July 22, 1952 A. F. O'CONNOR 2,604,028

AIR IMPELLER FOR REFRIGERATOR CARS

Filed March 21, 1946 2 SHEETS—SHEET 1

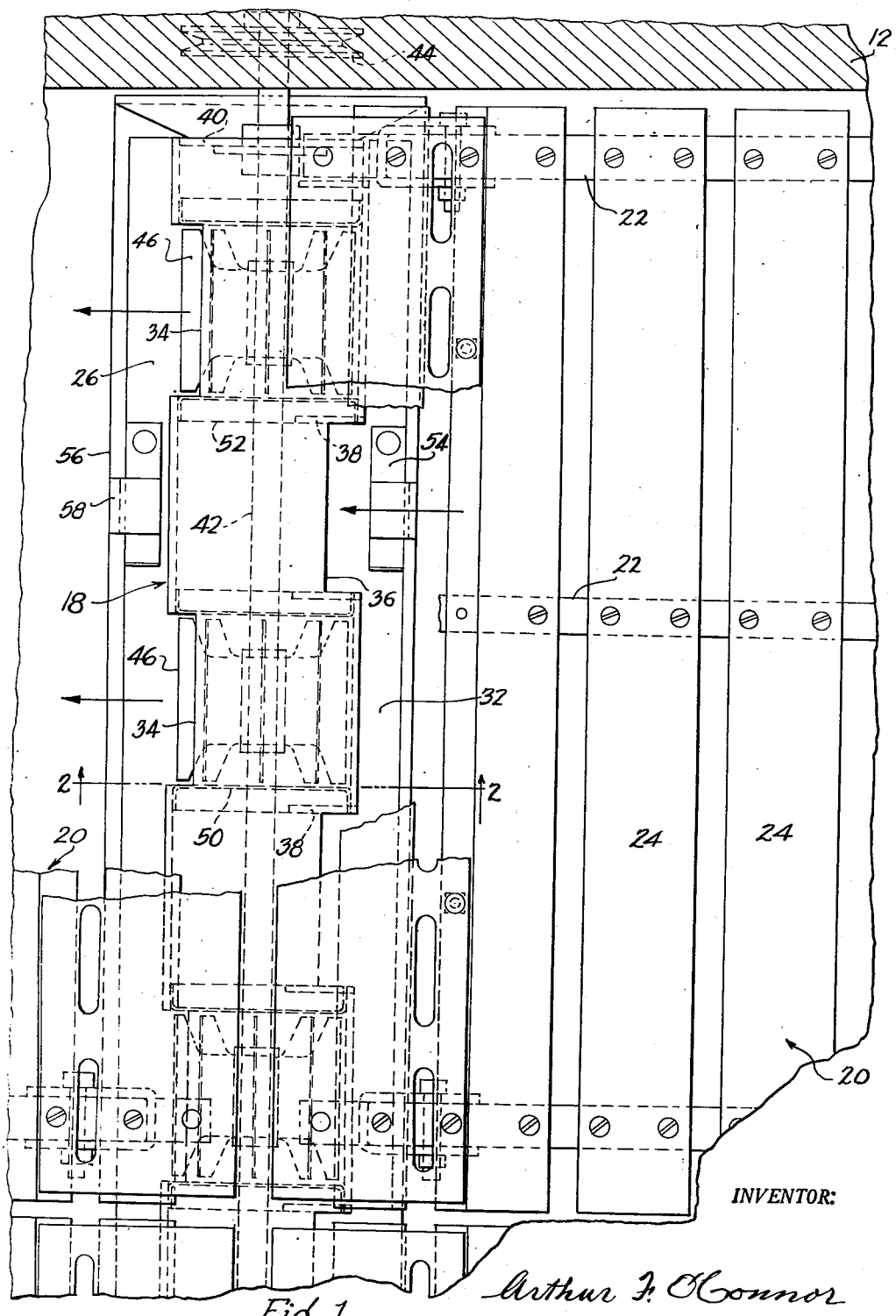


Fig. 1

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AIR IMPELLER FOR REFRIGERATOR CARS

