

Feb. 25, 1969

W. C. FEESER ET AL

3,430,183

PLUGBOARD SYSTEM

Filed Nov. 30, 1966

Sheet 2 of 4

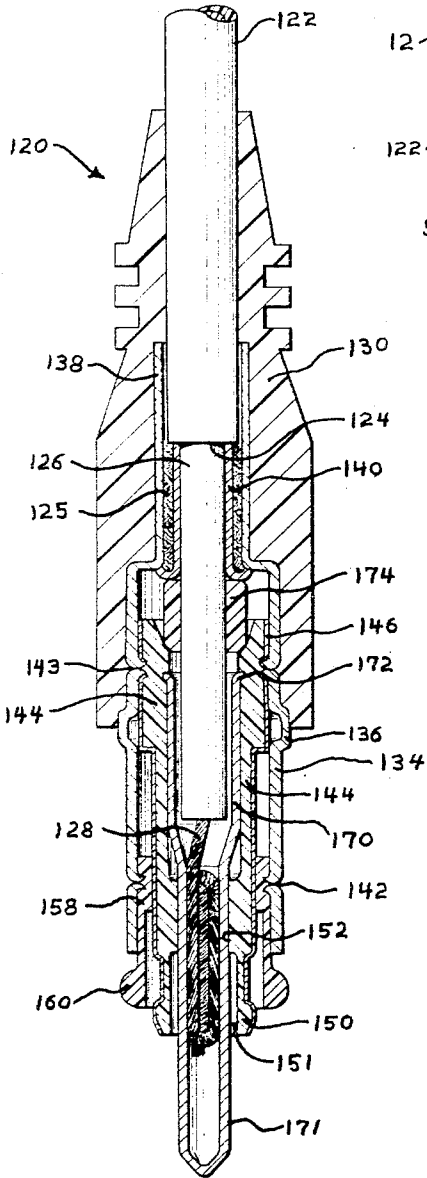


Fig. 14

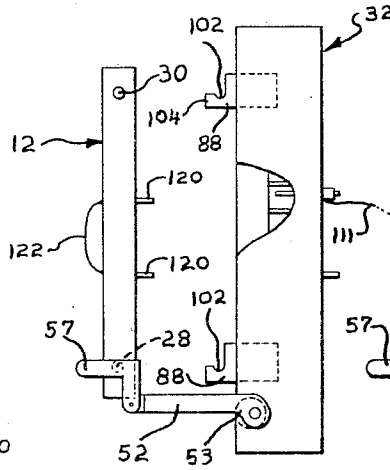


Fig. 2

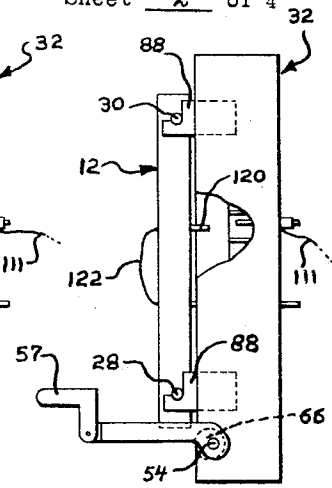


Fig. 3

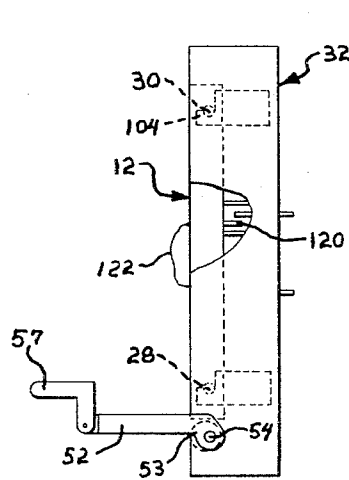


Fig. 4

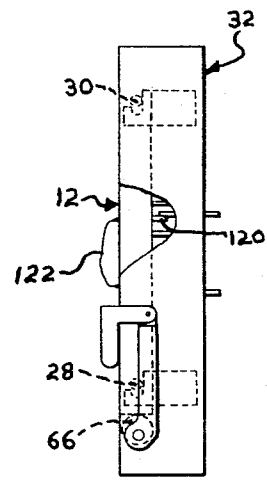


Fig. 5

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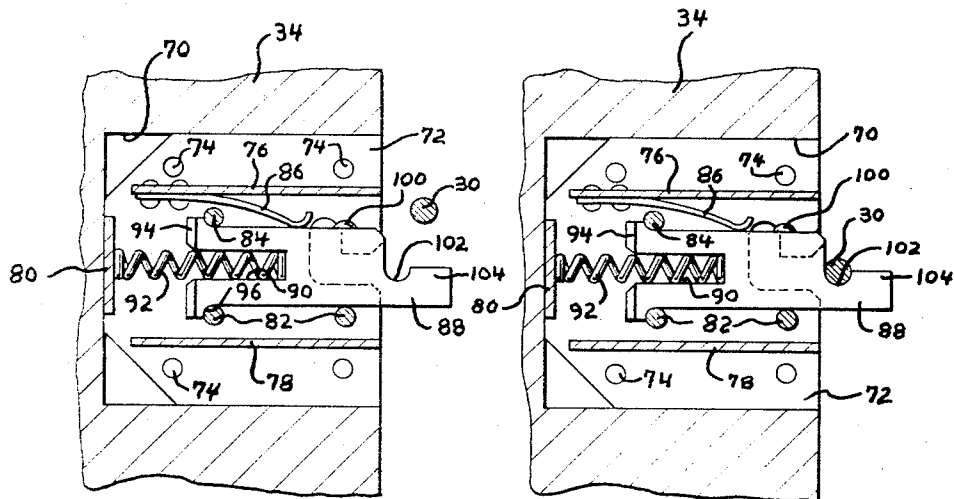


