG. 4 is a longitudinal section which is similar to FIG. 3 showing the internal arrangement after the pins are interlinked;

FIG. 5 is a transverse section taken through the plane indicated by line 5—5 in FIG. 4;

FIG. 6 is a transverse section taken through the plane indicated by line 6—6 in FIG. 4;

FIG. 7 is a transverse sectional view taken through the plane indicated by line 7—7 in FIG. 4; and

FIG. 8 is a perspective view of the contact pins incorporated in the connector.

Referring now to the drawings, there is illustrated a pair of hermaphroditic connectors, generally designated by numerals **10** and **10**–A. Since the connectors are of identical design, the components in connector **10** will be identified by a simple numeral, while the corresponding component in connector **10**–A will be identified by the same numeral followed by the letter A.

Connector **10** is constituted by an insulating block **12** of cylindrical construction which is fixedly held within the front end of a tubular metallic casing **13**. The rear end portion **14** of casing **13** is of enlarged diameter relative to the remaining front portion **15** thereof and has a circumferential groove formed therein to provide a channel **16**.

Attached to the rear end of casing **13**, by means of screws **17**, is a conical closure member **18** of the same metal which terminates in a bushing **19** threadably received therein. Interposed between closure **18** and casing **12** is a rubber gasket **20** which provides a moisture-proof seal therebetween.

The connector block **12** is formed of a molded insulating material, such as a high impact plastic of superior dielectric properties, and is divided into six sectors S_1 to S_6 which are alternately raised and depressed. A bank of connector pins **21** is supported within each sector.

As separately shown in FIG. 8, each connector pin **21** is provided with a longitudinal slot **21***a* at the front end to define a pair of resilient fingers **21***b* and **21***c*. To join two pins, they are brought into axial alignment with their

fingers at mutually perpendicular positions such that each pair of fingers engages the other pair. The rear extension **21***d* of the pins is of hollow construction to receive a bared wire which may be soldered thereto.

In mating two connectors, the raised sectors S_1 to S_6 of one intermesh with the depressed sectors of the other such that each bank of pins **21** engages the complementary bank. A more detailed description of the pin and block structure of the connectors may be found in my copending application 722,706, filed March 20, 1958. It is to be understood, however, that the present invention is not limited to this specific structure.

The cable **22** containing a plurality of wires **23** passes through a central bore in the conical closure **18**, the bared ends of the wires being soldered to the pin extensions **21***d*, as shown in FIGS. 3 and 4.

The front portion **15** of the casing **13** is telescoped within a metal sleeve **24**, the casing **13** being axially slideable therein but being prevented from rotational movement relative to the sleeve. This is accomplished by means of a pair of screws **25** and **26** threadably received in the sleeve at diametrically opposed points therein and projecting into longitudinal key slots **27** and **28** formed in the casing front portion **15**.

The slots **27** and **28** are of like length, the length of the slots determining the limits of the relative axial movement of casing **13** and hence the connector block held therein. Thus FIG. 3 shows the fully retracted position of the casing and FIG. 4 shows the extreme forward position thereof.

The axial movement of the casing **12** relative to the sleeve **24** is effected by means of a coupling ring **29** which is positioned to bridge the rear portion **14** of casing **12** and the adjacent rear portion **24***a* of sleeve **24**, rotation of the ring causing relative axial movement therebetween. The interior wall of ring **29** is threaded to engage the threaded surface of the rear portion **24***a* of the sleeve. The axial position of the ring **29** is fixed with respect to casing **12** by means of screws **31** which are received at circumferentially spaced points about the ring and are provided with pin extensions journalled within rollers **32**. Rollers **32** ride in the channel **16** formed in casing portion **14**, whereby ring **29** is free to rotate but is restricted from axial movement.

As best seen in FIGS. 1 and 2, the mating ends of the sleeves **24** and **24**–A are formed with arcuate cutouts **33** and **33**–A so shaped as to define bayonet tongues **34** whereby the sleeves may be interlocked by a twist motion, the tongues **34** and **34**–A being received within the complementary cutouts **33** and **33**–A.

Initially, as shown in FIG. 3, the sleeves **24** and **24**–A are interlocked, while the pins **21** projecting from block **12** are separated from each other. By rotating rings **29** and **29**–A in opposing directions, the blocks **12** and **12**–A housed in casings **13** and **13**–A are caused to advance axially toward each other until the pins **21** are brought into physical and electrical engagement, at which point no further rotation of the rings is possible and the connector coupling is fully effected.

The closures **18** and **18**–A are provided with corresponding surface ridges **35** and **35**–A which act to indicate the matching positions of the connectors. Thus, the operator may, by holding the separate connectors in his two hands and feeling the ridges with his thumbs, thereby align the two connectors even in the absence of light. The connectors are then brought together and twisted to lock the sleeves together, the rings being turned in opposing directions to effect intercoupling.

While there has been shown what is considered to be a preferred embodiment of the invention, it will be obvious that many changes may be made therein without departing from the essential scope of the invention as defined in the annexed claims.

I claim:

1. A hermaphroditic connector comprising a tubular sleeve whose front end has cutouts formed therein to define tongue and grooves for twist-lock coupling to a complementary sleeve, a tubular casing telescoped in said sleeve and axially slideable therein, said casing having a rear portion extending beyond the rear portion of said sleeve, a coupling ring bridging the rear portion of said casing and the rear portion of said sleeve, said ring threadably engaging the rear portion of the sleeve, means keying said ring to the rear portion of said casing to permit said ring to rotate but not to move axially relative to said casing, an insulating block housed in said casing and axially movable therewith upon rotation of said ring, and hermaphroditic pins supported by said block and projecting forwardly therefrom.

2. A hermaphroditic connector for a multi-wire cable comprising a tubular sleeve whose front end has cutouts formed therein to define twist-lock tongue and grooves, a tubular casing telescoped in said sleeve and axially slideable therein, said casing having a rear portion extending beyond the rear portion of said sleeve, a coupling ring bridging the rear portion of said casing and the rear portion of said sleeve, said ring threadably engaging the rear portion of the sleeve, means keying said ring to the rear portion of said casing as to permit said ring to rotate but not to move axially relative to said casing, an insulating block housed in said casing and axially movable therewith upon rotation of said ring, a plurality of pins projecting through said block and provided with rear terminal extensions and a conical closure attached to the rear end of said casing, said cable passing through said closure and the wires thereof being connected to said terminal extensions.

3. A hermaphroditic connector comprising a tubular metallic sleeve whose front end has cutouts formed therein to define twist-lock tongue and grooves, a tubular casing telescoped in said sleeve, means keying said casing to said sleeve to permit said casing to be axially slideable therein, said casing having an enlarged rear portion extending beyond the rear portion of said sleeve, a coupling ring bridging the rear portion of said casing and the rear portion of said sleeve, said ring threadably engaging the rear portion of the sleeve, means keying said ring to the rear portion of said casing as to permit said ring to rotate but not to move axially relative to said casing, and a hermaphroditic pin block housed in said casing and axially movable therewith upon rotation of said ring, said block being divided into sectors which are alternately raised and depressed whereby said connector is adapted to mesh with a like connector.

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