May 20, 1952 S. O. MORRISON 2,597,745

REFRIGERATOR AND STOVE

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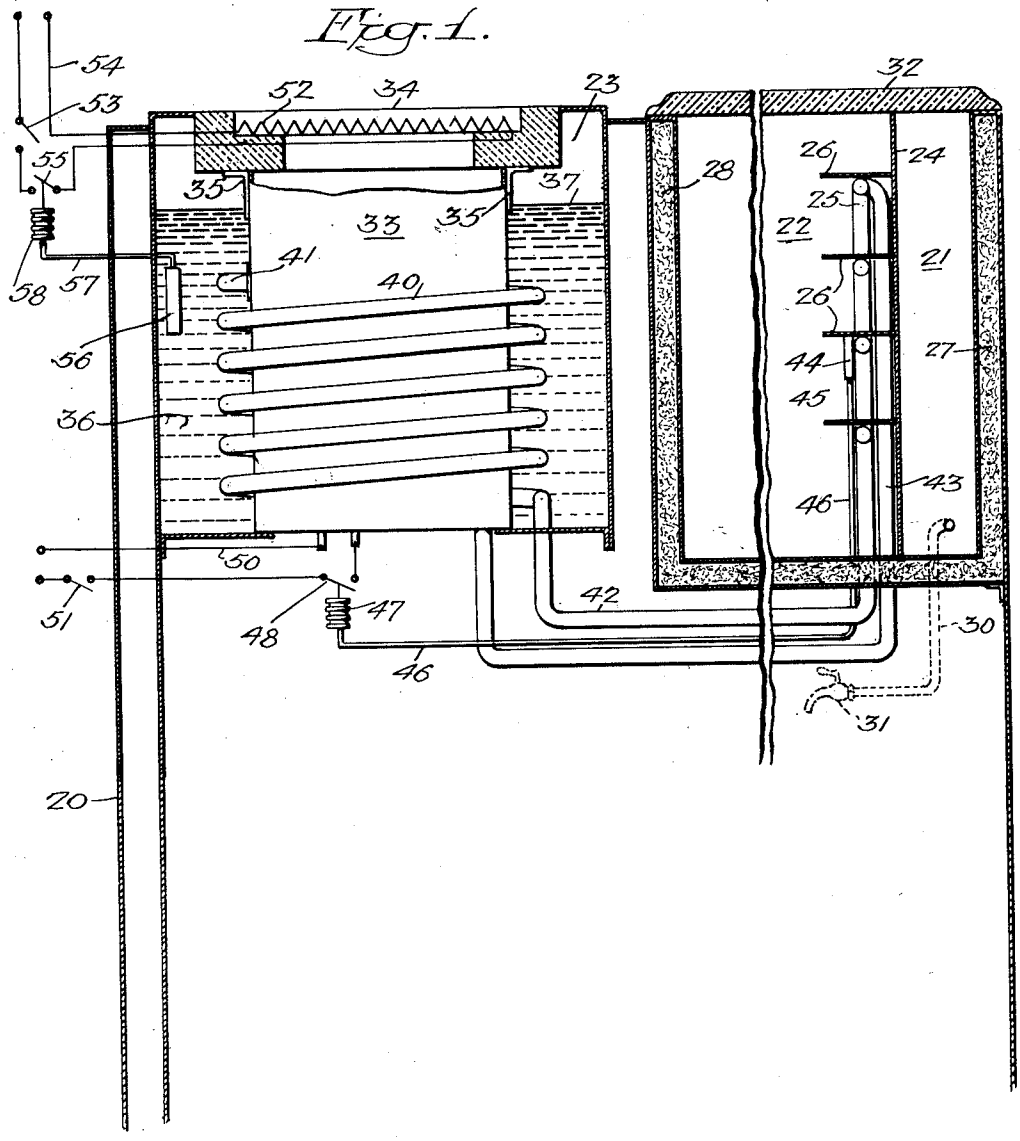
Fig. 1.



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REFRIGERATOR AND STOVE

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Fig. 2.

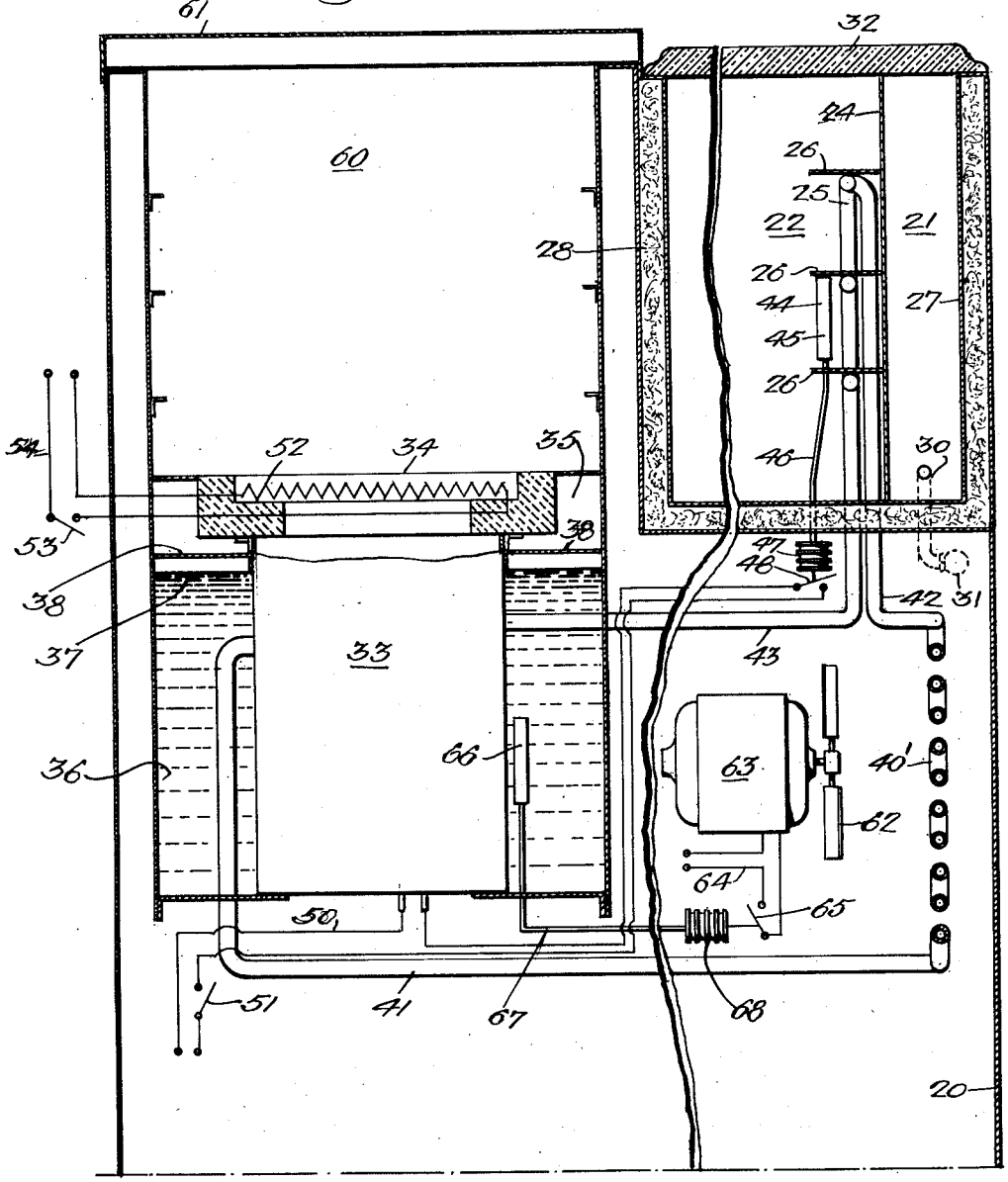

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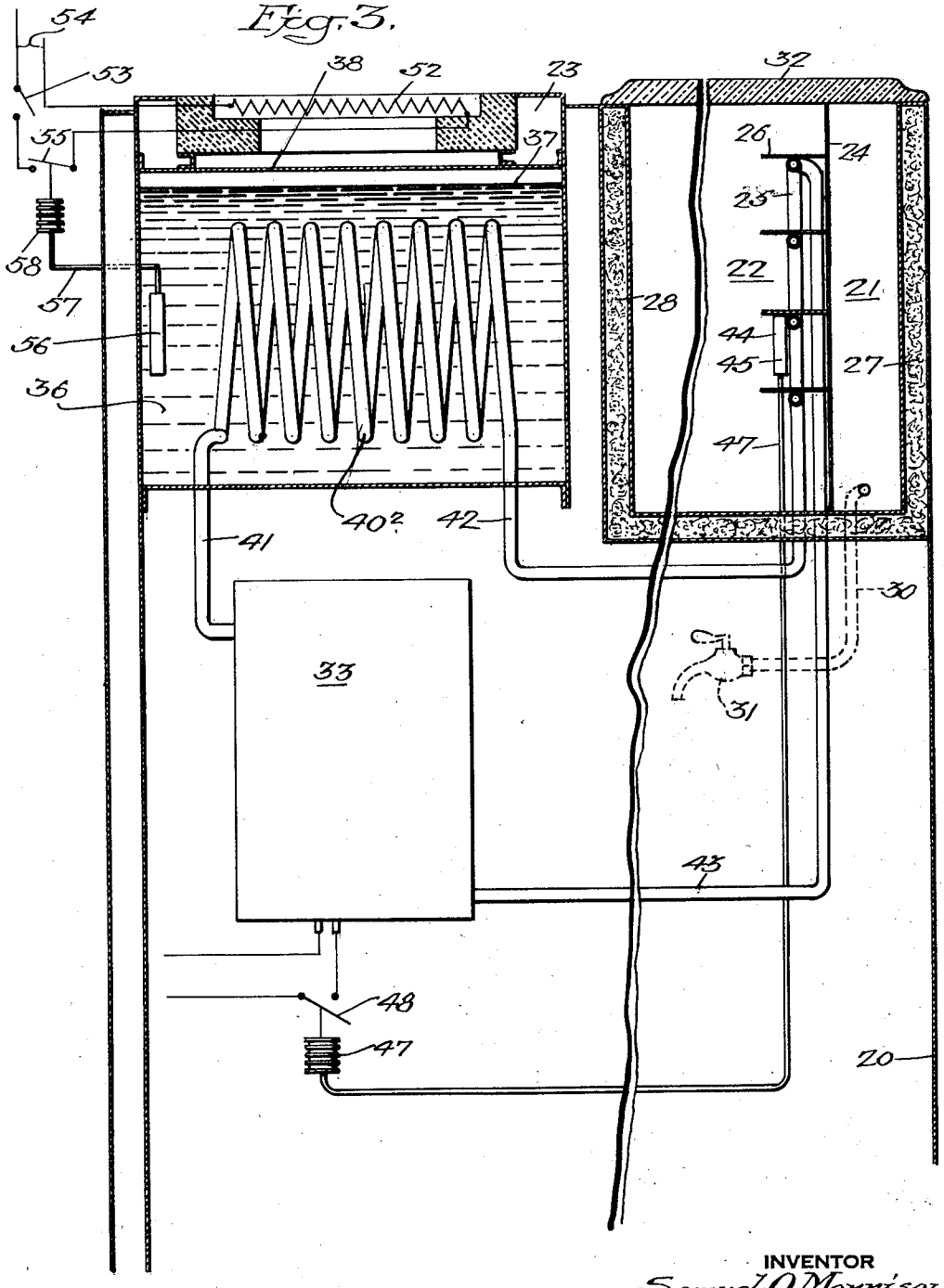
Fig. 3.



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Patented May 20, 1952

2,597,745

UNITED STATES PATENT OFFICE

2,597,745

REFRIGERATOR AND STOVE

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Application September 29, 1948, Serial No. 51,747

9 Claims. (Cl. 62—116)

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The present invention relates to refrigerators and stoves.

