

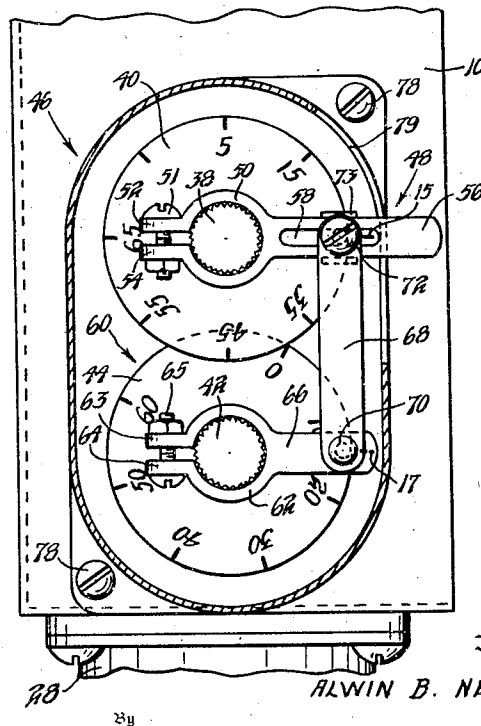
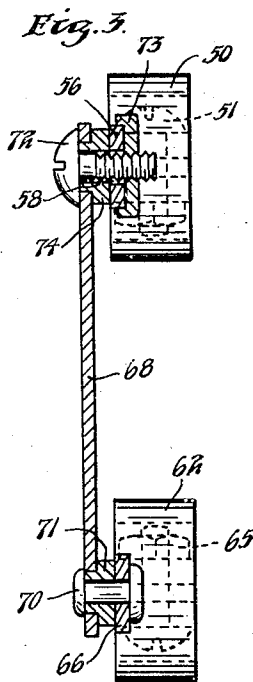
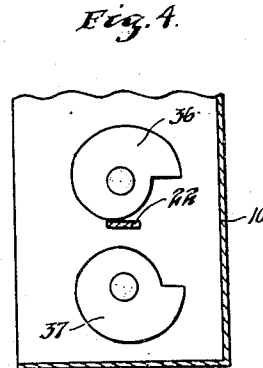
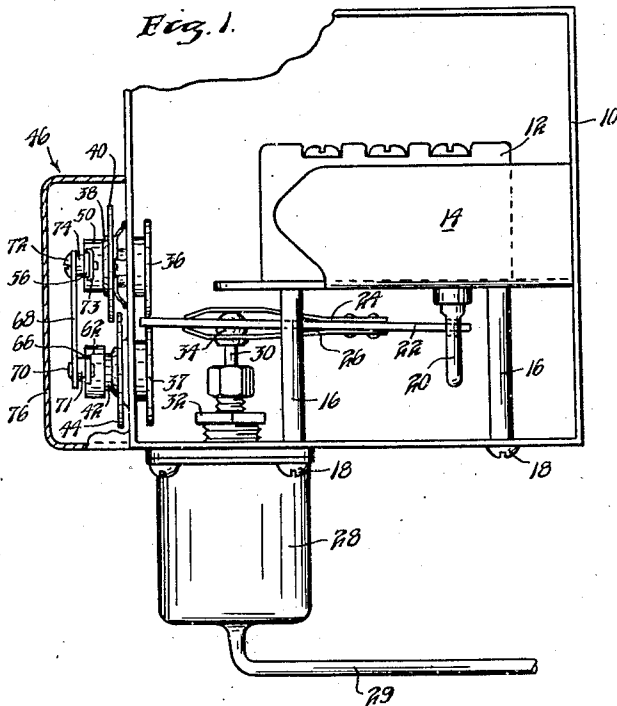
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ADJUSTMENT MEANS FOR CONTROL DEVICES

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ADJUSTMENT MEANS FOR CONTROL DEVICES

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5 Claims. (Cl. 74-522)

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This invention relates to an adjustment means or accessory for a control mechanism of an apparatus wherein the operating range of the apparatus can be readily adjusted.

The device appertains to an adjustment means for a control device of a mechanism whereby the upper and lower operating values of the mechanism can be simultaneously adjusted to meet the requirements desired.

