

[54] ACTUATOR FOR ELECTRO-MOTIVE
FORCE AND FLUID PRESSURE FORCE

[75] Inventors: Theodore E. Fiddler, 1268 Suffield
Dr., Birmingham, Mich. 48008;
Arnold G. Adams, Troy, Mich.

[73] Assignee: said Fiddler, by said Adams

[22] Filed: Dec. 14, 1972

[21] Appl. No.: 315,106

[52] U.S. Cl. 200/61.86, 200/DIG. 5, 200/81 H

[51] Int. Cl. H01h 9/06

[58] Field of Search 200/61.86, DIG. 5, 81 H

[56] References Cited
UNITED STATES PATENTS

2,914,629	11/1959	D'Aprile et al.	200/61.86
3,051,801	8/1962	Tranbarger et al.	200/61.86
3,122,616	2/1964	Rice et al.	200/61.86

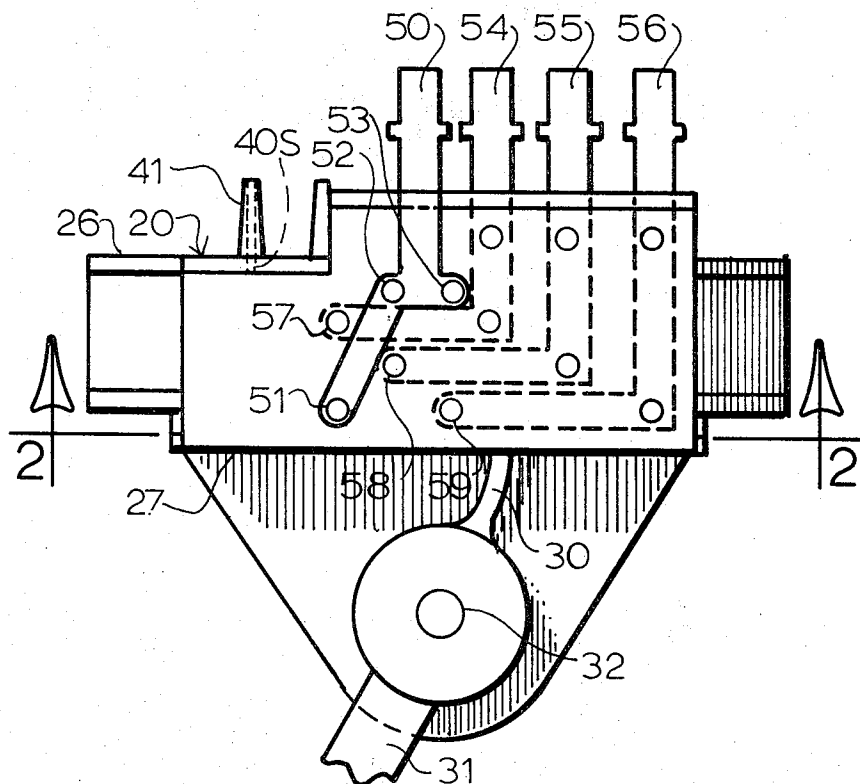
Primary Examiner—Robert K. Schaefer
Assistant Examiner—Gerald F. Tolin
Attorney, Agent, or Firm—William T. Sevald

[57]

ABSTRACT

A control device having one moving body for actuating application of both electro-motive-force (EMF) and fluid-pressure-force (FPF) in a system such as vehicular heating, ventillating, and/or air-conditioning having a case with a first wall equipped with selectively positioned FPF ports located between FPF supply and use in the system and a second wall equipped with EMF selectively positioned contacts located between EMF supply and use in a system; a movable body having a first surface equipped with a grooved maze lying against the ported wall of the case forming a plurality of selective FPF channels relative to the FPF supply and use ports and having a second surface equipped with a slide bridge member for selectively interconnecting the contacts to close EMF circuits; and means for selectively moving the body relative to the case to change the maze channels relative to the FPF ports and change the bridge member relative to the EMF contacts to selectively and simultaneously control the application of EMF and FPF in the system.

