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Fiddler et al.

[11] **3,845,257**

[45] **Oct. 29, 1974**

[54] **ELECTRICAL AND FLUID SWITCH WITH CROSSING SLIDE CHAMBERS**

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[73] Assignee: **said Fiddler, by said Adams**

[22] Filed: **Mar. 29, 1973**

[21] Appl. No.: **345,977**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 315,106, Dec. 14, 1972.

[52] **U.S. Cl.** ..... **200/61.86,** 200/153 LA

[51] **Int. Cl.** **H01h 3/04,** H01h 9/26

[58] **Field of Search** ..... 200/61.86, 153 W, DIG. 5, 200/81 H, 153 LA

[56] **References Cited**

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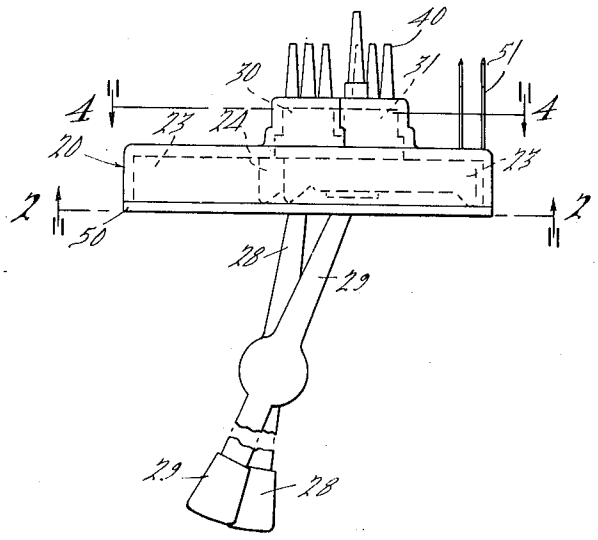
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Assistant Examiner—Gerald P. Tolin
Attorney, Agent, or Firm—William T. Sevald

[57] **ABSTRACT**

An apparatus for controlling electromotive force (EMF) and/or fluid pressure force (FPF) in a system having a case with walls defining at least one slide chamber and one or more intercommunicating cross-slide chambers. The case walls at the chambers carry circuit terminals for connection in the circuits of a system. The circuit terminals may be electrical contacts and/or fluid ports connected in a system by wires and tubes respectively. The slide and cross-slide carry circuit making and breaking means for connecting and disconnecting circuits in a system. The circuit making and breaking means may be a switch for coaction with the electrical contacts and/or a channel maze for coaction with the fluid ports. The slide carries at least one cam track and each cross-slide carries a cam lying in a cam track. With movement of the slide in one direction each cam track imparts transverse movement to each cross-slide at desired points of travel. The movement of the slide and the transverse movement of the cross-slide actuates the making and breaking means on the slide and/or cross-slide relative to the circuit contacts on the case to open and close circuits as coordinated in the engineering to the position of the slide and/or cross-slide.