The device comprehends an adjustment accessory for a refrigeration control such as illustrated in the application of Carl G. Kronmiller, Serial No. 371,001, filed December 20, 1940, now Patent 2,377,503, issued June 5, 1945, or other similar control mechanisms.

The adjustment means more particularly embodies a demountable means for the two manual control means of a control mechanism which are interconnected whereby both of the manual control means may be simultaneously moved.

The invention comprises an adjustable means for the two manual control means of a refrigeration control device whereby both of the associated stops may be variably and simultaneously adjusted so that the range of operation of a refrigeration system may be regulated to meet the conditions required by the refrigeration system.

Heretofore, the adjustments of the two manual control means for a refrigeration control mechanism have been made independently, but the present accessory or adjustment device is easily attached to the two manual control means, and the two manual control means can then be simultaneously moved so that the range of operation of the refrigeration system is quickly and accurately controlled. The adjustment means is adjustable so that the two manual control means may be either equally moved or unequally moved, depending on the setting of the adjustment means.

It is an object of the invention to provide an adjustment means for two independent manual control means of a control device whereby both of the manual control means may be simultaneously moved by a single operation of the adjustment means.

It is another object of the invention to provide an adjustable means for two independent manual control means of a control device for a refrigeration system whereby the manual control means can be simultaneously moved in varying ratios in respect to each other so that the range of operation of the refrigeration system can be varied as desired.

It is still another object of the invention to provide an adjustment means for the simultaneous operation of two independent manual control means of a refrigeration control device, and

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the adjustment means having a definite range of operation.

It is a further object of the invention to provide an adjustable means for the simultaneous operation of two independent manual control means of a refrigeration control device wherein the range of adjustment of one of the manual control means is greater than the range of adjustment of the other of the manual control means.

It is another object of the invention to provide an adjustment means for the simultaneous operation of two independent manual control means of a refrigeration control device which can be easily attached in operable relationship with said manual control means.

It is another object of the invention to provide means for housing the adjustment means when it is in operative position on the manual control means of the control mechanism and the housing having means for limiting the movement of an operating means of the adjustment means whereby the range of operation of the adjustment means and the manual control means are regulated.

Other and further objects will become apparent from the detailed description of the device and the appended claims.

Figure 1 is a front elevational view partly in section of a refrigeration control mechanism, cover removed, with the dial linkage means operably mounted on the cut-in and cut-out dials thereof.

Figure 2 is an enlarged view of the left side of the control mechanism of Figure 1, with a vertical sectional view through the housing for the dial linkage means, disclosing the dial linkage means in operable position on the cut-in and cut-out dials of the control mechanism.

Figure 3 is an enlarged sectional view of the dial linkage means, disclosing the arrangement of the adjustable means of the said dial linkage means.

Figure 4 is a fragmentary view of the inside of a side of the casing for the control mechanism disclosing the floating lever of the control device in operable engagement with the cut-in stop.

In Figure 1, 10 illustrates a casing with its cover removed and a snap switch 12 is shown mounted on a plate member 14 which is secured by appropriate means to the casing 10. Two tubular members 16 extend from the base of the casing to the plate member 14 and screws 18 extend through apertures in the casing into the tubular members 16 and are secured to the plate 14 for supporting the plate 14 in position.

The snap switch 12 has a reciprocating operating stem 20 extending through an aperture in plate 14. An end of a floating lever 22 extends into an aperture in the reciprocating stem 20. A housing 28 encloses an expansible and contractable bellows, the interior of which is con-

ected by a pipe 29 to the suction line of a compressor (not shown). The upper end of the bellows in the housing 28 is connected to an operating stem 30 which extends through a nut 32. The upper end of the stem 30 carries a ball member 34 which is disposed loosely within an aperture in the floating lever 22. A resilient leaf member 24 is attached by rivet means to the upper side of lever 22, and the leaf engages the ball member 34. A similar resilient leaf member 26 is attached by rivets or other appropriate means to the lower side of the floating lever 22, and this leaf member 26 is provided with an opening through which the operating stem 30 extends. This leaf member also engages the ball member 34. The ball member 34 and the leaf members 24 and 26 form a strain release connection between the operating stem 30 and the floating lever 22.

