Oct. 31, 1950 H. E. NORTON 2,528,449

AIRFLOW COOLER

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Fig. 1.

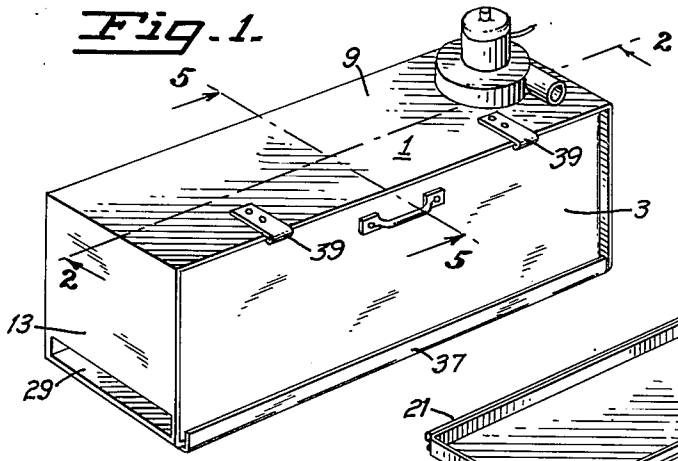


Fig. 3.

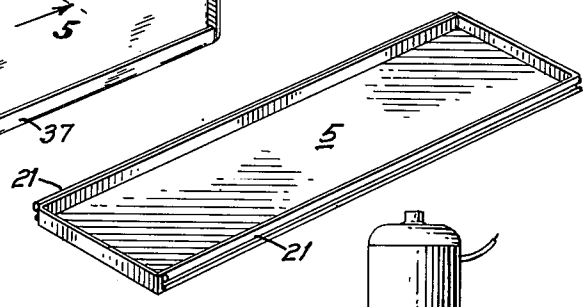


Fig. 2.

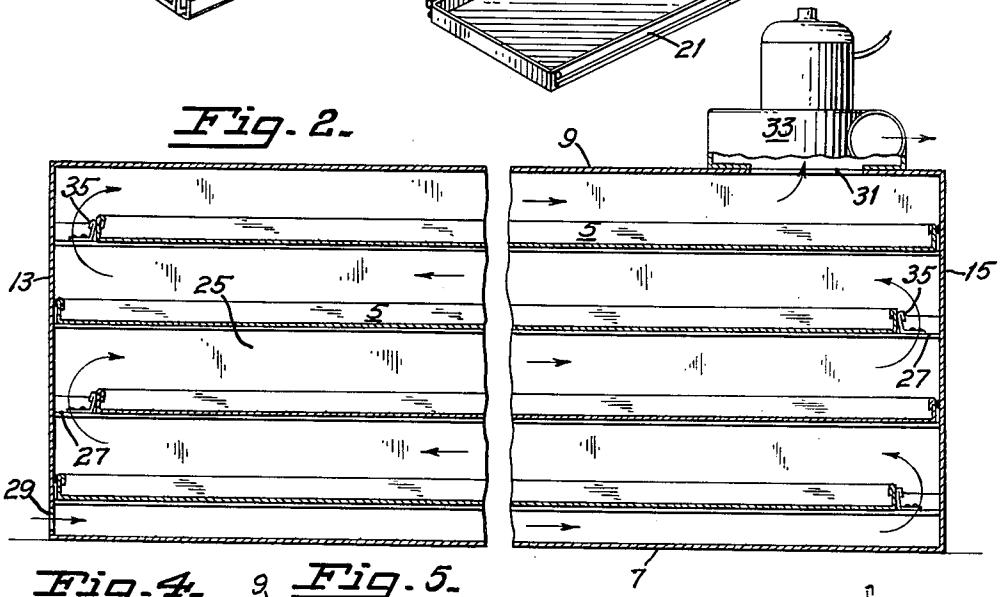


Fig. 4.