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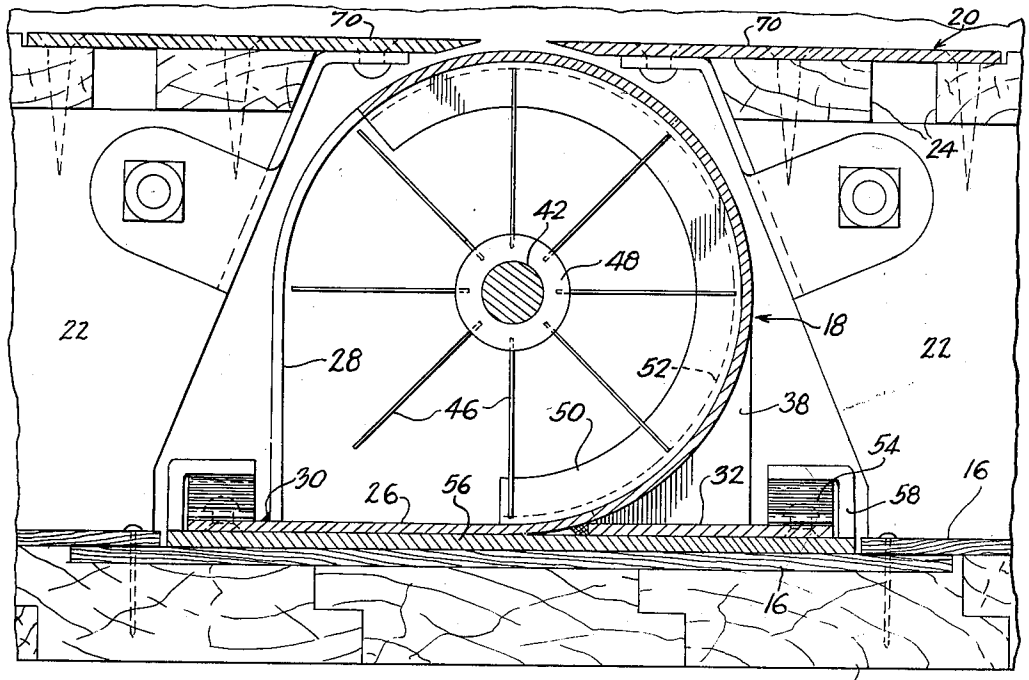


Fig. 2

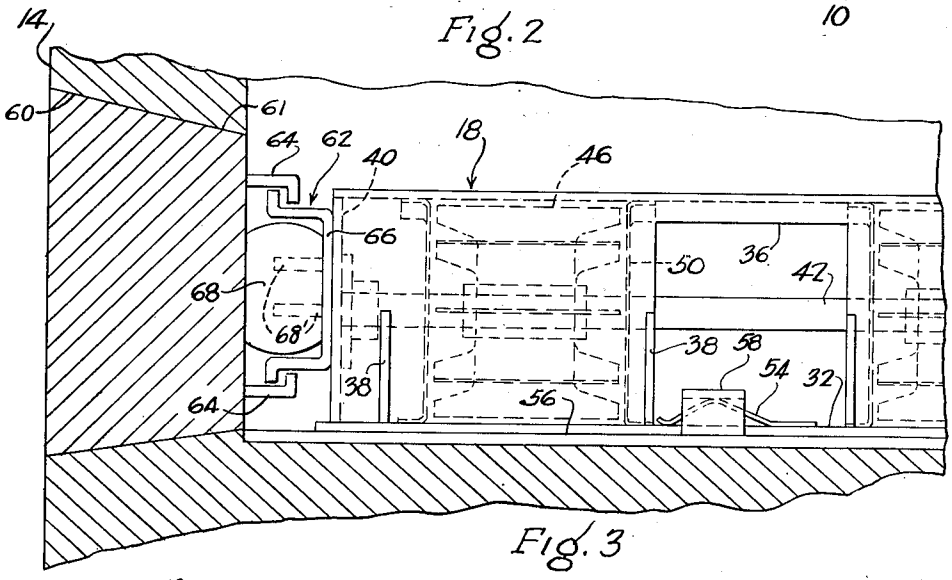


Fig. 3

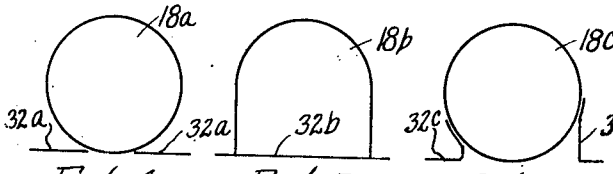


Fig. 4

Fig. 5

Fig. 6

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AIR IMPELLER FOR REFRIGERATOR CARS

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8 Claims. (Cl. 98—6)

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The invention relates to refrigerator cars and like vehicles used to transport perishable commodities, such as fruits and vegetables and, more particularly, to cars equipped with air impellers and, still more particularly, to cars equipped with air impellers removable from the car while the car is under load.

