

April 29, 1952

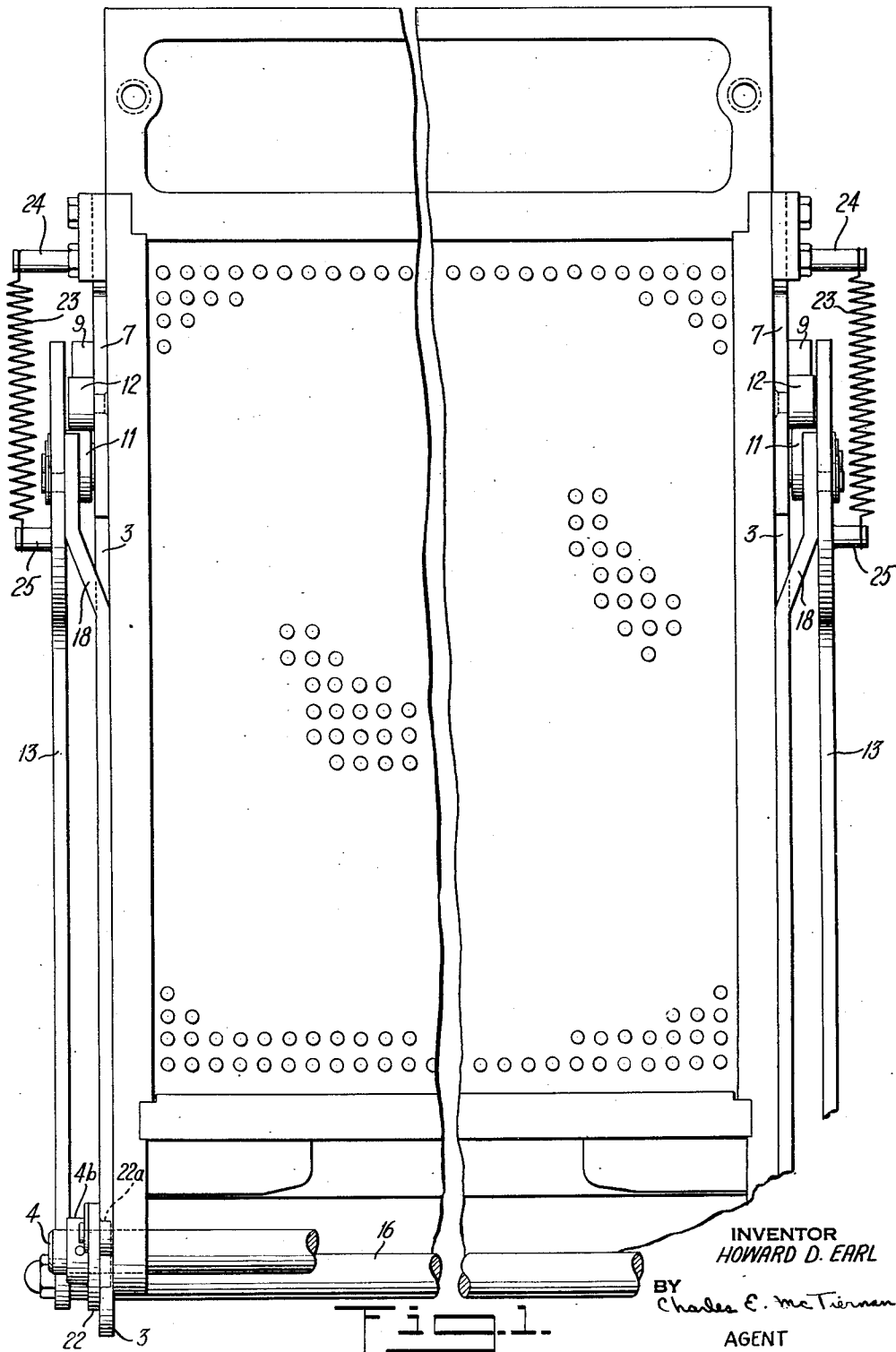
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2,594,748