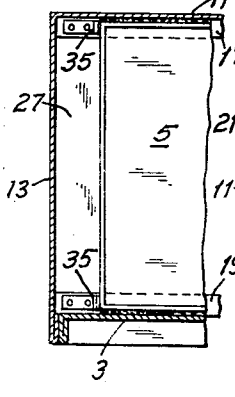
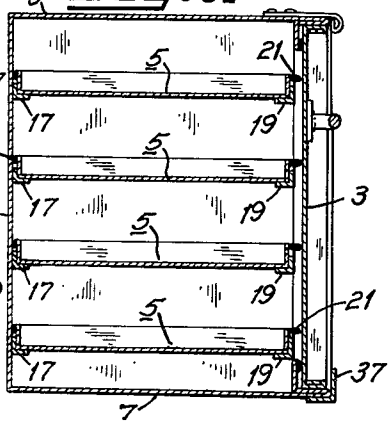


Fig. 5.



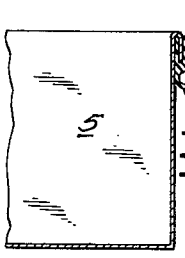


Fig. 6.

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Fig. 7.

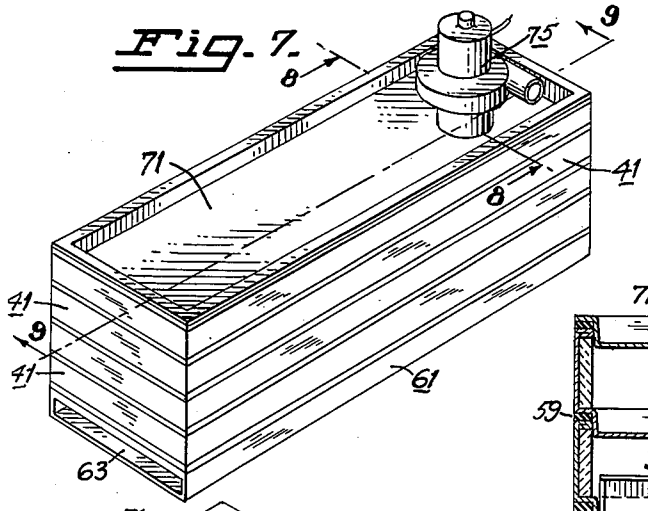


Fig. 8.

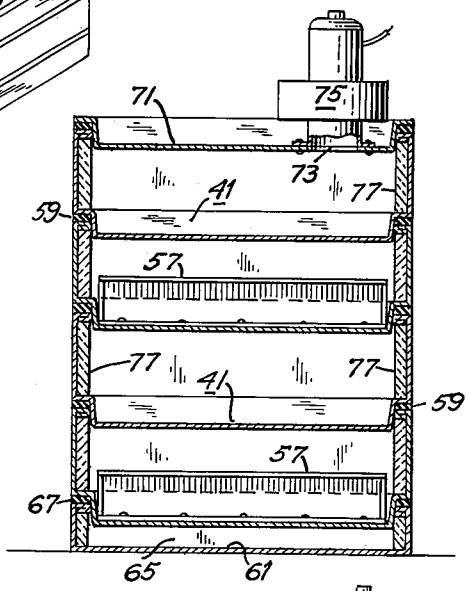
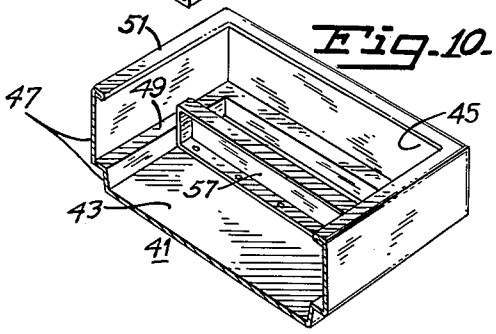


Fig. 10.



