Jan. 31, 1967 K. N. KAROL ETAL 3,302,065

PLUGBOARD ACTUATING MECHANISM

Filed Dec. 21, 1965 2 Sheets-Sheet 1

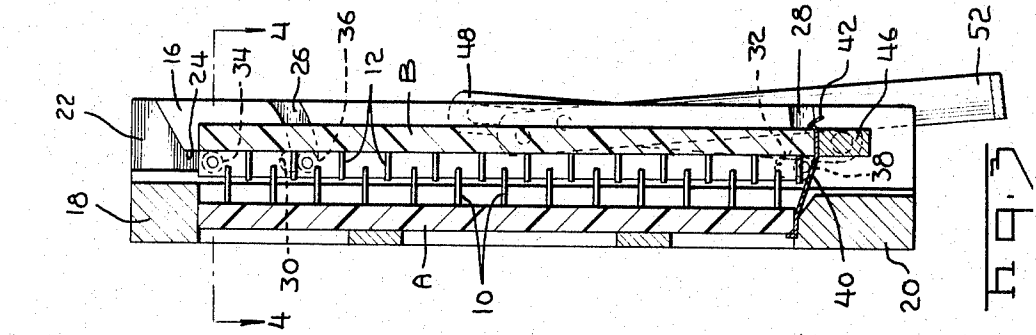


FIG. 3

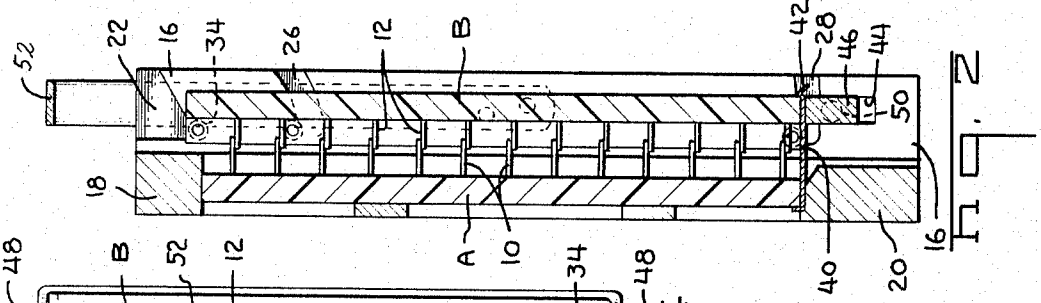


FIG. 2

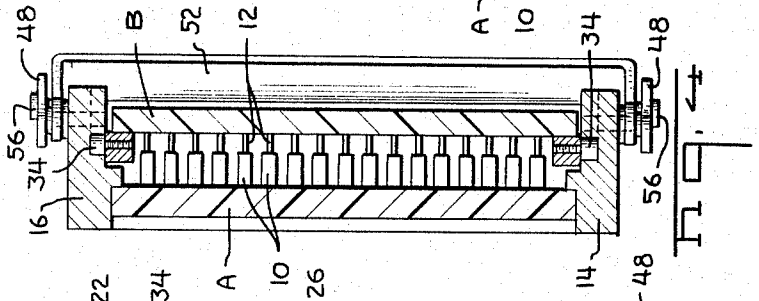


