March 28, 1950 S. L. ARSON 2,502,302

CONNECTOR

Filed April 9, 1945

Fig. 1

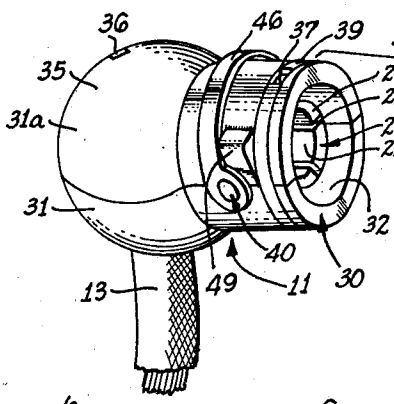


Fig. 2

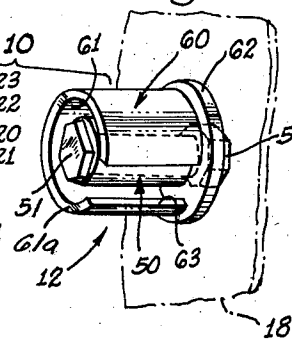


Fig. 3

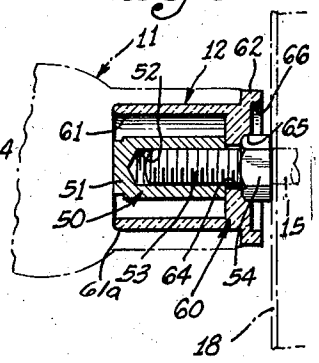


Fig. 4

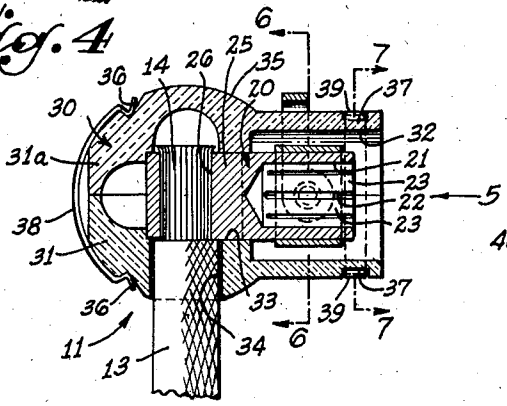


Fig. 5

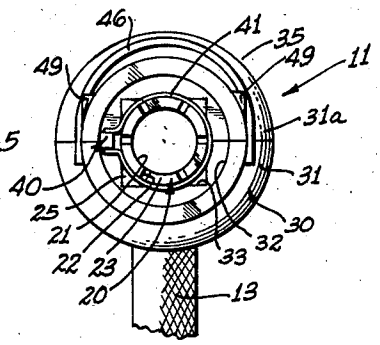


Fig. 6

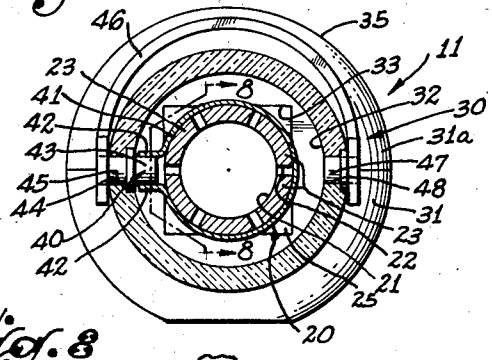


Fig. 7

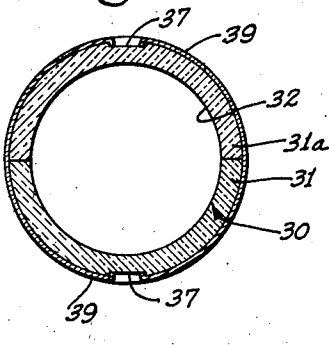
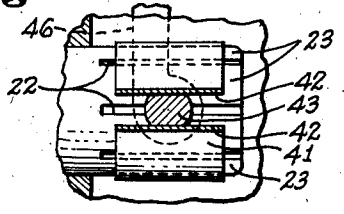


Fig. 8



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2,502,302

CONNECTOR

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Application April 9, 1945, Serial No. 587,281

5 Claims. (Cl. 173—363)

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My invention relates to a means for connecting a pair of conductors to define a continuous transmission path therebetween and, more specifically, to a device of this general character which comprises a socket adapted for receiving a terminal pin and incorporates a novel means for frictionally interlocking the socket and terminal pin to effect positive contact therebetween while permitting rapid and facile connection and disconnection thereof when desired.

