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H. W. KLEIST

2,690,653

STAMPED PLATE

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Fig. 1

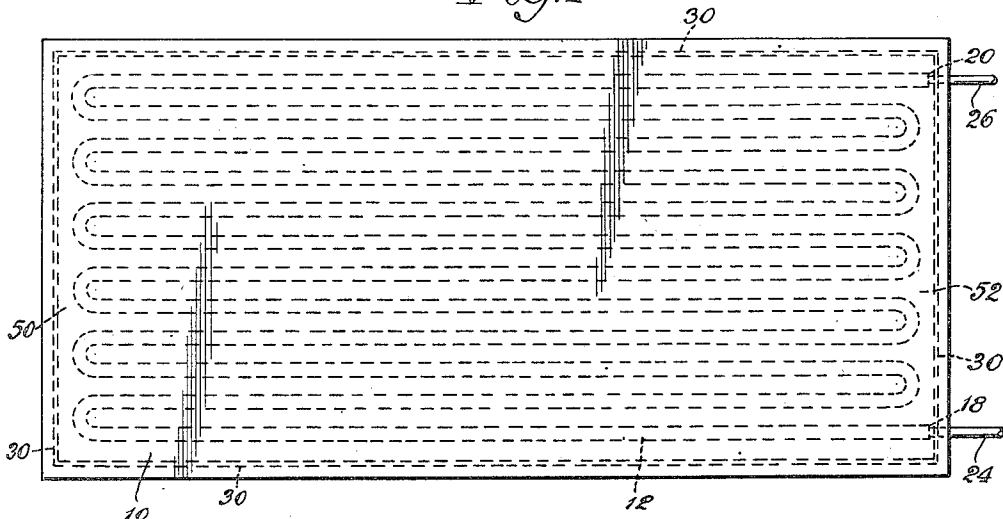


Fig. 2

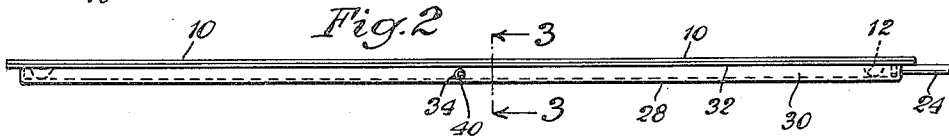


Fig. 3

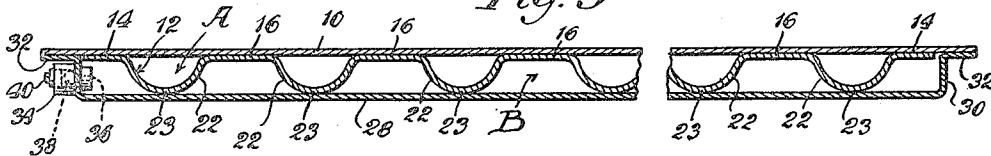
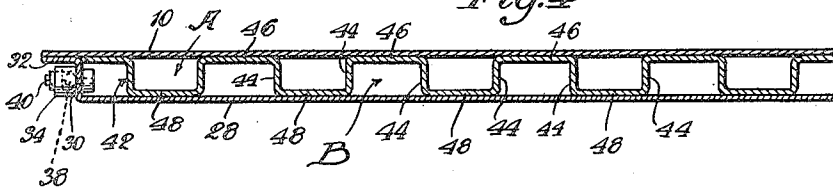


Fig. 4



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STAMPED PLATE

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4 Claims. (Cl. 62—126)

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My invention relates to an improvement in plates, and has for one purpose to provide a plane-sided plate which is efficient in use and simple to manufacture.

Another object is a plate which includes a pressed metal coil or evaporator passage structure.

Another object is an improved plate in which, in association with the pressed metal coil, a container is provided which is adapted to receive a eutectic.

Another purpose is an improved plate in which a pressure differential between the interior and the exterior of the plate is employed to hold parts of the plate in heat exchange relationship.

Another object of my invention is an improved plate in which a pressed metal coil in two forms positioned between the sides of the plate constitutes a container which receives a working fluid.

The present application is a continuation-in-part of my application Serial No. 79,274, which was filed on March 2, 1949 in the United States Patent Office, for "Refrigerant Plate," and which issued on May 19, 1953 as Patent No. 2,638,754.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate the invention more or less diagrammatically in the accompanying drawings wherein:

Figure 1 is a plan view;

Figure 2 is a side view of the structure of Figure 1;

Figure 3 is a section on an enlarged scale, on the line 3—3 of Figure 2, with parts broken away; and

Figure 4 is a sectional similar to Figure 3, through a variant form of plate.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, 10 generally indicates a plate side wall of sheet metal, shown as plane from edge to edge. 12 generally indicates an intermediate wall of sheet metal which is shown as pressed into proper shape to define, with the wall 10, an evaporating coil or passage, generally indicated as A. The member 12 may have plane edge portions 14 and the intermediate plane portions 16, all of which abut against the inner surface of the side wall 10. They are appropriately secured together. They may, for example, be initially spot-welded, and thereafter define an evaporator passage or coil A which is substantially gas-tight from end 18 to the end 20.

The coil proper is formed by bowed or offset wall portions 22 of the wall 12 with crests 23,

which may be of any suitable contour, and which are herein shown in the embodiment of Figures 1, 2 and 3 as generally rounded and so formed as to be readily made by a pressing operation.

It will be understood that the ends of the evaporator passage A, as at 18 and 20, are connected to suitable ducts or tubes 24 and 26, which may constitute, respectively, inlet and outlet passages for a volatile refrigerant or other suitable fluid. If such a fluid is admitted in liquid or partially liquid form through the pipe 24, it is allowed to evaporate in the coil space A, and the evaporated refrigerant may then be discharged along the tube.

In designing and using plates I find it highly desirable to have the sides of the plates plane, and, in most instances, parallel. It is easier to clean the surfaces of the plates and to remove frost. Plane surface plates are applicable to a wide variety of uses. It is frequently important to nest such plates in narrow spaces, the individual plates having adjacent walls separated by air spaces, as in air conditioning units and the like, or in refrigerating units for cooling air or liquids. In that event, it is important to have the outer surfaces of the plates plane on both sides. I employ a second outside wall 28, shown as plane throughout most of its surface, but as having side wall portions 30 and edge flanges 32 which may be secured to corresponding portions of the edge of the side wall 10, to form a housing or plate which is gas-tight.

It will be understood that I may form a plate otherwise than by the particular shape of edge flanges hereinshown, but the structure shown in the drawings is practical and satisfactory. The space between the side wall 28 and the intermediate wall 12, which I indicate as B, may receive a eutectic, or may be air-filled. In either event, I prefer partially to exhaust the space B. This may be done in any suitable fashion, but I may, for example, employ any suitable pump, not hereinshown, to exhaust air through the fitting generally indicated as 34. This fitting may have a duct 36 through which air may be drawn from the interior of the plate. When a suitable pressure differential has been obtained the operation of the pump may be terminated. When this takes place the outside air pressure urges the locking ball 38 against the inlet end of the duct or passage 36. Thereafter, any suitable sealing material may be positioned about the ball 38, if desired, and a tight closure plug 40 may be inserted. As a result, the pressure differential may be permanently, or substantially permanently, maintained, with the outside ex-

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cess pressure effective to urge the side wall 28 firmly against the crests 23 of the coil structure 12. Thus an adequate heat exchange relationship is maintained between the side plate 28 and the evaporating refrigerant in the coil space A. And the plate is maintained flat and firm, with the side walls 10 and 28 plane, and parallel in relation to each other.