3 Claims, 10 Drawing Figures



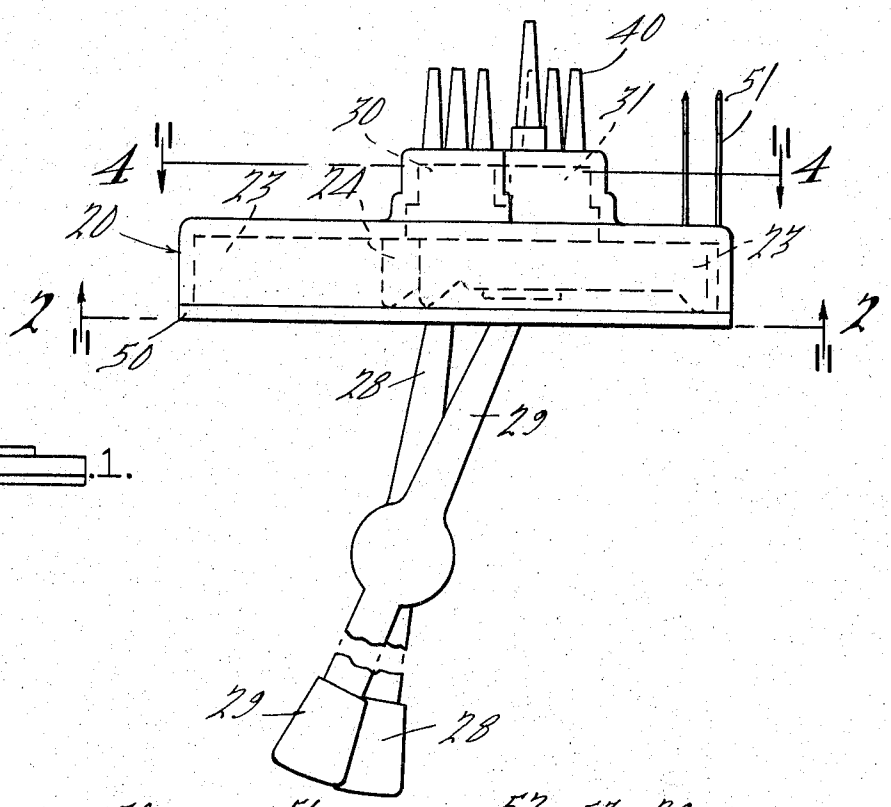


Fig. 1.

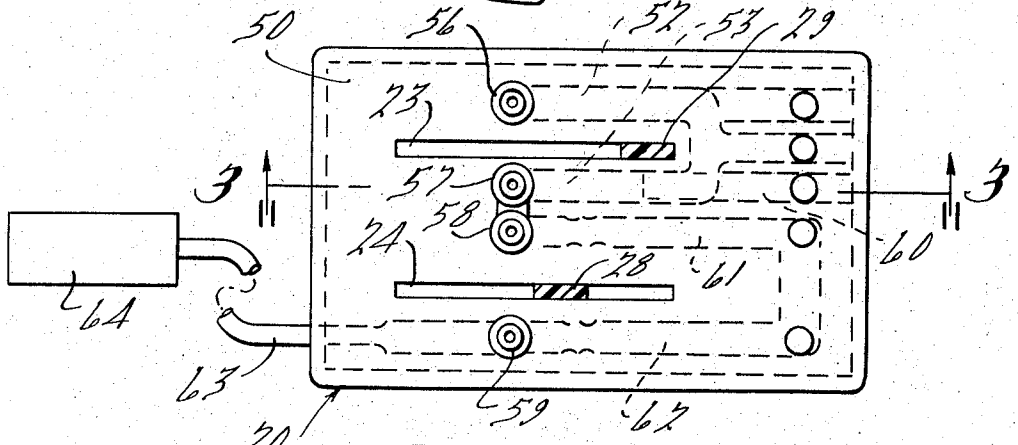


Fig. 2.

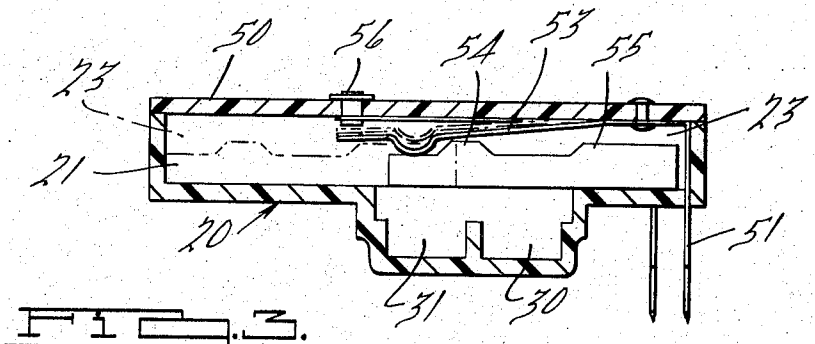


Fig. 3.