An important object is to provide an improved air impeller intermediate the car floor proper and the lading and movable into and out of the car independent of the lading floor and the lading thereon; the invention being an improvement in the removable air impeller of my co-pending patent application, Serial No. 652,758, filed March 7, 1946.

A further object is the provision of an air impeller including a housing wherein the side walls thereof are inclined throughout the upper part of the housing toward the top of the housing coincident the longitudinal center of the housing, adapted to permit the margins of the lading floor on opposed sides of the impeller to overlie the inclined portions of the housing and support the lading above the impeller independent thereof.

Another object is the provision of improved means for maintaining the impeller in its operative position and against movement in one direction transversely of the car as long as the impeller door is closed and latched.

Another object is to provide improved means for rigidifying the overlying spaced margins of the lading floor sections on opposed sides of the impeller, whereby to resist any tendency of the margins to depress into engagement with the impeller, caused by the lading supported by the margins.

A further object is the provision of new and novel arrangement of the margins of the lading floor sections on opposed sides of the impeller whereby they will be maintained in spaced overlying relation therewith and whereby the space between the opposed margins may conform with the maximum permissible space to accommodate the movement of wheeled trucks over the lading floor.

Another object is the provision of an improved air impeller housing, the inner walls of which are substantially equally spaced from and tangential with the periphery of the sets of impeller blade tips, adapted to eliminate "pockets" which create turbulence and interfere with the free circular movement of the impelled air in the housing and decrease the efficiency of the impeller.

A further object is to provide an improved housing for an air impeller simple in construction, economical to manufacture and being cheaper and lighter in weight than the box-like housings of the prior art.

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Another object is the provision of new and novel arrangement of the conventional waterproof floor covering to accommodate the mounting of my improved impeller on the car floor.

The foregoing and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which—

Figure 1 is a horizontal section through a portion of a refrigerator car, showing in plan the impeller and the cooperating portions of the car.

Figure 2 is an enlarged fragmentary sectional view taken along line 2—2 of Figure 1.

Figure 3 is a fragmentary vertical section through the car showing, in elevation, the opposite end of the impeller to that shown in Figure 1.

Figures 4, 5 and 6 show, diagrammatically, alternate cross-sectional configurations of the impeller housing and base portions.

In the drawings, the car structure may include a floor 10, side walls 12 and 14, and a floor covering 16. The side walls and floor may be of conventional insulated construction. The car may be provided at each end thereof with an ice bunker (not shown) and a conventional bulkhead separating the ice bunker from an adjacent lading compartment; the conventional refrigerator car having an ice bunker at each end thereof. An air impeller 18 may extend transversely of the car within the lading compartment area thereof, having flatwise relation with the floor 10. A sectional lading floor 20 may be provided in the lading compartment, adapted to support the lading in overlying, spaced relation with the floor 10 and provide an air duct in the inter-floor space communicating with the opposed ice bunkers of the car.

The lading floor 20 may comprise stringers or beams 22 extending longitudinally of the car and interrupted at one point to provide an interfloor space for the impeller 18, with transverse slats 24 supported thereon; the lading floor being preferably made in sections hinged to the walls 12 and 14 and separated along the longitudinal center of the car, whereby they may be swung from horizontal to vertical positions adjacent the side walls 12 and 14, as for purpose of cleaning the car floor 10.