CONTROL PANEL FOR ACCOUNTING MACHINES

Filed Oct. 29, 1949

7 Sheets-Sheet 1



April 29, 1952

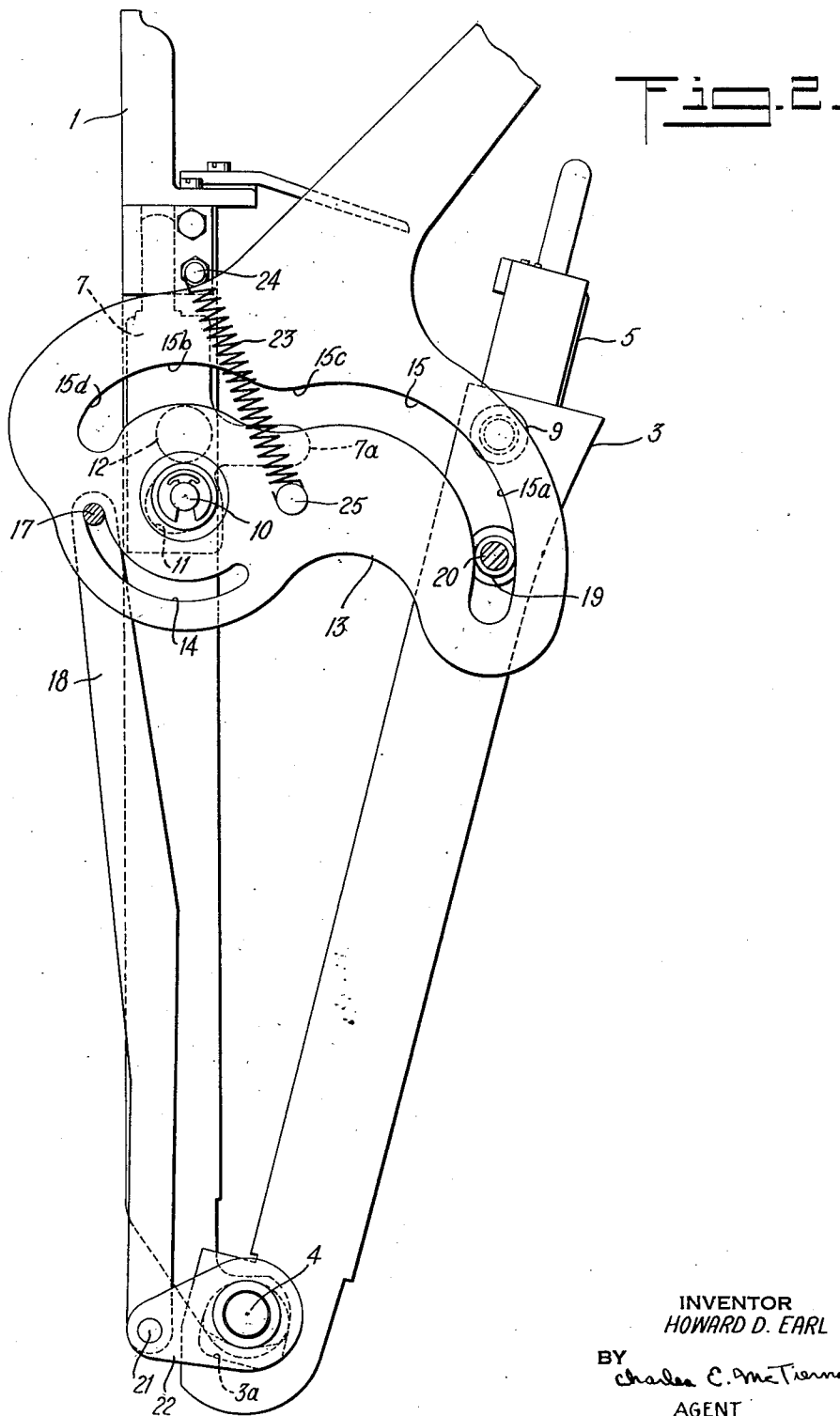
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CONTROL PANEL FOR ACCOUNTING MACHINES

Filed Oct. 29, 1949

7 Sheets-Sheet 2



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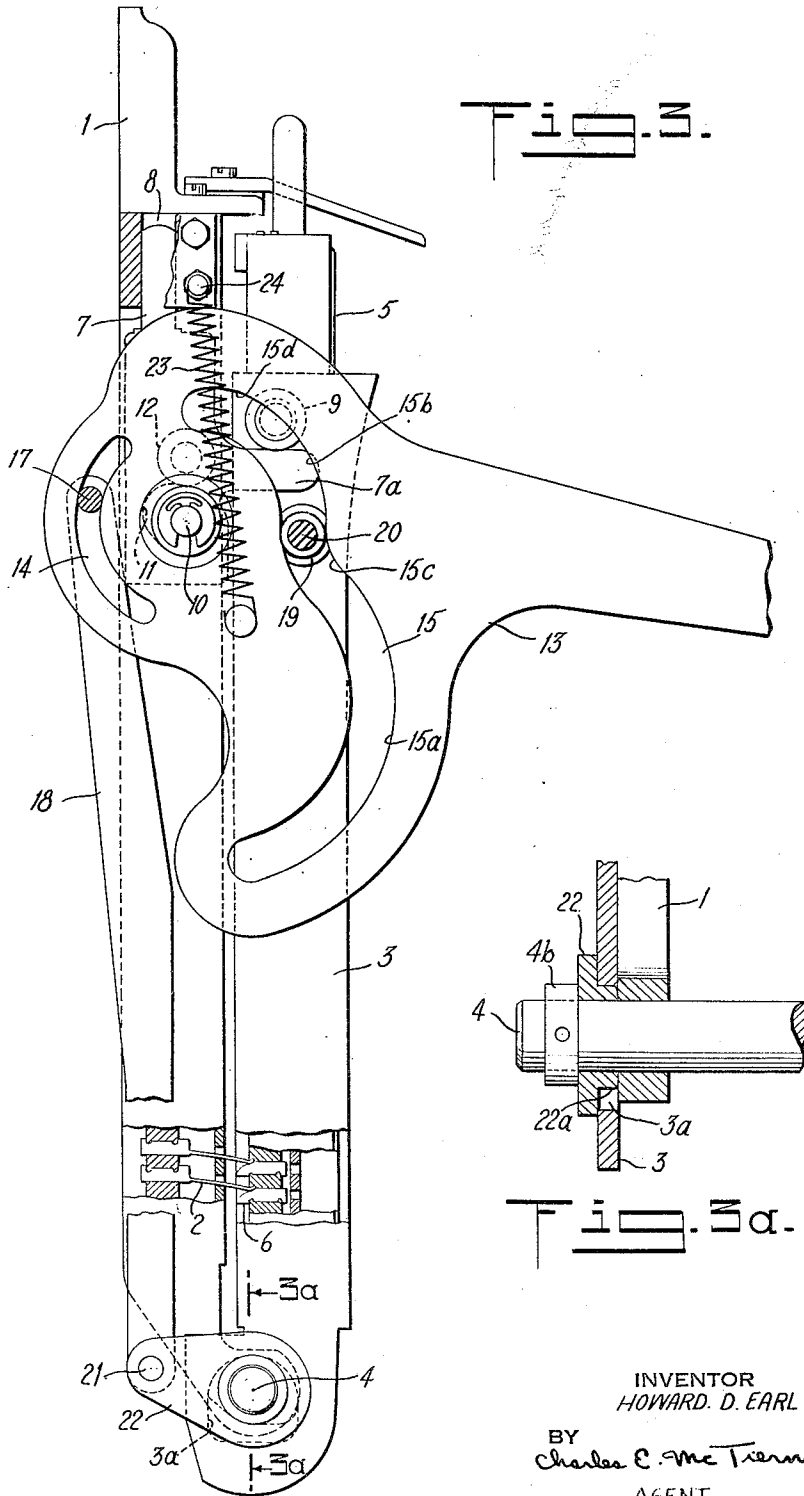
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Filed Oct. 29, 1949