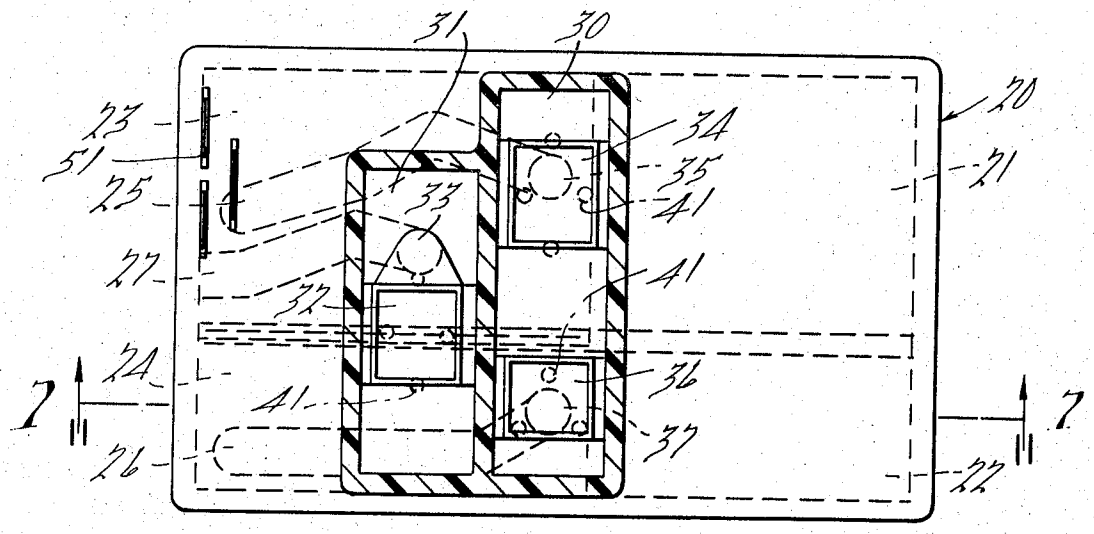


Fig. 4.

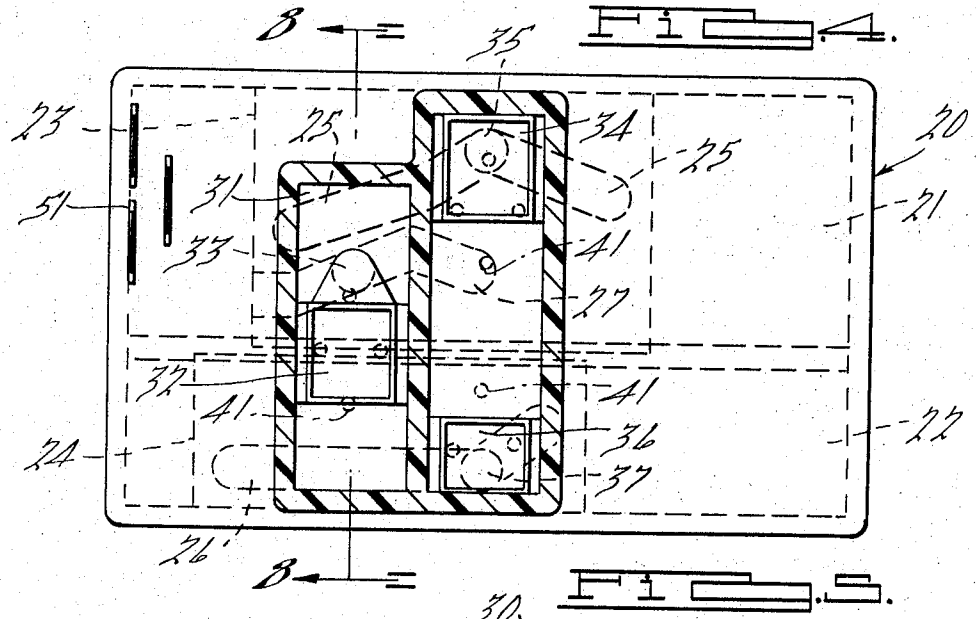


Fig. 5.