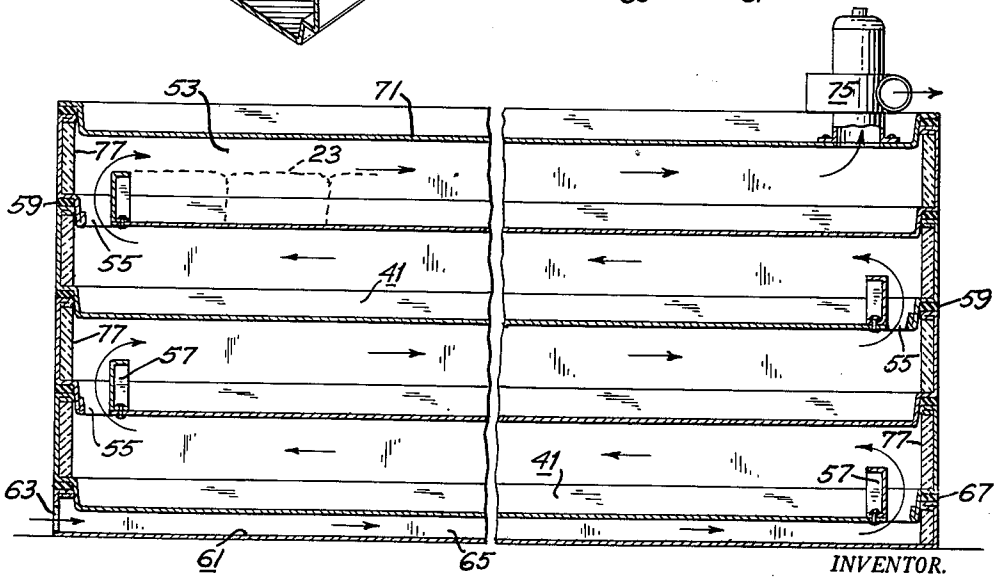


Fig. 9.

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UNITED STATES PATENT OFFICE

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AIRFLOW COOLER

Homer E. Norton, Oakland, Calif., assignor of one-half to Wil Evans

Application February 23, 1949, Serial No. 77,715

6 Claims. (Cl. 62—133)

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My invention relates to refrigeration and more particularly to a cooler for lowering the temperature of the surrounding atmosphere.

It is the purpose of the present invention to provide a simple and effective means for cooling surrounding atmosphere to desired refrigerating temperatures, and particularly to provide the same in the form of a portable unit assembly capable of utilizing a packaged refreezable refrigerant, such portable unit assembly being admirably adapted for refrigerating vehicles engaged for example, in the daily handling of perishable commodities.

The cooler of the present invention comprises a plurality of trays for holding refrigerant, particularly a packaged refrigerant capable of being refrozen following use. The trays are removably mounted in stacked relationship with their bottoms sufficiently spaced so as to provide an airflow space between the refrigerant in any one tray and the bottom of the tray next above. Air from outside the assembly is circulated through such airflow spaces in series and discharged therefrom at its lowered temperature.

For a disclosure of the invention in greater detail, reference will be had to the accompanying drawings wherein—

Figure 1 is a 3-dimensional view of the invention in one form;

Figure 2 is a view in section in the plane 2—2 of Figure 1;

Figure 3 is a 3-dimensional view of a tray employed in the assembly of Figure 1;

Figure 4 is a fragmentary horizontal view depicting one end of such tray as installed;

Figure 5 is a view in section taken in plane 5—5 of Figure 1;

Figure 6 is a fragmentary view on edge of a tray and depicting the manner of weatherstripping the same with the adjacent wall of the form of the invention illustrated in Figure 1;

Figure 7 is a 3-dimensional view of a different form of the present invention;

Figure 8 is a view in section taken in the plane 8—8 of Figure 7;

Figure 9 is a view in section taken in the plane 9—9 of Figure 1;

Figure 10 is a fragmentary view of one end of a tray utilized in the assembly of Figure 7.

The form of the invention depicted in Figure 1 contemplates the use of a housing 1 of fixed dimensions with a removable front wall 3, and provision for supporting in said housing, a plurality of refrigerant holding trays 5 in stacked relationship.

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The housing is formed, preferably of sheet metal, to include a bottom 7, top 9, rear wall 11 and end walls 13, 15 leaving the front wall section open. A pair of angle iron cleats 17, 19 are disposed longitudinally of the housing in a horizontal plane spaced somewhat from the bottom, one of said cleats extending along the rear wall and the other parallel thereto across the open front wall section. Similar pairs of cleats similarly designated, are in like manner assembled in the housing at vertically spaced intervals.

Each pair is adapted to receive and support one of the aforementioned trays, the upper edge of which overhangs the tray supporting cleats and includes weatherstripping 21. Each tray is of shorter length than the housing, which permits the trays to be installed with alternate trays against one end wall of the housing and intermediate trays against the opposite end wall. These trays are adapted to hold a refrigerant, preferably of the packaged refreezable type such as briquettes 23 of water saturated chemically treated wood fibres, the distance between trays being sufficient to define an airflow space 25 between the refrigerant in any one tray and the bottom of the one next above.

