US00RE34047E

United States Patent [19]

Elrod et al.

[11] E Patent Number: Re. 34,047

[45] Reissued Date of Patent: Sep. 1, 1992

[54] **REFRIGERATION SYSTEM**

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[21] Appl. No.: **694,224**

[22] Filed: **Apr. 3, 1991**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **4,852,365**
Issued: **Aug. 1, 1989**
Appl. No.: **224,500**
Filed: **Jul. 19, 1988**

[51] **Int. Cl.**[5] **F25D 15/00**

[52] **U.S. Cl.** **62/237**; 62/250; 62/381

[58] **Field of Search** 62/237, 281, 238, 297, 62/250, 453

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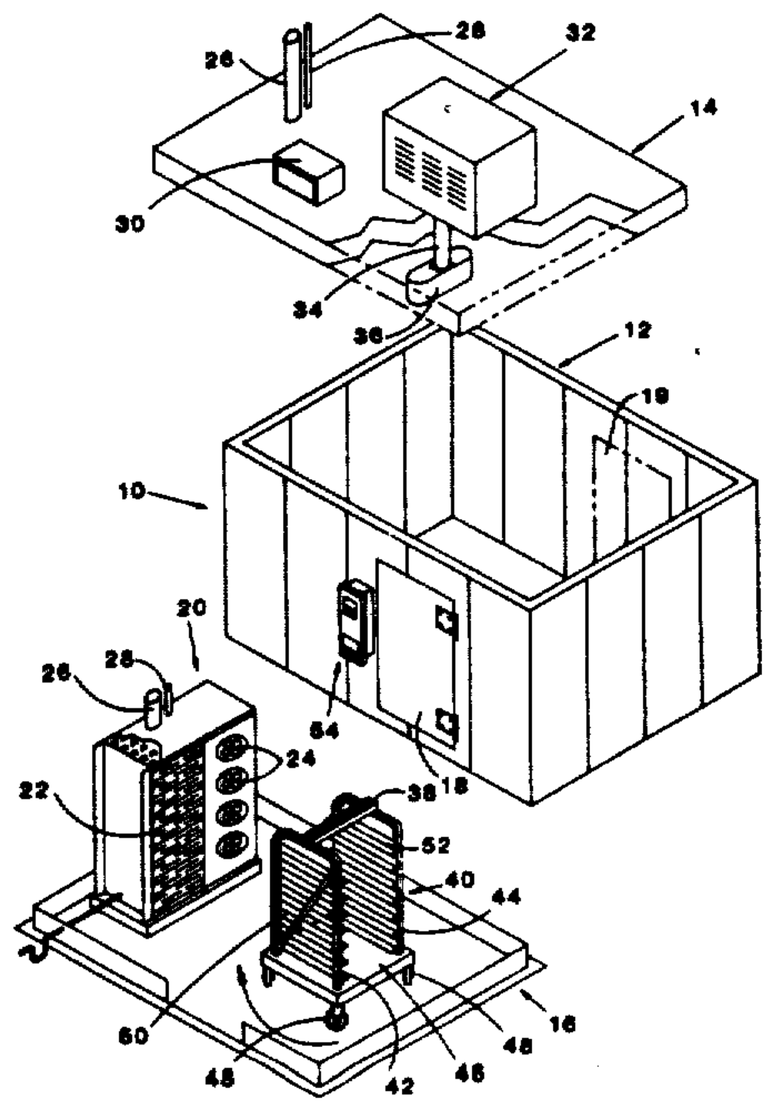
[57] **ABSTRACT**

A refrigeration system comprised of a walled insulated enclosure is provided with a drive motor having a drive shaft extending therefrom. The drive shaft and drive motor are positioned along the ceiling of the walled enclosure. The drive shaft terminates at a coupling mechanism. A complimentary coupling mechanism is attached to the top of a well-known movable food rack. Thus, when the food rack is stored within the walled enclosure, the coupling mechanism on the food rack mates with and attaches to the complimentary coupling mechanism of the drive shaft. When the drive motor is actuated, the drive shaft will rotate the movable food rack. It will be appreciated that by rotating the movable food rack, the present invention will permit the food stored on the food rack to chill far more quickly than if the food rack were to remain stationary. In addition, by rotating the food rack, the present invention eliminates warm air pockets which allow bacterial growth. As a result, the present invention provides less food spoilage relative to prior art refrigeration systems and therefore is more economical to the food service industry user.