Fig. 7

Fig. 8

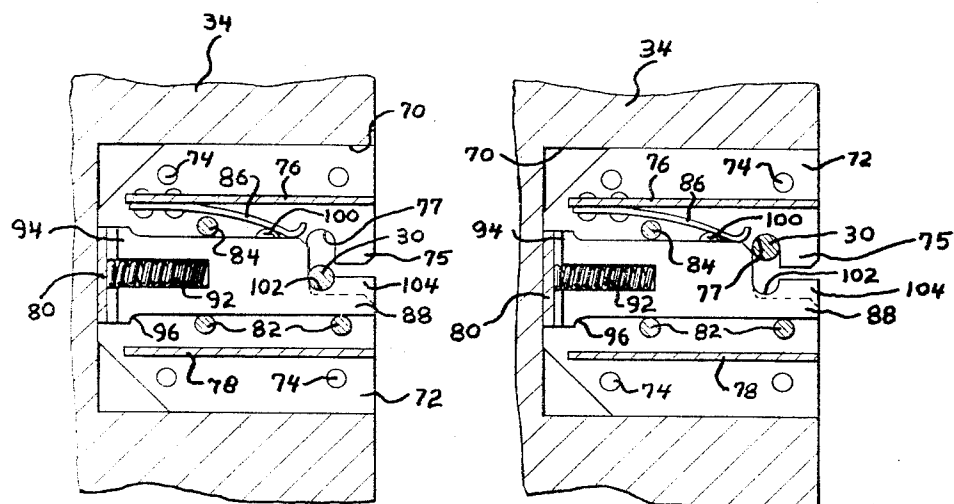


Fig. 9

Fig. 10

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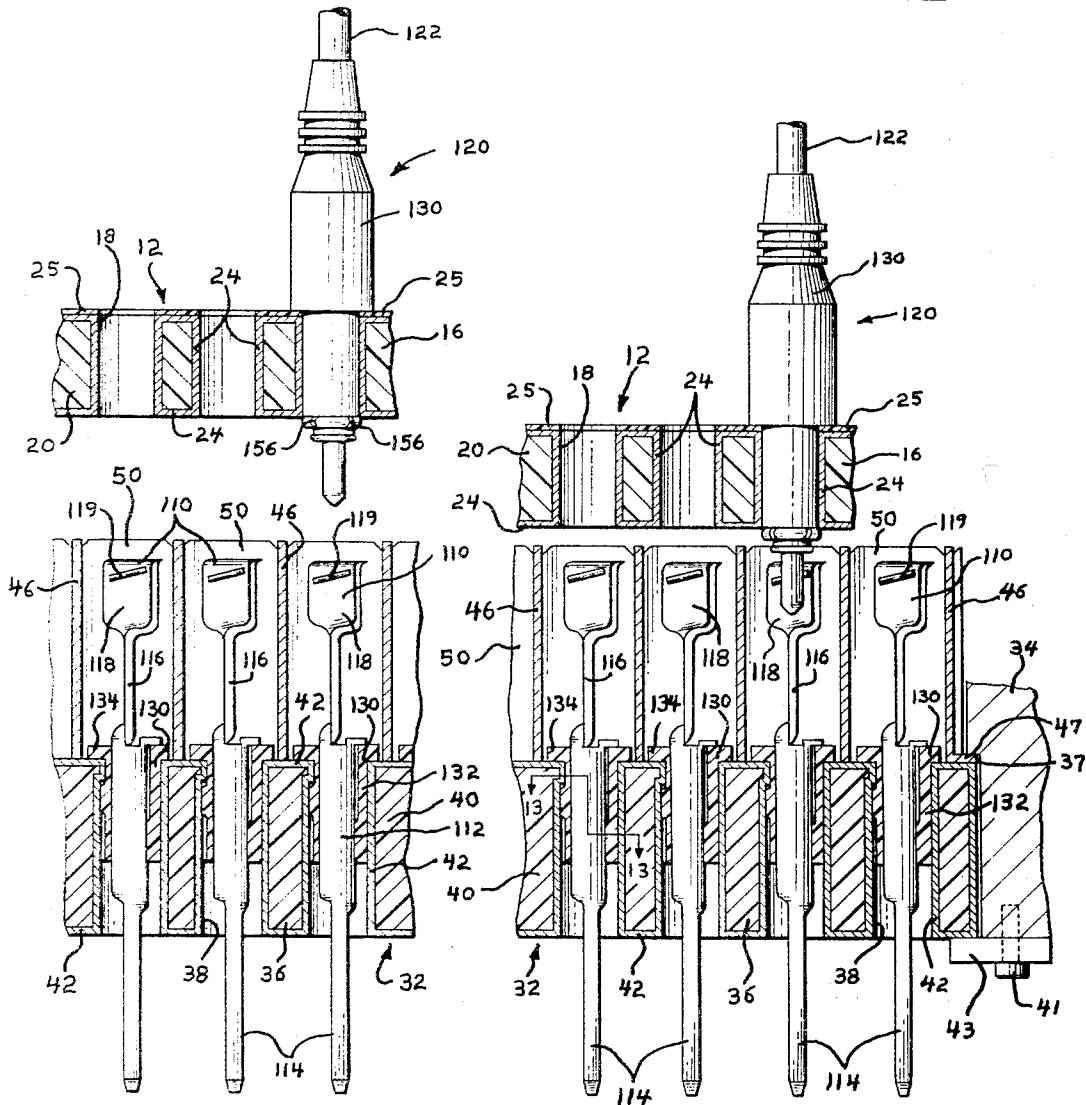


