This invention relates to refrigerating apparatus and particularly to a part of the refrigerating system thereof.

It is known that a condenser, especially a compact air-cooled condenser of the finned tube type, of a refrigerating translating device of a refrigerating system catches foreign substances, such as lint and dust particles commingled with and carried by air circulated over and through the condenser, the condenser which gradually accumulates as a mass of fuzz, or the like intermediate fins and tubes thereof to such a degree as to eventually clog or block passageways between parts of the condenser and air cannot be flown therethrough and over portions thereof for cooling same. Consequently, the effectiveness of the condenser to cool and condense refrigerant received therein from the refrigerating translating device of the refrigerating system is reduced or minimized, thus impairing the efficiency of the refrigerating system to an extent that the refrigerant evaporator of the system will be prevented from lowering the temperature in a refrigerated zone or chamber of a refrigerator cabinet to a predetermined desired low temperature. This necessitates a call to a refrigeration service establishment which requires a service man to make a trip to the refrigerator installation and remove, by brushing and/or blowing, the accumulation of foreign substances from passageways in the condenser to restore the efficiency of the refrigerating system. These service calls are quite frequent in some instances and they are annoying and expensive. I contemplate the elimination of such service calls by an arrangement that will at all times throughout use of the refrigerating system maintain air passages over and through parts of the refrigerant condenser therefrom free of dust and lint accumulations.

An object of my invention is to provide an improved refrigerating translating device of a refrigerating system of a refrigerating apparatus.

Another object of my invention is to provide means in a refrigerating system for periodically and automatically removing foreign substances from the refrigerant condenser of a refrigerating translating device of the system whereby to prevent accumulation thereof thereon so that its original effectiveness and predetermined efficiency of the refrigerating system will be maintained throughout prolonged use of a refrigerator cabinet or refrigerating apparatus with which the system is associated.

A further object of my invention is to provide means for stopping and depositing thereon lint commingled with and carried by air circulated toward a condenser of a refrigerating system and for consuming the lint by burning it therefrom.

In carrying out the foregoing objects, it is a still further and more specific object of my invention to provide an artificially heated grille element in front of and in the path of air circulated over an air cooled condenser of a refrigerating device of a refrigerating system upon which lint and other foreign substance is lodged or accumulated prior to reaching the condenser and to periodically and automatically render the heater of the grille element effective or to energize same for igniting the lint or foreign substance to consume it and cause its removal therefrom.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view diagrammatically showing a refrigerating system of a refrigerating apparatus having my invention embodied therein;

FIGURE 2 is an enlarged front view of a heated grille element disposed in the path of air circulated toward the air-cooled refrigerant condenser of the refrigerating system shown in FIGURE 1;

FIGURE 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIGURE 2 showing wires of the grille element, at least some of which are electrical resistance wires;

FIGURE 4 is a fragmentary sectional view taken on the line 4—4 of FIGURE 3 also showing wires of the grille element;

FIGURE 5 is a fragmentary sectional view taken on the line 5—5 of FIGURE 3 showing the spaced apart and crossed arrangement of the grille element wires; and

FIGURE 6 is a wiring diagram for controlling the refrigerating system and the heater of the grille element associated with the condenser thereof.

Referring to the drawings, for illustrating my invention, I show in FIGURE 1 thereof a refrigerating system which may be employed in a household refrigerator cabinet or which may be employed to cool a zone or chamber in any other type of refrigerating apparatus. Prior to describing the present invention, I wish to be understood that the refrigerating system herein disclosed is preferably adapted for use in a refrigerator apparatus or cabinet of the character more fully illustrated and described in the accompanying application of L. J. Mann and J. J. O'Connell, Serial No. 116,224, filed May 9, 1961, now Patent No. 3,050,961, and assigned to the assignee of this application. Reference is made to this copending application so as to simplify the present disclosure and maintain the description herein brief to my invention.