The snap switch 12 is of a type wherein movement of the reciprocating stem 20 in an upward direction closes the switch, and movement of the stem 20 in a downward direction opens the switch. After the switch is operated to open or closed position, it tends to remain in that position. The left end of the floating lever 22 is spaced between two adjustment cams 36 and 37. The cams 36 and 37 have spiral contours.

Cam 36 is mounted on a shaft which is journaled in a side wall of the casing 10 and may be rotated by a manual knob 38 exteriorly of the casing 10. Adjacent to the manual knob 38 and mounted on its shaft is a dial 40 which is graduated in pounds. The cam 37 is mounted on a similar shaft journaled in the side wall of the casing 10 and rotatable by a manual knob 42 exteriorly of the casing 10. Adjacent to the knob 42 and mounted on its shaft is a dial 44 which is graduated in pounds. The cams 36 and 37 form stops between which the left end of the floating lever 22 is movable.

When the bellows within the housing 28 expands in response to rising suction pressure of a refrigeration system (not shown) which is communicated to the bellows by conduit 29, the operating stem 30 moves upwardly carrying the floating lever 22 with it until the left end of the floating lever 22 engages cam 36. After the left end of the lever 22 engages the cam 36 further expansion of the bellows within the housing 28 causes the lever 22 to pivot about the cam 36, that is, rotating the lever 22 in a counterclockwise direction so that the right end of the lever 22 moves the reciprocating stem 20 upwardly so as to close the snap switch 12. The closure of the snap switch 12 completes a circuit for a compressor motor (not shown).

If the suction pressure should fall after the compressor motor is started, the bellows within the housing 28 will contract; therefore retracting the operating stem 30 downwardly causing the left end of the lever 22 to be moved downwardly until at a predetermined suction pressure it engages the cam 37. Further contraction of the bellows within the housing 28 will pivot the lever 22 about the cam 37 as a pivot and move the floating lever in a clockwise direction so that its right end moves the reciprocating stem 20 of the snap switch 12 downwardly so as to open the switch.

The selective adjustment of the cams 36 and 37 and their associated knobs 38 and 42 will vary the operational differential of the snap switch 12 in response to suction pressure. The stop or cam 36 is designated the cut-in stop member as

it limits the upward movement of the lever 22 resulting from rising suction pressure and thereby actuates the floating lever 22 to move the reciprocating stem 20 upwardly to actuate the snap switch 12 to closed position. The cut-in cam 36 determines the upper limit of the suction pressure or temperature which is desired. If the cam 36 as shown in Figure 4 is rotated in a direction which tends to move the lever 22 downwardly, it is apparent that the pressure at which the switch is closed would be lower, because the pressure will not have to rise to as high a value for the lever 22 to engage the cam 36 and to begin rotating in a counterclockwise direction. If the cam 36 as shown in Figure 4 is rotated in the opposite direction obviously the suction pressure at which the switch 12 is closed will be raised. Therefore the upper limit of the suction pressure can be easily raised or lowered. Likewise when cam 37 is rotated in a direction so as to decrease the space between cams 37 and 36, the pressure at which the switch 12 is opened will be raised because obviously the pressure will not have to decrease to as low a value for the lever 22 to engage the cam 37 and to begin rotating in a clockwise direction. Obviously, therefore, the differential and range of operation of the switch 12 can be adjusted by varying the positions of the cams 36 and 37 by their respective manual knobs 38 and 42. It is apparent that the pressure at which the switch 12 is closed and the pressure at which it is opened can be independently adjusted.