In the employment of mobile equipment requiring an electrical power supply, such as the starting motors for aircraft power plants, or in the use of a variety of electrical equipment receiving power from a single central supply panel, it is frequently necessary to provide a means for effecting a temporary connection between the source of supply and the equipment requiring power. The connecting device must provide positive electrical contact and should be readily disengageable to permit breaking the connection easily when the power supply is no longer required. Such electrical connectors are frequently used for the transmission of a relatively intense current and may also be subjected to a considerable amount of rough handling during the operation thereof. One of the objects of my invention, therefore, is the provision of a heavy duty connector which may be adapted for the transmission of current of high intensity and which is capable of withstanding severe usage.

Most electrical connectors of the conventional terminal pin-and-socket type rely upon a wedging action to effect positive electrical contact. A substantial force is required to insert the terminal pin in or withdraw it from the socket, which is extremely undesirable when frequent connection and disconnection is dictated by the nature of the employment of the device. Constant operation of such conventional connectors also results in rapid wear of the relatively soft mating surfaces with a consequent reduction of contact efficiency. A primary object of my invention, therefore, is the provision of an electrical connector of the terminal pin-and-socket type which is specifically adapted for smooth and effortless operation without sacrificing efficiency of electrical contact.

A further object of my invention is to provide an electrical connector including a socket which is particularly adapted for positive engagement with a terminal pin.

An important achievement of my invention is the provision of a connector incorporating a releasable means for frictionally interlocking a socket and terminal pin to effect positive contact therebetween.

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Another object of my invention is to provide a connector incorporating a means for effecting disengagement of a socket and terminal pin to permit facile operation of the connector.

A purpose of my invention is to provide a connector having a configuration which is especially adapted for convenient handling.

An additional object of my invention is the provision of a connector whose component parts may be fabricated and assembled readily.

Further objects and advantages of my invention will be made evident in the following disclosure and a full comprehension thereof may best be achieved by consideration of the accompanying drawing, which is for illustrative purposes only, wherein:

Fig. 1 represents a perspective view of a socket assembly forming one part of the connector;

Fig. 2 is a perspective view of a terminal pin assembly which forms the mating part of the connector;

Fig. 3 is a vertical section through the terminal pin assembly of Fig. 2;

Fig. 4 is a vertical section through the socket assembly of Fig. 1;

Fig. 5 is an end view of the socket assembly as indicated by the arrow 5 of Fig. 4;

Fig. 6 is a section through the socket assembly taken along the line 6—6 of Fig. 4;

Fig. 7 is a view similar to Fig. 6, but taken along the line 7—7 of Fig. 4; and

Fig. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of Fig. 6.

Referring particularly to Figs. 1 to 3, the connector, indicated generally by the numeral 10, includes a socket assembly 11 which is adapted to receive a terminal pin assembly 12 to define a continuous transmission path between a conductor 13 and another conductor 15 (shown in phantom), the latter being securable to a panel 18 (shown in phantom) by means not shown but well known in the art.

The contractible socket assembly 11 comprises a socket 20 disposed within a socket housing 30 and incorporates a releasable terminal pin engaging means 40. The socket 20, formed of a suitable electrically conductive material, is provided with a circular longitudinal aperture or bore 21 therein and radial slots 22 therethrough which communicate with the bore 21 to define a plurality of spaced peripheral segments or fingers 23. The socket 20 is preferably provided with

a square shank 25 having a transverse bore 26 therethrough adapted for containing an exposed portion 14 of the conductor 13 which may be secured in the bore 26, as is well known in the art, to effect positive electrical contact with the shank 25.