17 Claims, 2 Drawing Sheets



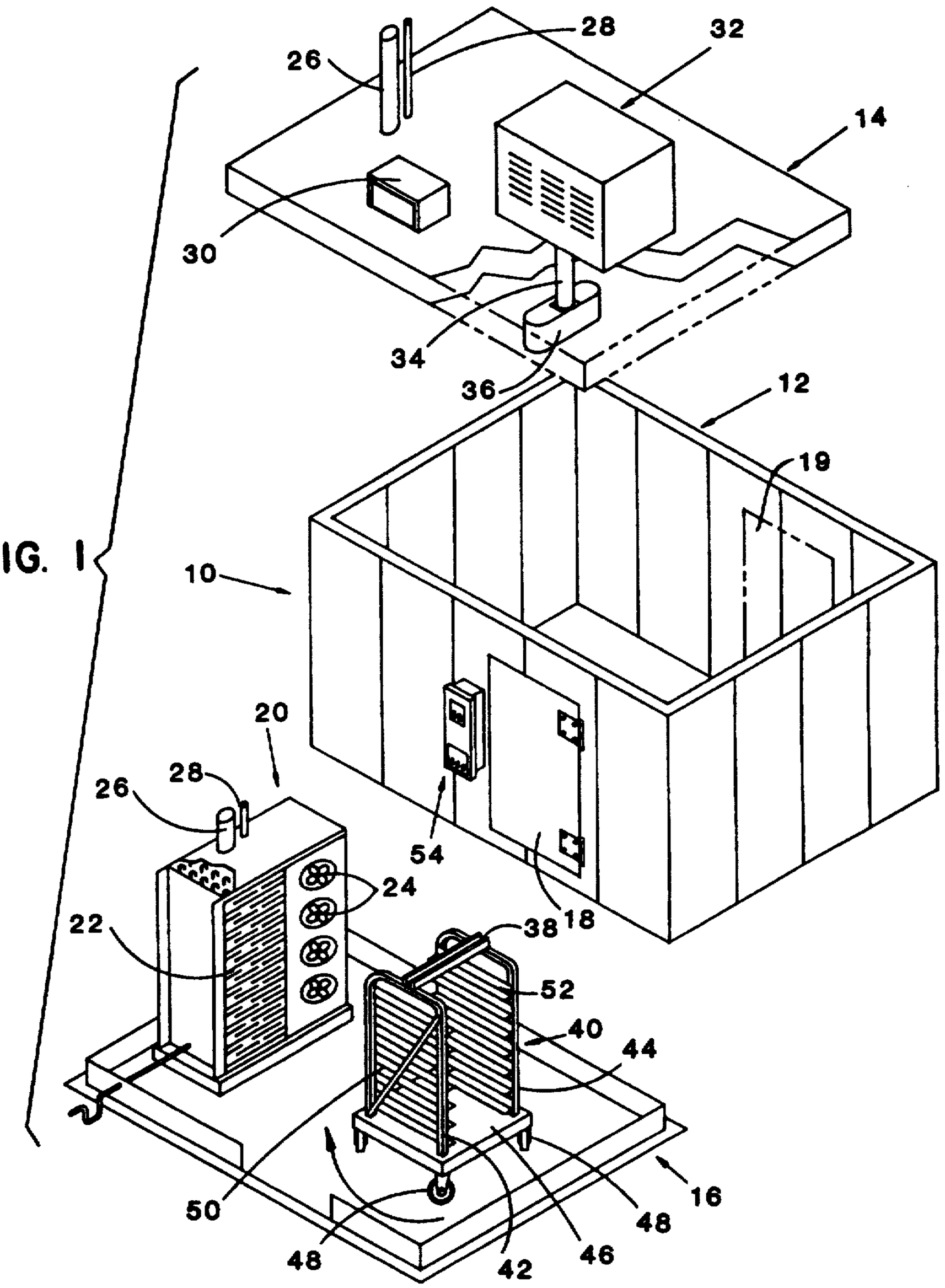

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FIG. 1

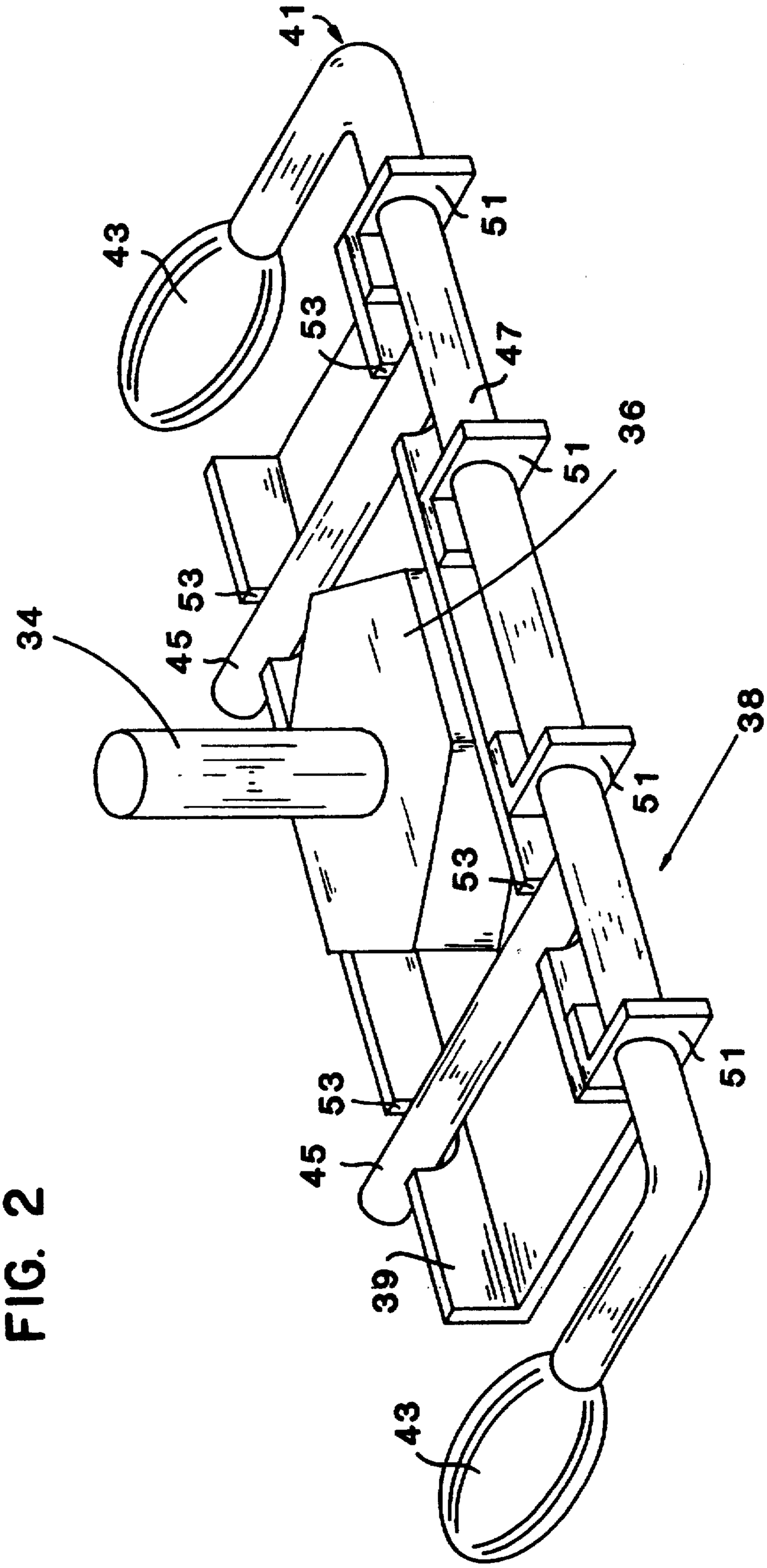

FIG. 2

REFRIGERATION SYSTEM

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

This invention relates generally to refrigeration systems used in the food service and related industries. More particularly, this invention relates to a refrigeration system employing means for rotating food racks and the like to obtain quicker chilling of food and to eliminate warm air pockets that allow bacterial growth.

The food industry has long used movable food racks for transporting prepared and unprepared foods to and from refrigerated storage units. These food racks typically comprise a pair of spaced U-shaped supports supported by a base, the base having movable casters thereon. A plurality of guide rails are attached to the spaced U-shaped supports. These guide rails slidably support food trays, pans and similar food containers.

Movable food racks of the type hereinabove discussed are transported to and from refrigeration units which typically comprise a four walled rectangular enclosure which is insulated and which is provided with a refrigeration system for cooling said enclosure. The enclosure includes a doorway and the food racks are stored within the enclosure in a stationary mode.

It will be appreciated that an important deficiency and drawback of known refrigeration enclosures and associated movable food racks is that during storage, the food stored on the food racks will often cool or chill at an undesirably slow rate. In addition, warm air pockets will exist at various places in the food rack. These warm air pockets provide a potential site for bacterial growth which may lead to food spoilage.

