March 13, 1945. F. W. KNOWLES 2,371,396

ICE RINK FLOOR

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Fig. 1

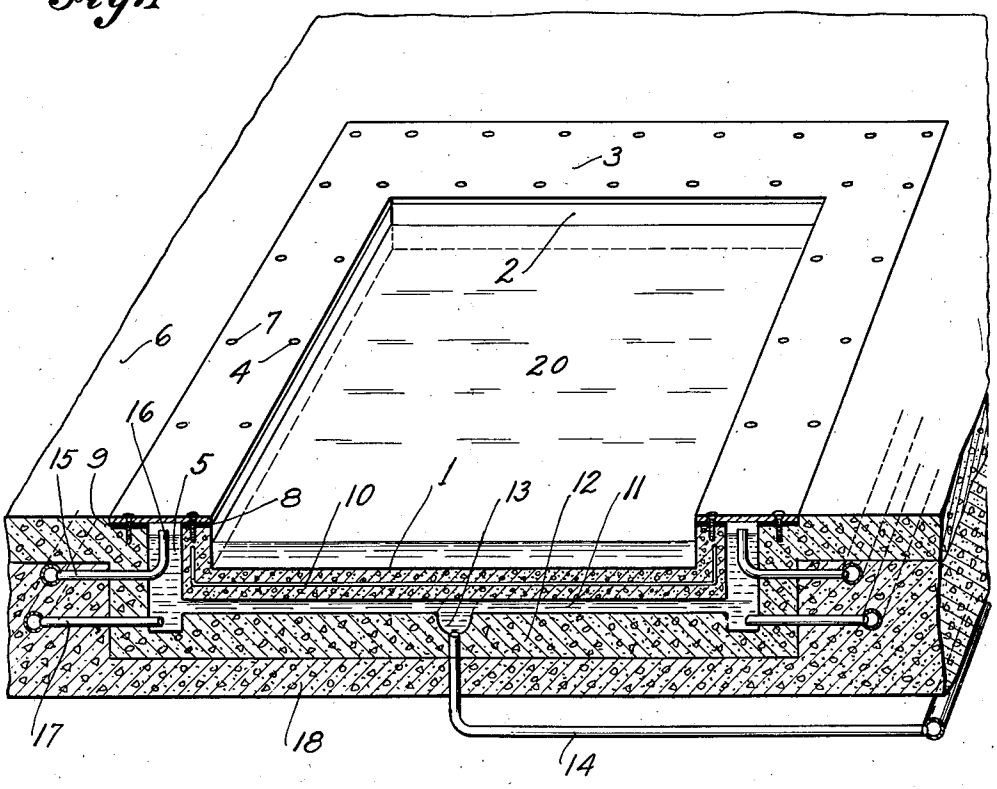
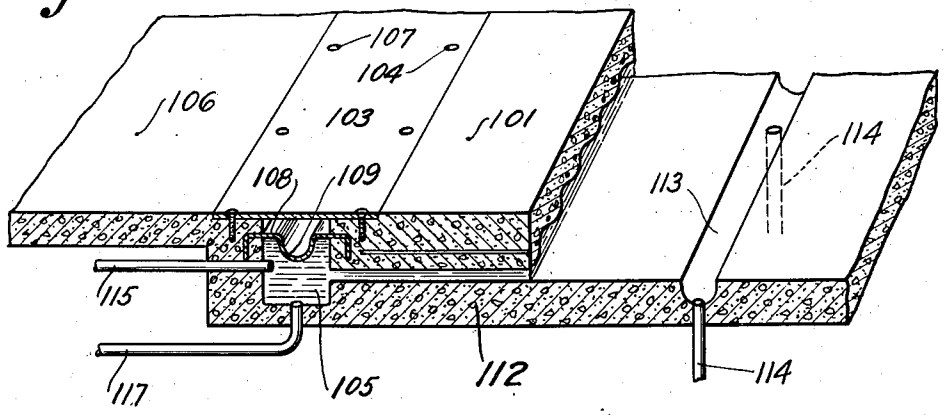


Fig. 2



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ICE RINK FLOOR

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6 Claims. (Cl. 62—12)

The present invention relates to improvements in the construction and operation of an ice rink floor. More particularly it relates to improvements in the construction of a floor that may be used either for ice skating, roller skating, dancing, conventions, or other obvious uses.

In the prior art, ice rink floors have had the refrigerant pipes laid over the floor, and these pipes were removed when it was desired to use the floor for other purposes. Such conversion was costly and time consuming. Other of the prior art floors had the pipes embedded in a sectional or monolithic floor usually composed of concrete. Such floors were costly and hard to construct. They were also prone to develop cracks due to the unequal co-efficients of expansion of the metal pipes and the concrete; and due to the drag of the slab on its supports as it expanded and contracted.

