May 8, 1934. H. A. GREENWALD 1,957,828

RESISTANCE UNIT

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Fig. 1.

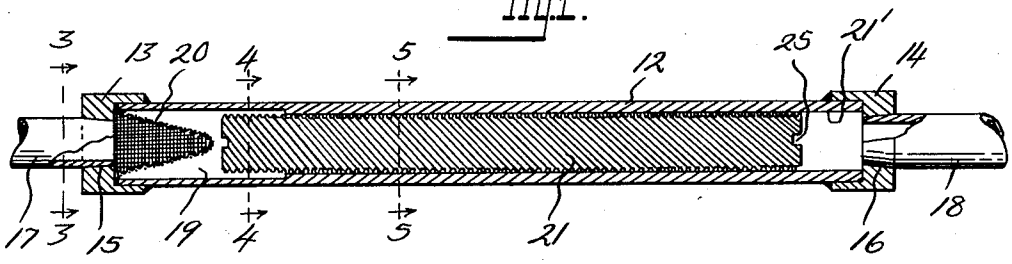


Fig. 2.

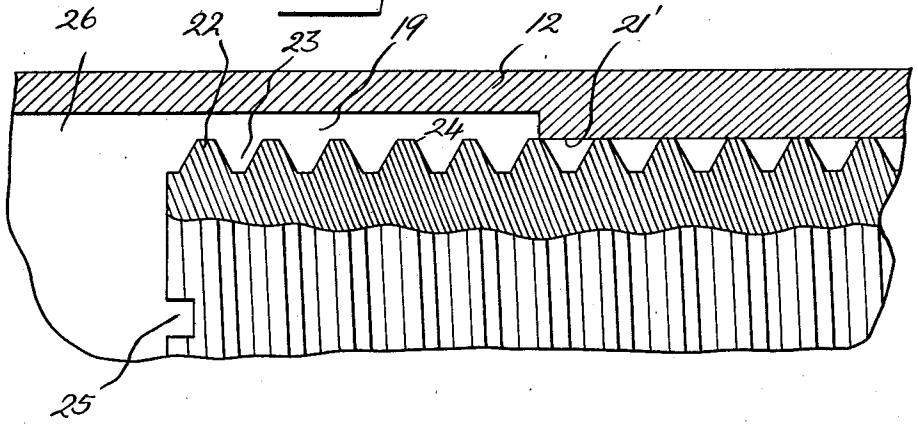


Fig. 3.

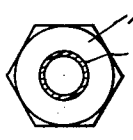


Fig. 4.

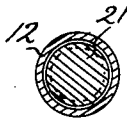
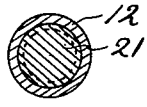


Fig. 5.



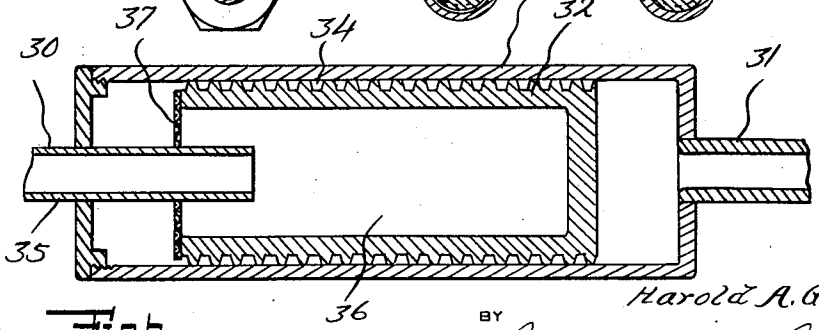


Fig. 6.

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Whittemore, Hughes & Whittemore & Dickerson

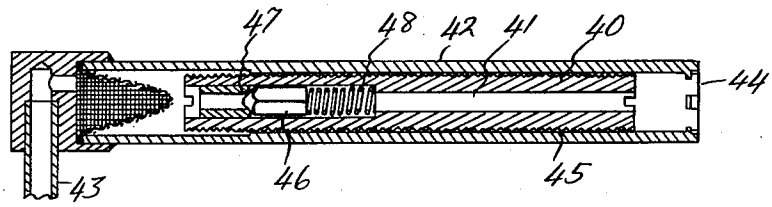
ATTORNEYS

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Fig. 7.



