

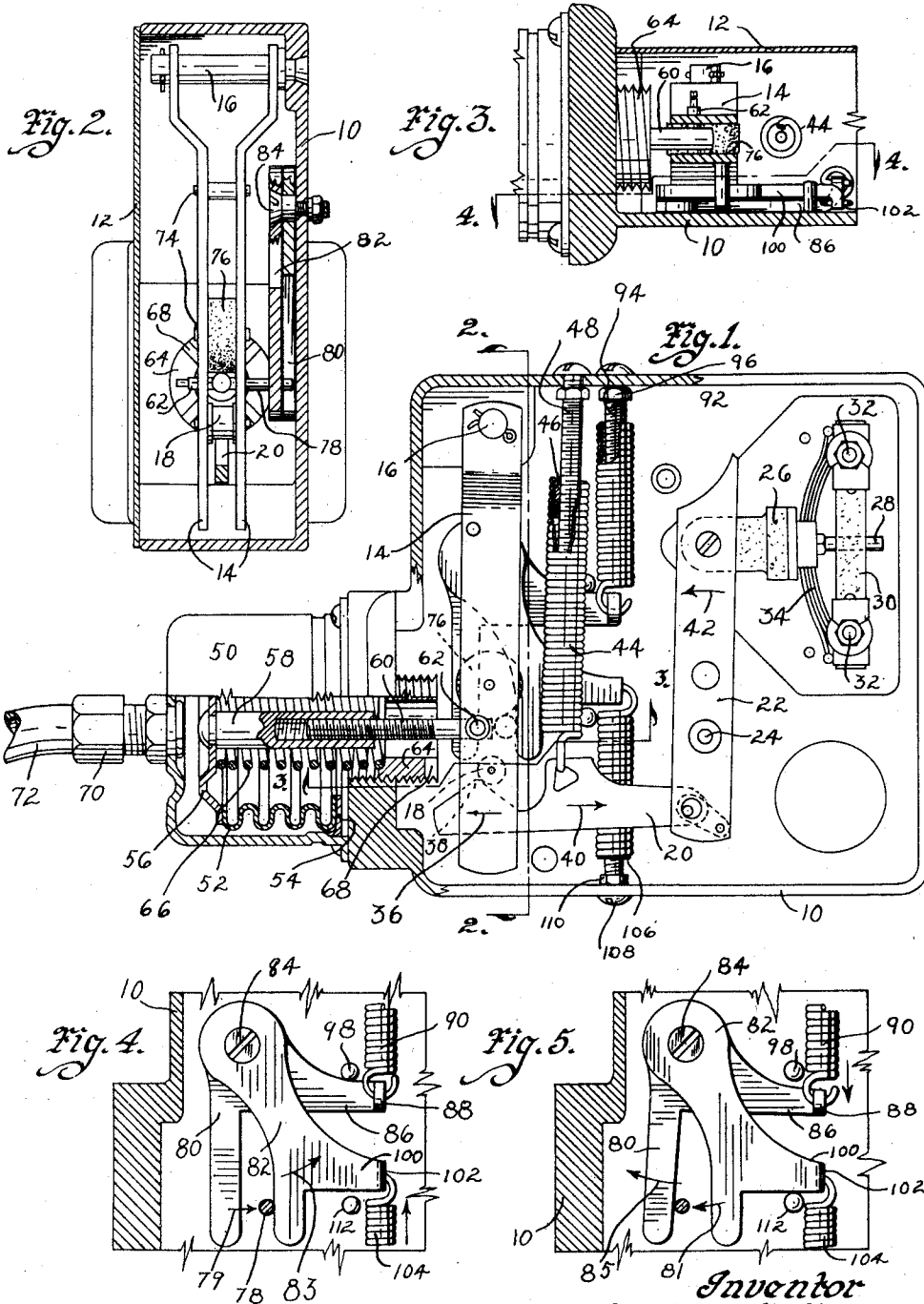
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DIFFERENTIAL ADJUSTING MECHANISM

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DIFFERENTIAL ADJUSTING MECHANISM

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It is the object of my invention to provide a differential adjusting mechanism for switches or the like, of simple, durable and comparatively inexpensive construction.

Still a further object is to provide in connection with a movable arm or other movable element, having a differential of operation, a means for adjusting such differential of operation by increasing it, my particular invention being arranged for increasing it in either direction and being adjustable for increasing it to varying degrees.

More particularly it is my object to provide in connection with a movable member such as an arm actuated in one direction by a spring and in an opposite direction by a pressure means and adapted to actuate a switch or the like, a mechanism for increasing the differential of operation of such arm by imposing thereon, a spring pressure working in opposition to the normal spring pressure of the first mentioned spring or the movement of the arm caused by pressure from a source of pressure.

Still a further object is to provide in connection with a movable arm having a predetermined differential of operation, a lever normally held against a stop by spring pressure and arranged to be actuated by the arm when it moves in one direction thereby moving the lever away from the stop and imposing such spring pressure on the movable arm itself.