The socket housing 30, formed of a suitable non-conductor such as one of the various thermoplastic materials, is preferably fabricated in two symmetrical and complementary halves 31 and 31a to define a circular opening 32 and a square recess 33 therebetween, the latter being adapted to contain the square shank 25 of the socket 20 to secure the socket 20 and socket housing 30 together as illustrated. The half 31 of the socket housing 30 is provided with an opening 34 thereinto to permit entry of the conductor 13 and the socket housing 30 is preferably formed with a substantially spherical end 35 to provide a configuration adapted for convenient handling. Each half 31 and 31a of the socket housing 30 is provided with recesses 36 and 37 in the outer surface thereof to permit securing the two halves 31 and 31a together by means of spring clips 38 and 39, preferably formed of a suitable resilient metal and having bent ends which are disposed in the recesses 36 and 37 respectively, as best shown in Figs. 4 and 7.

The terminal pin engaging means 40, best shown in Figs. 6 and 8, includes an expansible annular retaining spring 41, preferably formed of a suitable resilient metal, which encircles the peripheral segments 23 of the socket 20 and is adapted for urging the segments 23 inwardly to reduce the size of the aperture 21 therebetween. The retaining spring 41 is provided with a pair of substantially parallel and outwardly extending ends 42 which are engageable by a cam 43 to effect expansion of the retaining spring 41 in order to relieve the inward deformation of the segments 23 of the socket 20, as will be discussed in detail hereinafter. The cam 43 is secured to a rotatable shaft 44 projecting through a hole 45 in the socket housing 30, the shaft 44 being rigidly connected to one end of a bail-type trigger 46 which encircles the socket housing 30, as best shown in Fig. 1. The other end of the bail trigger 46 is provided with a pivot 47 extending into an opening 48 through the socket housing 30, the shaft 44 and the pivot 47 being disposed diametrically opposite each other, as best shown in Fig. 6. The bail trigger 46, preferably formed of a suitable non-conductor, or coated with a non-conductive material to permit operation thereof by the bare hand of an operator, provides a means for actuating the cam 43 to effect expansion or permit contraction of the annular retaining spring 41. Shoulders 49 are preferably provided on the socket housing 30 to limit the travel of the bail trigger 46 in one direction.

The terminal pin assembly 12 comprises a plug member or terminal pin 50 secured to a terminal housing 60, as best shown in Fig. 3. The terminal pin 50, formed of a suitable conductive material, is cylindrical in form to permit insertion thereof into the socket 20, as will be discussed in detail hereinafter, and is preferably provided with a hexagonal head 51 extending from one end thereof and an internally-threaded, longitudinal bore 52 in the opposite end thereof. The terminal housing 60, preferably formed of a suitable non-conductor, is of a generally cylindrical configuration to permit insertion thereof into the circular opening 32 in the socket housing 30 and is provided with a

circular longitudinal opening 61 therein to provide a cylindrical skirt or sleeve 61a which is adapted to receive the socket 20 and retaining spring 41, as will be discussed hereinafter. The terminal housing 60 is preferably provided with a peripheral flange 62 thereon which is adapted to abut the end of the socket housing 30 and is also provided with a slot 63 therethrough which is adapted to receive the ends 42 of the retaining spring 41. The terminal housing 60 is preferably provided with a concentric, longitudinal hole 64 therethrough which communicates with the opening 61 as illustrated, the hole 64 having inwardly-directed counterbores 65 and 66 which are concentric therewith, the hole 65 preferably being of hexagonal cross-section. The terminal pin 50 and the terminal housing 60 may be secured together by means of an externally-threaded stud 53 extending through the hole 64 in the terminal housing 60 and adapted for threaded engagement with the bore 52 in the terminal pin 50. The stud 53 is provided with a hexagonal head or nut 54 thereon which is complementary to the hexagonal hole 65 determining the position of the longitudinal slot 63. By suitably pre-positioning the hexagonal head 54 to determine the position of the slot 63 prior to assembling the terminal pin 50 and terminal housing 60, any desired position of the conductor 13 relative to the terminal pin assembly 12 may be obtained. The nut 54 is adapted to abut the panel 18, which may, for example, represent a central power supply panel, the surface of a junction box or the top of a battery case, and the stud 53 may be secured to the panel 18 by any suitable means as is well known in the art. The stud 53 and the conductor 15, which extends through the panel 18, may be formed integrally or joined by any suitable means and it will of course be understood that the panel 18 is not an essential component of the invention, having been included merely for the purpose of illustrating an application thereof.

