

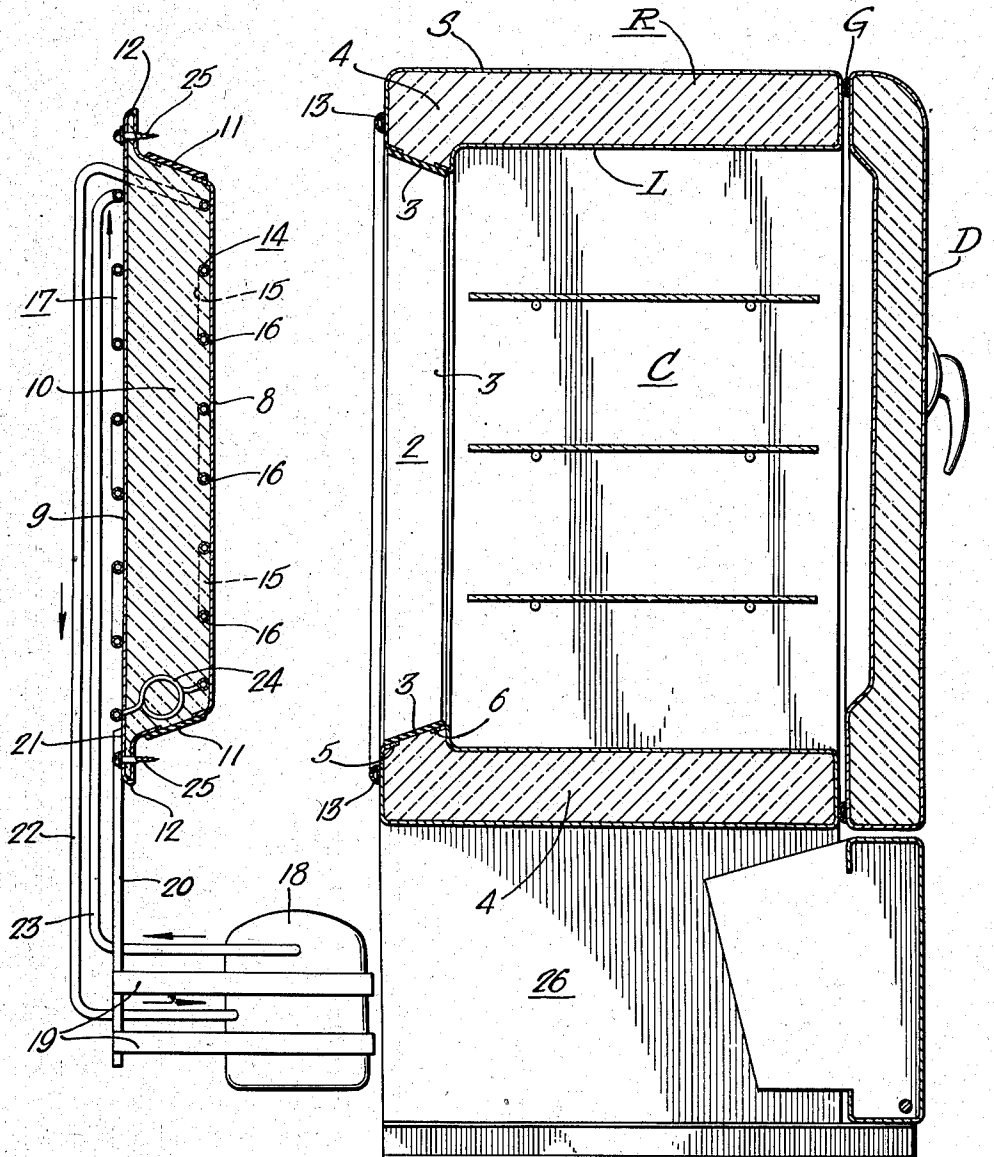
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EVAPORATOR CONDENSER CONSTRUCTION

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EVAPORATOR-CONDENSER CONSTRUCTION

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This invention relates to refrigerators of the mechanical type, and has to do particularly with a novel and advantageous arrangement in the refrigerator structure of the evaporator and condenser units of the heat exchange system.

More specifically, the present invention relates to an improved, unitary evaporator-condenser construction, which is especially useful in domestic refrigerators of a relatively simple and low-cost type.

It is customary, in present day refrigerators, to arrange the evaporator within the food storage compartment in such manner that the effective evaporator surfaces project into the storage space; and to locate the condenser at some position in the cabinet, well removed from the evaporator and its support.

Such arrangements have substantial disadvantages, particularly in refrigerators in which simplicity and low cost are factors of prime importance. For example, arrangements of this type are wasteful of refrigerated space and require extended and complicated connections between the evaporator, condenser, and motor-compressor unit. Such prior practice has been particularly disadvantageous in that it is difficult to detach the components of the operating mechanism from the cabinet to effect necessary repairs and replacements.

It is a primary object of the present invention to provide a refrigerator in which the evaporator and condenser are readily removable as a unit, and in which the necessary connections between the evaporator and the condenser are unusually compact and direct, thereby facilitating both manufacture and assembly.

More specifically, it is an object of the invention to provide a refrigerator in which one wall thereof incorporates both the evaporator and condenser elements; said wall being constructed as a unit and constituting a readily separable element of the cabinet structure.

The invention also contemplates an extremely low-cost construction, wherein the elements which form the interior and exterior sides of one wall are utilized also as evaporator and condenser heat exchange surfaces, respectively.

A further object of the invention resides in a wall structure of the general type referred to, which is provided also with means for supporting unitarily therewith the motor-compressor mechanism.

The invention further contemplates the provision of a domestic refrigerator in which adequate cooling of the food storage space is effected,

without sacrifice of available storage area or of accessibility thereto.

These and other objects and advantages will be better understood by consideration of the following description in conjunction with the accompanying drawing in which is illustrated a preferred embodiment of the invention, the single figure of the drawing being a sectional view taken generally through the vertical mid-plane of the refrigerator and showing the novel wall structure detached from the cabinet.

With reference to the drawing, the reference character R designates a domestic refrigerator of the mechanical type which, generally, comprises an outer metal shell S and an inner metal shell or liner L. The liner L surrounds the usual food storage compartment C, which preferably is provided with suitable shelves. The refrigerator has a door D, which may be of conventional type and which affords access from the front to the food storage compartment C, suitable gasket means G being interposed between the door and the cabinet in accordance with the usual practice.

In accordance with the present invention, one wall of the cabinet (preferably the rear wall) is provided with an opening 2 which, in the embodiment illustrated, is substantially coextensive with the area defined by the rear edges of the liner L. As shown at 3—3, suitable thermal breaker strips are provided around the marginal edge of the cabinet opening 2, and these strips form the walls of said opening and prevent any substantial heat transfer between the outer and inner shells. The breaker strips 3—3 also serve to conceal and to confine the adjoining portions of the insulation 4 which fills the space between the shells. These strips may be of any desired type, and may be attached by any convenient means to opposed flanges 5 and 6 of the outer shell and inner liner, respectively.

The removable wall portion with which the invention is particularly concerned, preferably takes the form of a unitary "plug," and is of a shape and size to fit snugly within the opening 2 of the cabinet. As mentioned above, and for convenience in illustration, this wall is shown detached from the refrigerator cabinet. Preferably, this removable wall comprises an inner metal facing 8 and an outer metal face portion 9, the space between the facings being filled with any suitable insulating material 10, such for example as spun glass. Breaker strips 11—11 maintain the facings 8 and 9, which may take the form of metal sheets, in spaced relation, and are secured to the

facings in a manner generally similar to that employed in connection with the thermal breakers 3-3. When the unitary wall structure is in assembly with the refrigerator cabinet, the breaker strips 11-11 support the removable "plug" by virtue of their contact with breakers 3-3 fixed in the cabinet aperture. It will be seen that the facing 9 is provided with a peripheral flange 12, which defines coplanar marginal edge portions adapted to cooperate with a gasket 13 to preclude entrance of air and moisture into the food storage compartment.

As brought out above, the removable wall structure of the present invention also incorporates the refrigerator evaporator and condenser elements as parts of the unitary construction. To this end, suitable evaporator tubing 14 is secured in convolute arrangement against the rearward surface of the facing 8, sufficient tubing being provided to assure the desired degree of cooling in the food storage compartment. While this tubing may be arranged on the facing 8 in any desired manner, it is preferably in serpentine configuration having relatively short vertical runs 15, and longer substantially horizontal runs shown in cross-section at 16. In the present instance the tubing is attached to the facing, and the attachment is effected in a manner to afford a highly efficient thermal coupling between the tubing and the facing. This may be accomplished in a number of different ways, such for example as by welding. By virtue of this construction, the facing 8, in addition to forming a complementary part of the liner L, functions also as an active element of the evaporator, with the entire exposed surface of the facing 8 operating as a heat exchange area.

In similar manner, convoluted metal tubing 17 is secured against the outer surface of the outer metal facing 9 to constitute the condenser portion of the heat exchange system of the refrigerator. Here again, the facing 9 not only forms the outer shell of the rear wall of the cabinet, but, in addition, serves to extend the effective heat exchange surface of the tubing and to materially increase the capacity of the refrigerator condenser. The facing elements 8 and 9 need not necessarily define the inner and outer limits of the wall "plug," it being necessary only that the facings be arranged in a manner such that when the "plug" is in place in the cabinet the facing 8 shall be disposed in heat exchange relation with respect to the atmosphere within the compartment C, and the facing 9 shall be thermally remote to the facing 8 and disposed exteriorly with respect to the said compartment in a position wherein it may adequately perform its condenser function.

The motor-compressor, designated generally by the reference character 18, is carried by an "outrigger" structure comprising transverse tie members 19 which directly support said motor-compressor, and one or more suspension rods 20, are fixedly secured to the "plug," as at 21, and to the rear ends of the members 19. Suitable suction and feed lines 22 and 23 extend upwardly from the motor compressor to the evaporator and condenser, respectively; while a flow restrictor, preferably in the form of a capillary tube 24, is arranged within the wall structure, and provides for delivery of the condensed liquid from the condenser tubing 17 into the evaporator section 14.

It should be understood that the suction and feed lines are shown removed from the exterior surface of metal facing 9 for convenience in illus-

tration, and that they may be variously arranged, in the interior of the wall structure, for example, immediately adjacent the exterior surface thereof, as desired.

In assembling the structure, the entire rear wall in the form of the unitary "plug" and carrying the motor-compressor, is introduced into the cabinet opening 2, as a unit, and is fixed therein (as by screws 25) with the peripheral flange 12 in firm engagement with the gasket 13. When thus assembled, the motor-compressor 18 is disposed entirely within the machinery compartment 26 provided in the lower part of the refrigerator cabinet. If desired, the motor-compressor may be mounted resiliently with respect to the tie members 19, in any convenient manner.

From the foregoing description, it will be evident that the present invention provides a unitary, readily removable evaporator, condenser, and motor-compressor assembly of greatly simplified construction and very low cost.

It should be noted, particularly, that not only are both the evaporator and condenser carried by the removable wall portion; but that the structural elements which form the interior and exterior faces of the removable "plug" assembly serve also as active heat exchange elements of the evaporator and the condenser, thereby effecting a substantial reduction and saving in metal that otherwise would be required in the evaporator and condenser units.

In addition, the complete refrigerating system may be constructed and assembled apart from the refrigerator cabinet and may then, if desired, be packed and shipped as a unit, for installation in the cabinet at the destination point. It will readily be appreciated that this is of substantial advantage also with regard to subsequent servicing operations and in the shipment of replacement systems.

While a particular embodiment of the invention has been herein described, it will be understood that the invention is not limited to this embodiment only, and that changes and modifications may be made within the scope of the appended claims.

I claim:

1. In a refrigerator, a cabinet having thermally insulated walls defining a food storage compartment, a separable wall portion comprising inner and outer metallic facing elements arranged in spaced relation with insulation therebetween and normally disposed in positions adjoining the interior and exterior of said compartment, respectively, evaporator means secured to said inner facing in intimate heat exchange relation therewith and arranged substantially in the plane thereof, and condenser means secured to said outer facing in intimate heat exchange relation therewith and arranged substantially in the plane thereof, said wall portion, said evaporator, and said condenser being removable as a unit from said cabinet.

2. In a refrigerator, a cabinet having thermally insulated walls defining a food storage compartment, a separable wall portion comprising inner and outer metallic facing elements arranged in spaced relation with insulation therebetween and normally disposed interiorly and exteriorly with respect to said compartment, respectively, evaporator tubing arranged within said insulation in heat exchange relation with said inner facing, and condenser tubing secured against the outside surface of said outer facing in heat exchange relation therewith, said wall

portion thereby constituting an evaporator-condenser assembly removable as a unit from the cabinet.

3. A domestic refrigerator comprising a cabinet provided with a pair of superimposed compartments, one of said compartments being thermally insulated and having an insulated removable wall portion, the inner and outer facings of said wall portion constituting heat exchange elements of an evaporator and a condenser respectively, a compressor unit located in the other of said compartments and supported by said wall portion, and refrigerant conduits operatively interconnecting said compressor unit, said evaporator, and said condenser.

4. A unitary insulated wall structure constituting a removable part of a refrigerator cabinet, said structure comprising a pair of metallic sheets arranged in spaced relation, insulation in the space between said sheets, an evaporator comprising a convoluted metal tube bonded integrally and substantially throughout its length to a surface of one of said sheets, a condenser comprising a convoluted metal tube bonded integrally and substantially throughout its length to the outer surface of the other of said sheets, and means carried by said wall structure and operatively interconnecting said evaporator and condenser.

15

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