Fig. 11

Fig. 12

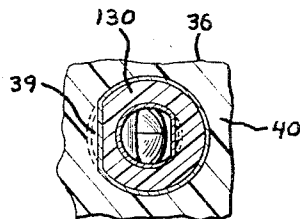


Fig. 13

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PLUGBOARD SYSTEM

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U.S. Cl. 339—18

12 Claims

Int. Cl. H01r 29/00, 3/06, 13/46

ABSTRACT OF THE DISCLOSURE

A plugboard system comprising opposed contact board means, one of which has receiver means for receiving and securing the other board means, moving it toward and then along the plane of the one board means for contact engagement. The board means are of apertured insulation, metal-coated to form shielding and grounding. One board means has a shielding grid which isolates the mated contact ends from each other and engages the coatings. Patchcord connectors form the contacts on one board means, and insulation-sleeve-mounted spring elements form the contacts in the other board means.

This invention relates to a plugboard system of the type utilized to program electrical connections for performing circuit functions in computers and like equipment.

In U.S. Patent No. 2,939,100 to W. S. Watts, granted May 31, 1960, there is described a plugboard for patchcord systems having an improved shielded contact board construction. The type of system disclosed in the Watts patent has a particular use in applications wherein the electrical signals connected by the system are of relatively low signal level and, therefore, subject to degradation from stray radio frequency interference called RFI or from degradation caused by cross-talk between signal paths which are physically close together in the system. The Watts type system provides a shielding between contact paths as mounted in the plugboard, but does not provide a shielding which is continuous through the system.

It is an object of the present invention to provide a plugboard system which includes shielding made to extend completely through the system so that each signal path is effectively shielded with respect to the environment of use and with respect to any adjacent signal path.

It is a further object of the invention to provide a plugboard construction having improved shielding characteristics and having an improved interconnection of the various shielding portions of the system.

It is still another object of the invention to provide a shielded patchcord which includes a latching structure capable of repeated use in a plugboard without excessive wear on such board.

It is another object of the invention to provide a plugboard construction utilizing plastic and plating materials for components which may be made without extensive machining and at the same time which offer an improved shielding of signal paths and an improved grounding of shield paths relative to signal conductive paths in the system.

It is still a further object of the invention to provide an improved receiver and drive mechanism for a plugboard system.

The foregoing objectives are attained by the present invention through a plugboard construction which features as a board structure molded plastic front and rear board members overlaid with conductive material. The board members serve as the principal means for mounting and positioning contact spring members and patchcord plug members for a controlled interconnection to provide a

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shielded programming function. The plated plastic board members are carried in a frame which includes a mechanism to receive and position the front board relative to the rear board and then to effect a controlled movement between the members to carry patchcords into engagement with contact springs for a switching function. Shielding is extended between the boards and made to surround each individual contact spring and patchcord path in the zone of engagement between spring and patchcord. The rear board contact springs are individually mounted in an insulating insert in plated apertures within the rear so as to be surrounded by conductive and shielding material from the point of entry in the board, through the board and out of the board. The patchcords of the system include a metal and plastic structure which surrounds the center conductor of shielded patchcord cable and extends vent through a plugboard construction which features a shielding and conductive covering from the point of connection with the shielding of the cable forwardly toward the end of the patchcord. A plastic detent structure is provided on the patchcord to latch the patchcord in a plated aperture in the front board. This plastic detent structure is shaped to provide a latching function with minimum wear to the plating of the front board. Beneath the plastic detent structure is a further plastic member plated over to surround the signal path formed by the center contact of the patchcord. The patchcord center contact is made to extend slightly forward of the shield structure. This portion is positioned so that in use it is surrounded by the shield which extends forward of the front face of the rear board. In this manner all contact paths are individually shielded when the system is in use. The system includes a receiver structure which permits a front board to be manually placed in a proper position for operation by insertion upon four hooks disposed at the sides of the rear board. These hooks are made to slide inwardly under a manual force to carry the front board into engaging position relative to the back board. The hooks are provided with a relief to permit a camming mechanism to engage the front board and drive it upwardly in a parallel motion to effect a contact engagement between patchcords and rear board contact springs and thereby a switching operation.