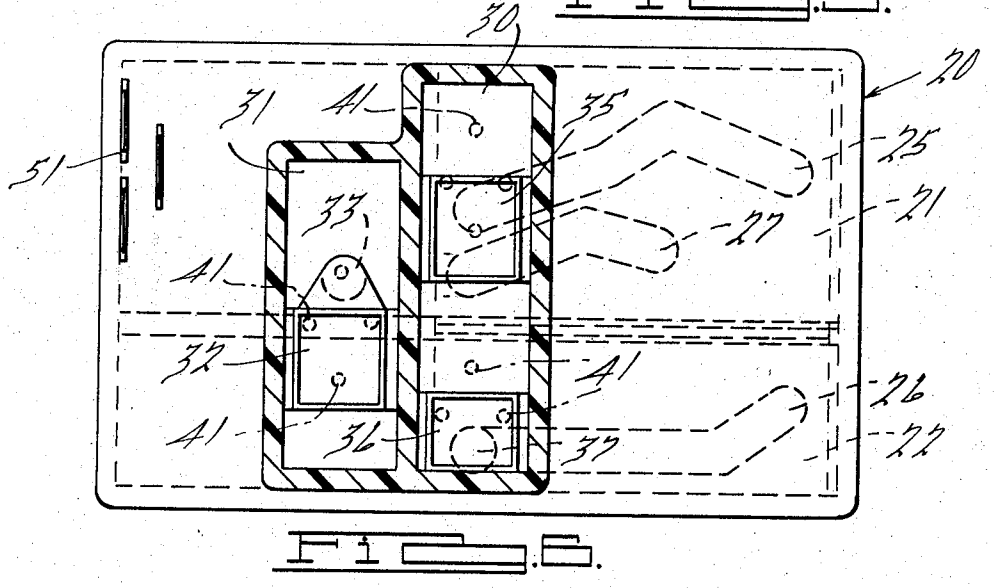


Fig. 6.

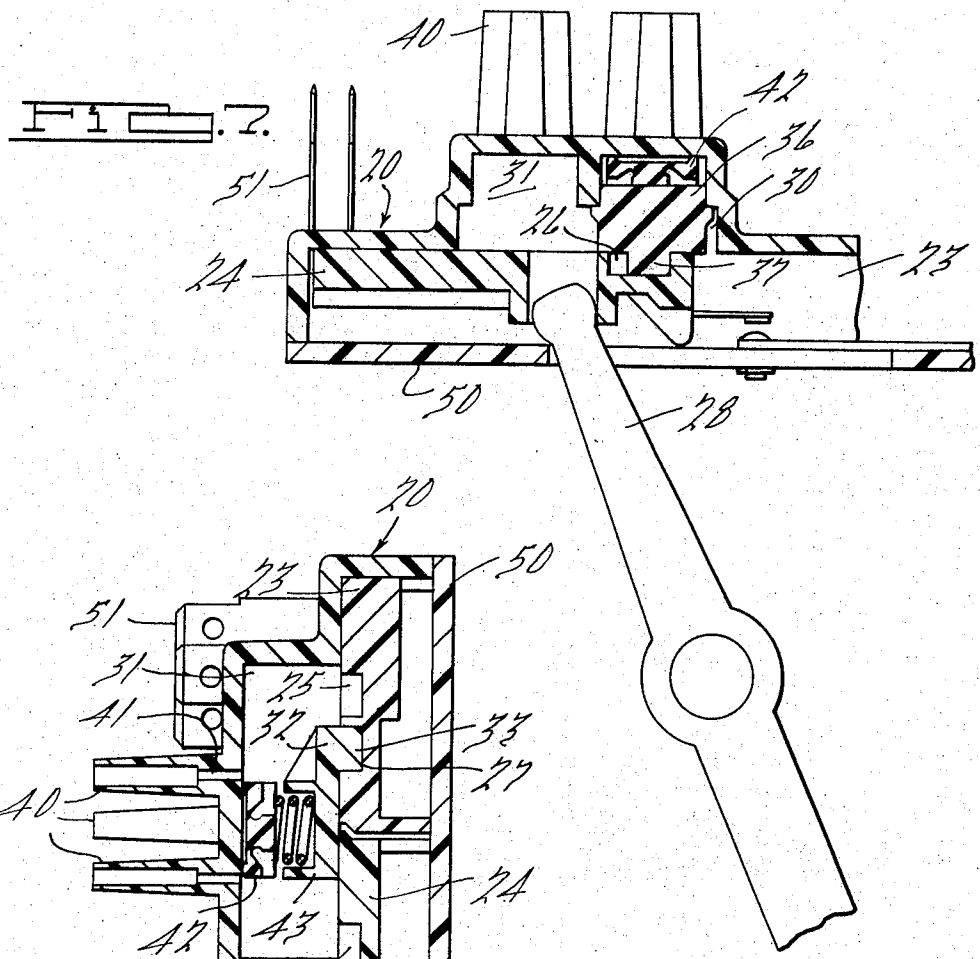


Fig. 7.

Fig. 8.

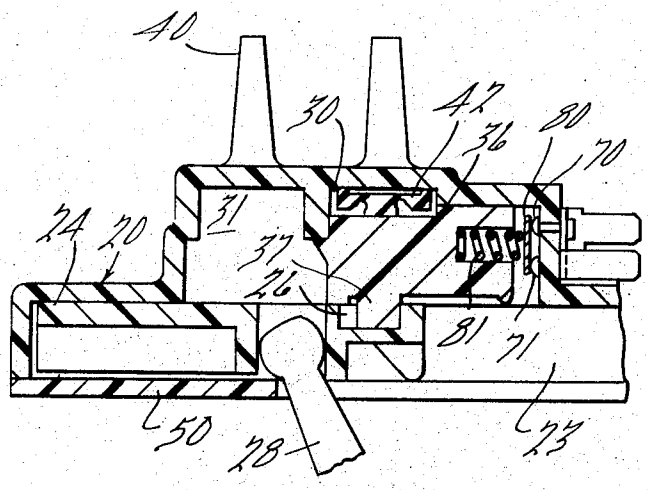


Fig. 9.