The air impeller 18 may include an elongated housing preferably formed of a sheet of metal arcuate in section throughout its upper half por-

tion and one quarter of its lower portion with a substantially flat marginal portion 26 extending laterally of and outwardly of the vertical center of the housing; the other marginal portion 28 of the sheet extending in a vertical plane from adjacent the horizontal center of the housing to and being affixed to the flat portion 26, as by welding 30. A flat plate 32 may be secured to the housing on the opposed side of and in co-planar alignment with the flat portion 26 and may extend outwardly from the housing equidistant with the flat portion 26. The housing may be rigidified adjacent the plate 32 by a series of spaced vertical web members 38 having their lower edges affixed to the plate 32 and one upstanding edge registering with and being affixed to the lower arcuate portion of the housing. The wall portion 28 may be formed with a series of spaced outlet openings 34 and the opposed wall of the housing may be formed with spaced inlet openings 36 in staggered relation with the openings 34. The ends of the housing may be closed by walls 40. While I have shown in the drawings a housing of arcuate configuration throughout substantially three quarters thereof, having in mind the economy of forming the greater part of the housing out of a single sheet of readily obtainable material, I contemplate the use of housings having the general configurations and cooperating base portions illustrated diagrammatically in Figs. 4, 5 and 6 of the drawings. As shown in Figure 4, the housing 18*a* is completely cylindrical and is supported by flat plates 32*a* secured to the bottom portion thereof and extending outwardly therefrom. According to Figure 5, the housing is made in the shape of an inverted channel 18*b* with its lower edges secured to the edge portions of a flat base plate 32*b*. In Figure 6, the housing 18*c* is cylindrical and is mounted on angle plates 32*c* which are secured to opposite sides thereof with their base flanges in alignment. It will be understood that the impeller housings now in general use are box-like in section, have relatively square corners (creating "pockets" which set up a turbulence within the housing and interfere with the efficiency of the impeller), and have flat tops which support a part of the lading which, with certain types of lading (in small cartons or boxes) exerts a retarding influence on the impeller as it is moved in a direction transversely of the car, as when removing the impeller for replacement.

Within the housing an elongated shaft 42 may be journaled in mountings affixed to the opposed end walls 40 and by intermediate mountings (not shown) if desired. The shaft may be rotated by any suitable means, shown as a driving pulley 44 removably affixed thereto adjacent one end thereof. The shaft supports within the housing a plurality of sets of impeller blades 46 extending radially outward from the shaft. As best shown in Fig. 2, the blades are carried by blocks 48 adapted to be clamped or keyed to the shaft, whereby the blocks 48 may be disposed in operative position within the housing and the shaft inserted through the aligned blocks during assembly of the impeller unit. It will be noted that each of the sets of blades is disposed opposite an outlet opening 34 and that the inlet openings 36 communicate with the spaces between the sets of blades. The blades may be relatively narrow adjacent the shaft and may be flared outwardly to wider portions at their tips. The widened outer portions of the blades may be partially enclosed by a shroud 50 in the form of a relatively thin metal strip.

The shroud 50 may be arcuate in configuration and may extend from the upper end of an outlet opening 34 around the arcuate inner surface of the housing substantially to the vertical center of the housing adjacent the flat portion 26. The shroud may be disposed in a vertical plane and may be affixed to the inner surface of the housing in any suitable manner, as by means of a lateral flange portion 52.

The opposed outer marginal portions of the flat portion 26 and the plate 32 may be provided with fastening members 54 comprising elongated strips of spring steel secured adjacent one end in flatwise relation with the flat portion 26 and the plate 32 and provided adjacent the other end portion with an arched portion adapted to be depressed, under tension, when the housing is in operative position, as hereinafter explained.

A substantially flat, elongated plate 56 may be secured in flatwise relation with the car floor 10 adapted to slidably support the impeller unit and may be provided along its opposed margins with upstanding detents 58 terminating at their upper portions in inwardly turned lateral flanges adapted to overlie and depress the fastening members 54 when the impeller is in operative position. The specific fastening members and cooperating detents shown and described do not form a part of the present invention, being covered in my beforementioned co-pending patent application.

A door opening 60 and door 61 may be provided in the side wall 14 in substantially axial alignment with the impeller adapted to permit the application or removal of the impeller through the door opening 60. The door may be removed axially for application or removal of the unit and when in place may be secured by any desired type of latching means not shown.

