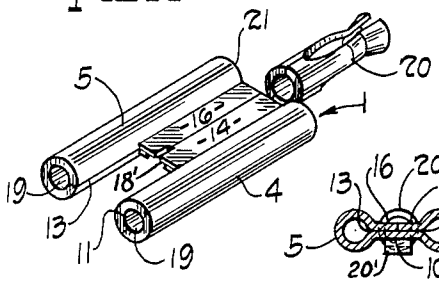
July 26, 1966 R. N. DEAN ETAL 3,263,203

ONE-PIECE DUAL-BARREL ELECTRICAL CONNECTOR

Original Filed May 22, 1963 2 Sheets-Sheet 1

Fig. 1



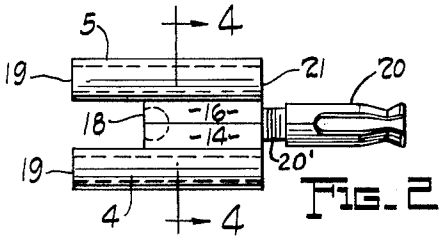


Fig. 2

Fig. 4

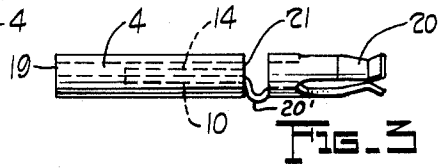


Fig. 3

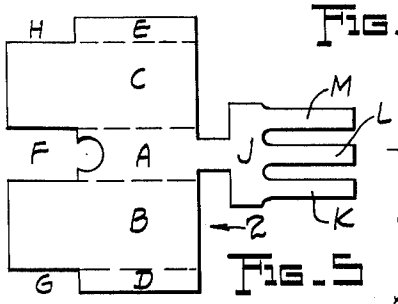


Fig. 5

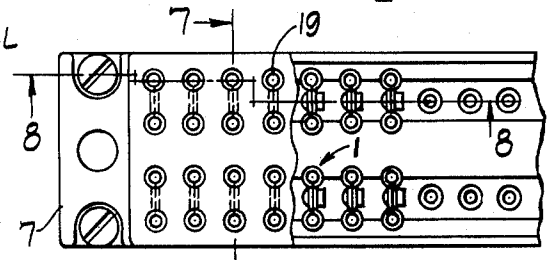


Fig. 6

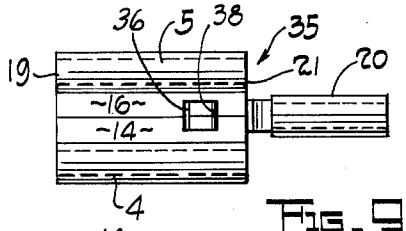


Fig. 9

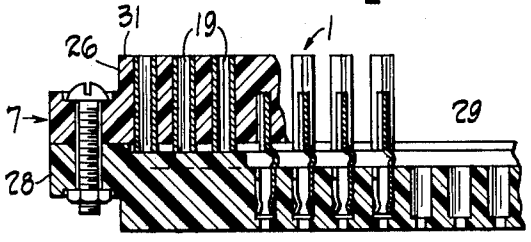


Fig. 8

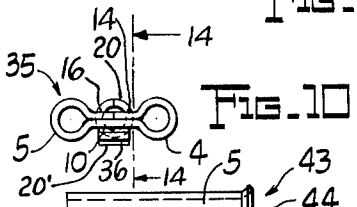


Fig. 10

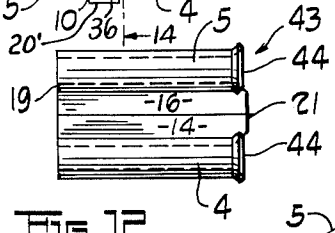


Fig. 12

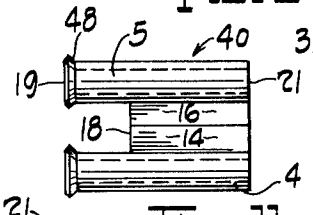


Fig. 11

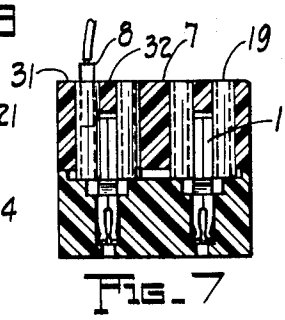


Fig. 7

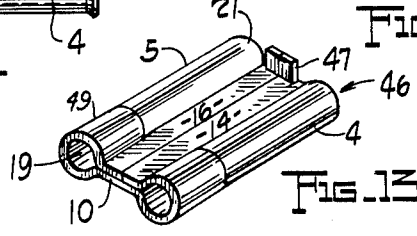


Fig. 13

INVENTORS.
RUSSELL N. DEAN
CHARLES A. KELLEY
BY EDWARD R. MEEKS

ATTORNEYS

July 26, 1966 R. N. DEAN ET AL 3,263,203

ONE-PIECE DUAL-BARREL ELECTRICAL CONNECTOR