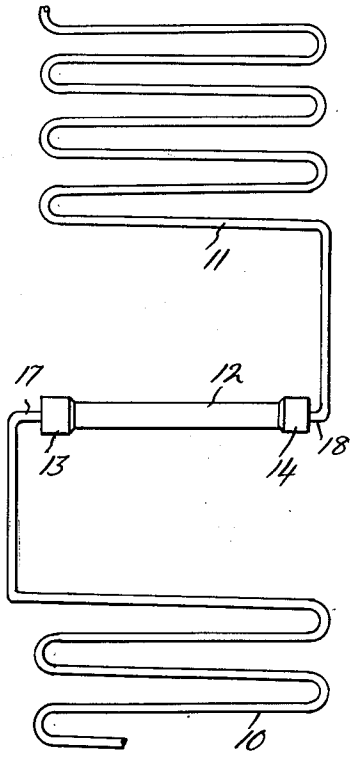


Fig. 8.

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UNITED STATES PATENT OFFICE

1,957,828

RESISTANCE UNIT

Harold A. Greenwald, Detroit, Mich., assignor, by mesne assignments, to Kelvinator Corporation, Detroit, Mich., a corporation of Michigan

Application October 20, 1930, Serial No. 490,073

1 Claim. (Cl. 62—127)

This invention relates generally to refrigerating systems and more particularly to improved means for controlling the flow of refrigerant from the high to the low pressure sides of the system.

One of the principal objects of this invention is to provide a resistance unit intermediate the high and low pressure sides of the system for accurately regulating the passage of fluid from the high to the low side and contemplates a device of this type which is extremely simple and compact in design and one that insures efficient operation of the system at all times.

With the foregoing as well as other objects in view, the invention resides in the novel details of construction illustrated and about to be described.

In the drawings:

Figure 1 is a longitudinal sectional view through a resistor unit constructed in accordance with this invention;

Figure 2 is a fragmentary enlarged sectional view of the construction shown in Figure 1;

Figures 3, 4 and 5 are cross sectional views taken respectively on the lines 3—3, 4—4 and 5—5 of Figure 1;

Figures 6 and 7 are views similar to Figure 1 showing slightly modified forms of the invention;

Figure 8 is a fragmentary diagrammatic view showing the resistor illustrated in Figure 1 as applied to a refrigerating system.

While the inventive idea involved herein is capable of many and diversified uses, nevertheless, I have shown the same for the purpose of illustration as applied to a refrigerating unit for regulating the flow of fluid from the high to the low pressure sides of the system. In other words, the resistor unit, forming the subject matter of this invention, may be used to advantage for controlling the flow of refrigerant from the condenser 10 to the expansion coils or boiler 11 shown in Figure 8.

Referring now more in detail to the resistor unit featured in Figures 1 to 5, inclusive, it is to be noted that this unit comprises a tubular elongated casing 12 having cap portions 13 and 14 upon opposite ends thereof provided with inlet and outlet openings 15 and 16, respectively. The openings 15 and 16 are adapted to receive the conduits 17 and 18 communicating respectively with the condenser and expansion coils. The tubular casing 12 is formed with an enlarged chamber or counterbored portion 19 at the inlet end thereof within which is disposed a suitable filter 20 extending over the inlet opening 15 for filtering the refrigerant discharged into the tubular casing 12 by the conduit 17.

In order to provide for efficient operation of the refrigerating system, it is necessary to restrict or retard the passage of refrigerant from the high to the low pressure sides of the system or in other words, to regulate the flow of refrigerant from the condenser to the expansion coils in order to create the necessary pressure difference. The foregoing is accomplished in the present instance by telescoping a rod or circular member 21 within the tubular casing 12 intermediate the inlet and outlet openings 15 and 16, respectively. The rod is preferably provided throughout its length with a continuous spirally-arranged projection 22 forming correspondingly disposed grooves 23 which cooperate with the adjacent inner surface of the tube 12 to form a circuitous passage for the refrigerant. In other words, the rod 21 may be said to be in the form of a screw, the outside diameter of which is substantially equal to the interior diameter of the major portion 21′ of the tubular member 12 so as to snugly engage the inner wall of the latter portion. While the peripheral portions 24 of the spirally-arranged projection 22 snugly engage the inner annular surface 21′ of the tubular member 12 to form the circuitous passage aforesaid, nevertheless, the engagement is such that upon relative rotation of the tubular member and screw, the latter will move axially of the tubular member for reasons to be presently described. In order to effect relative rotation of the tubular member and rod and thereby cause axial movement of the rod 21, the opposite ends of the latter are slotted as at 25 for receiving a suitable tool. At this time it is desired to point out that the contact between the flattened edges of the spiral projection 24 and the smooth surface 21′ of the tube 12 is such that it is impossible to move the screw 21 longitudinally of the tube 12 without turning it by a screw driver or some other suitable tool. For example, it is impossible to press the screw 21 longitudinally by end thrust without terrific force being exerted. In fact, the engagement between the projection 24 and the smooth surface 21′ is almost a press fit and the friction is such as to absolutely preclude the refrigerant admitted at the inlet end of the tube from pushing or moving the screw 21 in any manner whatever. Since the engagement of the projection 24 with the surface 21′ is so positive the turning of the screw by a screw driver is in effect like turning a screw in a threaded tube. Consequently such