By disposing the trays in the staggered relationship mentioned, connecting passages 27 are formed which connect these airflow spaces in series to define an extended airflow path through the housing, such airflow path having connection at one end with the atmosphere through an entrance opening 29 adjacent the bottom of that end wall against which the lowermost tray rests, whereby the entering air must traverse the housing along the bottom of said tray before entering the airflow space above said tray.

At its other end, the airflow path discharges to the atmosphere through an opening 31 in the top of the housing adjacent the end wall engaged by the uppermost tray, to cause the air flow to traverse the refrigerant in said tray.

A motor driven fan 33 mounted over the discharge opening will cause positive movement of air through the housing.

Stop elements 35, preferably of a resilient character, riveted or otherwise affixed to the cleats adjacent the free ends of the trays, will serve to removably hold such trays against shifting, and in weatherstrip engagement with the contacted end walls of the housing.

Along its front edge, the bottom of the housing is provided with a turned up anchoring lip 37 for the removable front wall 3 of the housing. This front wall is flanged along its upper and

lower edges so as to pressure engage the weatherstripped front edges of the trays, when placed in position, and is held in such position by a pair of spring clips 39 affixed to and overhanging the front edge of the top of the housing.

The housing itself is similarly weatherstripped between its upper and lower front edges and the removable front wall in its installed condition.

By so weatherstripping the assembly, the flow of air is thus confined to the airflow path, with no opportunity to bypass or leak around any of the trays. The air is thereby forced to traverse the bottom of each tray as well as along the refrigerant in such tray, and by making the trays of good heat conductive material such as metal, the air is thereby cooled more efficiently during its movement through the cooler.

The apparatus is preferably so dimensioned that, with the refrigerant in the trays, the airflow path is of substantially uniform cross section throughout. By so designing the assembly, expansion and contraction of the air flow during such flow, is substantially avoided, and the efficiency of the apparatus as a cooler is thereby enhanced.

In the form of the invention depicted in Figure 7 and subsequent figures, the trays 41 of such assembly, are so designed as to perform the function of the housing as well.

Each tray is formed to provide a bottom 43 with side walls 45 and end walls 47 extending upwardly therefrom. Each wall includes an offset 49 and terminates at its upper edge in an inturned flange 51 in vertical alignment with such offset. The trays are thus adapted to nest one within the other, and by making the walls sufficiently high, the desired airflow space 53 may be provided between the refrigerant in one tray and the bottom 43 of the tray immediately above.

To interconnect such airflow spaces in series, a connecting passage in the form of an opening 55 is provided in the bottom of each tray adjacent an end thereof, and the trays are stacked with alternate trays reversed with respect to the intermediate trays. A guard 57 riveted or otherwise affixed to the bottom of each tray crosswise thereof along the edge of such opening, serves to hold the briquettes 23 or other packaged refrigerant against dropping into or blocking any of such connecting passages.

In stacking the trays, weatherstripping 59 is assembled between the offsets and flanges of adjacent trays to assure against leak of air from the airflow path.

The tray stack is assembled upon a bottom or supporting base 61 having an intake opening 63 at one end and defining a passage 65 for guiding the air to the connecting opening in the lowermost tray of the stack. Suitable weatherstripping 67 is similarly provided between these two components.

At the top of the stack, a cover 71 is provided, suitably weatherstripped to the uppermost tray. This cover has a discharge opening 73 therein adjacent one end, remote from the connecting passage in the tray below, to assure flow of air over the refrigerant in the top tray. Spanning the opening in the cover is a suitable motor driven fan 75 to secure positive flow of air through the apparatus.

Heat insulation 77 may be applied along the walls of the trays and supporting base when deemed desirable.

Should the assembly of Figure 7 be exposed to conditions of excessive vibration or the like, it is within the contemplation of the present invention to removably bind the assembly to preclude possible displacement of the trays from their nesting arrangement.

In each form of the invention, the refrigerant may be frozen while in the trays and prior to assembling the trays to complete the cooler, and following a refrigerating period, the trays may be removed and the refrigerant therein refrozen for the next refrigerating period, without necessarily removing the refrigerant from the trays.