SUMMARY OF THE INVENTION

The above discussed and other drawbacks and deficiencies of the prior art are overcome or alleviated by the refrigeration system of the present invention wherein means are employed to rotate a food rack when the food rack is stored within the insulated enclosure of the refrigeration system. In accordance with the present invention, a refrigeration system comprised of a walled insulated enclosure is provided with a drive motor having a drive shaft extending therefrom. The drive shaft and drive motor are positioned along the ceiling of the walled enclosure. The drive shaft terminates at a coupling means. The present invention also includes a complimentary coupling means attached to the top of a well-known movable food rack. Thus, when the food rack is stored within the walled enclosure, the coupling means on the food rack mates with and attaches to the complimentary coupling means of the drive shaft. When the drive motor is actuated, the drive shaft will rotate the movable food rack.

It will be appreciated that by rotating the movable food rack, the present invention will permit the food stored on the food rack to chill far more quickly than if the food rack were to remain stationary. In addition, by rotating the food rack, the present invention eliminates warm air pockets which allow bacterial growth. As a result, the present invention provides less food spoilage relative to prior art refrigeration systems and therefore is more economical to the food service industry user.

The above discussed and other features and advantages of the present invention will be appreciated and understood by those of ordinary skill in the art from the following detailed description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings, wherein like elements are numbered alike in the several FIGURES:

FIG. **1** is an exploded view of a refrigeration system in accordance with the present invention employing means for rotating a food rack; and

FIG. **2** is a front perspective view showing the complimentary coupling means between the drive motor/-drive shaft and the food rack in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. **1**, a refrigeration system in accordance with the present invention is shown generally at **10**. Refrigeration system **10** is generally comprised of a walled enclosure **12** provided with a roof or ceiling **14**. Enclosure **12** and ceiling **14** is mounted on a base or floor **16**.

Enclosure **12** is comprised of any well known insulated material and includes a door **18** which permits exit and entry of movable food racks. An optional door **19** opposes door **18** and allows food racks to pass through the enclosure **12** if required. Enclosure **12** is associated with a known refrigeration system **20**. Refrigeration system **20** includes a plurality of refrigeration coils **22** and fans **24** which operate in a known manner to provide chilling or cooling within walled enclosure **12**. Refrigerant fluid is moved into and out of refrigeration unit **20** via refrigeration lines **26** and **28**. A unit for providing electrical power to refrigeration system **20** is identified at **30** and is mounted on roof **14**.

In accordance with the present invention, a drive motor **32** is positioned on roof **14**. Drive motor **32** includes a drive shaft **34** positioned through an opening in roof **14**. Drive shaft **34** terminates within enclosure **12** at a coupling means **36**. It will be appreciated that drive motor **32** rotates drive shaft **34** which in turn will rotate coupling means **36**. Coupling means **36** has a generally rectangular configuration and is sized to be received by a mating coupling unit **38** which is attached to a movable food rack shown generally at **40**.

Movable food rack **40** has a well known construction and is comprised of a pair of opposed spaced U-shaped supports **42** and **44** which are positioned on a base **46**. Base **46** includes four casters **48** attached to the bottom thereof which permit base **46** and rack **40** to be transportable. Support rails **50** and **52** are provided on support brackets **42** and **44**, respectively. Support rails **50** and **52** are in facing alignment and are capable of receiving food trays, food containers or food pans and the like which are slidably received thereon in a known manner.

Referring now to FIG. **2**, coupling unit **38** is comprised of a U-shaped bracket **39** which is welded or otherwise attached to supports **42** and **44** so that coupling means **38** is transverse to supports **42** and **44**. Coupling unit **38** further includes a restraint means **41** which is pivotably attached to U-shaped bracket **39** by L-shaped brackets or mounts **[50]** *51*. The restraint means **41** is comprised of a handle **43**, a main support rod **47** and restraint bars **45** mounted transversely on

rod **47**. When in use, bars **45** rest in slots **[47]** *53* cut into the walls of U-shaped bracket **39**. When movable food rack **40** enters enclosure **12**, restraint means **41** is lifted to allow coupling means **36** to slide into U-shaped bracket **39**. When coupling means **36** is positioned between restraining bars **45**, restraint means **41** is lowered and coupling means **38** is engaged to the drive coupler **36** as shown in FIG. **2**.

During operation, drive shaft **34** is actuated by drive motor **32** and will rotate drive coupler **36** which in turn will rotate coupler **38** so that movable food rack **40** will also rotate on swivelling casters **48**. Preferably, means are provided for controlling the speed of rotation. Such controlling means may be provided to a control panel identified at **54** located on the exterior of enclosure **12** near door **18**. Preferably, it has been found that the speed *of* rotation of food rack **40** should be between about five rotations per minute (rpm) to one-half rpm; and more preferably the speed of rotation should be about 1 rpm. This rotational speed is intended for a refrigerated enclosure having an air temperature of about −10° F. to about −20° F. and more preferably about −15° F.