3 Claims, 8 Drawing Figures



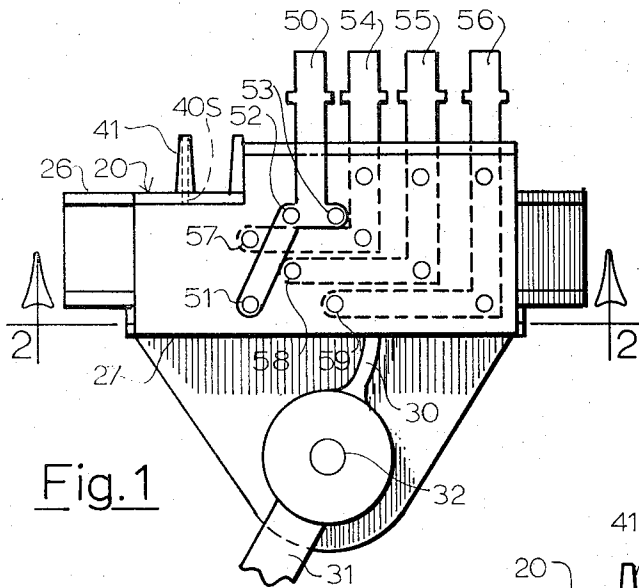


Fig. 1

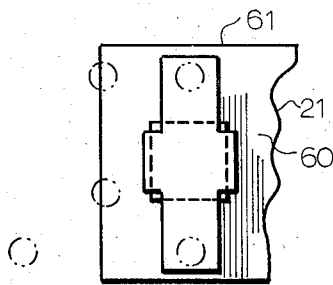


Fig. 3

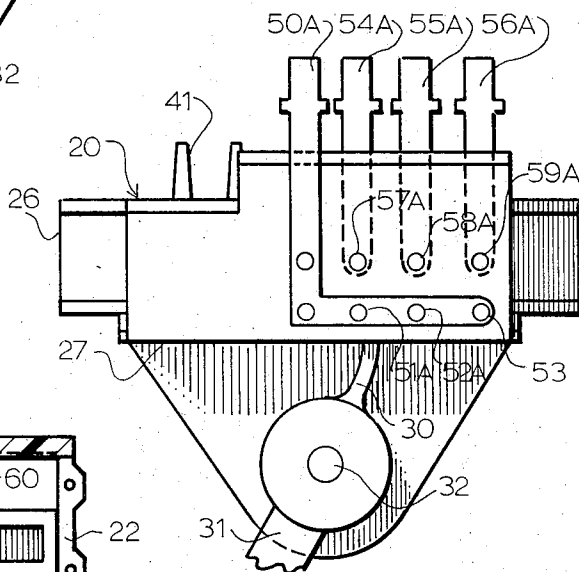


Fig. 4

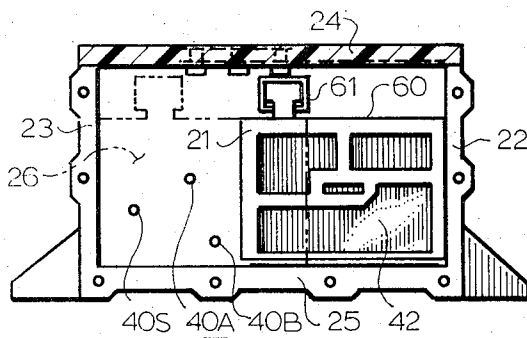


Fig. 2

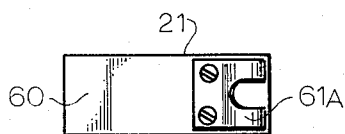


Fig. 5

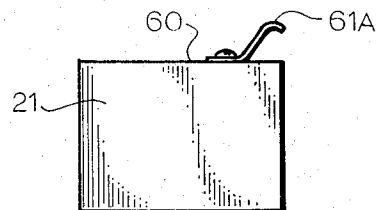
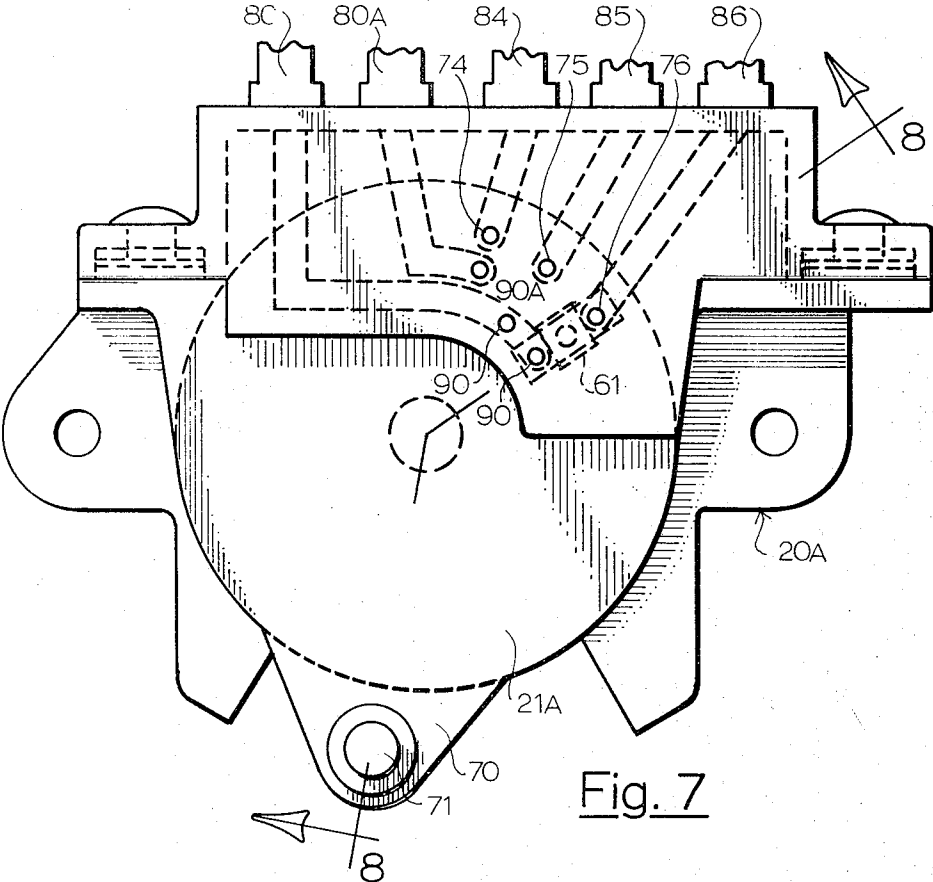
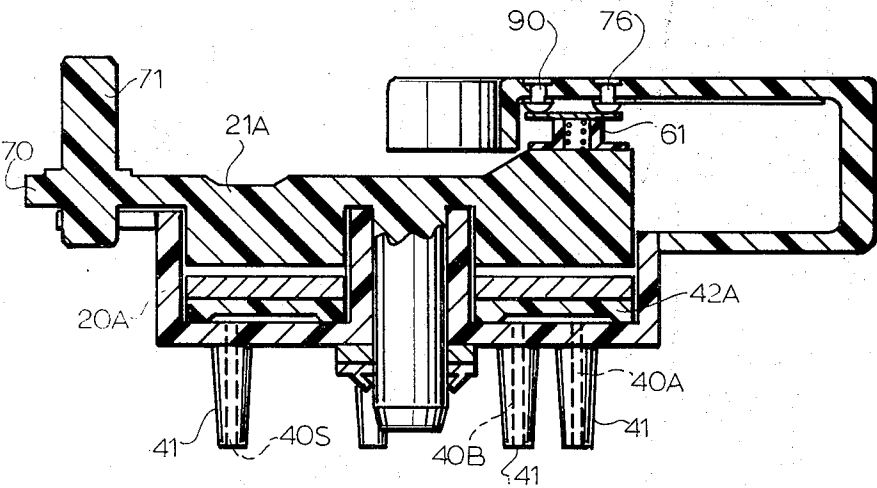


Fig. 6



ACTUATOR FOR ELECTRO-MOTIVE FORCE AND FLUID PRESSURE FORCE

BACKGROUND OF THE INVENTION

In the prior art devices, the fluid power force and the electro-motive force are controlled by separate parts or devices and their coaction integrated by connecting devices which are cumbersome, expensive, and difficult to maintain. These prior art devices have grown larger, more cumbersome, more complicated, more expensive, and have more parts year after year.