FIG. 4

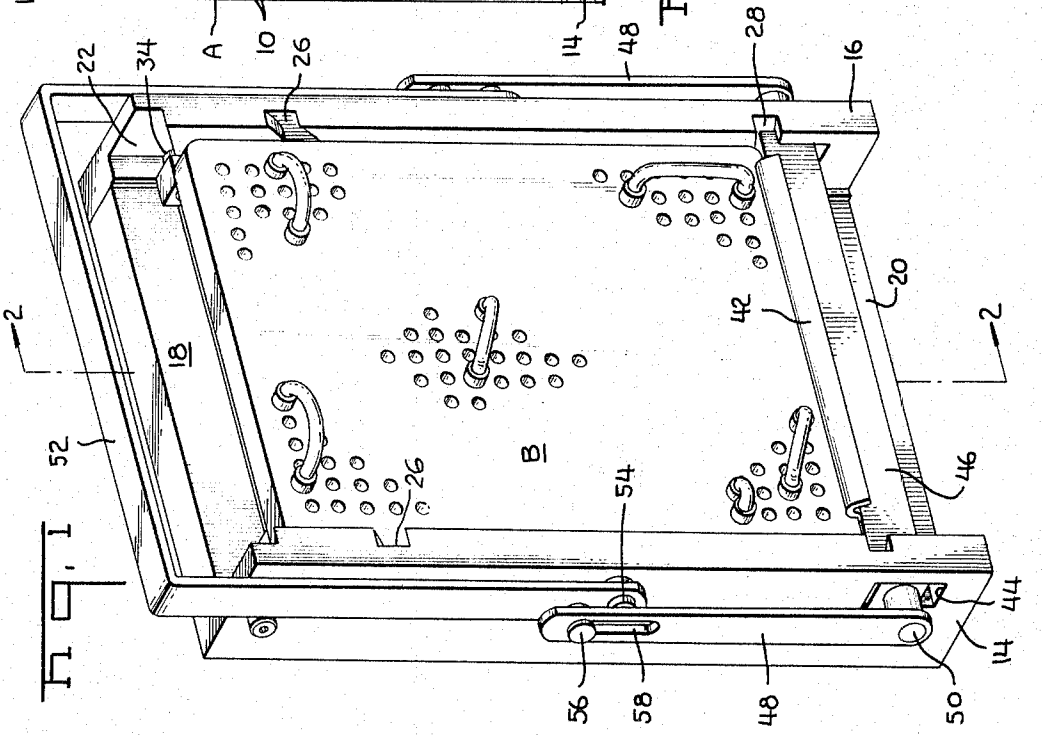


FIG. 1

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PLUGBOARD ACTUATING MECHANISM

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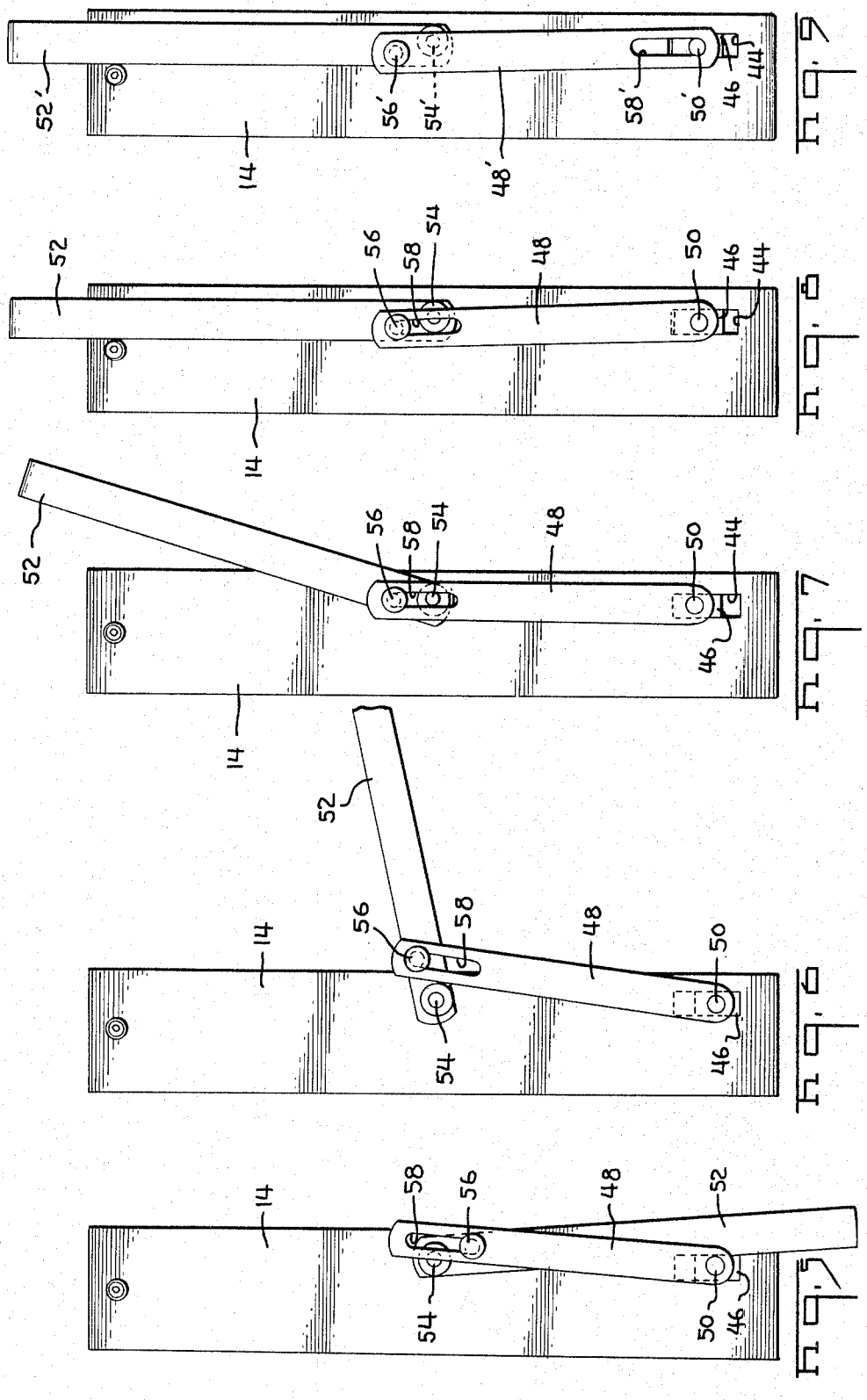


FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

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PLUGBOARD ACTUATING MECHANISM

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8 Claims. (Cl. 317—99)

This invention generally relates to plugboard assemblies for electrical accounting machines, computers and the like, and in particular to the mechanism for effecting an operative interconnection between the movable plugboard and fixed plug-board of such assemblies.

It has become the prevailing practice to provide in electrical computing machines a fixed panel on which are arranged a set of electrical contacts in rows and columns, certain of these contacts being connected to the sensing elements of the machine and the remainder providing terminals for the leads connected to the instrument panels that perform the operative functions of the machine. A control panel cooperates with the fixed panel to furnish circuit connections between the contacts associated with the sensing elements and in the instrumentalities desired to be operated according to some predetermined arrangement. Conventionally the control panel is adapted to be detached from the assembly for the purpose of interchanging such panels whenever a variation in the arrangement of circuit connections is desired, it being common practice to provide a preset control panel for each of the circuit arrangements periodically desired to be set into the machine whereby a particular group of computations may be similarly handled in accordance with certain standard reports to be rendered by the machine.

Generally the control panel is provided with a set of contacts conventionally in the form of removable plugs whereby any preset control arrangement or modification thereof may be made.

The mechanisms of the prior art for interconnecting the plugboards have, in general, taken two forms, the first of which simply comprises a lever which is coupled to and swings the carrier frame about a pivot on the base of the fixed plugboard. It has been recognized, however, that interconnection of the assembly solely by pivotal motion may result in warping of the control panel due to the uneven contact pressure distribution arising from engagement of the contacts nearest the pivot connection prior to those more removed. This defect led to the development of a second form of plugboard in which the mechanism is first operative to position the plugboards mutually parallel with the contacts being in an overlapping spaced relationship, and further operative to cause the movable plugboard to slide with respect to the fixed plugboard whereby the contacts may simultaneously be brought into engagement resulting in an even pressure distribution.

In addition to bringing the plugboards into operating relationship the control mechanism must include elements adapted to cooperate with the remainder of the assembly to perform certain other functions to achieve optimum results. For example, means for cleaning the contact surfaces must be provided to assure good electrical conductivity therebetween. Further means for maintaining the assembly against accidental displacement from the interconnected position must also be provided. Space limitations, however, dictate these objectives to be achieved by a mechanism of a simple and compact construction. The plugboard assemblies of the prior art, however, include complicated mechanisms which are bulky, difficult to assemble and exepnsive to maintain.

