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1,879,197

RESISTOR UNIT FOR REFRIGERATING APPARATUS

Filed Jan. 12, 1931

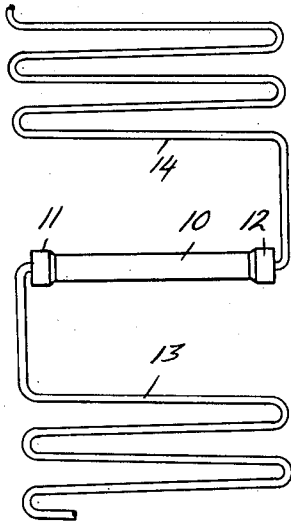


Fig. 1.

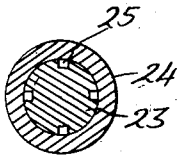


Fig. 5.

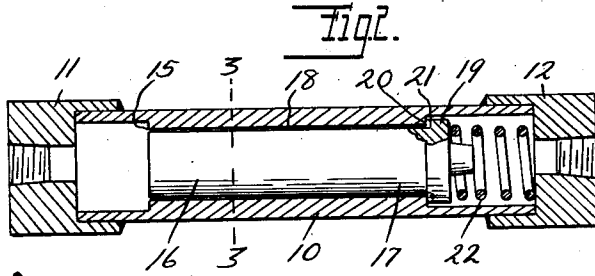


Fig. 2.

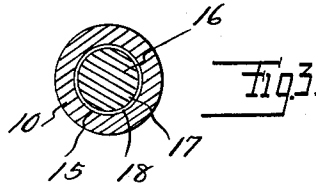


Fig. 3.

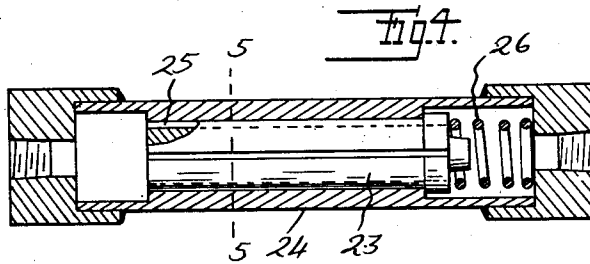


Fig. 4.

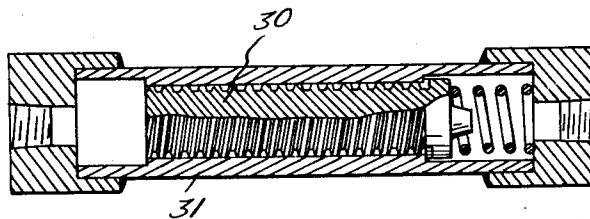


Fig. 6.

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RESISTOR UNIT FOR REFRIGERATING APPARATUS

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This invention relates to improvements in variable resistor units for regulating the flow of fluid from one point to another.

While the resistor unit forming the subject matter of this invention is capable of many and diversified uses, nevertheless, it finds particular utility when used in connection with refrigerating apparatus for regulating the flow of refrigerant from the high to the low pressure sides of the systems.

One of the principal objects of this invention is to provide a resistor unit of the type specified above automatically operable to vary the resistance offered to the passage of fluid therethrough in accordance with the pressure in the high side of the system or at the inlet end of the unit.

A further object of this invention is to simplify, render more efficient and improve generally resistor units of the type specified by simplifying the several parts involved and by reducing the number of such parts to a minimum.

Other objects of the invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a diagrammatical elevational view showing a refrigerating system equipped with a resistor unit constructed in accordance with this invention;

Figure 2 is a longitudinal sectional view through the resistor unit illustrated in Figure 1;

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a view similar to Figure 2 showing a slightly modified form of construction;

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 4;

Figure 6 is a view similar to Figure 2 showing still another modified form of construction.

For the purpose of illustration, I have shown my improved resistor unit as used in connection with refrigerating systems for regulating the flow of refrigerant from the high side of the system to the low side thereof. In general, the several resistor units illustrated herein comprise telescoping mem-

bers cooperating with each other to form a fluid passage proportioned to offer a predetermined resistance to the flow of fluid from the high to the low pressure sides of the system. It will further be apparent as this description proceeds that the telescoping members aforesaid are automatically movable relative to each other in accordance with the pressure built up by the refrigerant in the high side of the system to vary the effective length of the passage and accordingly the resistance offered to the flow of fluid from the high side of the system to the low side thereof. In other words, the resistance offered by the unit to the flow of fluid from the high to the low sides of the system is dependent upon the relative pressures in the high and low sides.

