July 30, 1935. W. FOURNESS 2,009,882

REFRIGERANT COOLER

Filed June 20, 1932

Fig. 1

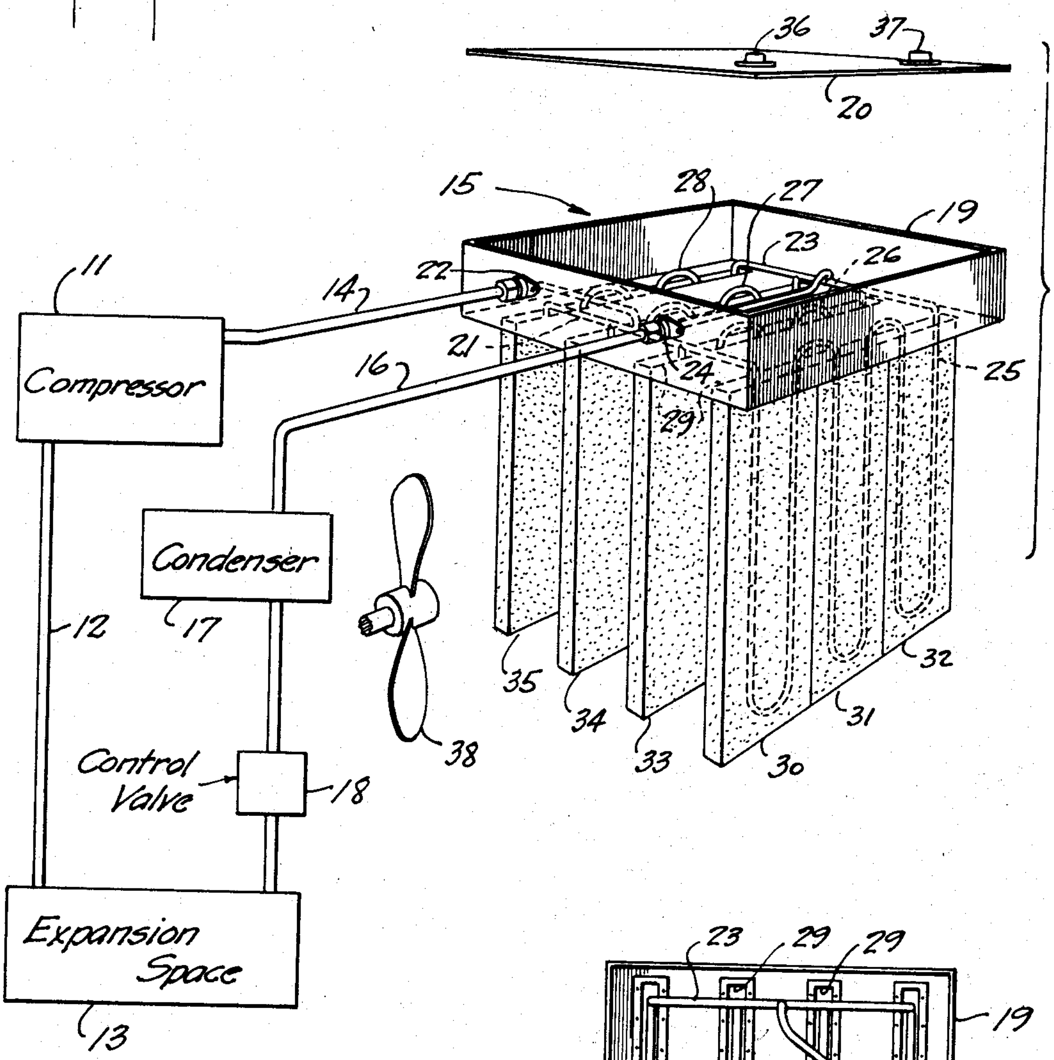
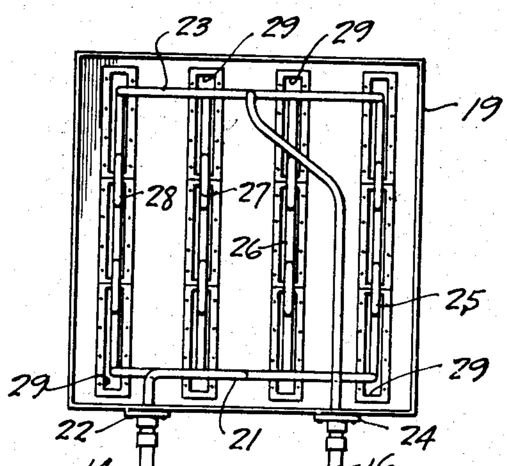



Fig. 2

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## REFRIGERANT COOLER

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8 Claims. (Cl. 257—36)

This invention relates to refrigeration, and more particularly to a system in which a liquid refrigerant, such as sulfur dioxide, is permitted to evaporate for absorbing heat, and then is later compressed and condensed.

In such systems, the compressor acts to increase the pressure of the vaporous or gaseous refrigerant after it leaves the expansion space (such as the usual expansion coils); and the compressed medium is then condensed. The compression of the gaseous medium very materially raises its temperature, and this in turn may materially interfere with the condensation into a liquid. In fact, the gas from the compressor may be in a superheated condition, especially in hot weather.

It is one of the objects of the invention to cool the compressed gas before it reaches the condenser, thereby raising the efficiency of the compressor mechanism.

This object is attained by the provision of cooler of simple and inexpensive construction; and it is another object of the invention to provide a cooler having these characteristics.

