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C. O. DALE ET AL
MAGNETICALLY ACTUATED CONTROL FOR THERMOSYPHONING
REFRIGERATOR SYSTEM

3,224,727

Filed Oct. 19, 1962

2 Sheets-Sheet 1

FIG. 1.

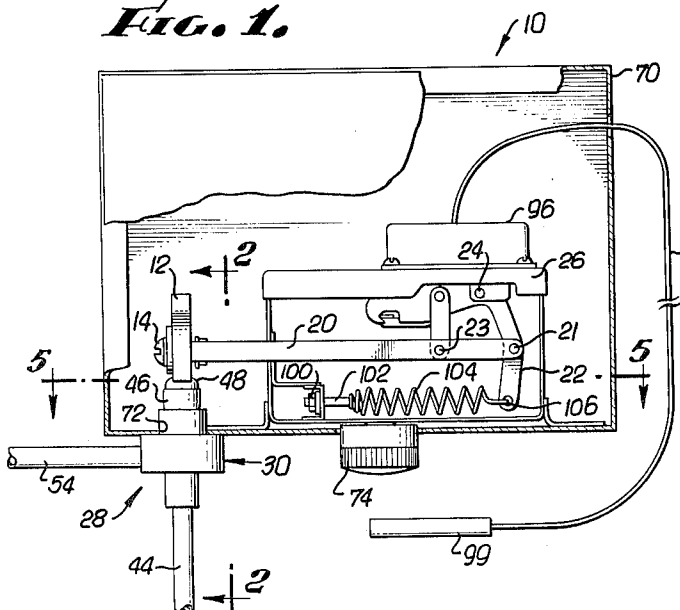


FIG. 2.

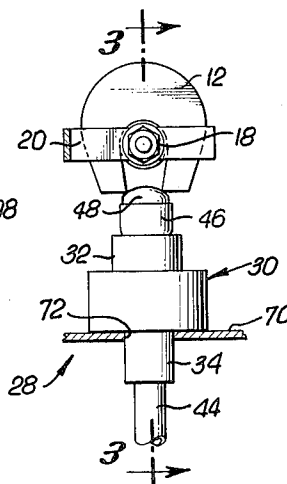


FIG. 3.

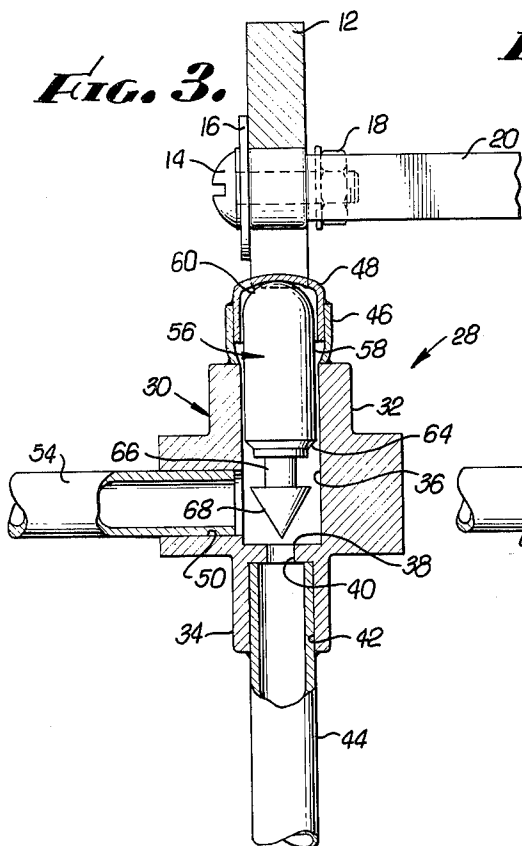
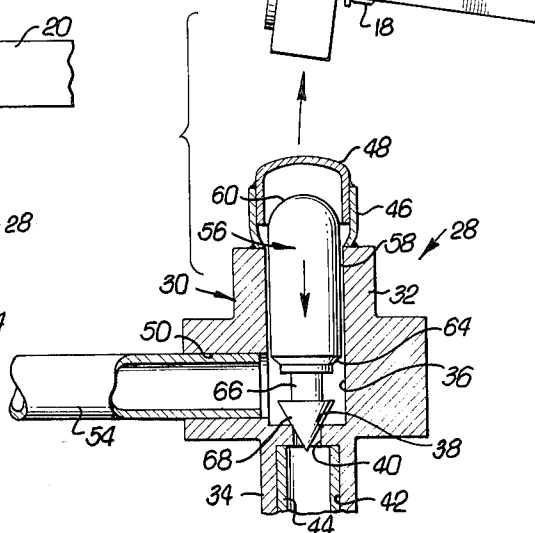