The refrigeration system of the present invention employing means for rotating a movable food rack when the food rack is stored within the insulated enclosure of the refrigerated system provides many improvements and advantages over prior art refrigeration systems used in the food service industry. For example, by rotating the food rack, the food is more quickly chilled thereby lessening the chance of food spoilage and markedly improving the overall efficiency of the refrigeration system. Also, by rotation of the movable food rack, warm air pockets which will remain at various points in a food rack when stored in a stationary position within a refrigeration system will be eliminated. It will be appreciated that the elimination of such warm air pockets will preclude bacterial growth and again lessen the chance for food spoilage.

While the present invention has been shown employing a food rack of the type identified at **40**, it will be appreciated that the present invention is equally well suited for any other type of food rack so long as the food rack is provided with means which permit rotary movement such as casters or wheels. Thus, for example, a food rack on circular tracks or channels would also be within the scope of the present invention.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustrations and not limitation.

What is claimed is:

1. A refrigeration system for storing movable food rack means comprising:

an insulated enclosure including an enclosure cover;

rotating means on said enclosure cover for rotating movable food rack means; and

at least one movable food rack means in said enclosure, said movable food rack means including rack coupling means for mating with said rotating means, said rack coupling means comprising a U-shaped bracket having restraint means pivotably mounted thereon.

2. The system of claim **1** wherein said rotating means comprises:

drive motor means;

rotatable drive shaft means operatively connected to said drive motor means; and

drive coupling means for mating with a movable food rack means.

3. The system of claim **1** wherein said restraint means comprises:

a rod; handle means attached to said rod, *and restraining bar means attached to said rod,* wherein said restraining bar means retains said drive coupling means in said U-shaped bracket.

4. The system of claim **2** wherein:

said drive coupling means comprises a bracket having opposed depending side walls wherein, said side walls are spaced to be received by said U-shaped bracket of said rack coupling means.

5. A refrigeration system comprising:

an insulated enclosure including an enclosure cover;

at least one movable rack means in said enclosure, said movable rack means including rack coupling means comprising a U-shaped bracket having restraint means pivotably mounted thereon; and

rotating means on said enclosure cover for rotating said movable rack means, said rotating means including drive coupling means for mating with said rack coupling means.

6. The system of claim **5** wherein said rotating means further includes:

drive motor means; and

rotatable drive shaft means operatively connected at a first end to said drive motor means and at a second end to said drive coupling means.

7. The system of claim **5** wherein said restraint means comprises:

a rod; handle means attached to said rod; and restraining bar means attached to said rod, wherein said restraining bar means retains said drive coupling means in said U-shaped bracket.

8. A refrigeration system comprising:

an insulated enclosure having a base, sides and a cover and refrigeration means;

closable access means in at least one side of said enclosure;

food rack means which is transportable into and out of said enclosure through said access means;

means on said food rack means to permit rotation of said food rack means;

rotation means mounted to said enclosure; and

means for disengageably joining said rotation means to said food rack means when said food rack means is in said enclosure.

9. The refrigeration system recited in claim 8, wherein said food rack means is transportable into and out of said enclosure on swivelable casters, said casters also comprising said means to permit rotation of said food rack means.

10. The refrigeration system recited in claim 8, wherein said means for disengageably joining comprises a drive coupling coupled to said rotation means and a mating rack coupling mounted to said food rack means.

11. The refrigeration system recited in claim 8, wherein said rotation means is configured to rotate said food rack means at an angular rotation velocity of between 0.5 and 5 revolutions per minute.

12. The refrigeration system recited in claim 11, wherein said rotation means rotates said food rack means at one revolution per minute.

13. The refrigeration system recited in claim 11, wherein said refrigeration means generally maintains the tempera-

ture with said enclosure at between about −10° F. and −20° F.

14. The refrigeration system recited in claim 13, wherein said refrigeration means maintains the temperature within said enclosure at about −15° F.

15. The refrigeration system recited in claim 8, wherein said rotation means comprises a drive motor having a drive shaft.

16. The refrigeration system recited in claim 15, wherein said means for disengageably joining comprises a drive coupling on said drive shaft and mating rack coupling means on said food rack means.

17. The refrigeration system recited in claim 8, wherein said enclosure comprises a plurality of rotation means and is shaped and configured to accommodate a like plurality of food rack means adapted to selectively be joined with one of said rotation means.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : RE34047

DATED : 1 September 1992

INVENTOR(S) : Granville P. Elrod, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 13, column 5, line 1, change "with" to

--within--.

Signed and Sealed this

Thirty-first Day of August, 1993

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks