April 17, 1956 J. J. COLLINS ET AL 2,742,626

MULTIPLE ELECTRICAL CONNECTOR WITH TAPERED PIN CONTACTS

Filed Oct. 30, 1952

Fig. 1

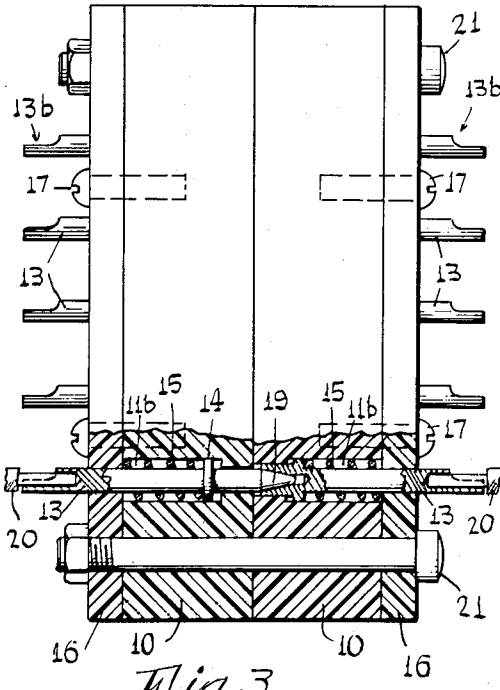


Fig. 2

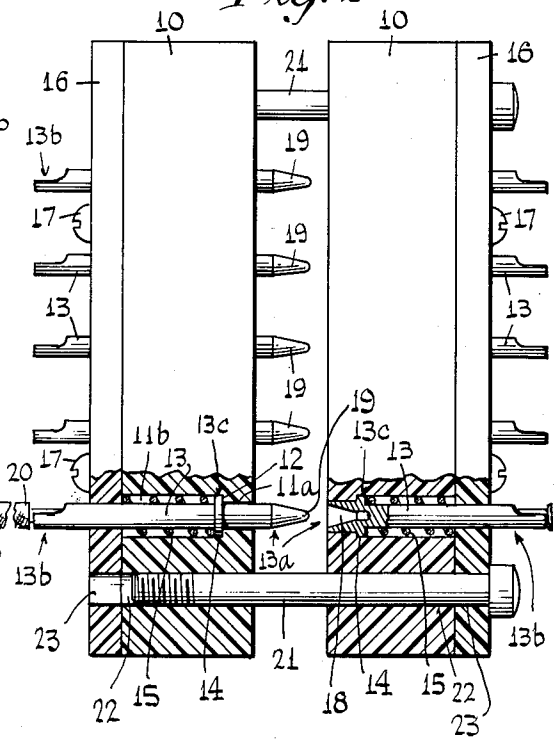
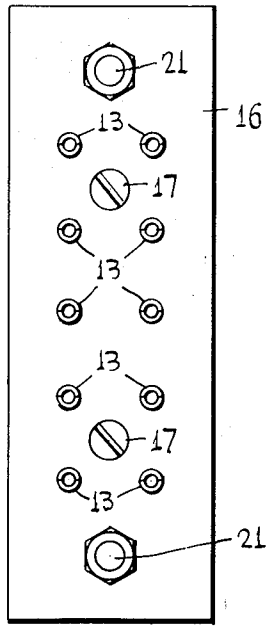


Fig. 3



INVENTORS

John J. Collins

Chauncey Castle Day

BY Johnson and Kline

ATTORNEYS

United States Patent Office 2,742,626 Patented Apr. 17, 1956

2,742,626

MULTIPLE ELECTRICAL CONNECTOR WITH TAPERED PIN CONTACTS

John J. Collins, Trumbull, Conn., and Chauncey Castle Day, Longmeadow, Mass.

Application October 30, 1952, Serial No. 317,738

5 Claims. (Cl. 339—176)

This invention relates to electrical connector means and more particularly to a readily assembled releasable connector for detachably connecting and disconnecting a plurality of circuits.

Heretofore in making terminal blocks, the terminal pins have been forced by a press into holes in the terminal block and fixed therein by forced fit. The terminal blocks have then been secured together and the contact portions of the terminals forced into engagement with one another. When it was proposed to separate the terminals it was necessary to pry the blocks apart which, in many cases, resulted in damaging the terminal pins. In some instances the terminal pins comprise spring pressed contact portions carried within sleeves which were forced into holes in the blocks and while this made separation of the blocks easier, the terminals were more costly and required a press to install them. Furthermore, it was particularly difficult without special tools to remove the terminal pins from the terminal block without permanently damaging the terminal.

The present invention overcomes these difficulties by providing a connector construction which is easy to manufacture and assemble and in which the contacts on the opposed terminal blocks can be readily separated, removed and replaced if necessary all without the need of special tools.

In carrying out the present invention, the terminal blocks of insulated material are provided with aligned bores in which terminal pins are slidably mounted. They are readily insertable into the bores and are yieldably urged into an engaging position by means located in the bores. The terminal pins are maintained in the terminal blocks by means of a removable closure.

A feature of the invention resides in the simplicity of the construction and assembly of the device wherein the terminals which may be simple screw machine parts may be readily slipped into the bores, the urging means inserted into cooperative relation with the terminal pin and the detachable closure secure to close the bore, the assembly all being made without special tools and without danger of damaging the terminal pin.

When the terminal blocks are clamped together to form a detachable connector, the cooperating terminal pins engage one another and the yielding means permits proper contact between the terminal pins without undue force being applied thereto as might damage the terminal pins. At the same time the yielding means will be compressed and apply a determined pressure to maintain the contacts in good electrical engagement.

When it is desired to separate the terminal blocks the clamping means is released and the pins are readily separated without damage to the contacting surfaces.

If it is desired to make a different contact arrangement for the terminal blocks, this can be accomplished simply by removing the closure and withdrawing the terminal pins and rearranging them in the required manner in the bores in the terminal blocks.

In the preferred form of the invention, the contacting

portions of the terminal pins are formed as male and female contacts embodying a tapered socket and a tapered point which, when the blocks are brought together, insure proper contact engagement in the terminals.

Other features and advantages will be apparent from the specification and claims when considered in connection with the drawings in which:

Figure 1 shows an assembled view partially in section, of the connector.

Fig. 2 shows a view of the connector, partially in section, with the terminal blocks separated.

Fig. 3 shows an end view of the connector.

As shown in the drawing the electrical connector of the present invention comprises opposed similar blocks **10** of insulating material. The blocks are provided with aligned terminal receiving bores extending therethrough, the bores adjacent the inner faces of the blocks having a restricted portion **11***a* thus providing a shoulder **12** and an enlarged portion **11***b* opening on the outer face thereof. While any number and arrangement of the aligned bores may be provided as required, in the illustrated form of the invention they are shown as being disposed in two parallel rows as is clear from Fig. 3. In each of the bores there is slidably mounted an elongate terminal pin **13**.

In the preferred form of the invention, the terminal pins are formed as a unitary structure of a diameter to slide in the restricted bore **11***a* and having a contacting portion **13***a* at their inner ends, a conductor connecting means **13***b* at the outer end and a projection **13***c* intermediate the ends of the pin adapted to engage the stop shoulder **12** and limit the inward movement of the terminal pins in an engaging position as shown in Fig. 2 wherein the contacting portion of at least one of the pins projects beyond the inner face of the block.

While the projection **13***c* may be a pin or the like extension, in the illustrated form of the invention, it is formed by a collar whose outer surface **14** engages the wall of the enlarged portion of the bore to provide a radially outwardly disposed bearing for the terminal pin.

Each terminal pin is normally urged to the engaging position as shown in Fig. 2 by a yielding means. In the illustrated form of the invention, this comprises a spring **15** insertable in the enlarged bores from outer end of the bore and surrounding the terminal pin with the inner end of the spring engaging the collar. The bores are then provided with a closure member which engages the outer end of the spring and retains the terminal pin in the bore. While the closure member may be formed as individual closures for each bore, in the present illustrated form of the invention it comprises a closure plate **16** having apertures therein in alignment with the bores for slidably receiving the projecting end of the terminal pin. The closure plate is releasably secured to the block by screws **17**.

The cooperating contact portions **13***a* at the inner ends of the terminal pins may be made in any desired form. In the present preferred form of the invention, these contact portions are shown to be male and female members, the female member being comprised in a conical socket **18** and the male member comprising a tapered point **19** which when brought together insures accurate alignment of the terminal pins and good contact between the engaging surfaces.

After the required conductors **20** have been secured to the terminal pins the two contact blocks are brought together in opposed face to face relation to bring the contacting portions into engagement to connect a plurality of circuits as shown in Fig. 1. While the blocks may be brought together and secured or clamped by any suitable means, in the illustrated form of the invention the clamping means comprises bolts **21** passing through apertures **22, 23** in the two terminal blocks and closure plates. As

the bolts are drawn up the springs will yield and prevent jamming of the contacts while still maintaining them pressed together with sufficient pressure to provide good electrical contact between them.

When it is desired to break the circuit connection it is merely necessary to release the bolts and separate the blocks. Since a forced fit of the contact engaging surfaces the contacts has not occurred, they are readily separated without any damage to the contacting surfaces.

From the foregoing it will be apparent that connector of the present invention can be easily and cheaply manufactured since the terminal blocks and closure members are identical and can be formed by the same molds or fixtures and the terminal pins are a unitary structure which can be readily produced in quantity on a screw machine and require no subsequent assembly operations.

Further the present invention produces a connector in which the elements thereof can be readily and easily assembled without the use of any presses or special tools by merely inserting the terminal pins into the bores through the outer ends thereof, placing the spring in position and securing the closure member in place by means of the locking screws. Should it be desired to replace a terminal pin or to rearrange the pins to produce a predetermined pattern, this can be accomplished by removing the closure member and withdrawing and replacing the terminal pins as desired, all without any damage to the terminal pins.

The connection or disconnection of a plurality of circuits by the present invention is easily and quickly accomplished since the terminal blocks, after the terminal pins have been assembled therein and connected to the conductors of said circuits, are placed in face to face relation with the contacting portions of the terminals in engagement. The bolts are then tightened clamping the blocks together. The springs will yield during the clamping operation to prevent forcing together of the terminal pins which might result in damage to the terminal pins while at the same time urging them together to provide good electrical engagement. Should it be desired to break the connection it is merely necessary to release the bolts and separate the blocks since the terminal pins will freely separate because of any lock force fit between them thus eliminating any danger of damage to the terminal pins incident to prying the blocks apart as was heretofore required.

Since the blocks can be readily assembled and released without substantial force being employed, the terminal blocks can be made of any desired shape and size as may be required.

The above advantages of the present invention are particularly important in aircraft and the like installations because of the versitility, simplicity and reliability of operation of the connector, all without necessity of special tools.

We claim:

1. An electrical connector comprising a pair of facing terminal blocks of insulating material each having a plurality of aligned terminal pin receiving bores therein, each of said bores being restricted adjacent the inner ends thereof to provide stop shoulders; pairs of terminal pins having male and female contact portions slidably mounted in aligned bores with at least one terminal projecting from the inner end of the bore, said terminal pins having collars thereon disposed in the enlarged bore and engaging the shoulders to limit the inward movement of the terminal pins; spring means surrounding each terminal pin and located in the enlarged bore with one end engaging the collar to urge the terminal pin into engaging position; closure plates lying wholly beyond the back of the blocks and having apertures therein in alignment with the restricted bores in the blocks to slidably support the outer end of the terminal, said closure plate being detachably connected to the back of each block and closing the enlarged bore and engaging the other end of the spring means; means on the outer end of the terminals for securing a conductor thereto; and means securing the terminal blocks together in face to face relation with the terminal pins engaging one another, said spring means yielding to insure engagement of the contact portions and compressing and pressing the contact portions into good electrical contact.

2. An electrical connector comprising a pair of facing terminal blocks of insulating material each having a plurality of aligned terminal pin receiving bores therein, each of said bores being restricted adjacent the inner ends thereof to provide stop shoulders; pairs of terminal pins readily insertable into the outer end of the aligned bores with the terminal pins slidably engaging the walls of the restricted bore and the end of at least one terminal pin projecting from the inner end of the bore and said ends having cooperating conical socket and tapered end contacting portions, said terminal pins having radially projecting collars thereon disposed in the enlarged bore and slidably engaging the walls of the enlarged bore, said collars also engaging the shoulders to limit the inward movement of the terminal pins; spring means disposed in the enlarged bore with one end engaging the collar to urge the terminal pins into engaging position; readily releasable closure means for the outer end of the enlarged bore overlying the rear of the block and having terminal pin receiving apertures therein in alignment with the restricted bores, said closure means slidably supporting the projecting outer end of the terminal pin; means for connecting a conductor to the projecting outer end of the terminal pin; and means securing the terminal blocks together in face to face relation with the terminals engaging one another, said spring means compressing and pressing the surfaces of the tapered end and conical socket into good electrical contact.

3. An electrical connector comprising a pair of facing terminal blocks of insulating material, each having a plurality of aligned terminal pin receiving bores therein; cooperating terminal pins slidably mounted in said aligned bores with at least one terminal projecting from the inner end of the bore, the inner ends of said aligned terminal pins having cooperating tapered points and conical point receiving sockets; yieldable means located in the bore urging the inner ends of terminal pins into engaging position; closure means overlying the outer ends of the bores and located wholly beyond the ends of said bores, said closure means having apertures slidably receiving the projecting outer ends of the terminal pins, said outer ends of the terminal pins having means to connect a conductor thereto; and means securing the terminal blocks together in face to face relation with the tapered points and conical sockets of the aligned terminal pins engaging one another, said yieldable means yielding to insure engagement of the terminal pins and pressing the terminal pins into good electrical contact.

4. An electrical connector comprising a pair of facing terminal blocks of insulating material, each having a plurality of aligned terminal pin receiving bores therein; cooperating terminal pins slidably mounted in said aligned bores with at least one terminal projecting from the inner end of the bore, said aligned terminal pins having contacts comprising cooperating tapered points and conical point receiving sockets at the inner end thereof; yieldable means located in the bore urging said inner ends of terminal pins into engaging position; and means securing the terminal blocks together in face to face relation with the tapered points and conical sockets of the aligned terminal pins engaging one another, said yieldable means yielding to insure engagement of the terminal pins and pressing the terminal pins into good electrical contact.

5. An electrical connector comprising a pair of facing terminal blocks of insulating material, each having a plurality of aligned terminal pin receiving bores therein; cooperating terminal pins mounted in said aligned bores

with at least one terminal projecting from the inner end of the bore, the inner ends of said aligned terminal pins having cooperating tapered points and conical point receiving sockets; closure means overlying the outer ends of the bores and located wholly beyond the ends of said bores, said closure means having apertures receiving the projecting outer ends of the terminal pins, said outer ends of the terminal pins having means to connect a conductor thereto; means securing the terminal blocks together in face to face relation with the tapered points and conical sockets of the aligned terminal pins engaging one another; and yieldable means urging the inner ends of the terminal pins into engaging position, said yieldable means yielding

to insure engagement of the terminal pins and pressing the terminal pins into good electrical contact.

References Cited in the file of this patent

UNITED STATES PATENTS

1,214,183	Kratz	Jan. 30, 1917
1,300,789	Tomlinson	Apr. 15, 1919
1,394,057	Woernley	Oct. 18, 1921
1,482,833	Averill	Feb. 4, 1924
1,686,534	Rosenzweig	Oct. 9, 1928
1,687,074	Wickert	Oct. 9, 1928
2,210,418	Larson	Aug. 6, 1940
2,369,860	Schroeder	Feb. 20, 1945