A purpose of the invention is to provide a stove for warming and heating which is operated from the heat produced by a mechanical refrigeration system.

A further purpose is to permit the warming of milk, coffee and other foods as a by-product advantage from the operation of a mechanical refrigeration system, particularly on vehicles such as railway trains and aeroplanes.

A further purpose is to provide refrigeration and stove compartments side by side in the same cabinet, but suitably insulated from one another, and operating from the same mechanical refrigeration system.

A further purpose is to operate a stove as the condenser of a mechanical refrigeration system.

A further purpose is to mount the compressor and/or the condenser of a mechanical refrigeration system in heat transfer relation to a stove, and preferably to immerse the compressor and/or the condenser in a liquid bath which provides heat for the stove.

A further purpose is to employ an auxiliary condenser which is normally ineffective, but is made effective to cool the compressor when the compressor reaches a specified high temperature due to the operation of the stove.

A further purpose is to employ an auxiliary electric heater for the stove, and desirably to equip the electric heater with an emergency cutoff to protect the compressor and its motor.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which my invention may appear, choosing the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figures 1, 2 and 3 are diagrammatic fragmentary central vertical sections of different embodiments of the invention. The upper portions of the cabinets only are shown, the lower portions being omitted to simplify the illustration.

Describing in illustration but not in limitation and referring to the drawings:

There are many installations of water coolers and mechanical refrigerators in places where facilities for warming food and other materials would be desirable. In some cases it would be desirable to be able to warm food which is stored in the refrigerator. In other cases it would be desirable to warm water which is dispensed by the water cooler. In still other instances food or other materials which are available independently of the refrigerator and water cooler should be warmed or heated; for example it is often desirable to warm a baby's bottle on a railway train or aeroplane, and such facilities are usually not available.

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In accordance with the present invention, the heat developed in the mechanical refrigeration unit or some portion thereof is made available for use in an electric stove or hot plate for warming or cooking food or other articles. By the invention, the compressor and also the condenser in one embodiment are placed in heat transfer relation with the stove, suitably in a liquid bath below the stove. In the meantime the refrigeration produced is employed in a refrigerator or water cooler in the usual manner.

The refrigerator compartment and stove compartment are preferably placed side by side at the top of a cabinet, so as to simplify the connections of the operating elements of the refrigeration unit, and make both the refrigerator and the stove readily accessible by the user.

In one embodiment of the invention an auxiliary condenser is provided which is normally effectively inoperative, but which is made operative when required in response to the abnormal rise in temperature in the compressor.

In many cases it is desirable to provide an auxiliary electric heater for the stove, so as to raise the temperature beyond the temperature reached by the compressor. The auxiliary electric heater is preferably provided with a safety thermostat cutoff to prevent unduly heating the compressor and its motor.

Referring to Figure 1, a cabinet 20 has conveniently located near its top a water storage and cooling compartment 21 of a water cooler, a refrigerator compartment 22 and a stove compartment 23, desirably located side by side so that each can be independently accessible to the user. The refrigerator and water cooler compartments are separated by a heat transfer wall 24, which permits ready cooling of the water as well as of the refrigerator compartment by an evaporator 25 located in the compartment. The evaporator is suitably equipped with shelves 26 for holding ice cube trays if desired. The refrigerator compartment and water compartment are surrounded by heat insulation 27, which is particularly important at 28 between the refrigerator compartment and the stove compartment. The water from the water cooler compartment is discharged by a pipe 30 to a dispenser 31, which may be a

faucet or bubbler. The refrigerator compartment and water cooler compartment are covered by a suitably removable lid **32**.