In the drawings:

FIGURE 1 is a perspective showing the plugboard system of the invention with the front board thereof displaced from the rear board thereof;

FIGURES 2, 3, 4 and 5 are schematic views from the side showing the front and rear boards prior to insertion, following insertion and following closure of the receiver mechanism to effect switch operation;

FIGURE 6 is an elevation and partial section showing the rear board camming mechanism;

FIGURES 7, 8, 9 and 10 are side elevations showing the board receiver mechanism in various positions prior to insertion, following insertion and following the camming operation of the closure mechanism;

FIGURE 11 is a sectional view showing a portion of a front board and a rear board having contact elements therein and positioned prior to insertion;

FIGURE 12 is a section showing part of the rear board and front board having contact elements therein following insertion of the front board;

FIGURE 13 is a section drawn through lines 13—13 in FIGURE 12; and

FIGURE 14 is a longitudinal section, considerably enlarged of a patchcord made in accordance with the invention.

FIGURE 1 shows a plugboard system 10 which includes a front board 12 in a position just prior to insertion into a receiver mechanism of a back board 32. The front

board is comprised of an outer frame 14 of a metallic construction which surrounds and supports a plurality of boards shown as 16, each including a plurality of apertures such as 18, across the surface thereof. The apertures 18 receive patchcords such as 120 shown in FIGURE 11, which are individually connected in pairs by a coaxial and shielded electrical lead 122. Frame 14 includes side pieces 17 and top, center and bottom pieces 77, as shown. The side pieces each have secured therein at the top and at the bottom, pin members such as 28 and 30. These pin members are made to extend outward of the frame and are positioned thereon to mate with hook members in the back board receiver.

The patchcords 120 are plugged in various patterns into the various apertures 18 of the front board to define a given program of interconnections to be made when the front board is inserted in the receiver and closure is effected. Handles 26 are provided on each side of 12 to facilitate manual handling of the board.

The back board 32 includes an outer metallic frame 32' which surrounds and supports a plurality of back board members such as 36, the details of which will be described hereinafter. A receiver and closure mechanism is mounted on the back board, including slidable hook members shown as 88 in FIGURE 1, which fit into a frame side member such as 34. Within the bottom frame member shown as 35 in FIGURE 1 is a camming mechanism which operates to drive the front board as positioned within the rear board receiver to effect closure between patchcords and contact springs carried in the rear board. The camming mechanism is driven by a shaft shown as 54 connected to cams, described in detail hereinafter, under a force developed by an operating arm 52.

FIGURES 2-5 show in general the structure which accomplishes switch operation. In FIGURE 2 the front board 12 is shown positioned out from and just prior to insertion in the receiver mechanism of the rear board. The operating handle 52 is in the open position so that the cam 66 driven thereby is in the down position. The hook members 88 of the receiver mechanism are in the out position, ready to receive the pin members 28 and 30 on each side of the front board frame. FIGURE 3 shows the front board 12 positioned in the receiver mechanism with the pin members 28 and 30 seated within grooves such as 102 in hook members 88 and held therein against accidental displacement by a projecting portion 104 forward of the recesses 102 in the members 88. At this time the operating handle is still in the open position and cam 66 is still in the down position. A manual force to the left relative to FIGURE 3 upon the handles 26 on the front board operates to push against the hook members which are displaced to the left, permitting the front board to move within the receiver mechanism so that the patchboards 120 are positioned parallel to but slightly before the contact springs 110 of the rear board. The system as shown in FIGURE 4 is now ready for closure of handle 52 to operate the cam and drive the board 12 upwardly to effect closure between the patchcords 120 and the contact springs 110. This closure is shown in FIGURE 5. Operation of the system to the position of FIGURE 5 effects a selected connection of pairs of leads. Each pair includes a path from a lead shown as 111, connected to a contact spring 110, through an individual patchboard 120 and through an individual shielded lead 122 to a connected patchcord 120, a connected contact spring 110 and a further lead 111. In accordance with the invention the path which extends through the system as described is shielded completely from a point of entry at the back of the rear board through the contact paths and patchcord leads and out of the back of the back board.

The operating handle for the system thus far shown is made to be utilized when a system is mounted adjacent to a flat surface such as at the rear portion of a working table or cabinet top. This type of position is frequently

necessary in an analogue computer application wherein the operator, seated at the console of the computer, has need for access to the plugboard system for operation and has need for a flat surface adjacent thereto for other purposes. The operating handle 52 includes a slight bend shown as 53, just adjacent the point wherein the operating handle joins driving shaft 54. The handle part, shown as 57, is pivotally secured to the end of the operating handle 52 so that one opening the system may grasp the depending portion of 57 and pull outwardly and downwardly with the portion 57 swinging outwardly and upwardly as the handle is rotated 90°. The operating handle 52 is made to effect closure through a rotation of 90° with a minimum width dimension. Other operating handle constructions are, of course, contemplated as useful with the invention system.