When an electrical connection between the conductors 13 and 15 is required, the terminal pin assembly 12 may be inserted into the socket assembly 11 to effect the desired connection. The insertion process involves displacing the bail trigger 46 toward the spherical end 35 of the socket housing 30 to effect expansion of the annular retaining spring 41 by means of the action of the cam 43 on the ends 42 of the retaining spring 41, whereby outward expansion of the segments 23 of the socket 20 results. The outward expansion of the segments 23 enlarges the aperture 21 therebetween to permit easy insertion of the terminal pin 50 therein. When the connector 10 is assembled with the terminal housing 60 disposed in the opening 32 of the socket housing 30 and the ends 42 of the retaining spring 41 extending through the slot 63 in the terminal housing, releasing the bail trigger 46 will permit contraction of the retaining spring 41 at the ends 42 thereof receive the minimum dimension of the cam 43 therebetween, as best shown in Fig. 8. The contraction of the retaining spring 41 deforms the segments 23 of the socket 20 inwardly into positive engagement with the terminal pin 50 to frictionally interlock the socket assembly 11 and terminal pin assembly 12.

The engagement of the socket 20 and terminal pin 50 provides an efficient electrical contact and strongly resists inadvertent separation of the assemblies 11 and 12. When it is necessary to break the connection, the assemblies 11 and 12

may be separated readily upon releasing the retaining spring 41 by means of the bail trigger 46. Since connection and separation of the socket and terminal pin assemblies 11 and 12 may thus be effected when the clamping action of the socket 20 is relieved, the operation of the connector 10 is smooth and effortless and may be effected repeatedly without appreciable wear of the mating parts. The construction of the connector 10 is relatively simple and the various components of the device may be fabricated and assembled readily. The connector 10 is particularly adapted for employment with electrical currents of relatively high intensity, although the device is not necessarily limited thereto. The construction of the preferred embodiment of the connector 10 as disclosed herein affords ample protection to the various conducting members and the device is capable of withstanding a considerable amount of severe usage.

Although I have herein described the preferred embodiment of my invention, various modifications and substitutions may be effected without departing from the underlying inventive concept; I do not intend, therefore, to be limited to the specific disclosure contained herein and hereby reserve the right to all such modifications and substitutions as properly come within the scope of the appended claims.

I claim as my invention:

1. In a connector of the character described, the combination of: a socket housing; a contractible socket member in said socket housing; a tubular plug housing insertable into said socket housing and having a longitudinal opening therein; a plug member in said plug housing and insertable into said socket member; means for contracting said socket member; and means for actuating said contracting means, said longitudinal opening in said plug housing being adapted to receive said actuating means therein.

2. In a connector of the character described, the combination of: a socket housing; a contractible socket member in said housing; means for releasably contracting said socket member; means for expanding said contracting means; and bail means semi-encircling said housing and pivotally connected thereto for operating said expanding means.

3. In a connector of the character described, the combination of: a socket housing comprising a tube; a contractible socket member in said socket housing and extending longitudinally of said tube; means for contracting said socket member; and means for expanding said contracting means including bail means pivotally connected to and semi-encircling said tube.

4. In a connector of the character described, the combination of: a socket housing; an expansible and contractible socket member in said socket housing; an expansible spring substantially encircling said socket member and adapted to contract said socket member; means including a pair of spaced elements operatively connected to said spring and a rotatable cam between said elements for expanding said spring to permit expansion of said socket member; a shaft rigidly connected to said cam and extending through a wall of said socket housing; and means carried by said socket housing for rotating said shaft to rotate said cam.

5. In an electrical connector, the combination of: a socket housing having a tubular portion; an expansible and contractible socket disposed centrally within said tubular portion of said socket housing, said socket being secured to said socket housing; a tubular terminal housing adapted to be telescoped into said tubular portion of said socket housing and to encompass said socket; a terminal pin adapted to be telescoped into said socket, said terminal pin being disposed within and secured to said terminal housing; expansible resilient means encircling said socket for contracting said socket into engagement with said terminal pin; and means carried by one of said housings for expanding said resilient means to permit expansion of said socket, whereby said socket releases said terminal pin.

SAMUEL L. ARSON.

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Certificate of Correction

Patent No. 2,502,302 March 28, 1950

SAMUEL L. ARSON

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 2, line 46, strike out the word "contractible" and insert the same in line 47, before "socket 20"; column 4, line 64, for "at the" read *as the*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of July, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.