SUMMARY OF THE PRESENT INVENTION

It is an object of the invention to provide an electro-motive force (EMF) and fluid-pressure-force (FPF) control device which has a single moving body, is simple in design and construction, inexpensive to manufacture, easy to operate, use, and repair, and facile to place, mount, and connect.

It is a further object of the invention to provide a slide member for closing circuits between electrical contacts selectively to control EMF in a system.

A further object of the invention is to provide a case equipped with FPF connections and ports and equipped with EMF terminals and contacts.

A further object of the invention is to provide a single moving body in the case having a plural channel maze side relative to the FPF ports and a bridge member slidable relative to the EMF contacts so that movement of the body relative to the case selectively actuates the desired coordinated application of both EMF and FPF in a system.

These and other objects of the invention will become apparent by reference to the following description of a control device embodying the invention taken in connection with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a linearly moving control device embodying the invention with the top cover wall removed, showing the EMF connections in elevation, showing the EMF contact points, and showing the actuator lever foreshortened.

FIG. 2 is an enlarged face elevational view of the device of FIG. 1, as seen on the line 2—2 thereof, showing the slide body in the device from the FPF channel maze side and showing the EMF sliding contactor member relative to the EMF contact points.

FIG. 3 is an enlarged partial cross-sectional view showing the wall supporting the EMF contacts and the EMF slide contactor in elevation with the ends of the wall broken away.

FIG. 4 is a view similar to FIG. 1 showing a different arrangement of EMF contacts.

FIG. 5 is a reduced top plan view of the slide body showing a modification of the sliding contact member.

FIG. 6 is a side elevational view of the slide body and sliding contact member seen in FIG. 5.

FIG. 7 is a view similar to FIGS. 1 and 4 showing an angularly moving slide body showing the EMF sliding contact member in dotted lines; and

FIG. 8 is a cross-sectional view of the device seen in FIG. 7, taken on the 8—8 of FIG. 7.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENT

Referring now to the drawings wherein like numerals refer to like and corresponding parts throughout the several views, the control devices disclosed therein to illustrate the invention comprise, a case 20 and a linear slide body 21, FIGS. 1-6, and an annular case 20A and rotary sliding body 21A, FIGS. 7 and 8. The case 20 has opposite end walls 22 and 23, a top wall 24, a bottom wall 25, a front wall 26, and a back wall 27. The walls 22-27 define a hollow interior and house the body 21 therein. The walls 22-27 of the case 20 may be split as desired, wherein selected walls are separately attached to the other walls to provide means to open the case 20.

An arm 30 extends into the back wall 27. A lever 31 is fulcrumed on the arm 30 by a stud 32 and is connected to the arm 30. The lever 31 leads through a slot in the back wall 27 into the interior of the case 20. An inner end of the lever 31 sits in a pocket in the body 21.

By swinging the lever 31, the body 21 is caused to slide against the front wall 26 to locate and hold the body 21 at the linearly adjusted position.

Ports 40, such as 40S, 40A, and 40B, are formed in the front wall 26 and shown schematically in FIG. 2, wherein the front wall 26 is removed. Nipples 41 or other connecting means surmount the ports 40 outwardly of the case 20 for connection to tubular lines. A channel maze 42 of at least two channels is formed on a surface of the body 21. The channel maze surface 42 on the body 21 bears against the front wall 26 and coacts with the ports 40 selectively at various linear positions as desired and integrated in the positioning of the ports 40 and the design of the channel maze surface 42. By swinging the lever 31, the maze surface 42 is moved relative to the ports 40 to change channeling therebetween.

It will be understood that the channel maze surface 42 may be grooved as desired to connect and/or block use ports 40A, B, C, relative to the supply port 40S at the various positions of the body 21 as desired.

FPF supply may be higher or lower than atmospheric pressure and is connected to one or more ports 40 by tubular lines. FPF tubular lines to use are connected also to items which are powered thereby.