Original Filed May 22, 1963 2 Sheets-Sheet 2

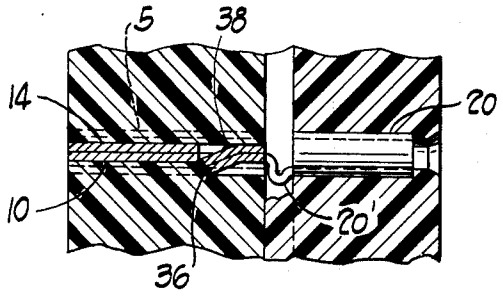


Fig. 14

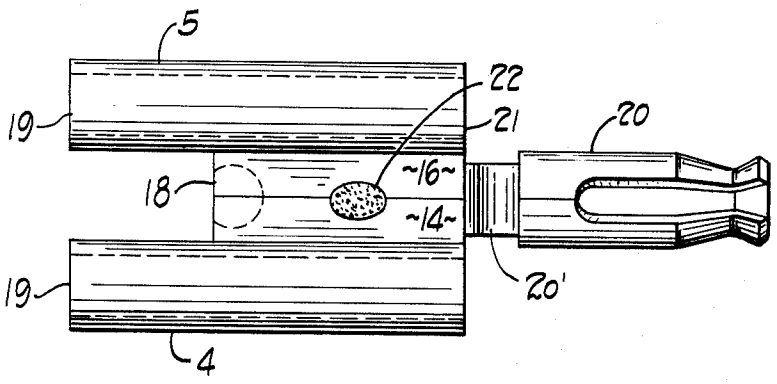


Fig. 15

INVENTORS
RUSSELL N. DEAN
CHARLES A. KELLEY
BY EDWARD R. MEEKS
Boeworth, Sessions,
Herrstrom & Knowles
ATTORNEYS

United States Patent Office

3,263,203

Patented July 26, 1966

3,263,203
ONE-PIECE DUAL-BARREL ELECTRICAL CONNECTOR

Russell N. Dean, Los Angeles, Calif., and Edward R. Meeks and Charles A. Kelley, Elyria, Ohio, assignors to EMTEC, Inc., Elyria, Ohio, a corporation of Ohio

Original application May 22, 1963, Ser. No. 282,363. Divided and this application Oct. 18, 1965, Ser. No. 496,951

7 Claims. (Cl. 339—150)

This is a division of applicant's co-pending application Serial No. 282,363, filed May 22, 1963.

This invention relates to electrical connectors and more particularly to dual-barrel female connectors for electronic circuits and the like.