It is the specific intention of this invention to provide a dial linkage accessory which is designated by the numeral 46 and which is adapted to be mounted on the cut-in and cut-out knobs 38 and 42 respectively whereby simultaneous adjustments of the cut-in and cut-out dials of the control device may be obtained. The dial linkage means 46 consists of a lever assembly 48 for the cut-in knob 38. The lever assembly comprises an adjustable collar 50 which has a pair of apertured flanges 52 and 54 for mounting a bolt and nut means 51. The adjustable collar 50 also consists of an integral handle 56 which is provided with a longitudinal slot 58. The adjustable collar 50 is adapted to be mounted on the cut-in knob 38 and it is securely fastened thereto by manipulating the bolt and nut means 51. A crank assembly 60 which is associated with the cut-out knob 42 comprises an adjustable collar 62 having a pair of apertured flanges 63 and 64 for mounting a bolt and nut means 65. The adjustable collar 62 has an integral lever means 66. The crank assembly 60 is adapted to be mounted on the cut-out knob 42 and is securely fastened thereto by the proper adjustment of the bolt and nut means 65. A link 68 is pivotally connected by a pin means 70 to the lever 66 of the crank assembly 60. A bearing member 71 is spaced between the link 68 and the lever 66. The link 68 is fastened to the handle 56 of the lever assembly 48 by a bolt means 72 extending through the link and secured in the slot 58 of the handle 56. The link 68 is held in its adjusted positions in the slot 58 by means of the bolt 72 cooperating with a lock washer 73, which washer is locked against the lower side of the handle 56 by tightening up on the bolt means 72. A bearing member 74 is spaced between the lower side of the link 68 and the upper surface of the handle 56. The link 68 can be adjusted in different positions in the slot 58 by turning the screw 72 to loosen the lock washer 73 and sliding

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the end of the link along the slot 58, and when the desired position has been selected, the bolt 72 is turned so as to secure the lock washer 73 against the handle 56 to again lock the link 68 to the handle 56.

In Figure 2 of the drawing the link 68 of the crank assembly 60 is shown positioned at a point in the slot 58 of the handle 56 of the lever assembly 48 so that the link 68 is substantially parallel with a line passing through the centers of the knobs 38 and 42. The cut-in dial 40 and cut-out dial 44 may be adjusted to any position desired before the dial linkage 46 is mounted on the cut-in and cut-out knobs 38 and 42. Marks 15 and 17 on the casing 10 are means for determining the respective adjustment of the cut-in dial 40 and the cut-out dial 44. Whatever graduation on the cut-in dial 40 is aligned with mark 15, will be the setting of the cut-in dial in pounds. Likewise, the graduation of dial 44 which is aligned with markings 17 will be the adjustment of this dial in pounds. In Figure 2, the cut-in dial 40 is shown set at approximately 25 pounds while the cut-out dial is shown as set at approximately 13 pounds. That is, the cut-in dial 40 is adjusted so as to operate the switch 12 through the medium of the stop 36 and floating lever 22 to close the switch 12 at 25 pounds suction pressure. The cut-out dial 44 is set, as shown in Figure 2, so that its stop 37 actuates the floating lever 22 whereby to move the reciprocating stem 20 of the snap switch 12 for actuating the snap switch to open position when the pressure falls to 13 pounds.

When the link 68 is adjusted to a position in the slot 58 of the handle 56 of lever assembly 48 for the cut-in dial 40 so that the link 68 is parallel with a line passing through the centers of the knobs 38 and 42, as is substantially shown in Figure 2 of the drawing, the cut-in and cut-out dials 40 and 44 are moved equally by the dial linkage 46 when the dial linkage 46 is operated by the handle means 56. If the link 68 should be adjusted to approximately the mid-position of the slot 58 between its position as shown in Figure 2 and the left end of the slot, the operation or movement of the handle 56 moves the cut-out dial 44 through means of the dial linkage 46 approximately 85% of the movement of the cut-in dial 40. On the other hand, when the link 68 is adjusted to the extreme left of the slot of the handle 56, the cut-out dial 44 has a movement of approximately 67% of the movement of the cut-in dial 40. Other ratios of movement of the cut-in dial in relation to the cut-out dial may be obtained by adjusting the link 68 in other positions in the slot 58 of the handle 56 between the position of link 68 as shown in Figure 2 of the drawing and the left end of the slot. The different ratios of movement of the cut-in dial in relation to the cut-out dial is accomplished through the different leverage lengths which are obtained between the center of the dial knob 38 and the different adjusted positions of the link 68 in the slot 58 of the handle 56. The cut-in dial 40 has a greater movement than the cut-out dial 44 when the link 68 is adjusted in all positions of the slot 58 to the left of the position of the link 68 as shown in Figure 2 of the drawing. When the link 68 is adjusted in any position in the slot 58 to the left of the position where the link 68 is parallel with a line extending through the centers of the knobs 38 and 42, and the link 68 is then moved and secured in any other position in the slot 58 to the left of the

