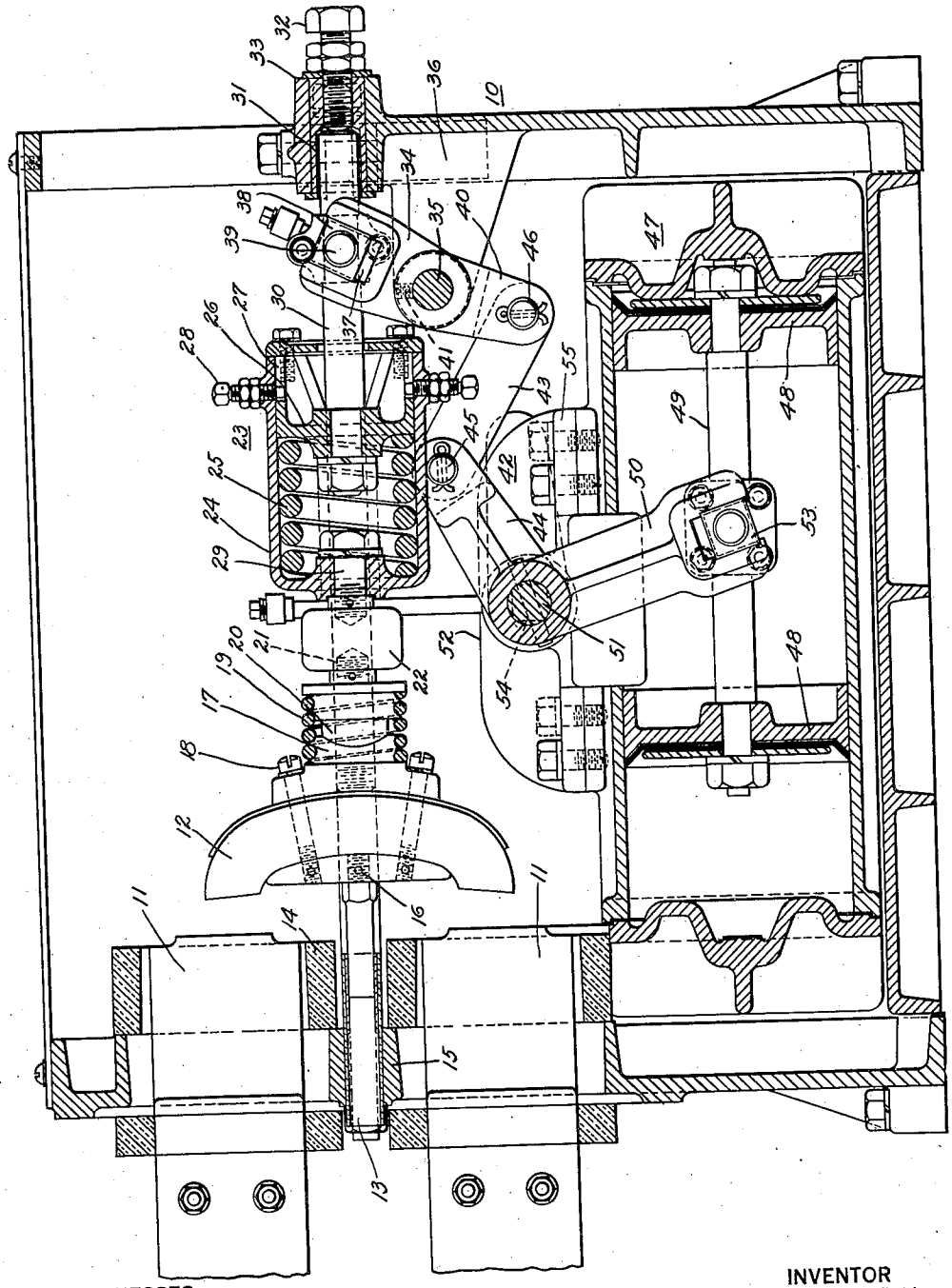
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CONTROL APPARATUS

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CONTROL APPARATUS

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This invention relates to improvements in control apparatus and more particularly to operating means for the switching members of the control apparatus.

The object of the invention, generally stated, is the provision of switching mechanism for control apparatus that shall be simple and efficient in operation and readily and economically manufactured.

A more specific object of the invention is to provide for the actuation of the switching members of control apparatus and the locking of them in predetermined positions.

Another object of the invention is the provision of a resilient connection between switching members and the actuating means to effect the retention of the switching members in contact under spring pressure.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

This invention accordingly is disclosed in the embodiment thereof shown in the accompanying drawing and comprises the features of construction, the combination of elements and arrangements of parts that will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawing, in which the single figure is a view, partly in section and partly in side elevation, of a switching mechanism constructed in accordance with this invention.