Many connectors have been proposed and used in electric and electronic circuits. With the rapid increase in electronic apparatus and the need to use such connectors in both highly complex apparatus and/or apparatus subjected to severe shocks because of great forces exerted thereon during use, a need developed for connectors, for connecting multiple leads, which are rugged and positive in use and action. Such connectors are relatively small, and frequently took the form of multiple-barrel female connectors adapted to receive either cylindrical or tapered male pins or wire ends. When uses were limited, and time and cost of manufacture of no import, such connectors were machined from solid blocks of conductive metal to insure ruggedness and effective performance. However, the continued and increasing use of electronic apparatus and circuits, both for consumer and non-consumer and governmental and non-governmental purposes, the knowledge and experience gained therefrom, and increased competition soon rendered machined connectors impractical from the points of view of cost, time of manufacture and need, for required performance. Subsequently, multi-piece connectors having barrels of tubing joined by a stamped and formed yoke over which the end of the barrels were peened or crimped, were adopted. However, the torque exerted on the barrels as the male pins are twisted, reciprocably back and forth, either to seat or unseat them therein tended and tends to loosen the barrels within the yoke and it has become common practice to solder the barrels and yoke together in order to insure that the connector is rigid and the barrels and yoke do not become separated. This process is expensive and time-consuming. Further, such prior connectors were frequently, if not usually, adapted for use with tapered male pins or wire ends at a further cost in time and expense of manufacture for machining the interior of the barrels, adjacent their open ends, to the desired taper in order to insure that the engagement between the barrel and pin is tight and the area of engagement therebetween is sufficient to insure proper electrical transmission between the connector and pin. Further, the difficulty of obtaining proper mating tapers on apparatus of this type, with a rational amount of time, labor and cost, has been such that frequently such connectors have been used when only line or intermittent line contact was in fact obtainable between the pin and barrel. Thus the prior connectors have been deficient for one or more reasons and the art has not provided a dual-barrel connector of rigid construction which inherently provides excellent surface-to-surface contact between the barrrel of the connector and the pin to be connected therein.

Therefore the general object of this invention is to provide a new and improved dual-barrel connector for electronic circuits and the like.

Another object of this invention is to provide a dual-barrel connector, for electronic circuits and the like, which is of rigid construction and which inherently provides excellent surface-to-surface contact with both taper and right cylindrical male pins.

A further object of this invention is to provide a one-piece dual-barrel connector for electronic circuits and the like, which is made and formed without any machining whatsoever.

Further objects of this invention include the provision of a dual-barrel connector for electronic circuits and the like which grips both taper and right cylindrical pins tightly and firmly; which does not require machining of the barrels to insure proper electrical and mechanical contact between the barrels and the pins to be inserted therein; which resiliently engages the pin disposed therein, to conform with the shape thereof; which has a resilient side wall of varying adjustable diameter in the direction of the longitudinal axis; which has a side wall adapted to resiliently engage a pin disposed therein but maintained in firm functional contact therewith by an opposing lever actuated force; and which has a resilient side wall having decreasing resiliency in the direction of entry of a pin therein, whereby to increasingly resist entry of the pin therein while resiliently conforming to the shape thereof to provide a tight connection with large surface-to-surface contact.

Still further objects of this invention include the provision of a one-piece, dual barrel connector for electronic circuits and the like, stamped and formed from a single blank without requiring machining; which has cylindrical barrels yet tightly and firmly grips both taper and right cylindrical pins; which resiliently grips the pin disposed therein; which is of increasingly less resiliency in the direction of entry of the pin therein; which includes means for properly seating and holding the connector in terminal blocks and the like; which is easily and economically manufactured and used; which is not deleteriously effected by twisting or reciprocally twisting the pins as they are inserted in or withdrawn therefrom; which has a side wall for resiliently engaging a pin disposed therein and lever means to provide an opposing force for maintaining the side walls in firm contact with the pin; which conforms and tends to conform to the shape of the pin disposed therein to insure relatively large surface-to-surface contact and engagement between the barrel and pin; which is more efficient and effective in use than prior connectors; which increasingly resists entry of a pin therein as the pin enters thereinto, but resiliently conforms to the shape of the pin to provide improved surface-to-surface contact therewith; which is easily formed with one or more spring clip connectors at one end; which prevents torque, exerted on the barrels during use or during insertion of the pins therein, from deleteriously effecting the structure of the connector; which requires no soldering, machining, hand fabricating, or assembly; and which has lever means to oppose and minimize the effect of torque exerted on the barrel and requires no soldering for this purpose, albeit properly located solder can be used therewith without adversely effecting the other advantage of the connector.