The refrigeration for the refrigerator compartment and water cooler are provided by a motor-compressor **33**, preferably of the well known hermetic type. The motor-compressor is located in the stove compartment in heat transfer relation to the stove. This is best achieved by mounting the stove **34** directly on top of the motor-compressor as by metallic brackets **35**. To assure adequate storage of heat, the motor-compressor is desirably mounted in a metallic well **36**, which is properly liquid tight and contains a liquid bath up to a suitable level **37**. The liquid bath may vary with the intended use. For a dry stove or hot plate the liquid may suitably be molten paraffine, mineral oil, glycerine or other high boiling liquid. For a steam table, the liquid of the bath should be water or a solution in which a substantial amount of water is present. Of course, in the case of water, it will be necessary to replenish frequently, whereas with the high boiling liquids replenishment will not be required frequently. In order to suggest the practicability of using for a steam table, no sealing wall is placed over the liquid in Figure 1, but in Figures 2 and 3 a metallic partition **38** is placed over the top of the liquid to prevent splashing and minimize likelihood of fumes rising to the area where food will be heated.

In the form of Figure 1, a condenser **40** in the form of a coil is immersed in the liquid bath around the motor-compressor. Thus in this form the heat is removed from the compressor and from the condenser to the liquid bath and transmitted to the stove. As shown in Figure 2, however, a condenser may be employed which is outside the liquid bath. It should be recognized that the immersion of the compressor in the liquid bath makes the liquid bath in itself effectively a condenser.

High pressure refrigerant from the compressor passes through a pipe **41** to the condenser **40** and from the condenser flows preferably through a constrictor **42**, which serves as an expansion control (while an expansion valve may be employed, it is preferred to use a capillary tube) and thence to the evaporator **25**, from which it returns to the low pressure side of the compressor by a pipe **43**.

The refrigeration control of the motor-compressor is accomplished in the usual manner. A thermostat **44**, suitably of the expansible fluid type, includes a bulb **45** in close association with the evaporator, a capillary tube **46** connecting to the bulb and a bellows **47** connecting to the tube. On expansion of the fluid the bellows closes a switch **48** in the circuit **50** of the compressor-motor. A manual switch **51** can be operated to disconnect the mechanism, as for defrosting.

The stove is intended to derive its main source of heat from the compressor and the condenser, and by this means can be safely heated to a temperature of about 175° F. without danger of burning out the motor, even over a long period of time. For reasonable periods the motor will, however, stand considerably higher temperatures. Accordingly the stove is provided with an auxiliary electric heating element **52** connected in circuit by closing a manual switch **53** in its electric circuit **54**. In series with the auxiliary electric heating element is a normally closed thermostat switch **55**. The switch **55** is operated under emergency conditions by a thermostat suitably

of the expanding fluid type, including a bulb **56**, capillary connecting tube **57** and bellows **58**. When the temperature of the liquid bath and therefore of the motor and compressor reaches an abnormally high value, the thermostatic switch **55** will open, thus disconnecting the auxiliary heater **52**.

In operation the water cooler and refrigerator will be operated in the normal manner, while the heat developed by cooling will then be made available in the stove. Since the liquid bath will have considerable heat capacity, heat will be retained by the stove whether or not the compressor and motor are operating at the moment. If, however, the user desires to obtain a higher temperature this can be achieved by turning on the auxiliary heater. The auxiliary heater will, however, be limited to a reasonably short period of operation by the thermostatic switch, which will cut it off before the temperature of the motor-compressor can reach a dangerously high value. Thus for example, the auxiliary heater might be used to boil water, but the thermostatic switch may be set to cut the auxiliary heater off when the temperature of the liquid bath reached 220° F.

Figure 2 shows a variation in the form of Figure 1. In this form the stove is placed in the bottom of a warming oven **60**, provided with a removable lid **61**.

Instead of locating the condenser in the liquid bath, reliance for normal condenser action is placed entirely on the liquid bath acting on the motor-compressor and the short section of the pipe **41** immersed in the bath. A condenser **40'** is located outside the bath, and is normally maintained effectively inoperative because no source of cooling air or medium is provided. When, however, the motor compressor is in danger from an abnormally high temperature, protection is provided by an air circulating fan **62** having a motor **63** driven by an electric circuit **64** closed by a thermostatic switch **65** to blow a stream of air under the condenser **40'**. The thermostatic switch is desirably controlled by a thermostat of the expanding liquid type, having a bulb **66** immersed in the bath and connected by a capillary tube **67** with a bellows **68**, which on expansion closes the switch.