The refrigerating system shown in FIGURE 1 of the drawings comprises a refrigerant evaporator 11, a refrigerating translating device 12 including an air-cooled refrigerant condenser 13 and conduits connecting the evaporator, device 12 and condenser 13 in closed refrigerating flow or circulating relationship. Condenser 13 is preferably of the type including coiled tubing 14 and a plurality of fins 16 (see FIGURE 3) mounted thereon for increasing heat transference from the tubing. An electric motor 17 drives a fan or blower 18 which forcibly circulates air over the condenser 13. The refrigerating translating device 12 includes, in addition to condenser 13, a casing containing an electric motor operatively connected to a refrigerant compressor also contained or sealed in the casing as is conventional in the art. Operation of the motor and compressor within casing 12 of the device causes evaporation or vaporization of refrigerant in evaporator 11, to cool air in a chamber or compartment (not shown) in which the evaporator is located, and this vaporated refrigerant is drawn into the compressor and compressed thereby and the compressed refrigerant is forced into condenser 13. Motor 17 is energized simultaneously with the compressor motor and operates fan 18 to flow air over condenser 13 for cooling and liquefying refrigerant received in the condenser from the compressor. Liquid refrigerant is admitted, by way of a restrictor or expansion valve (not shown), to evaporator 11 for evaporation therein as is well known to those skilled in the art. The air moving means or fan 18 causes foreign substances, such as dust and lint commingled with and carried by air in a room or the like in which the refrigerator cabinet or refrigerating apparatus containing the refrigerating system is located, to be circulated toward the
refrigerant condenser 13. This lint and dust, if not prevented from contacting condenser 13, is deposited on the condenser and in passageways therebetween and an accumulation thereof on the condenser will, in time, clog and block air passages through the condenser and impair or minimize its effectiveness to condense refrigerant therein which results in a reduction in efficiency of the refrigerating system.

According to my invention, I provide a means cooperating with and disposed in front of condenser 13 in the path of air circulated by fan 18 toward same for catching and accumulating therein foreign substances, such as dust and lint, carried by the circulating air which is periodically energizable or rendered effective to consume the foreign substances caught or accumulated on the means so as to maintain the condenser free thereof whereby its effectiveness is not impaired. This means is preferably a component part of the condenser 13 and is of a character that will periodically and automatically ignite and burn this accumulation of lint therewith to as to consume the lint. Thus, I mount, in any suitable or desirable fashion, a screen a grille element, generally represented by the reference numeral 20 in FIGURE 1 of the drawings, on the forward or air incoming side of condenser 13. Grille element 20 comprises a frame 21 which is telescoped over and secured to a bounding member 22 on the condenser 13 so as to form a component part thereon (see FIGURE 3). The four walls of frame 21 of element 20 each have a metal strip 24 secured by rivets or the like to the inner face thereof and each strip 24 is provided with a plurality of spring-tensioned fingers 26 projecting therefrom and spaced from frame 21. Each spaced apart finger 26 carries a grooved ceramic or the like insulator 27 and a wire is located in the groove of these insulators. The screen or grille element 20 is composed of a vertical continuous piece of wire 28 and a horizontal continuous piece of wire 29. Runs or loops of the vertical wire 28 are parallel and all of them are in the same plane with one another and the runs or loops of horizontal wire 29 are also parallel and disposed in the same plane with one another. Parallel vertical wires 28 are in a different plane than horizontal wires 29 and are spaced a small distance behind the vertical wires to form the screen or grille. It should be understood that, for the purpose of illustrating my invention, only one set of the wires 28 or 29 may be sufficient and would be less expensive. However, in consideration of all contingencies, both of the sets of vertical and horizontal wires 28 and 29 respectively are shown in this disclosure. One or both sets of wires 28 and 29 may be electrical resistance wires in series in each set and provided at ends thereof with an insulated terminal connector indicated at 31 in FIGURES 1 and 2 secured to bounding frame 21 of the screen or grille element 20. In the present disclosure, only the vertical wires 28 are electrically energizable to provide a heater associated with the grille or screen element 20. The terminal connectors 31 have conductor wires 32 and 33 attached thereto and these conductor wires are connected to a source of electric current supply as will be hereinafter described relative to FIGURE 6 of the drawings and in respect to the explanation of automatically energizing and deenergizing a set of the heater wires of element 20. Heater wire 28 is tightly strung, wound or coiled about the spring fingers 26 to place these fingers under tension at all times so as to compensate for expansion of the wires 28 when heated and contraction on cooling.