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position as shown in Figure 2, the range of a refrigeration system will be changed from one range to that of another range, and the change of the cut-in pressure is greater than the change in the cut-out pressure, and therefore the movement of the cut-in dial 40 has been greater than the movement of the cut-out dial 44.

If it is desired to use the control to maintain a storage temperature of 35° F., suitable compressor operation may require 35 pounds cut-in pressure and 17 pounds cut-out pressure, or an operating differential of 18 pounds. In order to maintain a storage temperature of 10° F., suitable control pressures may be 17 pounds cut-in pressure and 3 pounds cut-out pressure, or an operating differential of 14 pounds. With the link 68 properly positioned in the slot 58 these desired control pressures may be established by a simple adjustment of the handle 56.

In the example set forth above the lever assembly 48 is secured on the cut-in knob 38, and the crank assembly is secured on the cut-out knob 42. Then the link 68 of the crank assembly 60 is secured in the slot 58 of handle 56 of the lever assembly 48 so that the link 68 is parallel with a line extending through the centers of the knobs 38 and 42. Then when the dial linkage 46 is actuated, both the cut-in and cut-out dials 40 and 44, respectively, have equal movements, and the range of movement of both dials is 20 pounds. The dial linkage means 46 as shown mounted on the knobs of the control mechanism in Figure 2 will operate to impart the same range of movement to the dials 40 and 44.

The lever 68 is now loosened and shifted to the left in the slot 58 and secured in such position in the slot. Then the dial linkage means 46 is operated through means of the handle 56, and the cut-in dial 40 will still have a range of movement of 20 pounds, but the cut-out dial 44 may have a range of movement of 16 pounds. The link 68 is adjusted further to the left in the slot 58 until the cut-out dial 44 will have a range of movement of 14 pounds while the range of movement of the cut-in dial remains at 20 pounds.

The bolt and nut means 51 and 65 of the lever and crank assemblies 48 and 60, respectively, are loosened so that the assemblies are loosely mounted on the knobs 38 and 42 respectively. The dial linkage 46 is then moved upwardly until the handle 56 engages the upper end of the slot 79 in the housing 76. The cut-in dial 40 is now moved until the graduation of 35 pounds is aligned with the mark "15" on the casing 10; and the cut-out dial 44 is moved so that the graduation of 17 pounds registers with the mark "17" on the casing 10. The bolt and nut means 51 and 65 are again adjusted until the lever and crank assemblies 48 and 60 are securely fastened to the knobs 38 and 42 respectively. If the handle 56 of the crank assembly 46 is now moved until it engages the lower end of the slot 79 in the housing 76, the cut-in dial 40 which has a range of movement of 20 pounds, is adjusted from the setting of 35 pounds cut-in pressure to a setting of 15 pounds cut-in pressure. The cut-out dial 44, which is moved simultaneously with the cut-in dial 40, having a range of movement of 14 pounds, is moved from a setting of 17 pounds cut-out pressure to a setting of 3 pounds of cut-out pressure.

In Figure 2 of the drawing, where the cut-in dial 40 is shown set at approximately 25 pounds and the cut-out dial 44 is shown set at approxi-

mately 13 pounds, the box temperature would be set for 25 degrees Fahrenheit operation.

It is possible and may be desired to reverse the mounting of the lever assembly 48 and crank assembly 60 on the cut-in and cut-out knobs 38 and 42, respectively. That is, the lever assembly 48 is mounted on the cut-out knob 42 and the crank assembly 60 is mounted on the cut-in knob 38. Then in this case, the operation of the dials, will be reversed. That is, the cut-out dial 44 has a greater movement relative to the movement of the cut-in dial 40, when the link 68 is positioned in any position in the slot 58 of the handle 56 between the position in the slot where the link 68 is parallel with a line extending through the centers of the knobs 38 and 42, and the end of the slot adjacent the collar portion 50.