The inner surface of the door 61 may be provided with a yieldable stop member 62 adapted to engage the adjacent end of the impeller unit whereby to maintain the impeller unit from moving transversely of the car when it is in operative position and the door is closed and secured. The member 62 may comprise a spaced pair of retainer members 64 affixed to the door 61, a member 66 cooperatively associated with the retaining members for restricted movement toward and away from the door 61 and a resilient member 68 intermediate the door and member 66 adapted to normally urge the member 66 in a direction away from the door. The stop member 62 is adapted to compensate for any variation in the distance between the end of the impeller and the door 61 when the impeller is in operative position, such variations being common in refrigerator cars. The member 68 may comprise a block of rubber or suitable spring material formed with openings 68' to facilitate flexing and secured at one end to the member 66 and at its other end to the door to support the member 66 from the door.

The sections of lading floor 20 on opposed sides of the impeller unit may be provided along their opposed margins with a flat metal plate 70 adapted to overlie the housing of the impeller unit whereby to support the lading directly over the impeller in spaced relation therewith. The opposed edges of the plates 70 above the impeller unit may be spaced apart approximately the same distance as the conventional spacing between the lading floor slats 24 in order to insure a lading supporting surface having uniform and even

spacing to accommodate the use of wheeled trucks thereon. The undersides of the opposed margins of the plates 70 may be beveled in order that they may project toward each other sufficient to provide a space therebetween not in excess of the permissible distance.

It will occur to those skilled in the art that the sections of lading floor on opposed sides of the impeller unit may be joined, above the impeller unit, by a single plate adapted to space the lading above the unit and I contemplate such a structure. However, such a construction requires a housing smaller in cross-section and shorter blades, inasmuch as any further raising of the lading floor is prohibited. The distance between the car floor proper and the load supporting surface of the lading floor determines the maximum cross-sectional dimension of the impeller housing as no part of the housing may project above the load-supporting surface of the lading floor. The lading floors have been progressively raised, with relation to the floor proper, since the original use of air impellers, reducing the head-room in cars and reducing lading capacity with each increase in height to a point where the car owners and shippers have finally refused to permit any increase in the lading floor height. It will be noted, as best shown in Fig. 2, that the car floor 10 is depressed coincident with the location of the base plate 56 and I contemplate depressing the floor at this point in order to obtain additional head-room for the housing, without raising the lading floor, if a single plate is used to connect the opposed margins of the lading floor sections on opposite sides of the impeller.

It will be understood that an important object of the present invention is to provide improved means for supporting the lading above the impeller independent thereof whereby neither the lading nor the lading floor will retard the free movement of the impeller transversely of the car into and out of the car while fully loaded.

It is generally known that air impellers of the type now in general use in refrigerator cars must continue to function from the time the car is loaded with fruit or vegetables and sealed until it reaches a predetermined unloading point in order to meet the minimum requirements of such a car. It is also generally known that the presently used impellers do not continue to function and that numerous cars, loaded on the West coast and destined for the East coast, are detected at intermediate points with inoperative impellers. When such cars are detected with inoperative impellers the car must be set out of the train, the large side doors opened, the load in the affected part of the car must be removed (before the impeller unit may be seen), the impeller must be released from its securement to the car floor (generally bolts or lag screws), the impeller must be removed from the car and repaired or replaced, the lading must be re-loaded. Most perishable commodities transported in refrigerator cars will deteriorate under such delays and lack of continuous refrigeration and will result in the loss of entire car loads of such commodities, valued at from one thousand dollars to several thousand dollars per car.

The present invention is adapted to eliminate this very serious situation which threatens the preclusion of the use of the impellers now in use, by making it possible to remove an impeller and replace it in the car from the exterior of the car.

While the embodiments of the invention have been shown and described in detail, it will be understood that this is illustrative only and is not intended as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

I claim:

1. In a refrigerator car having a floor and a lading floor spaced thereabove, and beams supporting the lading floor and interrupted at one point to leave an interfloor space extending transversely of the car, and a side wall formed with an opening registering with said space, an air impeller unit comprising an elongated housing having a top, a bottom, and sides formed with air inlet and outlet openings and of a height slightly less than the distance between the floors, means mounting the housing on the car floor for sliding movement transversely of the car into and out of the interfloor space through the opening in the car side wall, the housing being spaced from the lading floor whereby it can be moved into and out of the interfloor space independent of the lading, an elongated rotor in the housing carried thereby for circulating air through the openings and driving means connected to the rotor to turn it.