Referring now more in detail to the resistor unit illustrated in Figures 1, 2 and 3, it will be noted that this unit comprises a tubular member 10 having couplings 11 and 12 upon the inlet and outlet ends respectively connected to the condenser 13 and cooling unit 14 of a refrigerating system. The tubular member 10 is provided with an internal portion 15 of predetermined interior diameter adapted to telescopically receive a plunger 16 having a shank portion 17 corresponding in length to the interior portion 15 of the tubular member and having an external diameter proportioned to cooperate with the interior diameter of the portion 15 to provide an annular passage 18 of predetermined cross sectional area. The arrangement is such that when the plunger 16 is in the position illustrated in Figure 2 relative to the tubular member 10, the parts are so proportioned that the passage 18 formed thereby offers a predetermined resistance to the flow of refrigerant from the condenser to the cooling unit.

The end of the plunger 16 adjacent the outlet end of the tubular member 10 is provided with an enlarged head portion 19 adapted to engage a shoulder 20 formed by the internal portion 15 of the tubular member and having a diameter slightly less than the internal diameter of the tubular member at the outlet end thereof so as to provide a clearance between the head portion of the plunger

and the adjacent wall of the tubular member. As shown in Figure 2, spaced portions of the head 19 adjacent the shoulder 20 are cut away as at 21 in such a manner as to permit the flow of refrigerant from the passage 18 past the head portion 19 when the latter is in engagement with the shoulder 20. From the foregoing it will be apparent that when the head portion 19 of the plunger 16 is in engagement with the shoulder 20, maximum resistance will be offered by the unit to the flow of fluid therethrough and the parts are normally maintained in the above position by means of a coil spring 22 arranged within the outlet end of the tubular member with one end thereof engaging the coupling member 12. It may be mentioned at this point that when the resistor unit is in use, the plunger 16 is maintained concentric within the tubular member 18 by a film of fluid within the annular passage 18 surrounding the plunger.

The strength of the spring 22 is so determined that under normal operating conditions the parts of the resistor unit will be maintained in the position shown in Figure 2 wherein maximum resistance is offered to the flow of the refrigerant from the condenser into the cooling unit. However, if for any reason an abnormal pressure builds up in the condenser unit this pressure, acting upon the inlet end of the plunger, will compress the spring 22 to decrease the length of the passage 18 and thereby reduce the resistance offered to the flow of fluid from the condenser to the cooling unit. Thus, it will be seen that any tendency for sediment or the like to collect in the inlet end of the tubular member 10 tending to clog the passage 18 and thereby build up an abnormal pressure is prevented since the increased pressure of the fluid will immediately decrease the resistance offered to the flow of fluid through the unit and thereby dispose of the foreign matter.

The modified form of resistor unit illustrated in Figures 4 and 5 is similar in operation to the resistor unit specified above and differs in construction therefrom in that the plunger 23 slidably engages within the tubular member 24 and is provided with a plurality of circumferentially spaced longitudinally extending grooves cooperating with the internal portion 24 of the tubular member to provide passages 25 of predetermined cross sectional area. The number of grooves or passages may vary from one on up, but irrespective of the number of passages provided, the latter are so proportioned as to offer a predetermined resistance to the flow of fluid from the inlet to the outlet end of the resistor unit when the plunger is in the position shown in Figure 4. A spring 26 is provided for normally maintaining the plunger in the aforesaid position and as previously stated, the unit functions in the same manner as the resistor unit hereinbefore described in that

the effective length of the passage or passages in the unit is automatically varied in accordance with the pressure in the high side of the system or at the inlet end of the tubular member.

The modification illustrated in Figure 6 differs from the foregoing constructions in that the plunger is formed with a spiral groove extending from one end to the other and cooperating with the interior surface of the tubular member 31 to form a passage for the flow of fluid through the resistor unit. The plunger 30 slidably engages within the tubular member 31 to vary the effective length of the spiral passage and accordingly the resistance offered to the passage of fluid through the resistor unit. Thus, from the foregoing it will be apparent that in each of the modifications illustrated herein the resistance offered to the passage of fluid from the condenser to the cooling unit is automatically regulated by the pressure in the condenser with the result that if for any reason an abnormal pressure builds up in the condenser unit, the same is relieved by immediately and automatically reducing the resistance offered to the passage of fluid through the resistor unit.

What I claim as my invention is:

1. A variable resistor unit comprising elongated telescoping members having portions cooperating with each other to form a fluid passage proportioned to offer a predetermined resistance to the flow of fluid through the unit in one position of said members, and means normally maintaining said members in the aforesaid position automatically operable in accordance with pressure variations at the inlet end of the unit to permit relative longitudinal movement of said members for varying the effective length of the passage.

2. A variable resistor unit comprising relatively movable members cooperating with each other to form a fluid passage proportioned to offer a predetermined resistance to the flow of fluid through the unit in one position of the members, and means acting upon said members and normally maintaining the same in the aforesaid position, said means being automatically operable in accordance with pressure variations at the inlet end of said unit to permit relative movement of the members for varying the length of the passage.