When the link 68 is shifted in the slot 58 of handle 56 to any position to the right thereof as shown in Figure 2 of the drawing and the link 68 being secured in such position in the slot, the cut-out dial 44 would have a greater movement than the cut-in dial 40, when the dials 40 and 44 are moved simultaneously by the dial linkage 46. The relative movements of the dials 40 and 44 would be the same as if the lever assembly 48 and crank assembly 60 had been reversed in position on the knobs 38 and 42.

A housing member 76 is provided for the dial linkage means 46 and is adapted to protect the accessory when it is in position on the cut-in and cut-out dials and is secured to a side of the casing 10 by screw means 78. The housing 76 is provided with a slot 79 through which the operating handle 56 of the lever assembly 48 extends, and this slot means not only permits clockwise and counter-clockwise movements of the dial linkage means 46, but it also limits the range of operation of the dial linkage means 46.

This control may be used either on a single cooler without or with other temperature controls, or may be used in a multiple system zoned by temperature controls and values. The linkage may also be used on any control having a pair of normally independently adjustable members.

As various changes and modifications of this invention may occur to those who are skilled in the art, I wish it to be understood that I intend to be limited only by the scope of the appended claims and not by the specific embodiment disclosed herein.

I claim as new:

1. In a condition responsive mechanism, a device to be moved from a first position to a second position, condition responsive means for so moving said device, a first adjusting element for determining the value of said condition at which said device is moved to said first position, a second adjusting element for determining the value of said condition at which said device is moved to said second position, and means connecting said elements together for simultaneous movement whereby both may be adjusted by a single operation.

2. In a condition responsive mechanism, a device to be moved from a first position to a second position, condition responsive means for so moving said device, a first adjusting element for determining the value of said condition at which said device is moved to said first position, a second adjusting element for determining the value

of said condition at which said device is moved to said second position, and means connecting said elements together for simultaneous movement whereby both elements may be adjusted by a single operation, said last mentioned means including an adjustable member for varying the amount one of said elements is adjusted in respect to the other element.

3. In a condition responsive mechanism, a device to be moved from a first position to a second position, condition responsive means for so moving said device, a first adjusting element for determining the value of said condition at which said device is moved to said first position, a second adjusting element for determining the value of said condition at which said device is moved to said second position, said elements comprising a pair of rotatable members having parallel axes, and means removably connected to said rotatable elements for connecting said elements together for simultaneous movement.

4. In a condition responsive mechanism, a device to be moved from a first position to a second position, condition responsive means for so moving said device, a first adjusting element for determining the value of said condition at which said device is moved to said first position, a second adjusting element for determining the value of said condition at which said device is moved to said second position, said elements comprising a pair of rotatable members having parallel axes, and means removably connected to said elements for connecting said elements together for simultaneous movement, the removably connected means consisting of first and second portions, the first portion having a handle with a slot connected to the first adjusting element, the second portion comprising a link connected to the second adjusting element, the link adjustable to different positions in the slot of the handle of the first portion of the removably connected means for varying the amount one of said elements is adjusted in respect to the other element.

5. In a condition responsive mechanism, a control device to be moved from a first position to a second position, a condition responsive means for so moving the device, a first adjusting element for determining the value of said condition at which said device is moved to said first position, a second adjusting element for determining the value of said condition at which said device is moved to said second position, a removably adjustable interconnected means operably associated with said elements for simultaneous movement of the said elements by a single operation, the interconnected means consisting of two portions, one portion of the interconnected means comprising a handle having a slot associated with one of the elements, the other portion of the interconnected means comprising a lever having a pivoted link associated with the other element, the link adjustable to different positions in the slot of the handle of the one portion of the interconnected means for varying the amount one of said elements is adjusted in respect to the other element, and a means for housing the interconnected means when operably associated with the pair of adjusting elements, the housing having a slot for limiting movement of the handle of the interconnected means.

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