The present invention eliminates many if not all of the defects of the prior art structures and achieves all of their desirable results. Applicant's rink floor may be constructed in one section or several sections secured together and floated on the refrigerant. This eliminates the use of pipes, prevents unequal expansion, eliminates the drag as the floor floats, reduces the cost, obtains even distribution of heat transfer, and has other desirable features, as will hereinafter be evident.

Having in mind these defects of the prior art, it is an object of the present invention to construct an ice rink floor that will be without pipes but which will float upon the refrigerant.

Another object of the present invention is the provision of an ice rink with a subfloor supporting a top floor upon a refrigerant contained therebetween by the floors and a marginal seal.

Another object of the present invention is the construction of two superimposed floors adapted to have a refrigerant passed therebetween to refrigerate the top floor and make it usable as an ice rink.

A further object of the present invention is the construction of an ice rink floor that will be without pipes.

A further object of the present invention is the provision of sealing means for the margin of a floating floor.

A further object of the present invention is the provision of a floating floor.

These defects of the prior art have been remedied and these objects attained by the construction of a subfloor, and a top floor resting upon and supported by a refrigerating medium contained between the two floors. The refrigerant is constrained between the floors by means of suitable sealing means placed around the top floor at its margin. The refrigerant is circulated by means of suitably placed conduits that connect with conventional refrigerating machinery.

As will be apparent from the following disclosure, these objects and others are attained, and these defects remedied by means of the devices and construction shown in the accompanying drawing, wherein:

Figure 1 is a perspective view, partly in section, of an ice rink embodying my invention.

Figure 2 is a fragment of a perspective view, partly in section, of a modification of my invention.

In Figure 1, there is shown a perspective view, partly in section, of an ice rink embodying one form of my invention. In this view there is shown a top floor 1 made of reinforced concrete that has around the margin an upstanding curb 2. Secured to the curb is a flat horizontal marginal plate 3 made of a light weight sheet of metal that will flex relatively easily. This marginal plate 3 is secured to the curb by any suitable means such as the bolts 4. The plate extends across a sealing well 5 or sump, that extends around the top floor. On the other side of this sump is the adjacent floor surface 6 to which the marginal plate 3 is secured as by bolts 7. If desirable the marginal plate may rest upon gaskets 8 and 9 interposed between the plate and the curb 2 and the adjacent floor 6, respectively. Suitable reinforcing means 10 may be placed in the top floor and curb.

The top floor floats upon a refrigerant 11 which may be the usual calcium chloride brine or other similar refrigerant. The refrigerant may even be of the direct expansion type, in which case the gaskets 8 and 9 will be necessary. Underneath the refrigerant and the top floor is placed a concrete subfloor 12 that acts to support the top floor and to aid in constraining the refrigerant against loss. The subfloor has a marginal wall which is spaced from the curb 2 to form the sump 5, and to connect the subfloor with the adjacent floor surface 6. In the middle of the subfloor and longitudinally thereof is formed a distributing trough 13 into which is led by suitable pipes 14 the incoming refrigerant. From this distributing trough the refrigerant flows outwardly to the margins of the top floor where it is collected in the sump and returned to the refrigerating machine thru the overflow pipes 15. The depth of the refrigerant in the sump is determined by the height of the overflow

openings 16, or by other suitable means. This height determines the distance which the top floor will be spaced from the subfloor, and, hence, the refrigerant space between the floors. The sump may be drained by means of suitable pipes 17 opening from the bottom of the sump. The subfloor may be placed upon a bed of insulating material 18 such as cinders, cinder concrete, or other suitable means. The device may rest directly upon the ground, but it may be placed any where in a building. The device has been shown with a layer of ice 20 suitable for skating, covering the floor.

The operation of the device disclosed in Figure 1 is as follows. In a condition in which the top floor rests directly upon the subfloor and no refrigerant is contained therebetween, the marginal plate 3 will be found to have its inner portion flexed downwardly. As the refrigerant is delivered between the floors thru the supply pipes 14 and the longitudinal trough 13, the sump 5 will gradually fill and the top floor will float on the refrigerant. The height to which the floor will rise will be determined by the position of the openings 16 in the overflow pipes 15. The movement of the top floor is normal to its surface, that is, at a right angle to the surface. The structure may be so designed that the marginal plate 3 is level when the device is being used as a rink and has a layer of ice thereon, or it may slope upward and inward under this condition. The water for forming ice 20 may be placed on the floor prior to refrigerating the floor or it may be placed on thereafter. If placed on thereafter, it will be found that the floor has arisen above the desired level but will return as the water is added to its surface. It will be found that the space between the floors need not be over an inch and probably only about half that, even for large floors sixty to one hundred feet in width. From this it will be seen that the movement of the floor will be small. To reduce strain upon the marginal plate 3, it need not be secured in place by the bolts 4 and 7. This plate need not be sealed if a brine is used for refrigerating.