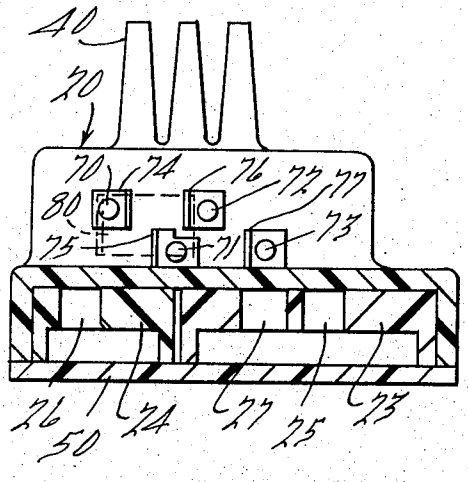


Fig. 10.

ELECTRICAL AND FLUID SWITCH WITH CROSSING SLIDE CHAMBERS

This is a continuation-in-part of our application Ser. No. 315,106 filed Dec. 14, 1972. The applicants are the patentees in U.S. Pat. Nos. 3,637,961 and 3,637,962 for control devices.

BACKGROUND OF THE INVENTION

Control programs for applying EMF and/or FPF in systems are becoming more complicated and use more circuits while the space allotted to the control devices is becoming smaller. Thus the control devices are being called upon to handle more circuits and to be reduced in size. Also, the programs are becoming more varied in many uses so that the control device is also called upon to be adaptable to handle many variations in programs in numerous systems.

SUMMARY OF THE PRESENT INVENTION

With the foregoing in view, it is an object of the invention to provide a control device which is reduced in size, which has capacity for controlling more circuits in a system, and which may be varied to suit various programs in many systems.

An object of the invention is to provide a case having a slide with relative motion and multiple positions between the slide and the case and a cross-slide with relative motion and various positions between the cross-slide and the case.

An object of the invention is to use the movement of the slide to actuate movement of the cross-slides so that they move with coordinated action.

An object of the invention is to provide cam tracks on the slide and a cam on each cross-slide lying in one of the cam tracks to impart movement to each cross-slide in conjunction with movement of the slide.

An object of the invention is to provide cam and cam track actuation between a slide and cross-slides so that a portion of the programmed control of the circuits may be engineered into the cam tracks.

An object of the invention is to provide cam and cam track actuation and program control so that the control device can be easily changed in its manufacture to suit the demands of each sutomer by changing the cam tracks.

An object of the invention is to provide a control device that has an increased number of circuits connections providing more selection for the user and reduced size so that less space is occupied by the device.

These and other objects of the invention will become apparent by reference to the detailed description of the illustrated embodiments of the invention taken in connection with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a control device embodying the invention indicating internal parts in broken lines and showing nipples at the FPF ports and an EMF terminal strip.

FIG. 2 is a back elevational view of the device of FIG. 1 as seen from the bottom of FIG. 1, with the operating levers shown in cross-section, additionally showing an electric cord and connector, and showing internal electrical leads in broken lines.

FIG. 3 is a cross-sectional view of the device taken on the line 3—3 of FIG. 2, showing the slide and EMF

contacts in elevation and indicating a changed position of the slide in broken lines.

FIG. 4 is a cross-sectional view of the device seen in FIG. 1 taken on the line 4—4 thereof showing the cross-slides, and indicating the cams on the cross-slides, the cam tracks behind the cross-slides and the slide chambers in the case in broken lines and indicating the FPF ports by phantom broken lines.

FIG. 5 is a view similar to FIG. 4 showing the cam tracks, cams and cross-slides in different positions upon changed position of the slides.

FIG. 6 is a view similar to FIGS. 4 and 5, showing the same parts in different positions.

FIG. 7 is a cross-sectional view of the device seen in FIG. 4 taken on the line 7—7 thereof, showing the slide in cross-section and the cross-slide and cam in elevation, and showing the operating lever in elevation and broken away.

FIG. 8 is a cross-sectional view of the device seen in FIG. 5 taken on the line 8—8 thereof showing the slide, cross-slide, cam, nipple, port and channel maze in cross-section.

FIG. 9 is a view similar to FIG. 7 showing an embodiment of the invention having EMF contacts actuated by the cross-slide; and

FIG. 10 is a side view of the device seen in FIG. 9 taken from the right side thereof, partly in cross-section and partly in elevation, showing the spaced disposition of the EMF contacts and terminals on the case.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now to the drawings wherein like reference numerals refer to like and corresponding parts throughout the several views, the control apparatus for electrical and/or fluid force comprises, FIGS. 1–4, a case **20** having a cavity defining a first slide chamber **21** and a cavity defining a second slide chamber **22.** A first slide **23** lies in the chamber **21** and a second slide **24** lies in the chamber **22.** Cam tracks **25** and **27** are carried by the slide **23** and a cam track **26** is carried by the slide **24.** An operating lever **28** is connected to the second slide **24** and an operating lever **29** is connected to the first slide **23.** Movement of the operating levers **28** and **29** moves the slides **24** and **23** in the slide chambers **22** and **21** respectively.

Transverse cavities in the case **20** define cross-slide chambers **30** and **31.** A cross-slide **32** lies in the cross-chamber **31.** A cam **33** on the cross-slide **32** lies in the cam track **27** of the first slide **23.** A cross-slide **34** lies in the top of the cross-chamber **30.** A cam **35** on the cross-slide **34** lies in the cam track **25** of the first slide **23.** A cross-slide **36** lies in the bottom of the cross-chamber **30.** A cam **37** on the cross-slide **36** lies in the cam track **26** of the second slide **24.**

Relative to control of FPF, nipples **40** on the case **20** at the cross-chambers **30** and **31** surmount ports **41** in the case **20** at the cross-slides **32, 34,** and **36.** A channel maze **42** on the cross-slide **32** slides against the wall of the case **20** at the ports **41** and is resiliently pressed thereagainst by a spring **43,** FIG. **8.** The cross-slides **34** and **36** are similarly housed, formed, and equipped and the case **20** has ports **41** similarly integrated therewith.

Relative to control of EMF, a back wall **50** is mounted on the case **20,** FIGS. **1–3.** A terminal **51** connects to one side of EMF power supply. Spring switch

arms 52 and 53 lead directly from the terminal 51. Cams 54 and 55 on the top slide 23 actuate the switch arms 52 and 53. Switch contact points 56, 57, 58 and 59 are carried by the back wall 50. The switch arms 52 and 53 engage the contact points 56 and 57 respectively when moved by the cams 54 and 55 upon movement by the top slide 23 as indicated by the broken line indcation, FIG. 3. A cross-connector 60 is mounted on the back wall 50. Switch arms 61 and 62 are connected to the cross-connector 60 and are actuated similarly by the bottom slide 24 by cams as described relative to the top slide against the contact points 58 and 59. Leads 63 are connected to each contact point 56–59 as illustrated relative to contact point 59. The leads 63 are accummulated in a plug 64. The cross-connector 60 may be fixedly connected to the terminal 51 or it may be engaged by the actuation of a switch arm such as the switch arm 53 as shown. Thus the supply of EMF to the switch arms 61 and 62 may be made dpendent on the actuation of another switch such as switch arm 53. This may be programmed in the control system so that an operator-user must first actuate a certain portion of a system before he may actuate another portion. Obviously the terminal 51 may be fixedly connected to the switch arms 61 and 62 rendering them independently operable.

EMF control may also be provided at the cross-slides 32, 34 and 36 as shown in FIGS. 9 and 10 relative to bottom cross-slide 36 and it will be understood that the other cross-slides 32 and 34 may be similarly equipped. Contact points 70–73 lie spaced inside the case 20 in the cross-slide chamber 30 at the cross-slide 36 and have exterior terminals 74–77 respectively for receptacle connection. A contactor plate 80 is carried by the cross-slide 36. A spring 81 urges the plate 80 toward the contact points 70–73. Movement of the cross-slide 36 carries the plate 80 relative to the contact points 70–73 to complete and interrupt circuits between the contact points 70–73 as engineered in the design of the system by the spacing and position of the contact points 70–73 and the size and shape of the plate 80 to control EMF in a system.