An electrical terminal strip 50 on the case wall 24 has three contacts 51, 52, and 53. Terminal strips 54, 55, and 56 on the case top wall 26 have contacts 57, 58, and 59 respectively which, when bridged, complete a circuit to the contacts 51, 52, and 53 respectively. The slide body 21 has a surface 60 equipped with a sliding contact member 61. The contact member 61 bridges the contacts 51, 52, and 53 and the contacts 57, 58, and 59 respectively to make and break circuits. By swinging the lever 31, the contact member 61 is slidably moved relative to the contacts 51-57, 52-58, and 53-59 to close circuits therebetween. A modified contact member 61A of FIGS. 5 and 6 operates similarly.

FIGS. 4, 5, and 6 show a different arrangement of the terminal strips 50A, 54A, 55A, and 56A and a different arrangement of the contacts 51A-53A and 57A-59A.

EMF wires are connected to the terminal strips in circuits between supply and use, and connect to items

which are powered thereby when the sliding bridge member 61 or 61A is actuated.

Referring now to FIGS. 7 and 8, the angular movement control device shown therein comprises an annular case 20A and a pivoting body 21A swung by an extension 70 and a handle 71. The body 21A carries the bridge member 61. Contacts 74, 75, and 76 on the terminal strips 84, 85, and 86 and contacts 90 and 90A on the terminal strips 80 and 80A are paired. The contacts are arranged accurately with strips 90 and 90A being two separate EMF circuit supply strips. By moving the body 20A angularly, the bridge member 61 closes the circuits between the contacts selectively at the various angular positions of the bridge member 61. The FPF channel maze member 42A is circular and turns with the body 21A relative to the ports 40S and 40A, etc., surmounted by the nipples 41. By swinging the body 21A angularly, the channels of the maze member 42A are selectively changed relative to the FPF supply and use ports 40S, 40A, etc.

The number of switch arms, contacts, and terminals, the number of ports and channels, and the number of various positions are designed and engineered in the device to suit the needs of desired control and/or to provide a device with a large plurality of EMF and FPF actuation positions so that less than all control positions may be selectively used. While the movement of the body 21, 21A has been shown and described as lever actuated, the body 21, 21A and case 20, 20A relative movement may be actuated by cams, cables, etc.

In an exemplary installation of the control device of the invention in a vehicle heating, ventilating, and/or air conditioning system, the FPF circuits are connected to the pressure powered servo-mechanisms, and/or motors and the EMF circuits are connected to the electrically powered servo-mechanisms and/or motors. In the control of the system, the FPF and EMF powered elements are coordinated by operating sequences and non-operating sequences. The inter-action of the ports 40 and channel maze surface 42, 42A is coordinated with the inter-action of the contacts and the bridge member 61 to control, selectively and in combination, the operating sequences and the non-operating sequences of the powered items in the system. The coordinated inter-action may be engineered and designed in the device to suit the needs of any particular system or the system may be engineered to suit the operation of any control device or various models of control devices.

The scope of the invention is defined in the appended claims.

We claim:

1. A control device having a single moving body controlling the application of both EMF and FPF in a system, comprising,

a case having at least a first wall and a second wall,

a single body in said case constituting said single moving body having at least a first surface and a second surface;

said first and second body surfaces lying adjacent said case first and second walls respectively;

means for moving said single body and said case relative to one another to locate said single body relative to said case in at least two positions,

said case having at least one FPF supply port and at least one FPF use port in said first wall surmounted by means for making connections to FPF supply and use,

said single body first surface movably sealing against said first ported wall of said case,

said single body first surface having a grooved maze constituting at least two separate channels between said FPF supply and use ports with at least one said channel selectively communicating between FPF supply and use ports at one said position of said single body relative to said case to effect desired application of FPF in a system,

said case having at least two sets of EMF contacts on said second wall,

EMF terminals on said case leading to and from said contacts for connection to EMF supply and use;

said single body second surface having a sliding bridge member for selectively making electrical connection between said sets of contacts for selectively actuating said EMF sets of contacts at one said position of said single body relative to said case to effect desired application of EMF in a system;

the bridge member and contacts control of EMF and the channel and port control of FPF, both being coordinated in operating a system by the position of said single body relative to said case.

2. In a device as set forth in claim 1, said case defining a linear cavity and said single body moving linearly in said case cavity to actuate change of channels and to actuate change of circuits.

3. In a device as set forth in claim 1, said case defining an annular cavity at least partially and said single body moving angularly in said cavity to actuate change of channels and to actuate change of circuits.

* * * * *