2. In a refrigerator car having a floor, a lading floor spaced above the floor, a series of spaced beams supporting the lading floor and interrupted at one point to provide an interfloor space extending transversely across the car, and an opening in one side wall of the car in register with said interfloor space, an air impeller unit comprising an elongated casing having a curved top, mounting means secured to the car floor in said space slidably to support the casing for sliding movement transversely of the car into and out of said space through the opening in the car side wall, impeller means in the casing, driving means connected to the impeller means, the lading floor above the impeller unit being interrupted transversely of the car and the portions thereof on opposite sides of the interruption partially overlying the casing in spaced relation therewith and complementing each other to form a lading supporting floor above and independent of said unit.

3. In a refrigerator car having a side wall and a floor, a lading floor spaced above said first named floor, a series of spaced beams supporting the lading floor and interrupted at one point to provide an interfloor space extending transversely across the car the combination of an air impeller unit disposed transversely of the car in the inter-floor space, means mounting the unit for movement transversely of the car into and out of operative position, driving means connected to the unit a door opening in said wall coincident one end of said unit, the upper part of said unit being spaced below the load bearing surface of said lading floor independent thereof, said unit being movable into and out of operative position and into and out of the car, through said door opening, independent of the lading floor and the lading thereon.

4. An air impeller for refrigerator cars including an elongated housing formed of a sheet of metal having a substantially flat marginal base portion on one side of and bent upwardly adjacent the vertical center of the housing to form an arcuate wall portion through substantially 270 degrees terminating in a depending opposite marginal portion of the sheet affixed at its lower edge portion to and inwardly disposed with relation to the edge of said base portion, a metal

sheet having a portion thereof in coplanar alignment with said base portion on the other side of said vertical center affixed adjacent its inner margin to the adjacent arcuate portion of said housing adapted to complement said base portion to form a base for said housing.

5. An air impeller for refrigerator cars comprising an elongate housing having a substantially flat base portion, spaced upstanding walls affixed to the side margins of the base portion connected at their upper portions by an arcuate wall portion, staggered inlet and outlet openings in said spaced walls, a shaft extending longitudinally through the housing, a plurality of sets of radial blades carried by the shaft in register with the outlet openings, the inner surface of the arcuate wall portion being uniformly spaced from the tips of the blades adapted to provide a substantially smooth surface free from pockets or uneven portions which create turbulence and interfere with the free movement of the impelled air in the housing.

6. An air impeller for refrigerator cars comprising an elongate housing circular in sectional configuration and provided with a substantially flat base portion, staggered inlet and outlet openings in the opposed side walls of the housing, a shaft extending longitudinally through the housing, a plurality of sets of radial blades carried by the shaft in register with the outlet openings, the inner surface of the circular housing being uniformly spaced from the periphery of the sets of blades throughout the interior of the housing whereby to provide a substantially smooth surface free from pockets or uneven surfaces around the tips of the blades.

7. In a refrigerator car having a side wall and a floor, a lading floor spaced above said first named floor, a series of spaced beams supporting the lading floor and interrupted at one point to provide an interfloor space extending transversely across the car the combination of an air impeller unit disposed transversely of the car in the inter-floor space, means mounting the unit

for movement transversely of the car into and out of predetermined operative position, driving means connected to the unit a door opening and a door in said wall coincident one end of said unit, said unit being movable transversely of the car into and out of said car through said door opening, and projecting parts on the door engageable with the unit to maintain said unit against movement in one direction when said unit is in said predetermined operative position and said door is closed and fastened.

8. In a refrigerator car having a side wall and a floor, a lading floor spaced above said first named floor, an air impeller unit disposed transversely of the car in the inter-floor space, means mounting the unit for movement transversely of the car into and out of automatic secured relation with the car, said unit being independent of said lading floor and the lading thereon, a door opening and a door in said wall coincident one end of said unit, said unit being removable from the car through said door opening, and a yieldable member engaging the door and unit to maintain said unit in its secured relation with the car irrespective of variations between the adjacent end of the unit and the closed door.

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