A still further object of this invention is to provide a new and improved dual-barrel connector for electronic currents and the like obtaining one or more of the objects and advantages hereinbefore set forth.

These and other objects and advantages of this invention will appear from the following description of preferred and modified forms thereof, reference being had to the accompanying drawings in which:

FIGURE 1 is a perspective view of a one-piece, dual barrel connector embodying a preferred form of this invention and including a spring clip connector;

FIGURE 2 is a plan view of the connector shown in FIGURE 1;

FIGURE 3 is an elevational view of the connector shown in FIGURE 1;

FIGURE 4 is a sectional view of the connector shown in FIGURE 1, taken along the line 4—4 of FIGURE 2;

FIGURE 5 is a plan view of the one-piece blank which is formed into the connector shown in FIGURE 1;

FIGURE 6 is a plan view of a terminal block with which the connector shown in FIGURE 1 is used, partly broken away to show the relationship between the connector and the terminal block;

FIGURE 7 is a transverse sectional view taken along the line 7—7 of FIGURE 6;

FIGURE 8 is a longitudinal sectional view taken along the line 8—8 of FIGURE 6;

FIGURE 9 is a plan view of a modified form of one-piece, dual-barrel connector, for electronic currents and the like, embodying this invention;

FIGURE 10 is an end view of the connector shown in FIGURE 9;

FIGURE 11 is a plan view of another modified form of one-piece, dual-barrel connector, for electronic circuits and the like, embodying this invention;

FIGURE 12 is a plan view of another modified form of one-piece, dual-barrel connector, for electronic circuits and the like, embodying this invention;

FIGURE 13 is a perspective view of still another modified form of one-piece, dual-barrel connector, for electronic circuits and the like, embodying this invention;

FIGURE 14 is a vertical section of the connector shown in FIGURE 9 in place in a connector block; and

FIGURE 15 is a view, similar to FIGURE 2, showing another modified form of the invention.

A one-piece, dual-barrel connector, for electronic circuits and the like, embodying this invention is indicated generally at **1**, FIGURE 1, and is formed from a single flat blank **2**, FIGURE 5.

The connector **1** comprises two barrels or sockets **4** and **5** which are adapted to receive male pin or plugs therein for making electrical connections in electronic circuits and the like. Such connectors are frequently used in and in connection with terminal blocks **7** and the pins, wire ends or plugs **8** used in such circuits may have either a tapered or right cylindrical end.

Connector **1** is formed on a punch press or similar machine and requires no machining to make either the blank **2** or the connector, nor any assembly of parts, or jigs, fixtures or apparatus necessary to assemble parts, since the connector in its entirety comprises and is formed of only one piece, the blank **2**. Thus connector **1** is economically manufactured.

The structure of connector **1** also provides improved mechanical and electrical engagement between the barrels **4** and **5**, respectively, and the pin inserted therein, insuring such engagements whether the pins be of the right cylindrical or tapered type.

Accordingly, the barrels **4** and **5** function to distort slightly, as required, to conform to the shape of the pin being pushed or worked, as by twisting to and fro, therein, while at the same time increasingly resisting the entry of the pin, as it progresses into the barrel. Further the structure of connector **1** is such that the connector suffers no deleterious effect from any torques exerted thereon, because of twisting or reciprocally twisting the pins to facilitate their entry or withdrawal from the barrels, but rather the connector structure receives, transmits and opposes such torques, transversely so that the same may be exerted by the user, as the user wishes, without harm to the connector.

To this end, the barrels **4** and **5** are interconnected throughout at least a major portion of their length by a web **10**. Web **10** is conveniently flat and preferably is disposed to extend between the barrels **4** and **5** at the shortest distance therebetween or more particularly with its upper, as viewed, surface, substantially coincident with the plane defined by the axes of the barrels.

Web **10** is therefore formed by the central portion A of the blank **2** and the barrels **4** and **5** are formed by the portions B and C, respectively, immediately outwardly thereof. Barrels **4** and **5** are formed by bending and shaping the portions B and C, respectively, into cylinders, as shown in FIGURES 1 through 4, having their circumference completed and a melting line **11** and **13**, respectively, formed substantially in the plane defined by the axes of the barrels **4** and **5** and extending for the full length of the respective barrels.

Such construction provides cylindrical barrels having a resilient wall adapted to distort and conform about and to the pin, be it tapered or right cylindrical, which is inserted therein during use of the connector.

However, as hereinbefore set forth, it is desirable that the barrels increasingly resist entry of the pins therein and also resist any deleterious effects resulting from torque applied to the connector during insertion or removal of the pins. To this end the blank **2** is provided with tab ends D and E which extend outwardly from the portions B and C, respectively, a distance substantially equal to half the width of the web **10**. When the connector **1** is formed from the blank **2**, the tabs D and E are bent at right angles to the portions B and C, respectively, at the barrel meeting lines to form tabs, levers or lever arms **14** and **16**, respectively. Levers **14** and **16** extend parallel with web **10** and are preferably pressed into engagement therewith to further strengthen the web by laminating the same and to provide resistance, by the lever, per se, and by the friction resulting from engagement between the lever and web, against distortion of the barrel associated with the lever as a pin is forced therein. The structure being such that the resistance against distortion or against entry of the pin increases as the pin enters further into the barrel; the resistance having a spring-like effect as it resists and opposes the forces of entry.

Also, the levers **14** and **16** provide added resistance against torque tending to part the respective barrels at the meeting line and bear upon web **10**, to resist any deleterious effects of torque in the opposite direction tending to collapse the respective barrels at the meeting line.

Further, in order to facilitate initial entry of the pins into the barrels and the distortion of the barrel to conform to the shape of the pin and grip the same with a relatively large surface-to-surface contact, blank **2** is preferably notched as at F, G, and H in portions A, D and E, respectively, to the end that the web **10** and levers **14** and **16** of the connector **1** are foreshortened or stepped as at **18**, FIGURES 1 and 2, so that the spring-like resistance of each barrel to distortion is reduced immediately adjacent its open end.

Thus, on the one hand, the open or mouth end **19** of each barrel resiliently distorts and adapts to the configuration of the pin to ensure a relatively large surface-to-surface engagement therebetween because of the longitudinal meeting line and the spring like resilience the barrel structure provides, and, on the other hand, the action of the levers **14** and **16** increases the resistance of the barrel to entry of the pin therein the further the pin enters. And, of course, the web **10** and levers **14** and **16** provide a structurally strong connector which effectively opposes deleterious effects due to the torques resulting from twisting or reciprocatively twisting a pin as it is pushed into or withdrawn from a barrel.

Connector **1**, conveniently, as shown, is also provided with a spring clip socket **20** connected by means of arm **20'** to web **10** at the connector end **21**, remote from step **18**, for the reception of a third connector or if desired the ends **21** may be straight across, stepped as at **18** or treated as in the modified forms of the invention to be hereinafter more fully described.

Clip socket **20** is formed simultaneously with formation of connector **1** from the tab J, having the fingers K, L and M, on the blank **2**. Also, if desired, solder **22**, see FIGURE 15, may be applied to the juncture of levers

14 and 16, albeit this is not necessary and the advantages of this invention are more fully realized without it.

Connectors 1 are useful in many applications in electronic apparatus, electric circuits and the like, one common use being in terminal blocks 7, such as shown, by way of illustration, in FIGURES 6, 7 and 8.

Terminal blocks 7 conventionally comprise two halves 26 and 28 having apertures 29 therein for receiving and holding connectors for the various circuits led thereto.

The apertures 29 are shaped complementary to the connectors to be used therein, and are sufficiently larger than the connector so that the same may be easily placed therein. However, it is preferred that the connectors normally be disposed so that the free ends and particularly the ends 19 thereof remain flush or substantially flush with the base or surface 31 of the block.

To this end stop means is conveniently provided on connector 1 to coact with complementary means on or in the block 7 to position the connector 1 longitudinally, relative to its length, and retain it in such position against forces exerted thereon by the withdrawal of pins therefrom.

When the connector 1 is stepped as at 18, the step 18 may comprise the stop means by using the connector with a block portion 32, FIGURE 7, which extends between the step 18 of the connector and the surface 31.

Alternatively, a separate stop means may be provided having structure of the type hereinafter described with respect to the modified forms of this invention.

A modified form of connector embodying this invention is indicated generally at 35, FIGURES 9 and 10, wherein like reference characters refer to like parts as in the preferred form of the invention.

Connector 35 is similar to connector 1, except that in this form of the invention, step 18 is omitted so that web 10 and levers 14 and 16 are flush with end 19 of the barrels 4 and 5.

Thus, in this form of the invention, the barrels 4 and 5 present a greater initial resilient resistance to the entry of the pin therein, albeit the resolution of forces is such that the resistance, in this form of the invention as with the preferred form of the invention, increases as the pin enters further into the barrel.

Accordingly, connector 35 is formed from a blank which is similar to blank 2 except that it is not notched as at F, G and H.

Also, since the web 10 extends for the entire length of the connector 35, there is no step to function as a stop means in cooperation with a terminal block 7. Accordingly, when such means is desired it conveniently and preferably comprises a projection 36 provided on the web 10 or levers 14 and 16. Projection 36 is conveniently formed as a three sided structure hinged to the web and levers, as at 38, by stamping the same out through the levers and web, after or during the formation of the connector. Terminal blocks which are to be used with connectors having projection or stop means 36 are, of course, formed with complementary seats, against which the projection 36 bears to align the connector end 19 and surface 31, or otherwise properly position the connector in the terminal block.

Obviously, if no stop means is desired projection 36 is omitted from connector 35 and also, obviously, a similar projection 36 could be provided on connector 1 to provide stop means therefor should it be desired, as when connector 1 is used in a terminal block 7, having a seat complementary to the projection 36 but no portion 32. Similarly terminal blocks 7 having portions 32 may or may not also be provided with seats for other stop means, such as projection 36 or those to be hereinafter more fully described.

Another modified form of connector embodying this invention is indicated generally at 40, FIGURE 11, wherein similar reference characters refer to like parts as in the preferred form of this invention. Connector 40 is in

all respects similar to connector 1 except that it is not provided with a spring clip socket 20 and, if desired, pins could be inserted into the barrels 4 and 5 from either or both ends.

Another modified form of connector embodying this invention is indicated generally at 43, FIGURE 12, wherein like reference characters refer to similar parts as in the preferred form of the invention.

Connector 43 is similar to connector 40 except that the step 18 is omitted therefrom and the web 10 and levers 14 and 16 extend for the full length of the barrels in the same way that connector 35 differs from connector 1, in this respect.

In addition, connector 43 is provided with stop means which comprises belling or enlarging the ends 21 of the barrels 4 and 5, slightly, as at 44, so that the flanges or edges thereof will not pass through an aperture 29 in terminal block 7 of proper size for receiving the rest of the barrel. Of course, the block 7 with which the connector 43 is used is complementarily shaped to receive the bell ends 44 and support the connector.