Accordingly it is an object of the present invention to provide an improved coupling mechanism for plugboard assemblies.

Another object of the present invention is to provide a coupling mechanism for plugboard assemblies which is compact, durable and simple to assemble and maintain.

A further object is to provide an improved locking arrangement for the coupling mechanism of the plugboard assemblies.

A still further object of the invention is to provide a plugboard assembly wherein the contacts are first caused to wipe clean a path thereon during interconnection of the assembly then caused to engage at a prewiped intermediate point on said path.

Another object resides in the provision of a member for prepositioning the movable plugboard relative to the fixed plugboard and for taking up wear resulting from movement of the operating mechanism relative to the movable plugboard.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purpose of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings, in which like reference numerals refer to like parts:

FIGURE 1 is a perspective view of the plugboard assembly constituting a preferred embodiment of the present invention;

FIGURE 2 is a cross-sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a cross-sectional view similar to FIGURE 2 but showing the operating mechanism in its open position;

FIGURE 4 is a cross-sectional view taken along the line 4—4 of FIGURE 3;

FIGURES 5 through 8 are side elevational views showing the operating mechanism in its various positions of movement; and

FIGURE 9 is a side elevational view similar to FIGURE 8 showing an alternative form of control mechanism.

The objects of the present invention are generally obtained by the provision of the coupling mechanism for plugboard assemblies in the general form of a sliding block linkage which is further characterized in that the linkage is stopped in an over center position when the assembly is interconnected. Means are provided to render ineffective the sliding block action of the linkage during a portion of the movement of the operating mechanism. The linkage mechanism is operative during movement to dead center to lift the movable plugboard thereby causing a set of contact plugs on the movable plugboard to engage and wipe a corresponding set of spring contacts on the fixed plugboard. Movement of the linkage mechanism over center completes the interconnection of the assembly and results in a slight dropping of the movable plugboard which partially withdraws the plug contact along the path of wiping action for insuring final contact engagement at a point of good electrical conductivity. In addition the tension of the spring contacts acting through the plug contacts and movable plugboard biases the linkage mechanism over center which maintains the assembly inter-

connected. Referring now to the drawings a fixed plugboard panel of any suitable electrical insulating material such as phenolic or diallyl phthalate and generally designated at A is provided with rows and columns of apertures which are adapted to receive therein a set of spring contact members 10. Cooperating with contact members 10 to effect the desired circuit interconnections is a set of plug contact members 12 that are adapted to be received by a plurality of apertures in control plugboard panel B which also is of suitable insulating material. The panel A is held in position within a suitable framework comprising side frames 14 and 16 and top and bottom cross beams 18 and 20 respectively.

The control or movable panel B is completely separable from the fixed panel A and its corresponding frame assembly. Side frames 14 and 16 are mirror images of each other and therefore only one side frame will be described. The side frame 16 is provided with a grooved end 22 adjacent the upper end of the frame, groove 22 terminating in an elongated slot 24 as best seen in FIGURE 3. A pair of grooves 26 and 28 are formed in the side panels and are arcuately shaped along a radius having its center adjacent the bottom of slot 24. The arcuate grooves 26 and 28 terminate at their inner ends in relieved portions 30 and 32 respectively.

The control panel B is provided with three sets of rollers 34, 36 and 38. When it is desired to assemble panel B the rollers 34 are placed within grooves 22 and allowed to drop to the bottom of slots 24. The panel B then pivots about rollers 34 in a clockwise direction, as seen in FIGURE 3, whereby rollers 36 will enter grooves 26 and rollers 38 will enter grooves 28. The panel B will then be positioned parallel with panel A. However, the plug contacts 12 will be vertically displaced from their corresponding spring contacts 10.