FIG. 4.



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FIG. 5.

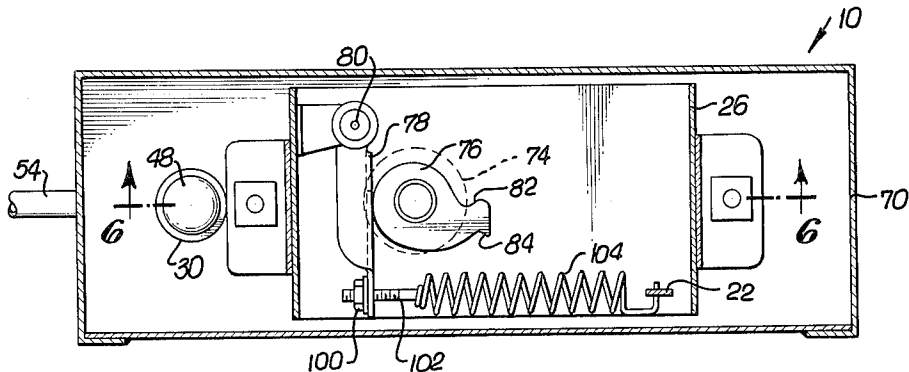
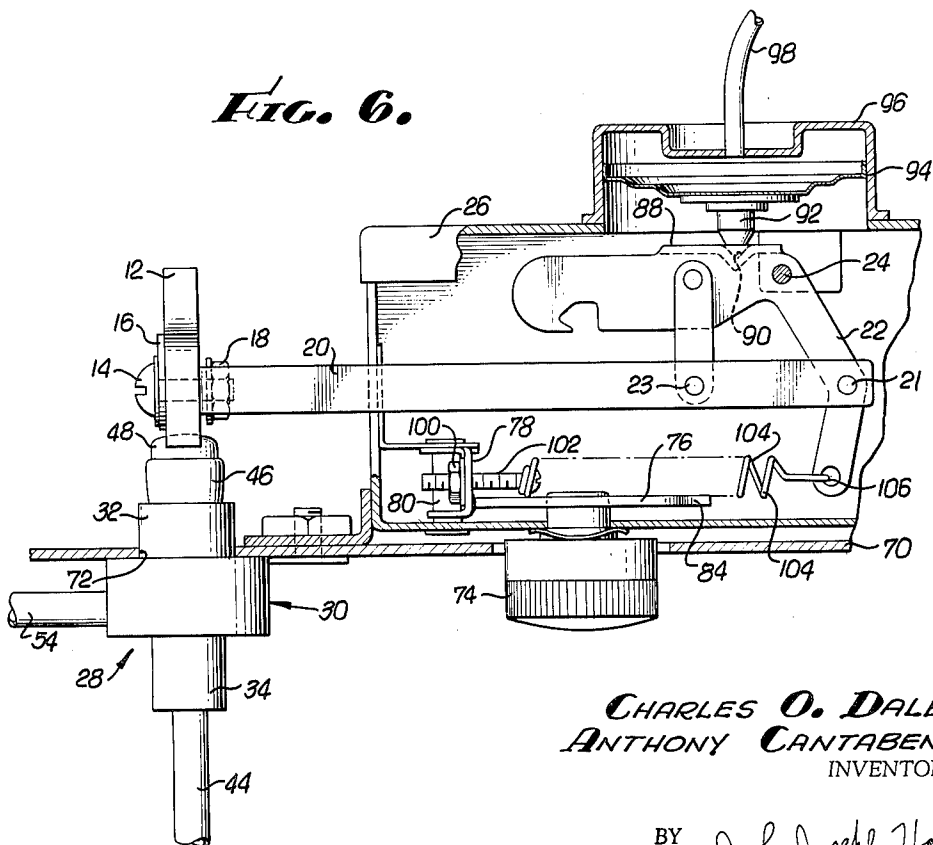


FIG. 6.