FIGURE 6 shows one side of the driving mechanism which is operated responsive to movement of the handle 52. There would be an identical driving mechanism on the other side of the rear bay receiver frame. In FIGURE 6 the front board is shown in the upward position with the bottom portion of the frame shown in phantom at 27. This would be in the position of closure, as indicated in FIGURE 5. As indicated in FIGURES 3-5, the front board is carried within the receiver mechanism and then cammed upwardly to effect contact closure. The driving mechanism includes a shaft 54 which is pinned to operating handle 52 by a pin member, shown at 56 in FIGURE 6. Shaft 54 is supported for rotary movement within the lower frame 35, as indicated in FIGURE 6. Support is provided by bearings 58 and 60 disposed on each side of cam 66. Each bearing includes an inner race 62 fixed to the shaft, which in turn is fitted within a sleeve such as 64, secured to the outer frame of the rear bay receiver in the manner indicated. Disposed between the bearings 58 and 60 is a cam shown as 66, which includes an eccentric 67, a bearing 68 surrounding and supporting the eccentric and an outer sleeve 69 driven thereby, when shaft 54 and the cam structure is rotated and it drives the board 12 upwardly to effect closure of the contacts. In accordance with a preferred embodiment, this cam structure is made to be driven overcenter to drive the front board up for an initial closure and wiping engagement between the patchcords and the rear board contact springs and then slightly downwardly to effect a rewipe of the contacts. This kind of mechanism is disclosed in more detail in U.S. Patent No. 2,927,295 to G. C. Sitz.

The receiver mechanism is shown in more detail in FIGURES 7-10. The receiver mechanism is comprised of four hooks each arranged like the hook 88, shown in FIGURES 7-10 and each operable in the same or similar manner. It is to be understood that there are righthand and lefthand pairs of hooks to accommodate the right and lefthand sides of the front board. In FIGURE 7 the pin 30 is shown above and out of contact with a hook 88 and just prior to being displaced downwardly to nest within and be supported by the hook 88. FIGURE 8 shows the pin 30 nested within the hook 88 and FIGURE 9 shows the hook 88 displaced inwardly to carry the front board within the receiver so that the contacts are in the position shown in FIGURE 4. FIGURE 10 shows the disposition of the receiver mechanism following the camming operation previously described with the contacts in the position shown in FIGURE 5.

Each hook includes at its forward end the recess 102 shaped to receive a front board pin such as 30, and the projecting portion 102 which serves to hold the pin within the recess 102 and as a ramp for guiding the pin therein. The hook mechanism is mounted in a recess in the side walls of the rear board frame, such as 34. This recess is shown as 70. A hook frame 72 is secured within recess 70 as by rivets 74. The frame includes horizontal, spaced side walls 76 and 78 and a vertically disposed rear wall 80. Extending across the frame 72 and rigidly attached

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thereto are roll pins 82, which support the hook 88 from beneath and a pin 84 which supports the hook from above. These pins entrap the hook for sliding movement. The rear of the hook 88 includes an enlarged diameter portion 94 rounded on its inner surface, as at 96 to engage the rearmost pin 82 and the pin 84. There is provided within the hook a slot 90 which receives a compressing spring 92 made to engage the rear flange 80 and the hook. This spring tends to push the hook to the right of the frame 72 and of the rear board frame 34. The spring is shown in its relaxed position in FIGURES 7 and 8 and in its compressed position in FIGURES 9 and 10. The upper flange 76 includes, secured thereon, a leaf spring member shown as 86, which is biased down to engage a detent shown as 100 on the top of the hook. This leaf spring operates to provide a latching of the hook in the inward position by engagement with detent 100 in the manner shown in FIGURES 9 and 10. The end of the spring 86 and the surface configuration of detent 100 are made so that the spring rides up over the detent as the hook is displaced from the right to the left, or inwardly of the frame. The spring is made sufficiently stiff to hold the hook inwardly against the force of the compression spring 92, which tends to push it outwardly. As the spring clears the detent when the rear board is withdrawn from the receiver mechanism the force of the spring serves to push the hook and therefore the front board to the fully open position, as indicated in FIGURE 8. The mechanism disclosed in FIGURES 7-10 thus operates to receive and position a front board prior to insertion and then to carry the front board in an exact inward movement to effect insertion and then to permit the board to be cammed upwardly and still lock into the board.

FIGURE 9 shows the front board inserted, but prior to switch closure and camming action. There is included, aligned with the pin 30, in the bracket 72 a further rounded recess portion 77 which receives the pin 30 as the board is cammed upwardly. A downwardly projecting portion of the flange shown as 75 prevents the front board from being displaced outwardly of the assembly once the camming operation has taken place. The hook and receiver mechanism guides the front board very exactly to avoid damage or premature engagement of portions of the contact spring members of the rear board and the patchcords of the front board.