The location of the cams 54 and 55, FIG. 3, on the top and bottom slides 23 and 24, the placement of the switch arms 52, 53, 61 and 62, FIG. 2, the positioning of the contact points 70–73, FIG. 10, are engineered into the device for the system desired together with the location of the ports 41 relative to the channel maze 42 on each cross-slide 32, 34 and 36 and the channeling and blocking configuration of each channel maze 42, FIGS. 4–9, the independency of dependency of the circuits exemplified by the switch arms 52, 53, 61, and 62, and the angles and conformation of the cam tracks 25, 26, and 27, FIGS. 4–6, relative to the cams 33, 35, and 37 on the cross-slides 32, 34, and 36.

In operation FPF tubes, not shown, are connected on the nipples 40 between supply and use and EMF circuits, not shown, are connected to the terminals 51, 63, and 74–77. When the user swings the lever 29 it moves the top slide between the dotted line positions indicated and the solid line showings of FIGS. 3–6 during which the cams 54 and 55 actuate the switch arms 52 and 53 and the cam tracks 25 and 27 actuate the cross-slides 32 and 34 via the cams 33 and 35 respectively relative to the ports 41. If the circuit to the switch arms 61, 62 is dependent, this also actuates the cross-connector 60.

Upon the user swinging the lever 28 it moves the bottom slide 24 between the positions indicated in broken lines FIGS. 1 and 4–6 and solid line positions shown, FIGS. 7–10, during which like cams 54 and 55, not shown, actuate the switch arms 61, 62, FIG. 2, and the cam track 26 actuates the cross-slide 36 via the cam 37 relative to the ports 41, FIGS. 4–10, and also moves the plate 80, FIGS. 9, 10, relative to the point contacts 70–73.

It will be understood that due to the interaction between the slides 23 and 24 and cross-slides 32, 34 and 36 that many EMF and FPF circuits can be controlled in coordination with one another in a very small space and that the device is capable of controlling a large plurality of circuits.

The device and elements shown are exemplary and the scope of the protection of the invention is defined in the appended claims.

We claim:

1. A control device comprising,

a case having a front wall, opposite end walls, and opposite top and bottom walls; said case walls having interior surfaces defining an interior linear slide chamber in said case; said front wall having an opening therein intermediate said end walls and extending toward said top and bottom walls;

a housing on said front wall overlying said opening in said case front wall; said housing having a face wall, opposite side walls, and opposite upper and lower walls; said housing walls having interior surfaces defining an interior cross-slide chamber in said housing relative to said linear slide chamber in said case;

a cross-slide in said housing in sliding contact with said housing side walls and in spaced relationship to said housing upper and lower walls for movement toward and away from said upper and lower walls of said housing;

a cam on said cross-slide extending into said case;

a linear slide in said case in sliding contact with said case top and bottom walls and in spaced relationship to said case end walls for movement toward and away from said end walls of said case;

said linear slide abutting said cross-slide to position said cross-slide in said housing;

said linear slide having a cam track receiving and engaging said cam on said cross-slide so that linear movement of said linear slide between said case end walls effects transverse movement of said cross-slide between said housing upper and lower walls,

a back wall on said case in sliding contact with said linear slide containing said linear slide in said case;

means on said back wall for moving said linear slide to selected positions between said case end walls;

FPF ports in said face wall of said housing,

attaching means surmounting said ports for connecting said ports to FPF supply and use; and

a channel maze switch-valve on said cross-slide facing said ports for selectably interconnecting and blocking fluid communication between said ports relative to FPF supply and use coordinated with the position of said cross-slide in said housing.

2. In a device as set forth in claim 1,

EMF contacts on said housing leading to the interior surface of one said end wall of said housing adjacent said cross-slide,

connector means on said housing connected to said contacts for attaching EMF supply and use lines to said contacts, and

a switch plate on said cross-slide facing said contacts for selectably interconnecting and disconnecting electrical communication between said contacts relative to EMF supply and use coordinated with the position of said cross-slide in said housing.

3. In a device as set forth in claim **1,**

EMF contacts on said case leading to the interior surface of said back wall of said case adjacent said linear slide,

connector means on said case connected to said contacts for attaching EMF supply and use lines to said contacts,

switch means on said back wall facing said contacts for selectably interconnecting and disconnecting electrical communication between said contacts relative to EMF supply and use; and

means on said linear side for operating said switch means coordinated with the relative position of said linear slide in said case.

* * * * *