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1

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MAGNETICALLY ACTUATED CONTROL FOR THERMOSYPHONING REFRIGERATOR SYSTEM

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1 Claim. (Cl. 251—65)

This invention relates to a new type of control for thermosiphoning refrigerator systems and particularly to magnetic means of control without the need for electrical outlets.

Existing controls for refrigerator systems are not self-contained in that they need an external source of electricity to actuate their mechanism. Consequently such controls are dependent upon a constant supply of electrical power. Further, such controls are often difficult to assemble and also are subject to metal fatigue thereby causing a failure.

It is therefore an object of this invention to provide a control means for refrigerator systems which is self-contained and is not dependent upon an external source of electrical or other types of power.

Another object of this invention is to provide a control means for such systems which is easy to assemble and trouble-free.

A further object of this invention is to provide control means for such systems which is rugged and maintains its sensitivity over a wide range of operating temperatures.

These and other objects will be more readily understood by reference to the following description and claim taken in conjunction with the accompanying drawing, in which

FIGURE 1 is an elevational view of an embodiment of this invention.

FIGURE 2 is a view taken on line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged section taken on line 3—3 of FIGURE 2 showing the magnetic valve closure pin in the open position.

FIGURE 4 is a view similar to FIGURE 3 showing the magnetic valve closure pin in the closed position.

FIGURE 5 is a section taken on line 5—5 of FIGURE 1.

FIGURE 6 is an enlarged section taken on line 6—6 of FIGURE 5.

In the construction of the invention illustrated in the drawing, the magnetic control 10 has a permanent magnet 12 rigidly attached by screw 14 with washers 16, and nut 18 to arm 20 which is rigidly attached to pivot arm 22 at 21 and 23. Pivot arm 22 is pivotally mounted at pivot pin 24 to frame 26.

Below the magnet 12 is the magnetically actuated control valve 28, which has a valve body 30 with an upper portion 32 having a reduced outer circumference and a lower portion 34 with a reduced outer circumference. Inside the valve body 30 is a cylindrically-shaped valve chamber 36 with a valve seat 38 and an orifice 40 in its bottom. Orifice 40 leads to an outlet for outlet port 42 of the valve body 30 which receives outlet tube 44.

The upper end of valve chamber 36 terminates with a tubular extension 46 which receives valve cap 48 which is secured inside the extension 46 by suitable means such as brazing or soldering.

An opening 50 in a side wall of the valve chamber 36 provides an inlet which receives the inlet tube 54.

The valve chamber 36 contains valve closure pin 56 which has a cylindrical body 58 fitting the inside contour

2

of the valve chamber 36. The upper portion of the cylindrical body 58 of the valve pin 56 is formed into a bullet-shaped head 60 which fits the inside contour of valve cap 48. The head 60 may be constructed of any suitable material which is magnetically attracted to the magnet 12. However, all other elements of the magnetic control valve are preferably made of non-magnetic material.

The lower end of the cylindrical body 58 of the valve pin 56 is formed into a bevel 64 which terminates in a valve rod 66 having at its end a cone-shaped plug 68 which seats against valve seat 38. The overall length of valve pin 56 is less than the distance from valve cap 48 to the orifice 40.

The valve body 30 is secured to the housing 70 by inserting the upper portion of the valve body 30 up through a hole 72 in the housing 70 and cementing or otherwise securing the valve body 30 to the housing.