7 Sheets-Sheet 3



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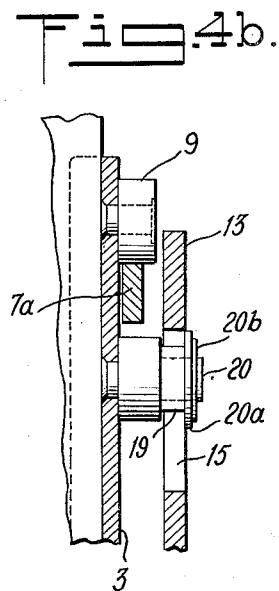
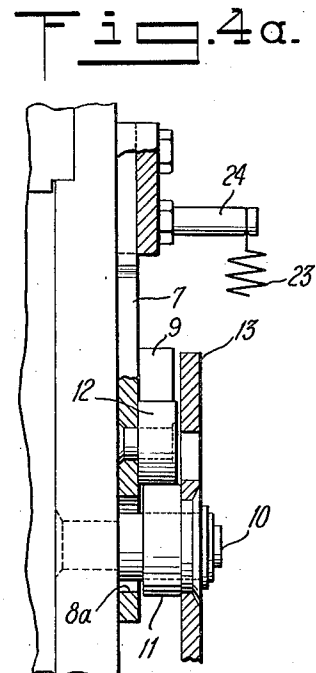
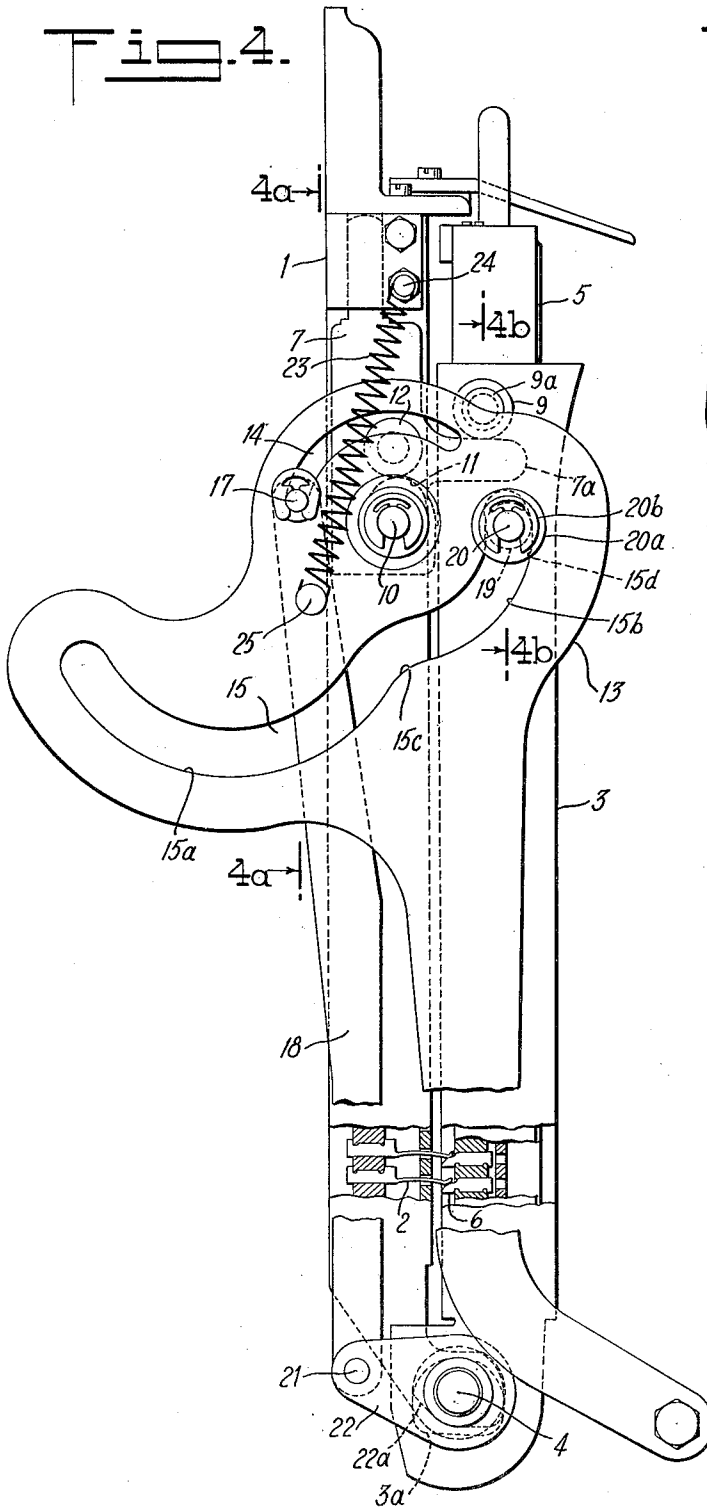
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CONTROL PANEL FOR ACCOUNTING MACHINES