Referring now to the drawing, the control apparatus shown comprises a frame 10 having a plurality of stationary contact members 11 disposed thereon in spaced relation and insulated from one another. It will be readily understood that any number of contact members may be provided, depending on the purpose for which the control apparatus is to be used.

The illustrated embodiment of the invention was primarily designed for use as a reversing switch and, while only one switching mechanism is shown, it is to be understood that any number may be provided in order to effect, in any well-known manner, the reversal of the direction of flow of current in any desired circuit. Furthermore, the switching mechanism to be described hereinafter may be used to operate the switch members of control apparatus of any type.

In order to establish connection between the pair of contact members 11 shown in the figure, a bridging member 12 of any well known type may be provided. As will be observed, the bridging member is pinned to a slidably mounted rod 13. In this particular construction, the rod is disposed to slide in a sleeve 14, which is supported in a bushing 15 that is mounted on the frame 10. The rod 13 serves to guide the bridge 12 into engagement with the proper contact members 11.

With a view to obtaining good contact between the bridge 12 and the contact members 11, the bridge 12 is loosely mounted on the rod 13, so that it may oscillate through a certain angle about a pin 16. Thus, when the faces of the contact members 11 do not lie in a plane parallel to the contact faces of the bridge 12, the latter will adjust itself to establish contact throughout substantially the whole area of the contact faces.

Since the bridging member 12 is thus mounted to permit a certain oscillation about the pin 16, in order to apply pressure thereto and distribute it evenly, a ball-and-socket connection is interposed between the bridge 12 and the actuating engine. As will be observed, the socket member 17 is attached to the bridge 12 by means of screws 18. In this particular embodiment, in order to flexibly connect the bridge member 12 to the main actuating members, the periphery of the socket member is threaded to receive a tension spring 19.

The ball member 20, which is shaped to seat in the socket member 17, is threaded to receive the other end of the spring 19. Attached to the ball member is a threaded projection 21 for receiving an insulator 22

that is provided to insulate the bridging member 12 from the other members of the switching mechanism.

In order to introduce a resilient action in the operating members for the bridge member 12, a resilient unit 23 is provided. As shown, this unit 23 comprises a cylinder or casing 24 in which a compression spring 25 is located. Slidably mounted in the cylinder is a piston 26 which is provided with slots 27 for the reception of set screws 28. These set screws are disposed to limit the movement of the piston in the casing.

As will be observed, a bolt 29 is mounted in the forward end of the casing and is of sufficient length to engage a threaded opening that is provided in the insulator 22. In this manner, the resilient unit 23 is satisfactorily connected to the bridge 12.

In order to actuate the piston 26, a connecting rod 30, which may be attached thereto in any suitable manner, such for example, as by providing an opening in the piston for the reception of the end of the connecting rod 30 and a nut for clamping the piston against a shoulder formed on the connecting rod.

As will be noted, the outer end of the connecting rod 30 is disposed to slide in a bearing 31 which is carried by the frame 10. The outward travel of the connecting rod 30 may be limited in a variety of ways and, in the particular embodiment shown, a set screw 32 is longitudinally disposed in an extension 33 that is formed integrally with the bearing 31. This set screw 32 may be adjusted to limit the travel of the connecting rod 30 as desired.

In order to actuate the connecting rod 30, a crank 34 is keyed to a shaft 35, which is rotatably mounted in a bearing formed in a bracket 36 that is cast integral with the frame 10. The outer end of the crank 34 has a longitudinal slot 37 cut therein and the walls defining the slot are shaped to form guides for the reception of a crosshead 38. As shown, the crosshead is rotatably mounted on a pin 39 which extends through the connecting rod 30. Consequently, when the crank 34 is actuated, the crosshead 38 slides in the slot 37 and the connecting rod 30 is given a reciprocatory motion.

A second crank 40 is rotatably mounted on the shaft 35 and may be set in any position thereon by means of a set screw 41. Since the crank 40 may be set in any desired angular position relative to the crank 34, the throw of the latter upon the actuation of the toggle, to be described hereinafter, may be regulated.

In order to give the crank 40 an angular motion, a toggle 42, including two members 43 and 44 that are pivotally connected by a pin 45, is provided. One end of the toggle member 43 is pivotally connected to the lower end of the crank 40 by a pin 46.