Turning now to a description of the front and rear boards, reference is made to FIGURE 11, which shows the boards spaced apart and prior to insertion of the front board within the rear board receiver. In accordance with the invention, each of the front and rear boards is comprised of a core of plastic material having the outside surface thereof covered over by a metallic covering in the form of a coating. The board cores are typically molded of phenolic resin including a relatively hard insulating and dielectric material. The metallic coating is provided by plating the molded board first with a thin coating of electroless conductive material, such as electroless copper or electroless nickel, which serves to provide a bond between plastic and metallic materials and which can be readily plated upon plastic material. Then an electro-plate metallic material, such as copper, nickel or tin is plated on over the electroless material to provide an outside finish coat and to provide a body for the plating sufficient to withstand the forces of use and sufficient to provide adequate shielding and grounding for the system. In an actual unit constructed in accordance with the invention the core of the board was made of a phenolic resin overplated to a thickness of approximately 0.000025 with electroless copper, which was then electroplated to a thickness of 0.0005 with electroless nickel. Another embodiment was plated first with electroless nickel and to a thickness of .00025 and then plated to a thickness of 0.0005 with tin. A finish or flash coating of silver or other material may be added if desired.

In the construction of the boards the plating is carried across the outer surfaces of the boards and down through the surfaces of the apertures in the manner shown in FIGURE 11. The front board core 20 is covered by a plating 24 and the front of the front board is then insulated by a thin sheet of insulating material bonded thereto and shown as 25. This sheet is suitably apertured to permit the insertion of patchcords 120. The sheet 25 serves to prevent an accidental grounding of the patchcord during insertion (post-patching) after the system is closed.

The rear board is constructed in the same manner as the front board with respect to a plastic core overplated with metallic conductive material, the core being shown as 40 and the material being shown as 42, in FIGURE 11. The apertures 38 each include a projecting flange 39 at one end, as shown in FIGURE 13, and are made to receive a plastic insert 130. The inserts include a body 132, wedge fitted into the aperture and a flange portion shown as 134, made to extend out over the inner surface of the board in the manner shown in FIGURE 11. Each insert 130 carries therewithin a contact spring member shown as 110. The contact spring is supported within the insert and within the board by a D-shaped cross-sectional configuration of spring, insert and aperture, best indicated in FIGURE 13. The contact spring member includes a support portion 112, which has a D-shape in cross-section fitted into a similar shaped aperture in the insert which has an outer D-shape. This outer D-shape locks the insert to the board to orient the spring therein. Spring orientation is shown in FIGURE 6 to include an alternative disposition of the plane of the contact from contact member to contact member. This orientation has been found to more evenly distribute stresses in the rear board assembly which result from deflection of the contact springs by patchcord members.

FIGURE 11 shows the construction of the contact spring to further include a terminal portion such as a post 114, which extends out of the rear of the board to receive and be terminated by input and output leads from the equipment served by the system. In accordance with a typical use these leads will be shielded coaxial leads having a center conductor terminated to the body of 114 and a shielding conductor terminated in a suitable fashion to the shielding of the system. The forward portion of each contact member includes a spring 116 which is vertically disposed with respect to the movement of closure of the front board relative to the back board. Spring portion 116 has an extension shown as 118, which is placed at 45° relative to the movement of the spring portion 116. The portion 118 carries thereon a contact bar 119, as shown in FIGURE 11. The operation of spring members of this general construction is more completely described in U.S. Patent No. 2,882,508 to W. S. Watts.

Extending out from the forward face of the rear board is a grid comprised of conductive portions 46 and 50 which form a box-like cavity surrounding the rear bay contact members 110. The grid may be made of strips of thin metal sheet material in the manner indicated in FIGURES 11-12 and in FIGURE 6. Alternatively, it is contemplated that the grid could be made of a construction wherein the body of the grid is plastic overplated with an electroless and electro-plate metallic material to provide shielding. The grid is secured to and connected to the conductive plating of the rear board in the manner indicated in FIGURE 12 through a flange on the outside sheet member shown as 47. The grid flange 47 is held down against the plating of the board through a recess and offset shown as 37, in the rear board frame by means of a clamp member 43 secured to the frame as at 41.

FIGURE 12 shows a front board inserted within the rear board receiver in the position shown from the side in FIGURE 4, which causes the center conductive pin of the patchcord 120 to overlap the contact bar 119 of

the rear board contact spring 110. When the front board is cammed upwardly in the manner previously described the contact pin of the patchcord will engage 119 to interconnect the patchcord to the contact spring. As can be discerned from FIGURE 14, the pin 170 is surrounded by a conductive material formed by a plating shown as 146 which extends out over an end portion 150 of an insulating sleeve 144. When the front board is in position shown in FIGURE 12 the contact path formed between the patchcord and the rear board contact spring is entirely surrounded by conductive material. This includes the grid formed by sheets 46 and 50 and the plating 146, which is made to extend back and contact the shielding of the patchcord. The contact spring 110 is surrounded along its length within the board by the grid and the conductive plating of the rear board.