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7 Sheets-Sheet 4



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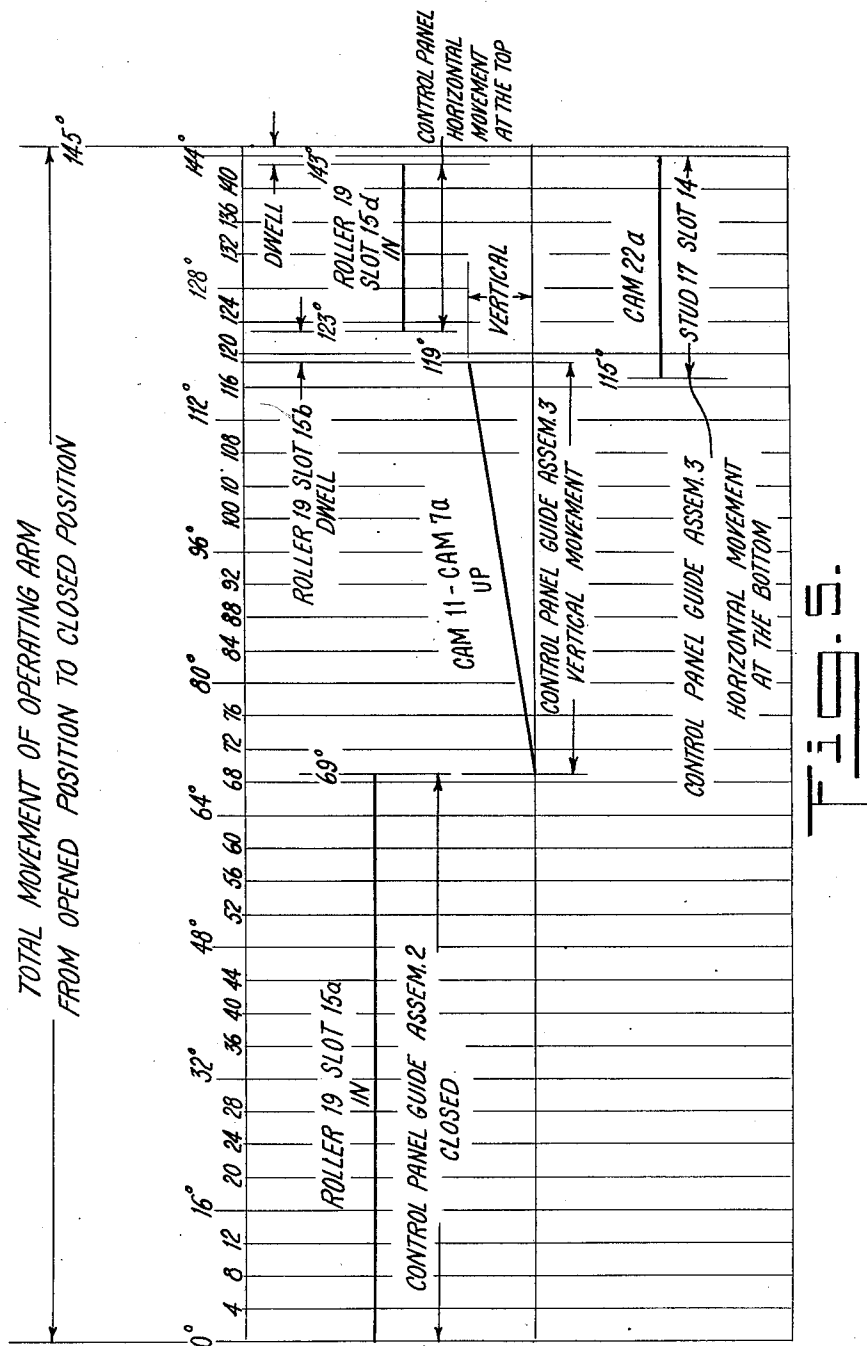
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CONTROL PANEL FOR ACCOUNTING MACHINES