The cooler, in accordance with this invention, is formed of a branched conduit or pipe, immersed in a cooling liquid, and carrying the compressed gases. The cooling liquid, which is most conveniently water, is in a container that permits moisture to exude to the exterior surface, such as a fabric or flax bag or other porous bag.

It is the evaporation of this exuded water from the exterior surface which keeps the temperature of the cooling liquid at a value low enough to enable considerable heat exchange between the compressed gas and the liquid. In hot, dry weather this method of cooling is especially effective, as evaporation of the cooling liquid is then accelerated.

This process can be still further intensified, as by the aid of a fan blowing a current of air against the bags. Furthermore, the process of evaporation can be applied in other ways to effect the same results.

My invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of my invention. For this purpose I have shown a form in the drawing accompanying and forming part of the present specification. I shall now proceed to describe this form in detail, which illustrates the general principles of my invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of my invention is best defined by the appended claims.

Referring to the drawing:

Figure 1 is an isometric view of a cooling device, with its cover removed, and with the other elements of the system diagrammatically indicated; and

Fig. 2 is a top plan view of the device with the cover removed.

The compressor 11 is shown as fed with evaporated refrigerant through a connection 12, from an expansion space 13. This space may be in the form of the usual expansion coils now common in refrigerating systems. The refrigerant is compressed by the compressor 11, and is heated to a superheated condition thereby, because of the mechanical work performed on it. From the compressor, the compressed gas is discharged, as through a connection 14, to a "desuperheater" 15, which reduces the temperature so that all or part of the superheat is carried away, and therefore the condensation of the compressed gas is facilitated. In other words, the gas is caused to approach the vapor stage.

From the cooling device 15, a connection 16 carries the cooled gas or vapor to a condenser 17, where the gas is liquefied in the manner common to the art, and whence it can be discharged through a control valve 18 to the expansion space 13, as required. This cycle of expansion or evaporation for heat absorption, compression, condensation, and re-evaporation is now well understood in connection with refrigerating systems further detailed explanation thereof is considered unnecessary.

The cooling device 15 utilizes the principle of the evaporation of a liquid to reduce the temperature of the liquid, said liquid being in heat exchanging relationship with the compressed gas.

To effect this result, a metal pan 19 is provided, shown in this instance as substantially rectangular, and having a cover 20 which is permanently attached as by soldering. In Fig. 1, this cover is shown as lifted off the pan, in order to better disclose the construction. Inlet conduit 14 and outlet conduit 16 are both shown as leading through reinforced threaded apertures in one side of the pan 19. An inlet header 21 inside pan 19 connects to conduit 14 through one aperture 22, which thus serves as a nipple connection. Near the opposite side of pan 19 is the outlet header 23, similarly connected through the other aperture 24 with the discharge conduit 16.

Connecting the headers 22, 23 is a series of convolutions 25, 26, 27, 28, forming parallel conduits between the headers, and extending downwardly through the slots 29 in the bottom of the pan 19, Each individual convolution in this instance is shown as immersed in a separate porous container, such as 30, 31, 33, 34, 35. These containers can be conveniently made from fabric that exudes moisture, such as flax bags, and the tops thereof are fastened in any suitable manner to the edges of the slots 29. The containers 30, 31, etc. as well as pan 19 can be filled with water or other cooling liquid. This liquid slowly exudes to the exterior surface of the bags, thereby causing a very substantially accelerated evaporation of the water with attendant cooling. Appropriate filling and venting apertures 36, 37, can be provided in cover 20.

This device, as is apparent, requires no circulation of cooling liquid. It is economical and simple to operate, and is particularly applicable to motor truck refrigerating systems. In such systems, the motion of the truck can be utilized to direct a current of air past the surfaces of bags 30, etc. and through the passages between them. In hot, dry weather this is sufficient to produce effective cooling; however, if desired, a fan 38 can be additionally provided or can be used in stationary installations for creating the air current.

The cover 20 is especially useful in portable equipments for preventing loss of the liquid as by splashing.

I claim:

1. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, and a porous container for immersing the conduit in a liquid.

2. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, and a fabric container for immersing the conduit in a liquid.

3. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, said conduit having a series of convoluted branches arranged in parallel, as well as an inlet and an outlet header, a porous container for immersing the convolutions in a liquid, and a metal pan to which the container is fastened.

4. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, said conduit having a series of convoluted branches arranged in parallel, as well as an inlet and an outlet header, said convolutions extending out of the plane of the headers, a series of fabric bags, for immersing the convolutions in a liquid, and a metal pan to the bottom of which the bags are attached.

5. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, and a cooling device for said conduit, comprising a pan for holding a cooling liquid, and a series of porous containers leading from the pan and arranged to form one or more passageways for a stream of air past the outside walls of the containers.

6. In a device for reducing the temperature of gaseous refrigerant after it is discharged from a compressor, a conduit for passing the refrigerant from the discharge side of the compressor to a condenser, and a cooling device for said conduit, comprising a pan for holding a cooling liquid, and a series of porous containers leading from the pan and arranged to form one or more passageways for a stream of air past the outside walls of the containers, said conduit having portions extending into the containers for effective heat exchange between the liquid and the conduit.

7. The combination as set forth in claim 5, in which the containers are made from fabric.

8. The combination as set forth in claim 5, in which the pan has a series of slots in the bottom from which the containers depend, said containers being made from porous fabric.

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