turning of the screw causes the same to move longitudinally of the tube and such longitudinal movement can be accomplished only by turning the screw. The arrangement is such that axial movement of the screw relative to the tubular casing 12 varies the effective length of the circuitous passage for the refrigerant since movement of the screw 21 toward the inlet end of the casing disposes the adjacent end of the screw in the counterbored portion 19 of the tubular casing 12 as clearly shown in Figure 2. When the screw is in the position shown in the above figure, it will be apparent that the peripheral surfaces of the spiral projection disposed in the enlarged portion 19 is spaced inwardly a substantial distance from the adjacent surface 26 of the counterbored portion and as a consequence, does not restrict the flow of refrigerant to a predetermined path and is therefore ineffective to retard the flow of refrigerant. Thus, it will be seen that the resistance offered to the flow of refrigerant from the condenser to the expansion coils is reduced by merely moving the screw axially to locate a portion of the same within the counterbored part of the tubular casing. On the other hand, when the screw 21 is moved axially toward the outlet opening 16 of the casing, the length of the circuitous passage is progressively increased until the entire length of the screw is located within the reduced portion of the tubular casing at which time the resistance offered to the flow of refrigerant is at its maximum.

Thus, from the foregoing description it will be observed that the resistor unit illustrated in Figure 1 comprises essentially a pair of telescopically engaging members cooperating with each other to form a circuitous passage for the flow of refrigerant and operable upon relative axial movement to vary the effective length of the passage and thereby accurately control the resistance offered to the flow of refrigerant from the high to the low pressure sides of the system.

The modified form of unit illustrated in Figure 6 is somewhat similar in construction to the previously described form of the invention with the exception that the resistance offered to the flow of refrigerant from the high pressure side designated generally by the reference character 30 to the low pressure side 31 is more or less constant since relative axial movement of the inner and outer telescopically engaging members 32 and 33, respectively, does not affect the circuitous passage 34. In the construction illustrated in Figure 6, however, the inlet conduit 35, extending from the condenser, extends within a recess 36 formed in the inner member 32. The arrangement is such that the refrigerant from the condenser is discharged directly into the recess 36 in the member 32 prior to flowing through the circuitous passage 34. If desired, a suitable screen 37 or other filtering device may be extended across the open end of the recess 36 for filtering the refrigerant prior to its entrance into the expansion coil.

Referring now to the modified form of the invention illustrated in Figure 7, it will be noted that this modification is identical to the first-described form of the invention with the exception that the screw 40 corresponding to the screw 21, hereinbefore described, is provided with an axially extending bore 41 establishing communication between the portions of the tubular casing 42 adjacent the inlet and outlet openings 43 and 44, respectively. The arrangement is such that refrigerant discharged from the condenser, in addition to flowing through the circuitous passage 45, may, under certain conditions, flow directly through the bore 41. The flow of refrigerant through the bore 41 is normally prevented by means of a check valve 46 arranged within the bore and normally retained into sealing engagement with an annular seat 47, also within the bore, by means of a spring 48. The pressure exerted by the spring 48 is sufficient under normal conditions to prevent opening of the check valve 46 by the pressure in the high side of the system. However, in the event the pressure in the high side of the system rises above a predetermined amount or above the pressure exerted by the spring, the valve 46 will open permitting the refrigerant to flow directly through the bore 41 into the low side of the system. In other words, the valve 46 functions as a relief valve for by-passing the refrigerant from the condenser directly into the expansion coils in the event too great a pressure builds up in the high side of the system.

While in describing and particularizing upon the advantages of the present invention particular stress has been placed upon the association of my improved resistor in connection with a refrigerating system, it is to be noted that the same may be employed with equal facility in connection with numerous other systems and accordingly reservation is made to make such changes as may come within the purview of the accompanying claim.

What I claim as my invention is:

A device with which to connect the high pressure side with the low pressure side of a refrigerating system for feeding liquid refrigerant to the low pressure side at reduced pressures comprising an outer tubular member having an inlet at one end and an outlet at the opposite end, a substantially cylindrical threaded member positioned within the hollow portion of said tubular member, said threaded member having a longitudinal bore closed adjacent the outlet end of said tubular member and being arranged so that the threaded portion thereof engages said tubular member to form a circuitous passage for the flow of refrigerant between said members, said high pressure side being associated with said inlet for supplying liquid refrigerant through said inlet into said longitudinal bore, and filtering means positioned for filtering said refrigerant before entering said circuitous passage, and said low pressure side being associated with said outlet.

HAROLD A. GREENWALD.