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7 Sheets-Sheet 5



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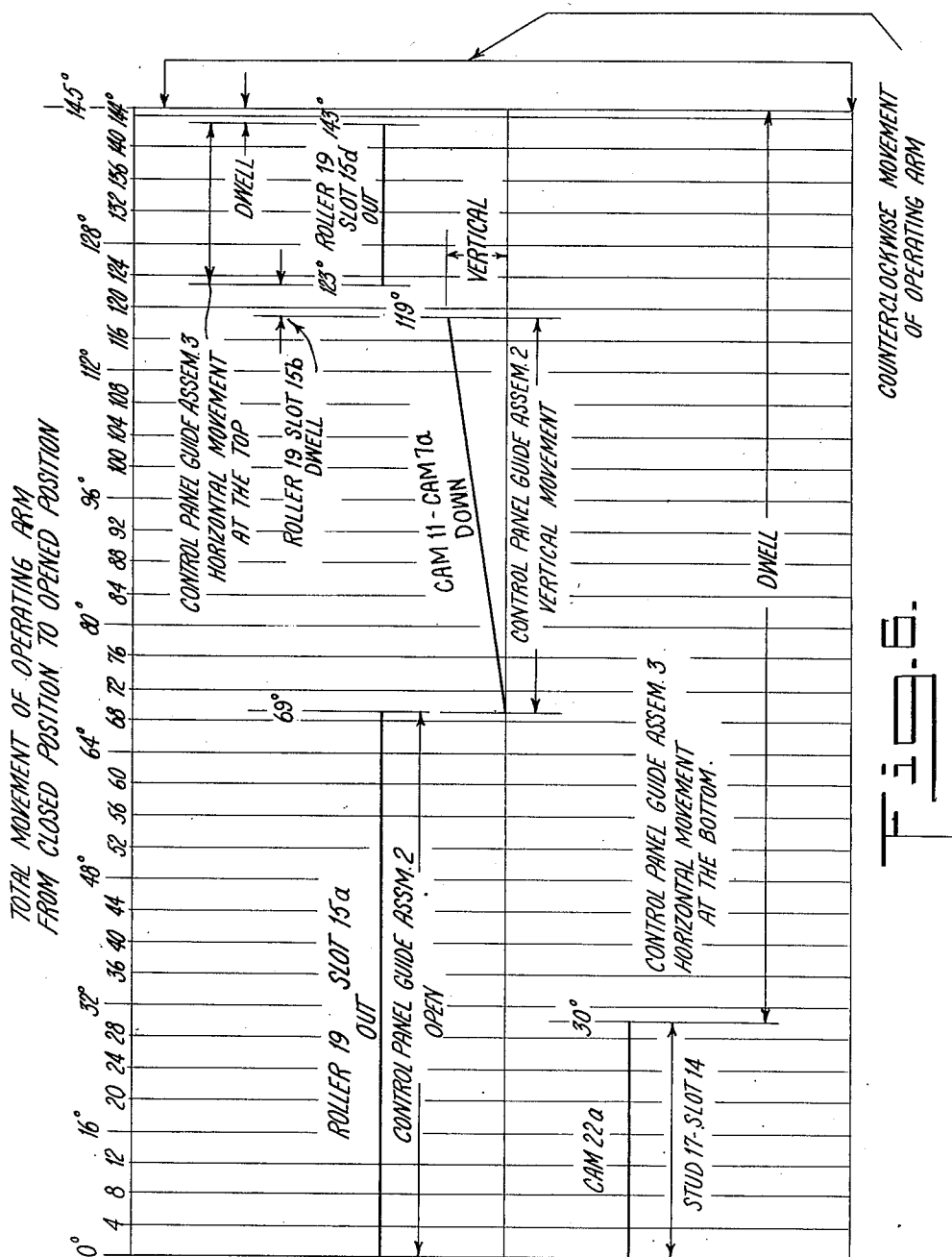
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CONTROL PANEL FOR ACCOUNTING MACHINES

Filed Oct. 29, 1949

7 Sheets-Sheet 6



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CONTROL PANEL FOR ACCOUNTING MACHINES

Filed Oct. 29, 1949

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Fig. 7.

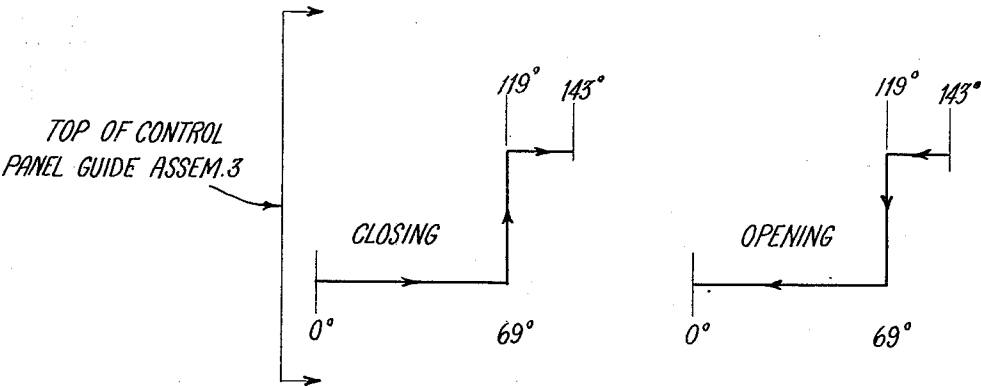
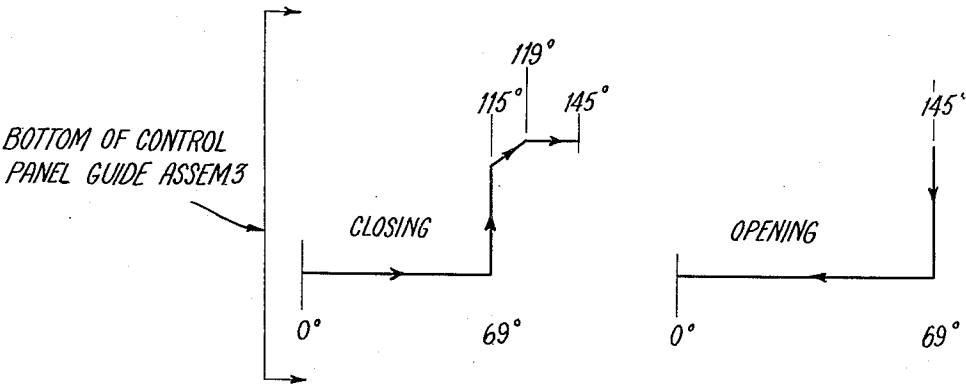


Fig. 7a.



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UNITED STATES PATENT OFFICE

2,594,748

CONTROL PANEL FOR ACCOUNTING
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Application October 29, 1949, Serial No. 124,467

8 Claims. (Cl. 173—328)

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This invention relates to electric plugboards for perforated record controlled accounting machines, such as, for example, the alphabetical accounting machine.

In the operation of electrical accounting machines, perforated record cards bearing separate columns of data are fed into the machine where they are to be sensed by separate brushes. When a punched hole in any column allows the corresponding brush to contact the conductor roll, an electrical circuit is completed thereby making available an electrical impulse from this circuit. The electrical impulse travels to the control panel associated with the machine where by means of a predetermined plugging arrangement this impulse can be directed to a type bar where the data can be listed, to a counter where the data can be added or subtracted, to a comparing position where the information can be compared, or the data can be eliminated completely.