In order to maintain panel B in its position shown in FIGURE 3 there is provided an elongated spring member 40 best seen in FIGURES 1, 2 and 3. Spring member 40 is secured along one edge thereof between the bottom cross beam 20 and the fixed panel A. Member 40 is formed at its free end with oppositely directed bends to constitute a detent as indicated at 42. Member 40 is normally in an unstrained position as indicated in FIGURE 2. However, upon initial insertion of the control panel B the spring will be deflected downwardly as shown in FIGURE 3 with the detent 42 overlying the exposed surface of panel B to thus temporarily retain the panel in position.

With control panel B positioned and held as shown in FIGURE 3 it is now necessary to raise panel B into a position whereby there will be electrical contact between the plug contacts 12 and their corresponding spring contacts 10. This is accomplished by a linkage mechanism to be now described. The side frames 14 and 16 are provided with elongated rectangular slots 44 which slidably receive a rectangular bar 46. The bar 46 is disposed on the opposite side of spring member 40 from the control panel B. A pair of links 48 are pivotally secured to the bar 46 by a pair of pins 50. An actuating handle 52 of generally U-shaped configuration is pivotally secured to side frames 14 and 16 by means of pins 54. A second pair of pins 56 are carried by the handle 52 and ride in elongated slots 58 formed in the links 48. It is important to note that the pins 54 and 56 are disposed on opposite sides of the center line of handle 52, the importance of which will become apparent as the description proceeds.

At the start of the operation of the actuating mechanism the various parts are in the position shown in FIGURES 3 and 5. The handle 52 is in the down position and the bar 46 is in engagement with the lower end of slot 44. Spring 40 is in its stressed condition maintaining the panel B in its vertical position. As handle 52 is moved in a counterclockwise direction, as seen in FIGURES 5 and 6, the pin 56 will ride along slot 58 causing oscillation of the link 48, however there will be no movement of bar 46. At some point of the travel of handle 52, depending on the length of slot 58, the pin 56 will engage the upper end of slot 58 and will draw link 48 upwardly thus causing the raising of bar 46. It is to be remembered that the links being described are actually pairs of links, there being one set of link on each side of the frames 14 and 16 as seen in FIGURE 1. As the bar 46 ascends it causes the raising of panel B and during such raising the contacts 12 will engage the contacts 10 and will ride along the surface thereof. It is noted that the bar 46 does not contact panel B but rather the force is applied to the panel through the intermediate spring 40. This enables the wear to be taken up by the spring, which is metallic, rather than by the panel which is of an insulating material and would be subject to wear. When the links reach the position shown in FIGURE 7 the panel B will be at its extremity of upward movement. This position of the links is defined by the point at which the pins 50, 54 and 56 all lie along a straight line. Continued movement of handle 52 into the position shown in FIGURE 8 causes the pins 56 to move off center from the pins 54 and 50 thus locking the mechanism in position in the manner of a toggle joint. The panels A and B will then be in the position shown in FIGURE 2. The movement of the linkage from the position of FIGURE 7 to that of FIGURE 8 causes a slight lowering of the bar 46 and consequently a lowering of panel B. The lowering of panel B is due primarily to the spring forces exerted between the contacts 10 and 12. This slight lowering of panel B is of extreme importance in that during the raising of panel B the plug contacts 12 were caused to move along the surfaces of spring contacts 10 thus wiping the contact area clean but at the same time causing an accumulation of foreign matter such as dust, shavings, etc. which accumulation will be at the tip of the plug contacts 12 when the panel B is in its extreme upper position. Therefore by allowing panel B to drop slightly the contacts 12 are caused to move back to an intermediate position on the contacts 10 which have been wiped clean thus separating the contacts 12 from the accumulated dirt. This backwipe is necessary due to the many applications of the plugboard panels wherein a very low current is employed. The accumulated foreign matter at the junction of the contacts would be sufficient to prevent the passage of the current due to the rise in resistance.