In operation the form of Figure 2 will be essentially the same as that of Figure 1 except that the protection of the motor-compressor against abnormally high temperatures will be provided by cooling the refrigerant through the auxiliary condensor rather than by disconnecting the auxiliary heater.

Figure 3 is a variation of form of Figure 1, in which the condenser **40²** is immersed in the liquid bath **36** in heat transfer relation with the stove, and the motor-compressor **33** is located outside of the liquid bath and not in heat transfer relation with the stove. The protection for the motor-compressor is in this case provided by a thermostat operating responsive to the temperature of the liquid bath and therefore of the condenser. The form of Figure 3 operates similarly to the form of Figure 1, but has the advantage in some cases that the motor-compressor need not be of the hermetic type.

The device of the invention is particularly applicable to use on vehicles and in other installations where casual warming or cooking of food is required and the heat incidentally made available by the water cooler or refrigerator can be used.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a refrigerator and stove, a refrigerator compartment, a stove, a liquid bath in heat transfer relation with the stove and a mechanical refrigeration system having a compressor in heat transfer relation to the liquid bath and having an evaporator in heat transfer relation with the refrigerator compartment.

2. In a refrigerator and stove, a refrigerator compartment, a stove, a liquid bath in heat transfer relation with the stove and a mechanical refrigeration system having a condenser in heat transfer relation to the liquid bath, and having an evaporator in heat transfer relation with the refrigerator compartment.

3. In a refrigerator and stove, a refrigerator compartment, a stove, a liquid bath in heat transfer relation with the stove and a mechanical refrigerator system having a compressor and condenser in heat transfer relation to the liquid bath and having an evaporator in heat transfer relation with the refrigerator compartment.

4. In a refrigerator and stove, a refrigerator compartment, a stove, a mechanical refrigeration system having a compressor in heat transfer relation to the stove, having a condenser free from heat transfer relation with the stove, having a device for cooling the condenser which is operated intermittently, and having an evaporator in heat transfer relation with the refrigerator compartment, and thermostatic mechanism responsive to the temperature of the compressor for operating the device for cooling the condenser when the compressor becomes excessively hot.

5. In a refrigerator and stove, a cabinet having a refrigerator compartment and a stove compartment side by side at the top, insulation between the refrigerator compartment and the stove compartment, a stove in the stove compartment, a liquid bath below the stove and in heat transfer relation with it and a mechanical refrigeration system having a compressor immersed in the liquid bath and having an evaporator in heat transfer relation with the refrigerator compartment.

6. In a refrigerator and stove, a cabinet having a refrigerator compartment and a stove compartment side by side at the top, insulation between the refrigerator compartment and the stove compartment, a stove in the stove compartment, a liquid bath below the stove and in heat transfer relation with it and a mechanical refrigeration system having a condenser immersed in the liquid bath and having an evaporator in heat transfer relation with the refrigerator compartment.

7. In a refrigerator and stove, a cabinet having a refrigerator compartment and a stove compartment side by side at the top, insulation between the refrigerator compartment and the stove compartment, a stove in the stove compartment, a liquid bath in the stove compartment beneath the stove and a mechanical refrigeration system having a compressor and a condenser, both immersed in the liquid bath and having an evaporator in heat transfer relation with the refrigerator compartment.

8. In a refrigerator and stove, a refrigerator compartment, a stove, an auxiliary electric heater for the stove, a mechanical refrigeration system having a compressor in heat transfer relation to the stove and having an evaporator in heat transfer relation with the refrigerator compartment and a thermostatic switching device responding to the temperature of the compressor and in circuit to turn off the auxiliary electric heater when the compressor becomes excessively hot.

9. In a refrigerator and stove, a refrigerator compartment, a stove, an auxiliary electric heater for the stove, a mechanical refrigeration system having a condenser in heat transfer relation to the stove and having an evaporator in heat transfer relation with the refrigerator compartment and a thermostatic switching device responding to the temperature of the condenser and in circuit to turn off the auxiliary electric heater when the condenser becomes excessively hot.

SAMUEL O. MORRISON.

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