In the plugboard arrangements of the prior art, the control panel which is adapted to be inserted in a carrier, which is pivoted at the base of the fixed plugboard, is designed such that the contacts of the control panels may be swung and lifted into position with the corresponding contacts of the fixed plugboard. During the initial stage of the swinging period the contacts of the panel and of the fixed plugboard closest to the pivot connection will engage before those contacts which are farther away thereby creating an uneven pressure distribution between the contacts. During the subsequent lifting action the pressure differential is accentuated and is exerted against the control panel with the maximum force appearing at the bottom of the panel and gradually decreasing in an upward direction. As a result of this uneven distribution of pressure along the control panel, the control panel becomes warped and distorted such that the contacts in the warped area of the control panel will not engage with the contacts of the fixed plugboard. A further defect found in the plugboard arrangements of the prior art was the accumulation of foreign matter such as oxides, film and dirt upon the contacts due to the absence of any appreciable wiping action between the contacts thereby producing electrical contact failures.

The principal object of the invention is to provide a plugboard mechanism which is not subjected to warping during the normal operation thereof.

Another object of the invention is to provide a plugboard mechanism wherein the contact pres-

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sure between all the cooperating contact members is evenly distributed.

A further object of the invention is to provide a plugboard arrangement having three distinct movements whereby a control panel is first swung into a position parallel with a fixed panel, then lifted whereby the contacts of the control and fixed panel are brought into engagement with each other, and finally moved horizontally whereby the contacts of the control panel are made to wipe the contacts of the fixed panel thereby insuring good electrical contact therebetween.

A still further object of the invention is to provide a pivotal plugboard arrangement whereby the lifting action of the control panel is delayed until after the panel has been brought to a vertical and parallel position with the fixed panel.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of examples, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a rear elevational view of the plugboard arrangement.

Fig. 2 is a side elevational view of the plugboard in an open position.

Fig. 3 is a side elevational view of the plugboard arrangement after the control panel has been brought into a vertical and parallel position.

Fig. 3a is a sectional view taken along the lines a—a of Fig. 3.

Fig. 4 is a side elevational view of the plugboard arrangement in a closed operating position.

Figs. 4a and 4b are sectional views taken along the respective lines a—a and b—b of Fig. 4.

Fig. 5 is a timing diagram showing the movement of various members of the plugboard when being moved from an opened to a closed position.

Fig. 6 is a timing diagram showing the movement of various members of the plugboard when being moved from a closed to an opened position.

Fig. 7 is a diagram of the movement of the top of the control panel guide assembly during the normal operation of the plugboard.

Fig. 7a is a diagram of the movement of the bottom of the control panel guide assembly during the normal operation of the plugboard.

Referring to the drawings, the stationary or fixed plugboard 1 having a plurality of contact members 2, such as shown in Fig. 3, some of which are coupled to the sensing brushes of the machine while others are coupled to various control parts, is secured to the electrical account-

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ing machine associated therewith. The control panel guide assembly 3 is coupled to the plugboard 1 by being loosely hinged through a pair of oversized openings 3a to the shaft 4 supported on lower extensions of the fixed plugboard frame 1. The hinge arrangement at one side is shown in Fig. 3a, where a collar 4b holds the control panel guide assembly 3 and associated mechanism to be described later, on the shaft 4.

There is mounted on each side of the fixed plugboard 1 a plate 7 having an extended cam portion 7a and a stud 10 on which is pivotally mounted an assembly comprising the cam 11 and the control panel operating arm 13, which partially overlaps the plate 7. The plate 7 is positioned upon the plugboard 1 for vertical reciprocation with the upper end thereof movable in the slot 8 and the lower end thereof guided upon the stud 10 by an elongated slot 8a, as shown in Figure 4a. The extended cam portion 7a which is an integral part of the plate 7 is adapted to cooperate with the roller 9 which is mounted upon the guide assembly 3 by a headed stud 9a, while the cam 11, which is mounted upon the stud 10, is adapted to cooperate with the roller 12 which is secured to the plate 7 such that as the cam 11 through the roller 12 causes a vertical movement of the plate 7, the cam 7a through the medium of the roller 9 causes a vertical movement of the guide assembly 3. The arm 13 comprises a pair of curved slots 14 and 15 as well as an operating handle 16 where the slot 14 controls the movement of the stud 17 which is secured to the link 18 and the slot 15 controls the movement of the guide roller 19 which is fastened to the guide assembly 3 by means of the stud 20, washer 20a, and spring clip 20b. The slot 14 comprises a single arcuate section having the center thereof at the stud 10 while the slot 15 comprises a pair of arcuate sections 15a and 15b joined together by a slot 15c in the form of a reverse curve to form a common slot, and a slot 15d at the upper end of slot 15b. The slot 15a, which has a center of rotation different from that of slot 15b, functions in moving the guide assembly 3 into and out of a position parallel to the fixed board 1 while the slot 15b, which has a center of rotation about the stud 10, is instrumental in holding the top portion of the guide assembly 3 stationary while the guide assembly 3 is moved vertically. The slot 15d imparts the final horizontal movement to the top of the guide assembly 3 to close it against the fixed board 1.

The link 18 is pivotally coupled at 21 to the arm 22 which is secured to and rotates about the shaft 4. The arm 22 has integral therewith a raised cam portion 22a having a double cam surface which is adapted to cooperate with the wall of the oversized opening 3a, as shown in Fig. 3a, in a manner to be subsequently described.