Turning now to FIGURE 14, a patchcord 120 is shown terminated to a shielded lead 112, which includes an outer protective sheath 124, a sheath of dielectric material 126, a braid 125 surrounding 126 and beneath 124. The center of the lead contains a conductor 128. The lead is stripped and prepared as shown in 120 to expose various segments of the center conductor, dielectric sheath, braid and outer sheath. An insulating boot 130 is formed over the outside of the metallic portions of the patchcord and made to extend back over the outer sheath of 122 to provide support thereto and to protect the connection between the conductive portions of the patchcord and the lead. The main body of the patchcord is formed by a thin metallic shell 134. The diameter of 134 in its forward portion is controlled so as to always permit 134 to be inserted without undue force within an aperture 18. Toward the center of the shell 134 is an enlarged portion forming an annular flange 136 which serves to limit the insertion of the patchcord within the front board by engagement with the front surface of the board; namely, the insulating sheet 25, which is shown in FIGURE 11. The rear portion of shell 134 is of a reduced diameter and is of a construction to permit it to be crimped inwardly against the exposed braid 125 and against a backup ferrule shown as 140 slipped under the braid and over the dielectric sheath 126. This crimping operation may be in any suitable fashion to permanently terminate the braid of the cable to the shell 134 through the portion 138. The shell 134 is staked to a number of further sleeves through indentations as at 142 and 143. These first further sleeves include sleeve 144, which extends within the forward portion of 134 and directly supports the patchcord pin member 170. The sleeve 144 is formed of plastic such as nylon, overplated on its outside surface as at 146. The indentation at 143 terminates the sleeve 134 electrically to the plating on sleeve 144. The interior of sleeve 144 is made to engage the pin 170 at spaced points axially as at 152, to rigidly secure the pin within 134. The plating 146 extends only to each end of the sleeve 144 so as not to engage pin 170, which would effectively short out the signal path to the grounding path of the lead. This isolation between the shielding path and the signal path is facilitated in the forward end of the patchcord by a relief shown as 151 beneath 150, which extends back within the body of 144. Toward the forward end of 144 and positioned within 134 is a further sleeve shown as 158. This sleeve is of a plastic material such as nylon and is mechanically secured to shell 134, as by the indentation at 142. The forward portion of 158 is made to include rounded detents, as at 160, which serve to latch the patchcord within the front board by an engagement with the inner face of the board at the edges of the apertures 18. The outer diameter of 160 in its relaxed condition is thus greater than the diameter of the aperture 18. Sleeve 158 is axially slotted to provide a spring action for the detents 160. This slotting is best shown in FIGURES 11 and 12, as 156. The inner diameter of 158 in its forward end is relieved to permit an inward deflection of the detents as the patchcord is inserted within the patch board. The detents 160 are axially spaced relative to the flange 136 so

as to latch the patchcord in an aperture 18 against axial displacement out of the board. This particular mounting and confinement of 158 has been found to be advisable due to its being of a resilient material.

The contact pin 170 includes a forward portion shown as 171, which is rounded and preferably plated so as to define a contact surface for engagement with the contact bar 119 of the rear bay contact spring 110. The pin is crimped to the center conductor 128 in a suitable fashion to electrically extend the signal path of the lead forwardly of the patchcord. The rear of the pin is enlarged as at 172 to be received within the sleeve 144 and mechanically held therein against axial displacement. To the rear of 172 there is provided a sleeve insert 174 of insulating material which prevents forced displacement of the pin rearwardly which could cause an electrical short between the signal and the shielding paths. The sleeve 174 is wedged within the bore of 144 at one end and made to engage the front end of the ferrule 140 at the other end.

The patchcord 120 has been found to effectively extend the shield of a shielded lead through the front board and at the same time to provide a latching thereof which operates to hold the patchcord in the front board without requiring an excessive insertion or withdrawal force. The latch structure has been found to be capable of repeated use without damage to the plating of the front board. When the patchcord is in use and generally in the position shown in FIGURE 12, the force applied to the pin 170 has been found to be quite sufficient to cause the shell 134 to bear against the conductive plating of the front board to effect completion of contact between the shield of the patchcord of the shield of the board.

In the above description the various boards of the system have been taught as having a shielding structure. It is fully contemplated that the boards may be only partially shielded or that certain boards may be shielded and others may be standard. For example, it is contemplated that half of the apertures in a given board for the front and rear boards may be shielded and the other half of standard construction, or that two of the boards for the front and rear may be shielded, with the other two being standard. The foregoing would permit substantial economics in systems requiring only a few shielded leads.

Having now described the invention in terms intended to enable its preferred mode of practice, we define it through the appended claims.

What is claimed is:

1. In a multiple electrical switch device for connecting signal paths, a first board having an array of contact springs secured therein and extending therefrom, a receiver secured to said first board to position and drive a second board having contact members positioned thereon to cause an engagement and disengagement of said contact springs and said contact members for switch operation, means shielding each signal path from other signal paths including a conductive metallic barrier extending axially through each board and axially between boards to separately surround the said contact springs and contact members connected together, said barrier being comprised along at least a substantial part of the length thereof of a conductive plating supported on and bonded to an insulating material surrounding and radially spaced from said signal paths as defined by said contact spring and contact members.

2. The device of claim 1 wherein said boards are comprised of insulating material and said plating is supported thereby and bonded thereto.