High efficiency is obtainable through the use of apparatus embodying the basic features of the present invention, for it provides a long flow path in which the air in flowing along the bottom of each tray as well as the surface of the refrigerant, is cooled from both sides.

While the form of the invention illustrated in Figure 1 is fixed as to outside dimensions, its capacity may be altered, if desired, through variation in the number of trays installed. The form of the invention depicted in Figure 7, offers the additional advantage of altering the size of the apparatus with capacity, whereby the same may be adjusted to handle a wide range of situations.

While I have disclosed my invention in its preferred forms and in considerable detail, the same is subject to alteration and modification without departing from the underlying principles involved, and I, accordingly, do not desire to be limited in my protection to such details of construction as have been illustrated and described except as may be necessitated by the appended claims.

I claim:

1. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical end and side walls, said walls each including an offset and terminating in a flange overlying the offset to permit stacking of said trays with their bottoms in spaced relationship to one another to define an airflow space between adjacent trays; means forming communication passages interconnecting said airflow spaces in series to form a continuous airflow path, said means including an opening adjacent one end of each tray, with the openings associated with alternate trays disposed at the ends opopsite from the locations of the corresponding openings of the intermediate trays; and means for producing flow of air through said airflow path.

2. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical end and side walls, said walls each including an offset and terminating in a flange overlying the offset to permit stacking of said trays with their bottoms in spaced relationship to one another to define an airflow space between adjacent trays; means forming communication passages interconnecting said airflow spaces in series to form a continuous airflow path, said means including an opening in the bottom of each tray adjacent an end thereof, with the openings in alternate trays disposed at the ends opposite from the locations of the corresponding openings in the intermediate trays; and means for producing flow of air through said airflow path.

3. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical end and side walls, said walls each including an offset and terminating in a flange overlying the offset to permit stacking of said trays with their bottoms in spaced relation-

ship to one another to define an airflow space between refrigerant in one tray and the bottom of the tray next above; means forming communication passages interconnecting said airflow spaces in series to form a continuous airflow path; and means for producing flow of air through said airflow path, said means including a base supporting said trays in stacked formation and defining a passage from the atmosphere to the opening in the bottom of the tray next above, and a cover supported on the uppermost of said trays when stacked, and a fan mounted on said cover and having communication with said uppermost tray.

4. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical end and side walls, said walls each including an offset and terminating in a flange overlying the offset to permit stacking of said trays with their bottoms in spaced relationship to one another to define an airflow space between refrigerant in one tray and the bottom of the tray next above; means forming communication passages interconnecting said airflow spaces in series to form a continuous airflow path; and means for producing flow of air through said airflow path, said means including a bottom tray supporting said trays in stacked formation and defining a passage from the atmosphere to the opening in the bottom of the tray next above, and a cover supported on the uppermost of said trays when stacked, and a fan mounted on said cover and having communication with said uppermost tray at the end farthest from the opening in the bottom of said tray.

5. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical end and side walls, said walls each including an offset and terminating in a flange overlying the offset to permit stacking of said trays with their bottoms in spaced relationship to one another to define an airflow space

between refrigerant in one tray and the bottom of the tray next above; means forming communication passages interconnecting said airflow spaces in series to form a continuous airflow path, said means including an opening in the bottom of each tray adjacent an end thereof, with the openings in alternate trays disposed at the ends opposite from the locations of the corresponding openings in the intermediate trays; and means for producing flow of air through said airflow path, said means including a bottom tray supporting said trays in stacked formation and defining a passage from the atmosphere to the opening in the bottom of the tray next above, and a cover supported on the uppermost of said trays when stacked, and a fan mounted on said cover and having communication with said uppermost tray at the end farthest from the opening in the bottom of said tray.

6. A cooler comprising a plurality of trays for holding a refrigerant, each tray involving a bottom with vertical walls, said walls including offsets and terminating in flanges overlying said offsets to permit stacking of said trays with their bottoms in spaced relationship to one another to define an airflow space between adjacent trays; means forming communicating passages for connecting said airflow spaces, said means including an opening adjacent one end of each tray connecting an airflow space with that airflow space immediately above; and means for producing flow of air through said airflow spaces.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Country	Date
23,580	Great Britain	Nov. 4, 1908