Still a further object is to provide a second lever held against a second stop by spring pressure and adapted to be engaged and moved by the movable arm when the arm moves in an opposite direction for imposing such second spring pressure on the movable arm.

Still a further object is to provide means for adjusting the spring pressures acting upon the arm for the purpose of varying or adjusting the force required to move the arm.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more

fully set forth, pointed out in my claims and illustrated in the accompanying drawings. Although the invention is susceptible of a variety of embodiments, it is unnecessary to fully describe and illustrate more than one in order to give a full understanding of the invention both from its structural and functional standpoints. Accordingly, I have illustrated a preferred and desirable embodiment of the invention in the accompanying drawings in which:

Figure 1 is a side elevation of a switch structure in connection with which my differential adjusting mechanism is illustrated, parts of the switch being broken away and other parts being shown in section.

Figure 2 is a detail sectional view on the line 2—2 of Figure 1.

Figure 3 is a detail sectional view on the line 3—3 of Figure 1.

Figure 4 is a sectional view on the line 4—4 of Figure 3, showing parts of my invention in the position already illustrated in Figure 1; and

Figure 5 is a similar view showing the parts of my invention in a different position.

On the accompanying drawings I have used the reference numeral 10 to indicate generally a switch housing. A cover plate 12 is provided in connection with the switch housing 10. Within the switch housing 10 a movable arm 14 is pivoted to a pin 16.

The arm 14 is formed of two bars as clearly shown in Figure 2 of the drawings and carries a roller 18. The roller 18 is adapted to coact with a link 20 which has one end loosely and pivotally connected with a switch arm 22. The switch arm 22 is pivoted to the switch housing 10 on a pivot pin 24. A switch head 26 is pivoted to the switch arm 22 and is provided with a guide pin 28 slidably mounted in a supporting block 30. The head 26 and block 30 are preferably of insulating material.

Mounted on the block 30 is a pair of terminals 32 adapted to be connected in an electric circuit of a refrigerating system or other device to be controlled by the switch structure. The switch head 26 is provided with a plurality of contact springs 34 adapted

to electrically connect the two terminals 32 with each other when in the position shown in Figure 1.

When the switch arm 14 is moved in the direction of the arrow 36, the roller 18 travels over a hump 38 formed on the link 20 and causes the link to travel in the direction of the arrow 40. This causes the upper end of the switch arm 22 to travel in the direction of the arrow 42 for disengaging the contact springs 34 from the terminals 32 and thus opening the electric circuit.

The hump portion 38 of the link 20 is held in contact with the roller 18 at all times by means of a spring 44. The spring 44 is provided with a plug 46 into which an adjusting screw 48 extends.

For moving the switch arm 14 any desirable structure may be provided. On my drawings I have illustrated a pressure actuated device consisting of a bellows housing enclosing a bellows 52. The bellows 52 is sealed relative to the housing 50 by means of a washer 54. The bellows 52 is provided with a head 56 which in turn is operatively connected by means of a pin 58 and a screw threaded rod 60 to the movable arm 14.

A pivot pin 62 serves the purpose of connecting the rod 60 with the arm 14. Screw threadedly mounted in the portion of the switch housing 10 on which the bellows housing 50 is mounted, is an adjustable plug 64. A spring 66 is interposed between the plug 64 and the head 56 of the bellows 52. Slots 68 are provided in the adjustable plug 64 for rotating the same and thereby adjusting its position relative to the switch housing 10.

Mounted in the head of the bellows housing 50 is a fitting 70 to which is connected a pipe line 72 adapted to be connected with a source of pressure, whereby the switch structure may be actuated depending on variations in pressure introduced into the bellows housing 50 and surrounding the bellows 52.

By means of pins 74 and suitable spacers, the two bars of the arm 14 are connected together. On one of the pins 74, a felt washer 76 is mounted and arranged in contact with the rod 60 whereby the felt washer 76 may be soaked with oil which will serve the purpose of oiling the pivotal connection between the pin 62 and the rod 60.

From the foregoing construction, it will be seen that variations in pressure introduced into the bellows housing 50 will move the arm 14 in opposite directions depending on whether the pressure is increasing or decreasing. At predetermined points in the movement of the arm 14, the roller 18 will pass over the hump 38 of the link 20 for actuating the switch contacts 34 for opening and closing the electric circuit.

This construction has a predetermined differential of operation, that is, at a certain pressure the switch will open and at another

pressure, say of two pounds difference, the switch will close. This two pounds differential may be lowered for operation between fifty and fifty-two pounds, for example, or raised for operation between seventy-five and seventy-seven pounds, for instance, by decreasing or increasing the tension of the spring 66 by adjusting the plug 64. Adjustment of the plug 64 does not affect the normal differential of operation in any way and it will remain at two pounds.