An air-engine or motor 47, of any well-known type, including two pistons 48, having a connecting rod 49 interposed therebetween, is provided for operating the toggle 42. The transmission of motion from the air-engine to the toggle is accomplished by providing a crank 50 which is pinned to a shaft 51. This shaft is rotatably mounted in a bearing formed in a bracket 52 that is mounted on the frame of the air-engine 47. The connection between the crank 50 and connecting rod 49 comprises a crosshead 53 that is slidably mounted in a slot provided in the lower end of the crank 50 and pivotally connected to the connecting rod 49. In order to utilize the crank 50 for actuating the toggle 42, the toggle member 44 has a rectangular opening provided in its outer end and adapted to fit over the squared end 54 of the shaft 51. Thus the crank 50 and and toggle member 44 are rigidly connected through the shaft 51.

While the embodiment of the invention described above includes only one bridging member 12, it will be readily understood that any number of such bridging members may be provided and actuated simultaneously to complete the desired circuits. Furthermore, any number of such mechanisms may be provided and operated at will to make and break the proper contacts for effecting the reversal of the flow of current in predetermined circuits or for effecting any other desired switching operations.

Assume that the bridge 12 is separated from the contact members 11, as shown in the drawing. In order to establish connection between the contact members 11, air is admitted to the air-engine 47 to project the pistons 48 to the left, as viewed in the drawing. As will be readily understood, when the pistons 48 travel to the left, the crosshead 53 slides in the slot provided in the crank 50 and the latter is given an angular movement, whereby the toggle member 44 is rotated into substantial alinement with toggle member 43.

In this manner the cranks 40 and 34 are rotated counter-clockwise about the shaft 45 thus projecting the connecting rod 30 to the left. Any suitable stop, such, for example, as a bumper 55 which is mounted on the engine 45, may be provided for limiting the movement of the toggle 42 after it passes dead center. Thus the cranks 40 and 34 are locked against clockwise rotation about the shaft 35, and the connecting rod 30 is retained substantially at the limit of its movement to the left. As will be readily understood, when the connecting rod 30 is moved to the left, the bridging member 12 is projected into engagement with the contact members 11.

The crank 40 is preferably set on the shaft 35 so that the movement of the connecting rod 30 serves to project the bridging member 12 into engagement with the contact members 11 before the toggle has reached dead center. Consequently, as the toggle continues to move toward dead center, the piston 36 is moved in the cylinder 24 to compress the spring 25, thereby providing for the exertion of a spring pressure to maintain contact between the bridge 12 and the contacts 11. The stop 55 that is provided for limiting the movement of the toggle after it passes dead center may be positioned so that the expansion of the spring 25 caused by such travel of the toggle is very small and thus the spring pressure exerted on the bridge 12 is maintained.

Since the bridge 12 is disposed to oscillate about the pin 16, it will adjust itself to seat on the faces of the contact members 11 when they do not lie in the same plane. Further, the ball-and-socket connection between the bridging member 12 and the actuating mechanism provides for an even distribution of the spring pressure, thus tending to maintain engagement between the bridge and the contact members.

When it is desired to break the circuit established through the bridge 12, the air-engine 47 is operated to project the pistons 48 to the right to break the toggle and rotate the cranks 40 and 34 clockwise about the shaft 35. In this manner the connecting rod 30 is moved to the right, thereby permitting the spring 25 to expand and drawing the piston 26 into engagement with the set screws 28.

When the piston 26 engages the set screws 28, a substantially rigid connection between the connecting rod 30 and the bridge 12 is established and the latter is withdrawn from the contact members 11.

Since various changes may be made in the above-described construction and arrangement of parts and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In control apparatus, in combination, a plurality of contact members, a bridging member disposed for reciprocatory movement, a toggle for actuating the bridging member, a reciprocatory engine for actuating the toggle, a plurality of pivotally mounted crank arms for connecting the engine to the toggle and the toggle to the bridging member, and crossheads slidably mounted on the crank arms to permit the transmission of motion from the engine through the crank arms to the bridging member.

2. In control apparatus in combination, a bridging member disposed for reciprocatory movement and means for actuating the bridging member comprising a toggle, resilient means and a ball-and-socket joint interposed between the bridging member and the toggle, said resilient means being provided to permit the toggle to be actuated through dead center to lock the bridging member in position, said ball-and-socket joint being provided to permit universal movement of the bridging member and to effect an even distribution of applied force, and means for actuating said toggle.

3. In control apparatus, in combination, a bridging member disposed for reciprocatory movement and means for actuating the bridging member comprising a toggle, resilient means and a ball-and-socket joint interposed between the bridging member and the toggle, said resilient means being provided to permit the toggle to move through dead center and said ball-and-socket joint being provided to permit the setting of the bridging member in different positions and to effect an even distribution of the force applied to the bridging member, means for actuating the toggle and an arm interposed between the actuating means and the toggle, said arm being connected to the actuating means through a cross head.

In testimony whereof, I have hereunto subscribed my name this 29th day of April, 1925.

LYNN G. RILEY.