In the modification of Figure 4, an intermediate wall 42 is positioned between side walls 10 and 28 as was the intermediate wall 12 in the embodiment of Figure 3. In Figure 4 the offset portions 44 are formed and pressed as square channel members when contrasted with the arcuate formation of the offset wall portions 22 in Figure 3. These portions 44 are secured to the plate side wall 10 along the straight portion 46. Any conventional means, such as spot welding or the like, may be used and thereafter, seam welded to form with wall 10 a substantially gas-tight passage. The lower straight portion 48 of the intermediate wall is disposed parallel to the side wall 10. When a vacuum is placed on the space B, the side walls 10 and 28 will be drawn toward one another so that the lower straight portion 48 firmly contacts the side wall 28 and forms therewith a substantially gas-tight connection throughout the entire tortuous path defined by the channel portion of the intermediate wall 42. The offset portions 44 of the intermediate wall are disposed relatively perpendicular to the side wall 28 so that when the vacuum is applied and the side wall 28 firmly engages the lower straight portion 48, the offset portion 44 will become a strong internal supporting structure for the plate in addition to defining the space A for the working fluid and the space B which may receive eutectic or may be air filled.

It should be understood that eutectic, if used, is forced into the space B so as at least partially to fill the space between the lower wall 28 and the intermediate wall. The lowest portion of the intermediate wall is not contacting the side wall 28 so that the eutectic will at least partially fill the space in and around the tortuous passage or coil space A formed by the intermediate wall with relation to the side wall 10. The same is true with respect to both the modification of Figures 3 and 4, and after sufficient eutectic is pumped into the space B, the space may be evacuated in the manner as set forth hereinabove, by the use of any conventional vacuum pump on the exhaust fitting 34 so that the plate 28 will contact the crest 23 of the intermediate plate 12 in Figure 3 or the straight portions 44 of the intermediate plate 42 in Figure 4. By this procedure the eutectic will completely fill the left hand space in Figure 1 designated at 50 and the right hand space in Figure 1 designated at 52 as these two spaces will be separated from one another in gas-tight relation when the lower plate 28 firmly contacts the depending portion of the intermediate wall.

It will be realized that, whereas, I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing. For example, the intermediate wall 12 or 42, which is shown as secured directly to the plate side wall 28, its edge portions, for example, may also be secured direct-

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ly to the side wall 28. Its edge portions may extend, for example, between the plate side wall 10 and the edge flanges 32 of the plate side wall 28, if desired.

An important function of the intermediate plate 42 in Figure 4 is to provide an internal reinforcement, for the plates. The plates of the type herein shown are frequently in use in freezing pressure in order to compact the substances undergoing freezing between adjacent plates. The provision of this intermediate plate has the double function, in a structural sense, of resisting inward pressure against the side of the plate, and of holding the outer surfaces of the opposite faces or sides of the plate to true and parallel planes. Thus when the coil structure is positioned within the plate and the plate interior is partly exhausted, the outer pressure of the atmosphere against the walls of the plate maintains the plate as a strong structural element, having substantially true planes at each side, the planes of the outer surfaces of the two sides of the plate being substantially parallel.

I claim:

1. In a vacuum type plate, first and second plate walls having generally parallel, plane surfaced sides and connected edge portions, said edge portions being secured together in a gas-tight relationship with said plane surfaced sides being spaced apart, an intermediate sheet metal wall in the space between said plate walls and forming with said first plate wall a tortuous passage constituting a coil space adapted to receive working fluid, the opposed portions of said intermediate wall and said first plate wall being secured together in gas-tight relationship, the coil forming portion of said intermediate sheet metal wall being positioned to engage the second plate wall, and having abutting portions lying in a common plane substantially parallel to the plane of the first wall, and means for maintaining a less-than-atmospheric pressure in the interior of the space between the said second plate wall and the intermediate sheet metal wall, and for thereby urging the plane surfaced side of said second plate wall against and in heat transfer relationship with the coil forming portions of the intermediate sheet metal wall, and against said abutting portions of the intermediate wall, whereby, in response to external atmospheric pressure, the first and second walls are normally maintained in substantially parallel planes.

2. The structure of claim 1 characterized in that the coil forming portions of the intermediate sheet metal wall are generally curvilinear in transverse cross-section.

3. The structure of claim 1 characterized in that the coil forming portions of the intermediate wall are rectangular in cross-section and have side portions generally perpendicular to the first and second plate walls, whereby the plate walls, with the intermediate sheet metal wall, constitute a rigid structural element.

4. The structure of claim 1 characterized in that the space between the second plate wall and the intermediate sheet metal wall is filled at least partially with a eutectic.

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