Referring now to FIGURE 6 there is shown a wiring diagram for the refrigerator cabinet or apparatus with which the refrigerating system herein disclosed is to be associated. An electric current supply conductor 41 is connected through a starting relay 42 with the compressor motor 43, within casing 12, of the motor-compressor unit. The starting relay 42 controls the flow of current through a phase winding 44 of the motor 43. Also connected to the supply conductor 41 is the motor 17 of fan 18 which is connected in parallel with the motor 43 and in series with a thermostat 46 which is responsive to temperatures adjusted by thermostat 46 to control starting and stopping of compressor motor 43. Motor 17 is connected to a contact 47 of a double throw switch 48 controlled by a timer motor 49 or an electrical chronometric device 50 for effecting defrosting of evaporator 11. Periodically, say, for example, once each day, the double throw switch 48 is moved, by timer 49, to close switch 48 into contact with a stationary terminal 51. The switch 48 as well as the defrost timer 49 are connected to a second electric current supply conductor 52. When the defrost timer 49 operates to move switch 48 away from contact or terminal 47 into contact with the terminal or contact 51, a defrost period or cycle of the refrigerating system is initiated to rid evaporator 11 of frost or ice. This deenergizes the motors 17 and 43 to discontinue the refrigerating effect of evaporator 11 and to stop circulating of air by fan 18 over the condenser 13. It energizes a heater 53 through a normally closed defrostor limiter thermostat 54 associated with evaporator 11 to heat and defrost same. The heating of evaporator 11 continues a sufficient length of time to melt frost or ice therefrom. Heating of evaporator 11 is terminated when the defrost limiter thermostat 54 reaches a sufficient high temperature, say between 40° and 45° F., which indicates the condition thereto is not being defrosted. When this temperature is reached, the limiter thermostat 54 is opened. The resistance heater wire 28 of screen or grille element 20 is connected in parallel with defroster heater 53 and is simultaneously energized therewith to ignite and consume any foreign substance, such as lint, caught by and accumulated on the screen or grille element by burning it therefrom. This once a day energization of heater 53 assures that air passages through the refrigerant condenser 13 will be maintained open and free for flow of air therethrough or over the condenser. While I have illustrated the lint burner 28 as being energized or rendered effective every twenty-four hours, it is to be understood that the same may be energized in any other suitable or desirable fashion to consume accumulated lint more frequently or periodically throughout longer periods of time. When limiter thermostat 54 opens, an electromagnet 56 in a shunt around the limiter thermostat is energized and operates the double throw switch 48 back to its normal position in contact with terminal 47 so that refrigeration produced by the refrigerating system will be resumed since the switch 48 will be closed by the timer 49 when the defrost timer 49 prevailing during the defrost period. In the event that the defroster limiter switch 54 fails to operate, the switch 48 will be returned to its normal position by the defrost timer 49. If the present refrigerating system is employed in a household refrigerating cabinet of the type disclosed in the copending application hereinafter identified, a fan and a motor for driving same to circulate cool air within chambers of the cabinet will be included in the system with such fan motor connected in parallel relationship with motor 17 so as to be simultaneously energized therewith.

From the foregoing, it should be apparent that I have provided an improved refrigerating system wherein, regardless of the amount of air-borne foreign substance or lint carried by air circulated over the condenser therefrom, the effectiveness of the condenser is not minimized and the efficiency of the refrigerating system remains at a desired high capacity throughout the service or usage of the system. By periodically and automatically energizing a heating means associated with the grille element cooperating with the condenser of the refrigerating system in response to use of the system, no lint can accumulate on components of the refrigerant condenser and the same therefore never has to be mechanically cleaned. I, therefore, eliminate service calls while insuring continued use.
of a refrigerating system at its original maximum efficiency. Since my invention provides for igniting and burning list or other air-borne foreign substances from a condenser or a component part thereof at least once each day, there is no excessive amount of fuzz thereon at any time to emit odors sufficient to be objectionable and hazards incident to the burning process are thereby avoided.

While the embodiment of the present invention, as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A refrigerating system comprising in combination:
   (a) a refrigerant evaporator, a refrigerant translating device including a refrigerant condenser and conduits connecting said evaporator, said device and said condenser in closed refrigerant flow relationship,
   (b) means for cycling said refrigerant translating device automatically,
   (c) air moving means effective during effectiveness of the device for circulating air over said condenser to cool refrigerant received therein from said device,
   (d) means for maintaining said condenser free of foreign substances commingled with and carried by the air circulated toward same,
   (e) said last-named means including a grille secured to said condenser and providing a permanent component thereof,
   (f) said grille having spaced-apart lengths of electrical resistance wire paralleling the front of said condenser in the path of air circulated theretho,
   (g) said wires forming the sole means of catching and accumulating thereon the foreign substances circulating with said air, and
   (h) means actuated by said cycling means for energizing and deenergizing said wires to consume the foreign substances accumulated thereon by burning it during an off cycle of said translating device.

2. A refrigerating system comprising in combination:
   (a) a refrigerant evaporator, a refrigerant condenser, a motor, a compressor and conduits connecting said evaporator, said condenser and said compressor in closed refrigerant flow relationship,
   (b) means intermittently energizing said motor automatically in response to refrigeration demands imposed on said evaporator for operating said compressor,
   (c) air moving means effective during operation of said compressor for circulating air over said condenser to cool refrigerant received therein from said compressor,
   (d) a first heater connected to a source of electric current supply for defrosting said evaporator,
   (e) air filtering means for said condenser disposed in the path of air circulated toward same for catching and accumulating foreign substances commingled with and carried by the air,
   (f) said filtering means including a second heater connected to said source of electric current supply, and
   (g) means actuated periodically rendering said first-named means ineffective and simultaneously energizing both of said heaters for defrosting said evaporator and for consuming the foreign substances accumulated on said air filtering means respectively by burning it while the evaporator is being defrosted.

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