Still another form of connector embodying this invention is indicated generally at 46, FIGURE 13. Again, like reference characters refer to like parts as in the preferred form of this invention. Connector 46 is similar to connector 43, except that the stop means, instead of comprising bell ends 44, comprises a hook 47 disposed at the end 21 of the connector and adapted to catch on the adjacent surface of terminal block 7 to prevent the connector from passing therethrough. Hook 47 is preferably formed integrally with connector 46, as by bending and shaping integral tabs on the levers 14 and 16, respectively. Also, obviously, either connector 43 or connector 46 may be formed with a step 18, if desired, and each connector may or may not be formed with a socket 20, as desired.

Also, the mouth ends 19 of barrels 4 and 5 may be flared slightly, as shown, for example at 48 in FIGURE 11, if desired, to facilitate initial insertion of the pin into the barrels. This is more desirable when the pins to be used with the connector are right cylindrical, since it is otherwise more difficult to insert such pins into the barrels as there is no practical difference between the interior diameter of the barrel and the exterior diameter of the pin to be used therewith and the flare provides such a difference. Flared barrels may also, however, be provided when tapered pins are to be used.

Further while it is preferred and convenient that the barrels 4 and 5 be right cylindrical, they may be formed with a taper adjacent their mouth end, as shown, for example, at 49, FIGURE 13, to ensure even a wider surface-to-surface engagement when used with tapered pins. Such a taper is formed simultaneously with the formation of the connector, with no machining required for the purpose.

Modifications, changes and improvements to the preferred and modified forms of the invention herein illustrated and described may occur to those skilled in the art who come to understand the principles and precepts hereof. Accordingly, the scope of the patent to be issued hereon should not be limited to the particular forms of the invention herein particularly illustrated and described.

We claim:

1. A connector for electronic circuits and the like formed from a single piece of conductive metal and having two longitudinally extending barrels, having parallel axes and being spaced apart a predetermined distance and interconnected by a flat web, said barrels having longitudinally extending meeting lines at their respective junctures with said web, tab means extending from the free edge of each said barrel at said meeting line, parallel with and in frictional engagement with said web, the ends of said tab means extending from said barrels, respectively, meeting in abutting relationship intermediate said barrels, and integral, unitary stop means comprising a projection

extending laterally from said connector for positioning the connector in a terminal block means.

2. The connector according to claim 1, in which said projection extends from said connector intermediate said barrels.

3. The connector according to claim 2, wherein said projection extends from said connector intermediate the ends of said connector.

4. The connector according to claim 2, wherein said projection extends from said connector at one end of said connector.

5. The connector according to claim 1, in which said barrels are right cylinders.

6. The connector according to claim 5, in which said barrels have mouths for receiving tapered pins therein, and said barrels are tapered adjacent said mouths complementarily to the taper of the pins to be received therein.

7. A connector for electronic circuits and the like comprising a single piece of conductive metal and having two longitudinally extending barrels, having parallel axes and being spaced apart a predetermined distance and interconnected by a flat web, said barrels having longitudinally extending meeting lines at their respective junctures with said web, tab means extending from the free edge of each

said barrel at said meeting line, parallel with and in frictional engagement with said web, the ends of said tab means extending from said barrels, respectively, meeting in abutting relationship intermediate said barrels, and integral, unitary stop means comprising flange means on one end of at least one said barrel for positioning the connector in a terminal block means.

References Cited by the Examiner

UNITED STATES PATENTS

1,046,067	12/1912	Hart	339—198
2,424,966	8/1947	Buchanan et al.	339—198
2,989,724	6/1961	Woofter	339—258 X
3,005,180	10/1961	Dreher	339—198
3,076,171	1/1963	Hopkins	339—258
3,162,503	12/1964	Warzecka	339—258
3,169,814	2/1965	Collins	339—258 X

FOREIGN PATENTS

777,677	6/1957	Great Britain.

EDWARD C. ALLEN, *Primary Examiner.*

ALFRED S. TRASK, *Examiner.*