FIGURE 9 shows an alternative embodiment of the linkage previously described. The entire mechanism remains the same with the exception that links 48', which corresponds generally to the previously described link 48, carries a slot 58' which slot engages the pin 50. The slot 58' performs the same function as the slot 58 described in connection with link 48 in that the desired lost motion between link 48' and bar 46 is provided. The pin 56', which corresponds generally to the previously described pin 56, is pivoted to the link 48' whereby a bearing surface is provided entirely around the pin 56'. The advantage of the arrangement of FIGURE 9 resides in the fact that the provision of the bearing surface completely surrounding pin 56' gives a stronger linkage and a better guiding function to the bar 46.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the foregoing claims when viewed in their proper perspective against the prior art.

What is claimed is:

1. In a switching arrangement wherein a first array of contacts carried by a first member is movable into engagement with a second array of contacts carried by a second member, a frame, said second member being fixed

relative to said frame, an actuating mechanism carried by said frame and comprising a bar reciprocable along said frame in a straight line path between a retracted and an extended position, said bar being operatively connected to said first member whereby reciprocation of said bar causes like reciprocation of said first member, a pair of links pivotally secured at an end thereof to said bar, the opposite end of said links having slots formed therein, an actuating handle pivotally connected to said frame and movable between two extreme operative positions, and pin means fixed to said handle and received within said slots in said links to effect a lost motion connection between said handle and said links, whereby movement of said handle causes reciprocation of said bar from its retracted to its extended position, said bar being operative in its extended position to move said first array of contacts into engagement with said second array of contacts.

2. In a switching arrangement as set forth in claim 1 wherein movement of said handle into one extreme operative position causes said bar to assume a position intermediate its retracted and extended positions.

3. In a switching arrangement as set forth in claim 2 wherein said intermediate positioning of said bar is effected by the movement of said pin means to an over center position with respect to the pivot points of said links and said handle.

4. In a switching arrangement as set forth in claim 1 wherein a spring member is disposed between said first member and said bar, said spring member serving to initially position said first member and to take up wear caused by movement of said bar.

5. In a switching arrangement wherein a first array of contacts carried by a first member is movable into engagement with a second array of contacts carried by a second member, a frame, said second member being fixed relative to said frame, an actuating mechanism carried by said frame and comprising a bar reciprocable along said frame in a straight line path between a retracted and an extended position, an actuating handle pivotally connected to said frame and movable between two extreme operative positions, a pair of links pivotally secured at an end thereof to said handle, the opposite end of said links having slots formed therein, pin means fixed to said bar and received within said slots in said links to effect a lost motion connection between said handle and said links, said bar being operatively connected to said first member whereby reciprocation of said bar causes like reciprocation of said first member, and whereby movement of said handle causes reciprocation of said bar from its retracted to its extended position, said bar being operative in its extended position to move said first array of contacts into engagement with said second array of contacts.

6. In a plugboard assembly wherein a first array of contacts carried by a first board is movable into engagement with a second array of contacts carried by a second board, a frame, said second board being fixed relative to said frame, a spring member fixed relative to said second board and being engageable by said first board for maintaining said first board in position parallel to said second board with the contacts of said first board being out of engagement with the contacts of said second board, and an actuating mechanism carried by said frame for moving said first board relative to said second board to effect engagement between the respective contacts thereof, a portion of said actuating mechanism being in contact with said spring member whereby force is transmitted by said actuating mechanism through said spring member to said first board for causing said contact engagement.

7. In a plugboard assembly as set forth in claim 6 wherein said actuating mechanism includes a reciprocating member in contact with said spring member and wherein movement of said reciprocating member causes like reciprocating movement of said first board.

8. In a switching arrangement wherein a first array of contacts carried by a first member is movable into engagement with a second array of contacts carried by a second member, a frame, an actuating mechanism carried by said frame and comprising a reciprocable bar movable between a retracted and an extended position, said bar being in force applying engagement with said first member, a pair of links pivotally secured at one end thereof to said bar, an actuating handle pivotally connected to said frame, said second member being fixed relative to said frame, said links being pivotally secured at a second end thereof to said handle, whereby movement of said handle causes said links to reciprocate said bar along said frame from its retracted position to its extended position, said bar being operable in its extended position to move said first array of contacts into engagement with said second array.

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