Operation

In the description of the operation of the plugboard arrangement it shall be assumed that the plugboard is being brought from the open position of Fig. 2 to the closed and operating position of Fig. 4.

In the open position of the plugboard arrangement as shown in Fig. 2, the control panel operating arm 13 and the handle 16 associated therewith are held up through the medium of the spring 23 which has one end fixed to the stud 24 which is, in turn, secured to the fixed board 1 while the other end thereof is fixed to the stud

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25 which is secured to the arm 13 in order that the control panel 5 may be readily removed or inserted, as the case may be, from the control panel guide assembly 3. It should be noted from Fig. 2 that the stud 24 also functions as a stop which limits the movement of the operating arm while in an open position. After inserting the control panel 5 in the guide assembly 3, the plugboard is now in condition to be advanced to a closed position which is brought about by exerting a downward force on the handle 16 which overcomes the resistance of the spring 23.

The force on the handle 16 causes the arm 13, which has a total movement of 145 degrees, to commence rotating in a clockwise direction about the stud 10. During the initial movement of the arm 13, the guide assembly is made to rotate in a counterclockwise direction about the stud 4 due to the action of the guide roller 19, which is mounted on the stud 20 which is, in turn, fixed to the guide assembly 3, being forced to follow the contour of the slot 15a such that after the arm 13 has moved sixty-nine degrees the guide assembly is now in a position parallel to the fixed plugboard as shown in Fig. 3. After this parallel position of the guide assembly 3 has been assumed, the contacts of the control panel 5 are then in an overlapping but not in an engaging position with respect to the contacts of the fixed board 1. During this initial movement of the arm 13, the roller 12, which is mounted upon the plate 7, is riding upon the circular portion of the cam 11, which is rotating in a clockwise direction, whereby the position of the plate 7 remains the same while the stud 17 is riding passively in the slot 14 whereby the position of the link 18 remains substantially unaffected.

After the guide assembly 3 has been brought into a parallel position with the fixed board 1, further lowering of the arm 13 by pushing down on the handle 16 will bring the high portion of the cam 11 into engagement with the roller 12 whereby the plate 7 will be forced upward where the limit of the vertical movement of the plate 7 will be reached when the arm 13 has travelled an arc equal to 119 degrees. As the plate 7 moves in a vertical direction, the cam portion 7a, which is an integral part of the plate 7, pushes up on the roller 9, which is secured to the guide assembly 3, thereby lifting the contacts 6 of the control panel into engagement with the contacts 2 of the fixed board 1 whereby the force upon the contacts is evenly distributed over the entire board. During the vertical movement of the guide assembly 3 the roller 19 travels in the cam slot 15b, which is concentric to the stud 10, and the upper end of the guide assembly 3 undergoes no horizontal movement. It should be noted that as the high portion of the cam 11 moves beyond the vertical center line of the roller 12 that this provision insures the locking of the contacts 2 and 6 while in an engaged position.

After the arm 13 has reached the position of 115 degrees in the path of travel thereof, as shown in Fig. 5, the stud 17 becomes seated in one end of the slot 14, as shown in Fig. 4, whereby as the slot 14 moves in a clockwise direction about the stud 10 a force is exerted upon the stud 17 which pulls in an upward direction on the link 18. As the link 18 moves upwardly it causes the arm 22 to move in a clockwise direction about the stud 4 whereby the left hand cammed portion of the double cam 22a, which is carried by the arm 22, comes into contact with the left hand surface of

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the slot 3a thereby forcing the bottom of the guide assembly 3 and the control panel 5 horizontally to the left. As is shown by Figures 5 and 7a, it should be noted that there exists a slight overlap between the vertical movement of the guide assembly and the horizontal movement of the lower portion of the guide assembly. After the arm 13 has travelled an arc of 123 degrees and after the beginning of the horizontal movement of the lower portion of the guide assembly 3, the upper portion of the assembly 3 is moved horizontally toward the board 1 through the action of the contour of the slot 15d upon the guide roller 19. This horizontal movement of the control panel 5, which is carried by the assembly 3, results in a wiping action between the contacts 2 and 6 while under full contact pressure thereby eliminating any possible electrical contact failures due to the accumulation of foreign matter thereon.

The action of the various elements of the plug-board arrangement in being moved from an operating position, as shown in Fig. 4, to an open position, as shown in Fig. 2, is shown in Fig. 6. For the first two degrees of travel of the arm there is no movement of the guide assembly 3 and the control panel 5 but as the arm traverses the arc of travel from 143 to 123 degrees the top portion of the guide assembly will be moved horizontally to the right. Further movement of the arm 13 back to 69 degrees results in the guide assembly being dropped thus resulting in the contacts of the control panel and the fixed plugboard being separated. At 69 degrees the top of the guide assembly 3 begins to move out under the action of cam slot 15a and this continues to 0 degrees. When the arm 13 has reached a point in the travel thirty degrees from the end thereof, the stud 17 becomes seated in an end of the slot 14 thereby forcing the link 18 down and resulting in the movement of the double cam portion 22a of the member 22 whereby the right hand cam portion pushes out on the wall of the opening 3a resulting in the bottom portion of the guide assembly being moved horizontally in a direction away from the fixed board 1.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In an interconnecting plugboard for electrical accounting machines comprising a fixed plugboard having a first set of contacts, a guide assembly loosely pivoted to said plugboard, a control panel having a second set of contacts adapted to be inserted in said guide assembly, an operating arm having an arcuately shaped slotted portion pivotably coupled to said plugboard, means operably coupling said slotted portion with said guide assembly such that said slotted portion determines the path of movement for said panel whereby the initial movement of said arm causes said panel to be brought into a position vertical and parallel with respect to said plugboard with said first and second set of contacts being in a non-touching over-lapping position, a first cam means coupled to said arm, a

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plate having a second cam means integral therewith movably secured to said plugboard, said second cam means adapted to operate upon said assembly, roller means attached to said plate, said first cam due to the further movement of said arm vertically moving said plate by pushing upward against said roller whereby said second cam operates to lift said panel thereby bringing into engagement said first and second set of contacts, and means for moving said second set of contacts horizontally thereby causing a wiping with said first set of contacts.