3. The device of claim 1 wherein said boards are comprised of insulating panels having an array of apertures therein to position contact springs or contact members with substantially the entire surface area of said apertures being covered by said plating.

4. The device of claim 1 wherein there is included a conductive grid secured to the first board and positioned to provide a shielding compartment separately

surrounding said contact spring and forming part of said barrier.

5. The device of claim 1 wherein the said second board is comprised of a panel of insulating material having an array of apertures to position said contact members and said board is covered over substantially the entire surface thereof including the surface of said apertures by a conductive plating forming part of said barrier and said contact members each include a latching structure to latch said member in a board aperture, said latching structure being comprised of an elastic and flexibly resilient material to minimize damage to said plating.

6. The device of claim 1 wherein said receiver includes a plurality of hook members positioned to be engaged by and to support pin members attached to the sides of the second board, the said hook members being slidably supported to carry the second board toward the said first board without engagement of contact springs and contact members, means to then drive the second board off of said hook members and parallel to the first board to cause engagement between contact springs and contact members, and further means to support said second board during parallel movement to maintain alignment of contact springs and contact members.

7. In a multiple switch device a first board carrying an array of first contacts, a second board carrying an array of second contacts, the said arrays being of similar center-to-center spacing, the contacts being secured within the boards to extend outwardly, a receiver mechanism for positioning said boards with the said contacts in facing relationship, said receiver including a plurality of hooks supported in a frame attached to said first board and a plurality of pins fixed to the sides of said second board, the said hooks being slidably mounted to carry the said second board toward the said first board with said first and second contacts being carried into an overlapping and spaced axial relationship and further including means to then drive the second board off said hooks and parallel to the front board to cause an engagement of first and second contacts.

8. The device of claim 7 wherein there is included means to latch said hooks in an outward position and in an inward position to prevent accidental displacement thereof but permit manually forced displacement thereof.

9. In a system for providing a programmable interconnection of shielded signal paths the combination comprising a plurality of shielded signal leads forming inputs and outputs, a rear board having contact springs secured therein to project outwardly therefrom on one side and terminated to said leads on the other side, a receiver mechanism attached to said rear board and a front board adapted to be fitted into said receiver and carried into a position proximate said front board and then moved parallel thereto, a plurality of patchcords fitted in said front board with pairs of patchcords interconnected by shielded leads, said patchcords being positioned in said front board to engage contact springs in said rear board upon parallel movement of said boards, a conductive grid attached to said rear board to extend outwardly between the rear board and the front board, said grid surrounding said contact springs and portions of patchcords to shield the interconnection therebetween, each said contact spring and each said patchcord being surrounded apart from portions within said grid by a thin conductive shield bonded to said boards and extending therethrough to provide a shielding of signal paths into, through and out of said system.

10. The system of claim 9 wherein said boards are formed of insulating material and said conductive shield is comprised of a plating deposited on said boards.

11. In a plugboard system for providing programmable patterns of connections of shielded signal paths, the combination comprising a front board having apertures therein to receive and position patchcords, a plurality of patchcords each including a central signal conductor and an outer conductive shielding, a rear board having apertures therein to receive and position contact springs, a plurality of contact springs each including a surrounding insulating insert affixed thereto with each insert including means thereon to position and secure a contact spring in a rear board aperture, a receiver mechanism secured to said rear board to position and drive the said front board in movement to cause engagement of patchcords with contact springs to effect electrical connection between the signal conductor of a patchboard and a contact spring, each of said boards being comprised of a core of rigid dielectric material with each board including a relatively thin and integral metallic covering extending over the surface of said core including the surface of each of said apertures, conductive means secured to said rear board in electrical contact with the covering thereof and extending out from said rear board to surround each projecting contact spring, the said conductive means having an interior dimension to receive the signal conductor projecting from each patchcord for engagement with a contact spring and to permit deflection of the contact spring by each patchcord without contact with the said means, each said patchcord including an outer conductive portion overlying said signal conductor and made to extend to a point wherein upon engagement of the signal conductor of a patchcord with a contact spring, the said metallic covering and the said means serve to isolate each signal path from adjacent signal paths and to shield each signal path from stray radiation.

12. The system of claim 11 wherein each patchcord includes a detent means to latch the patchcord within a front board aperture, said detent means having a radially projecting detent of elastic and flexible material with a surface which is resilient whereby to minimize wear on the said covering.

References Cited

UNITED STATES PATENTS

2,440,037	4/1948	Wolff et al.	174—138
2,848,359	8/1958	Talmey	117—212
3,076,862	2/1963	Luedicke et al.	174—68.5
3,335,388	8/1967	Karol	339—143 X
3,341,801	9/1967	Brookman et al.	339—143 X
3,337,833	8/1967	Creedon	339—221 X

FOREIGN PATENTS

513,300 11/1930 Germany.

OTHER REFERENCES

Publication: "Connections Plated With Wiring," by E. A. Guditz; from "Electronics," Dec. 18, 1959, pp. 96, 98, 99. Copy in 339—278 C.

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339—14, 143, 75