3. A variable resistor unit comprising elongated telescoping members cooperating with each other to form an annular elongated fluid passage proportioned to offer a predetermined resistance to the flow of fluid through the unit in one position of said members, and means normally maintaining the members in the aforesaid position and automatically operable in accordance with pressure variations at the inlet end of said unit

for moving said members longitudinally relative to each other to vary the length of the passage.

4. A resistor unit for controlling the flow of refrigerant from the high side of a refrigerating system to the low side thereof, comprising relatively movable members co-operating with each other to form a passage for the refrigerant proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides aforesaid in one position of said members, and yieldable means normally maintaining said members in the aforesaid position and automatically operable in accordance with pressure variations in the high side of the system to permit movement of said members relative to each other for varying the effective length of the passage and accordingly the resistance offered to the flow of refrigerant.

5. A resistor unit for controlling the flow of refrigerant from the high side of a refrigerating system to the low side thereof comprising a tubular member having the opposite end portions communicating respectively with the high and low pressure sides of the system, a plunger telescoped within the tubular member and cooperating with portions of the interior surface thereof to form a passage proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides of the system in one position of said plunger, and yieldable means normally maintaining said plunger in the aforesaid position and operable upon variations in pressure in the high side of the system to permit movement of said plunger axially of the tubular member to vary the effective length of the passage and accordingly the resistance offered to the flow of refrigerant.

6. A variable resistor unit comprising two elongated members having cooperating portions forming a fluid passage proportioned to offer a predetermined resistance to the flow of fluid, one of said members being movable relative to the other by fluid pressure for varying the effective length of said passage, and means normally holding said member against movement but operable automatically in accordance with pressure variations to permit said movement.

7. A variable resistor unit comprising two elongated members having cooperating portions forming a fluid passage proportioned to offer a predetermined resistance to the flow of fluid, one of said members being movable relative to the other by fluid pressure for varying the effective length of said passage, and means opposing movement of said member but yieldable in accordance with pressure variations to permit such movement.

8. A resistor unit for controlling the flow of refrigerant from the high side of a re-

frigerating system to the low side thereof, comprising a tubular member having portions at spaced points thereof communicating respectively with the high and low pressure sides of the system, a plunger within the tubular member between said portions and co-operating with other portions of the member to form a passage proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides of the system, said plunger being movable relative to the tubular member by the fluid pressure in the high side of the system to vary the effective length of the passage and accordingly the resistance offered to the flow of refrigerant, and means normally holding said plunger against such movement but operable automatically upon variations in pressure in the high side of the system to permit said movement of the plunger.

9. A resistor unit for controlling the flow of refrigerant from the high side of a refrigerating system to the low side thereof, comprising a tubular member having portions at spaced points thereof communicating respectively with the high and low pressure sides of the system, a plunger within the tubular member between said portions and cooperating with other portions of the member to form a passage proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides of the system, said plunger being movable in substantially a straight line longitudinally of said member to vary the effective length of the passage and accordingly the resistance offered to the flow of refrigerant, and means normally holding said plunger against such movement but yieldable upon variations in pressure in the high side of the system to permit said movement of the plunger.

10. A resistor unit for controlling the flow of refrigerant from the high side of a refrigerating system to the low side thereof comprising an elongated member having couplings thereof at spaced points thereof communicating respectively with the high and low pressure sides of the system and having a tubular portion intermediate said couplings, a plunger within the tubular portion of said member, having portions cooperating with said tubular portion to form a passage proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides of the system, and having a head engageable with an end of the tubular portion of said member and disposed in spaced relation to one of the couplings aforesaid, said plunger being movable longitudinally of the member to vary the effective length of the passage and accordingly the resistance offered to the flow of refrigerant, and means holding the plunger

against such movement but operable upon variations in pressure in the high side of the system to permit the plunger to move, including a yieldable member in the space between the head and adjacent coupling.

11. A resistor unit for controlling the flow of refrigerant from the high side of a refrigerating system to the low side thereof comprising an elongated member having couplings thereof at spaced points thereof communicating respectively with the high and low pressure sides of the system and having a tubular portion intermediate said couplings, a plunger within the tubular portion of said member, having portions cooperating with said tubular portion to form a passage proportioned to offer a predetermined resistance to the flow of refrigerant from the high to the low pressure sides of the system, and having a head engageable with an end of the tubular portion of said member and disposed in spaced relation to one of the couplings aforesaid, said plunger being movable longitudinally of the member by the fluid pressure in the high side of the system to vary the effective length of the passage and accordingly the resistance offered to the flow of refrigerant, and a spring extending between the head and adjacent coupling, opposing movement of the plunger by fluid pressure but yieldable upon variations in pressure in the high side of the system to permit the plunger to be moved by said pressure.

In testimony whereof I affix my signature.

HAROLD A. GREENWALD.