2. In an interconnecting plugboard for accounting machines comprising a fixed plugboard having a plurality of contacts, a control panel having a plurality of contacts adapted to engage said contacts of said fixed plugboard, a guide assembly pivotably coupled to said plugboard and adapted to carry said panel, an operating arm pivotably coupled to said plugboard, said arm having first and second slotted portions, said first portion comprising first and second interconnected curved sections, stud means operably coupling said first portion with said guide assembly whereby the cooperation of said stud means with said first curved section causes said assembly to be moved into a position vertical and parallel with respect to said plugboard, said contacts of said plugboard and said panel assuming an over-lapping non-touching position when said assembly is moved into a parallel position, means for lifting said contacts of said panel into engagement with said contacts of said plugboard, means operably coupled to said second slotted portion for moving horizontally the lower portion of said guide assembly, said second curved section adapted to cooperate with said stud means whereby the upper portion of said guide assembly is moved horizontally toward said plugboard, said horizontal movement of said upper and lower portions of said assembly causing a wiping action to take place between said contacts.

3. In an interconnecting plugboard for accounting machines comprising a fixed plugboard having a plurality of contacts, a supporting frame pivotably coupled to said plugboard, a control panel operably associated with said frame and having a plurality of contacts adapted to engage said contacts of said fixed plugboard, a positioning member pivotably coupled to said fixed plugboard and operably coupled with said frame, said member including a first means for moving said panel into a vertical and parallel position with respect to said fixed plugboard such that said contacts of said plugboard are in an overlapping position, a second means for causing said contacts to be brought into engagement, and a third means for shifting horizontally said contacts of said panel whereby a substantial wiping action of said contacts is produced.

4. In an interconnecting plugboard for accounting machines as claimed in claim 3 wherein said member includes a pair of arcuate interconnected slots with each of said slots being of a different center of rotation, the movement of said frame being guided by said slots such that one of said slots will cause said frame to be brought into a vertical position while the other of said slots will move said frame in a horizontal direction when said member is moved about its pivot.

5. A plugboard arrangement for electrical accounting machines comprising a first plugboard having a first set of contacts, a supporting frame loosely pivoted to said plugboard, a second plugboard having a second set of contacts adapted

to engage said first set of contacts, said frame being adapted to carry said second plugboard, an operating arm pivotably coupled to said first plugboard and slidably coupled to said second plugboard, said arm upon being moved about its pivot causing said second set of contacts to be brought into an overlapping position with said first set of contacts, cam means coupled to said first plugboard, said cam means being rendered effective by said arm after said contacts are brought into an overlapping position, said cam means causing said first and second set of contacts to be brought into engagement upon becoming effective, and means for horizontally moving said second contacts so as to cause a wiping action on said first set of contacts.

6. In an interconnecting plugboard for electrical accounting machines comprising a first and second plugboard each having a set of contacts, a supporting member adapted to carry said second plug board, said supporting member being loosely pivoted to said first plugboard, an operating arm for moving said contacts into engagement, said arm being pivotably coupled to said first plugboard, said arm including a slotted portion for slidably coupling said arm to said second plugboard, said slotted portion including a pair of arcuate slots of different radii, said arm upon being moved about its pivot and by means of one of said slots causing said second plugboard to be brought into a vertical and parallel position with respect to said first plugboard whereby said contacts assume an overlapping position, means controlled by said arm for camming said contacts into engagement, and means including the other of said slots for relatively moving said contacts in a horizontal direction.

7. In an interconnecting plugboard arrangement for electrical accounting machines comprising a fixed plugboard having a first set of contacts, a control panel having a second set of contacts, a supporting frame adapted to carry said control panel, said frame being loosely coupled to the lower end of said fixed plugboard, an operating arm pivotably coupled to said fixed plugboard and including an elongated arcuate slotted portion, means for slidably coupling said frame with said slotted portion, means includ-

ing a first predetermined length of said slotted portion for positioning said panel parallel to said fixed plugboard whereby said first and second contacts are in a spaced relationship, a first cam means controlled by said arm for lifting said second set of contacts into engagement with said first set of contacts, a second cam means controlled by said arm for horizontally moving the lower portion of said contacts, and means including a second predetermined length of said slotted portion for horizontally moving the upper portion of said contacts.

8. In an interconnecting plugboard for electrical accounting machines comprising a fixed plugboard having a first set of contacts, a guide assembly pivotably coupled to the lower end of said plugboard, a removable plugboard having a second set of contacts, said assembly being adapted to support said removable plugboard, an operating arm pivotably secured to said fixed plugboard, said arm having a pair of curved interconnected slots of different centers of rotation, means for slidably coupling said assembly to said slots such that said slots guide the movement of said assembly, means including one of said slots for causing said assembly to be brought into a parallel plane with said fixed plugboard during the initial movement of said arm such that said first and second contacts are in an overlapping position, cam means controlled by said arm and rendered effective after said assembly assumes a parallel relationship with said fixed plugboard for moving said first and second set of contacts into engagement, and means including the other of said slots for horizontally moving said second set of contacts in such a manner as to wipe said first set of contacts.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,929,293	Saint-Germain	Oct. 3, 1933
2,111,118	Lake	Mar. 15, 1938