If a direct expansion system is used, the modification shown in Figure 2 is preferable. In this figure is shown a top floor 101, a marginal plate 103, bolts 104 and 107 securing the plate to the top floor and the adjacent floor 106. The marginal plate bridges a sump 105. Also bridging the sump 105 and connecting the top floor and the adjacent floor is a flexible metal or rubber seal 108 that has longitudinally thereof a bellows 109, or corrugation. One edge of this seal is embedded in the top floor and one edge in the adjacent floor. Liquid refrigerant is delivered between the top floor and the subfloor 112 thru the pipes 114 and the trough 113. The gas is removed thru the pipe 115. To reduce the distance which the two floors need to separate to allow for proper flow of the refrigerant, the under side of the top floor, or the top side of the subfloor, is transversely corrugated to form passageways for the refrigerant. In fact, using these corrugations, a device similar to the devices shown in the drawing might be constructed with the expectation that no movement of one floor away from the other, would occur. In the latter instance the two floors might be secured together thru out the area. If one of the floors is formed with corrugations, a form would be left in place. This form would be corrugated if on the underside of the top floor, or flat if the corrugations were on the top of the subfloor.

The operation of the device shown in Figure 2 would be similar to that shown in Figure 1. An advantage of the device shown in Figure 2 is that the refrigerated surface may be level with that of the adjacent floor. This means that the water for the ice must be added after the floor is refrigerated to prevent the overflow of the adjacent floor. Also, a temporary curb may be installed to prevent this overflow. Also, the structure may be so designed that the marginal plate is level when the two floors are in contact.

A construction somewhat similar to that shown in Figure 2 may be had by the use of a liquid seal in place of the mechanical seal 108. Such a structure would involve deepening the sump and placing a depending skirt on the edge of the top floor to extend down into the sump. The sump would then be filled with a material such as water, oil, ethyleneglycol, or other liquid suitable for the purpose, depending upon the refrigerant and the particular design. Such a seal is in common use in gas and oil storage tanks. In the following claims where the refrigerant or heat transfer medium is described as being under pressure, that pressure is, of course, measured at the surface of the medium in under the marginal seal.

Having thus described my invention, I claim:

1. An ice rink floor, comprising: a subfloor, a top floor placed over said subfloor and forming therebetween a sump, a marginal plate connecting said floors, and a flexible vapor tight seal secured between and to said top floor and said subfloor.

2. An ice rink floor, comprising: a subfloor, a top floor placed over said subfloor and forming therebetween a sump, a marginal plate connecting said floors, and means marginally of said top floor and over said sump for securing a vapor tight seal between said floors.

3. A heat transfer floor construction, comprising: a subfloor, a top floor placed over said subfloor but free therefrom, a seal placed marginally of said top floor and between said top floor and said subfloor, the freedom of said top floor and the nature of said seal allowing movement between said floors, and means including the above elements for confining between said floors a fluid heat transfer medium under a pressure above the atmospheric pressure on said top floor; whereby heat may be transferred between said top floor and said fluid medium, and at least a portion of the weight of said top floor may be carried by said fluid medium to reduce the strains upon said top floor caused by its deformation due to temperature changes.

4. A heat transfer floor construction, comprising: a subfloor, a concrete top floor placed over said subfloor but free therefrom, an adjacent floor connecting with said subfloor, said top floor and said adjacent floor being so constructed that and adapted to have their upper faces lie in the same plane, and a seal arranged marginally of said top floor and between said top floor and the other floors, and means including the above elements for confining a heat transfer fluid under a pressure greater than atmospheric between said top floor and said subfloor whereby heat may be transferred between said top floor and said fluid medium, and at least a portion of the weight of said topfloor may be carried by said fluid medium

to reduce the strain upon said topfloor caused by its deformation due to temperature changes.

5. A heat transfer floor construction, comprising: a subfloor, a concrete topfloor placed over said subfloor but free therefrom, a seal placed marginally of said topfloor and between said topfloor and said subfloor, the freedom of said topfloor and the nature of said seal allowing movement between said floors, and means including the above elements for confining between said floors a fluid heat transfer medium under a pressure above the atmospheric pressure on said topfloor; whereby heat may be transferred between said topfloor and said fluid medium, and at least a portion of the weight of said topfloor may be carried by said fluid medium to reduce the strain upon said topfloor caused by its deformation due to temperature changes.

6. A heat transfer floor construction, comprising: a subfloor, a concrete topfloor placed over said subfloor but free therefrom, a seal placed marginally of said topfloor and between said topfloor and said subfloor, the freedom of said topfloor and the nature of said seal allowing movement between said floors, means between and contacting said floors for spacing them apart and forming a heat transfer passage therebetween, and means including the above elements for confining between said floors a fluid heat transfer medium under a pressure above the atmospheric pressure on said top floor; whereby heat may be transferred between said topfloor and said fluid medium, and at least a portion of the weight of said topfloor may be carried by said fluid medium to reduce the strain upon said topfloor caused by its deformation due to temperature changes.

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