Spring control knob 74 has a cam 76 at its upper end which bears against spring arm 78 which is pivoted at pivot pin 80. Cam 76 has stops 82 and 84 which limit rotation of the cam 76 between two extremes by abutment with spring arm 78.

Pivot arm 22 has a top portion 88 with a depression 90 to receive bellows pin 92 mounted to a conventional bellows 94. Bellows 94 is hermetically sealed and is enclosed in bellows box 96 which is mounted on frame 26. Bellows 94 is constructed of a suitable metal which readily expands or contracts responsively to gas pressure. A tube 98 leads from bellows 94 to sensing bulb 99 which is filled with a suitable gas of a refrigerant type such as Freon which is non-toxic and responsive to changes in temperature.

Besides cam 76, an additional spring adjustment is provided by nut 100 threaded on screw 102 which is fixed to one end of spring 104. The other end of spring 104 is fixed to pivot arm 22 at 106.

The operation of the invention may be illustrated by a discussion of a complete cycle from the open position of valve closure pin 56 to the closed position of the pin 56. When pin 56 is in the closed position, not magnetically attracted by magnet 12, as the temperature external to the sensing bulb 99 begins to rise, the gas inside bulb 99 expands with a corresponding expansion of gas and increase of gas pressure inside bellows 94, which causes bellows 94 to expand. As bellows 94 expands, bellows pin 92 is urged downwardly which causes pivot arm 22 to exert a lever action on arm 20, causing the end of arm 20 holding the magnet 12 to be lowered.

As the magnet 12 moves downward, attraction occurs in the magnetic action between valve closure pin 56 and the magnet 12, attracting pin 56 which moves upward to unseat from valve seat 38, opening orifice 40 and permitting flow of refrigerant through tubes 44 and 54.

When the temperature external to the sensing bulb 99 begins to drop, the gas within the bulb contracts, with a corresponding contraction of gas and decrease of gas pressure inside bellows 94, which causes bellows 94 to contract. As bellows 94 contracts, bellows pin 92 moves upward, causing pivot arm 22 to move the portion of arm 20 having the magnet 12 upwards and away from valve closure pin 56. As the magnet 12 moves further than approximately three-sixteenths of an inch from the pin 56, the magnetic attraction of the magnet 12 for pin 56 is broken, so that pin 56 falls down to seat against valve seat 38 so as to prevent flow of refrigerant through tubes 44 and 54.

Tubes 44 and 54 have been arbitrarily designated as outlet and inlet tubes respectively and it is obvious that flow of refrigerant in either direction may be controlled by the invention.

3

The magnetically actuated control is independent of a source of any type of electrical power. The various parts of which it is constructed may be made of any suitable type of material and they are easily assembled. Because of the relatively few number of parts, and their rugged construction, the device is substantially trouble-free over wide ranges of operating conditions.

The device is sensitive to differences of temperature within plus or minus 3° F. at a particular setting. The range of sensitivity may be adjusted by turning spring control knob 74 in the direction desired to increase or decrease tension on spring 104. Further adjustment of spring 104 is provided by nut 100 threaded on screw 102.

While we have described our invention with respect to a preferred embodiment, it is understood that various modifications and changes may be made in the location and form of the various elements without departing from the spirit and scope of the invention as defined in the following claim.

We claim:

A magnetic control valve for a refrigerating system, comprising: a valve body having a ferromagnetic valve member therein, movable by gravity to a valve closing position; a pivoted lever having a magnet thereon and being swingable toward and from a position wherein said magnet is adjacent said valve body, to magnetically move said valve member to valve opening position; a hol-

4

low expandable bellows device having a portion engaging said lever to urge said magnet toward said position when said bellows expands; a remotely positioned temperature sensing bulb connected by a tube to the interior of said bellows; spring means secured at one end to said lever and at the other end to a movable member, said spring means being arranged to bias said lever in a direction to swing said magnet away from said position; and manually operable means for selectively moving said movable member to thereby adjust the tension of said spring means said movable member being a second pivoted lever and said manually operable means being a rotary cam engaging a movable portion of said second pivoted lever.

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M. CARY NELSON, *Primary Examiner*.