The foregoing description has been of a switch structure to which my invention may be applied for the purpose of adjusting the differential of operation thereof. My present invention consists of a means for imposing a resistance to the movement of the lever 14 whereby the differential of operation may be increased upwardly or downwardly depending on spring pressure being exerted in opposition to the action of the bellows 52 or the spring 66.

My differential adjusting mechanism consists of a pin 78 extending from the movable arm 14 and adapted to coact with levers 80 and 82. The levers 80 and 82 are pivotally mounted with respect to the switch housing 10 by means of a pivot bolt 84 preferably of shoulder construction as best shown in Figure 2 of the drawings.

The lever 80 is provided with an arm 86 terminating in an upwardly extending perforated ear 88 to which one end of a spring 90 is connected. The opposite end of the spring 90 is provided with a plug 92 shown in section in Figure 1 of the drawings. An adjusting screw 94 extends through an opening in the switch housing 10 and is screw threadedly mounted inside the plug 92. A lock nut 96 is provided on the screw 94. The spring 90 normally holds the arm 86 of the lever 80 against a stop 98.

The lever 82 is provided with an arm 100 terminating in a downwardly extending perforated ear 102. One end of a spring 104 is connected with the ear 102 and is provided with a plug 106 in its opposite end. A screw 108 is screw threadedly mounted in the plug 106 and a lock nut 110 is mounted on the screw 108. The spring 104 is adapted to hold the arm 100 on the lever 82 against a stop 112.

Practical operation

In the operation of my device, the movable arm 14 normally operates at a predetermined differential as has already been set forth. It will be noted in the positions shown in Figures 1 and 4 that the pin 78 has moved in the direction of the arrow 79 and engaged the lever 82, moving it in the direction of the arrow 83 and thereby causing the arm 100 to move away from the stop 112. This causes the spring pressure of the spring 104 to be exerted on the lever 14 for resisting the move-

ment thereof caused by pressure being built-up within the bellows housing 50.

It is readily obvious therefore, that it will take more pressure to move the arm 14 to the predetermined point where it causes the switch structure to move to closed position. Thus if the tension of the spring 104 has been adjusted by the screw 108 to cause a pressure of ten pounds to move the arm 14 to a position to which it would otherwise be moved by a two pound pressure, the differential of operation has been increased in the switch closing direction by eight pounds.

The differential of operation would now be ten pounds so that a variation of ten pounds in pressure must occur before the switch is actuated to move from one of its positions to another. Therefore, if the normal differential of operation is between 50 and 52 pounds, it has been increased by the spring 104 and the lever 82 to between 50 and 60 pounds. By adjusting the tension of the spring 104 the differential of operation may be increased if desired or diminished.

In order to increase the differential of operation in the opposite direction, I have provided the lever 80 adapted to be engaged by the arm 14 when moving in the direction of the arrow 81 which moves the lever 80 in the direction of the arrow 85. This swings the arm 86 away from the stop 98 causing pressure of the spring 90 to be imposed on the arm 14 in opposition to the spring 66. This will increase the differential of operation in a switch opening direction by a predetermined number of pounds depending on the tension of the spring 90. For example, if the spring 90 is adjusted to increase the differential of operation in switch opening direction by ten pounds, the differential of operation of the device is now between 40 and 60 pounds.

The pin 78 in a neutral position is arranged to not engage with either of the levers 80 or 82 so that the springs 90 and 104 will not work in opposition to each other.

It is obvious that my invention may be applied to any movable member having a predetermined differential of operation and will operate to increase such differential of operation in either direction and to any degree desired. For instance, instead of a switch structure, the movable member could actuate a valve or the like and instead of a bellows construction, a diaphragm or piston arrangement might be used for utilizing pressure to operate the device or any other source of variable power could be applied to the movable member.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims, any modified forms of structure or use of mechan-

ical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a device of the class described, a support, an actuating arm pivoted thereto, means responsive to pressure for moving said actuating arm, a control device actuated by said actuating arm and means for modifying the differential of operation of said actuating arm comprising a lever pivoted thereadjacent a stop for said lever, spring means constraining said lever to engage said stop and an abutment on said actuating arm adapted to engage said lever and move the same away from said stop against the action of said spring means thereon.

2. In a device of the class described, a support, an actuating arm pivoted thereto, means responsive to pressure for moving said actuating arm, a control device actuated by said actuating arm and means for modifying the differential of operation of said actuating arm comprising a pair of levers pivoted thereadjacent a stop for each lever, spring means constraining each lever to engage its respective stop and an abutment on said actuating arm adapted to engage said levers respectively when moving in opposite directions and move them away from their stops against the action of said spring means thereon.

3. In a device of the class described, a support, an actuating arm pivoted thereto, means responsive to pressure for moving said actuating arm, a control device actuated by said actuating arm and means for modifying the differential of operation of said actuating arm comprising a pair of spaced levers pivoted thereadjacent, a stop for each lever, spring means constraining each lever to engage its respective stop and an abutment on said actuating arm between said levers.

Des Moines, Iowa, November 30, 1928.

MALCOLM E. HENNING.