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Wilson et al.

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[54] **REFRIGERATION INSTALLATION FOR A CONTAINER SHIP**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **62/240**; 62/77; 62/89; 62/298; 62/299; 62/302; 62/419

[51] **Int. Cl.** **B63b 25/26**

[58] **Field of Search** 62/240, 89, 419, 298, 299, 62/302

[56] **References Cited**

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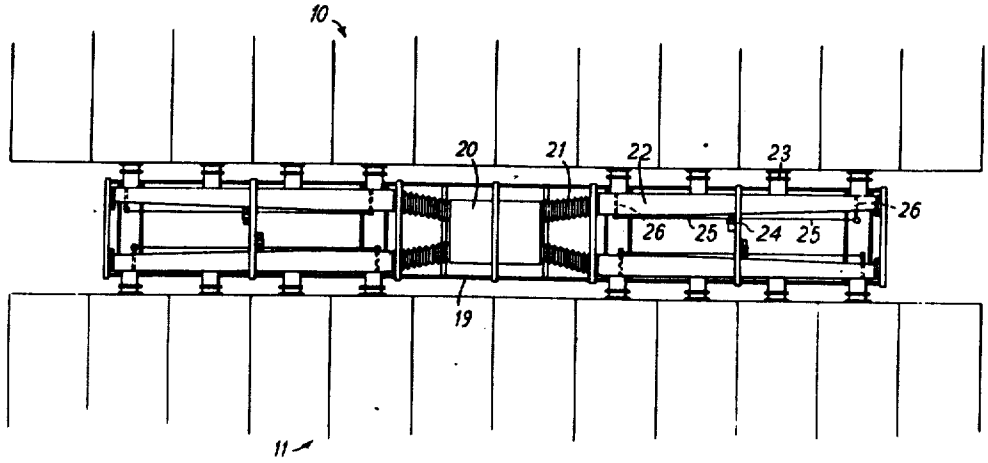
[57] **ABSTRACT**

In a container ship a refrigeration installation for circulating cool air through containers stacked on deck stands on the deck between stacks of containers and consists of a protective framework supporting supply and return ducts which are laterally displaceable on the framework to retract couplings attached to the ducts inside the framework when containers are being moved about and to extend the couplings from the framework for attachment to the containers after stacking of the containers.

5 Claims, 2 Drawing Figures



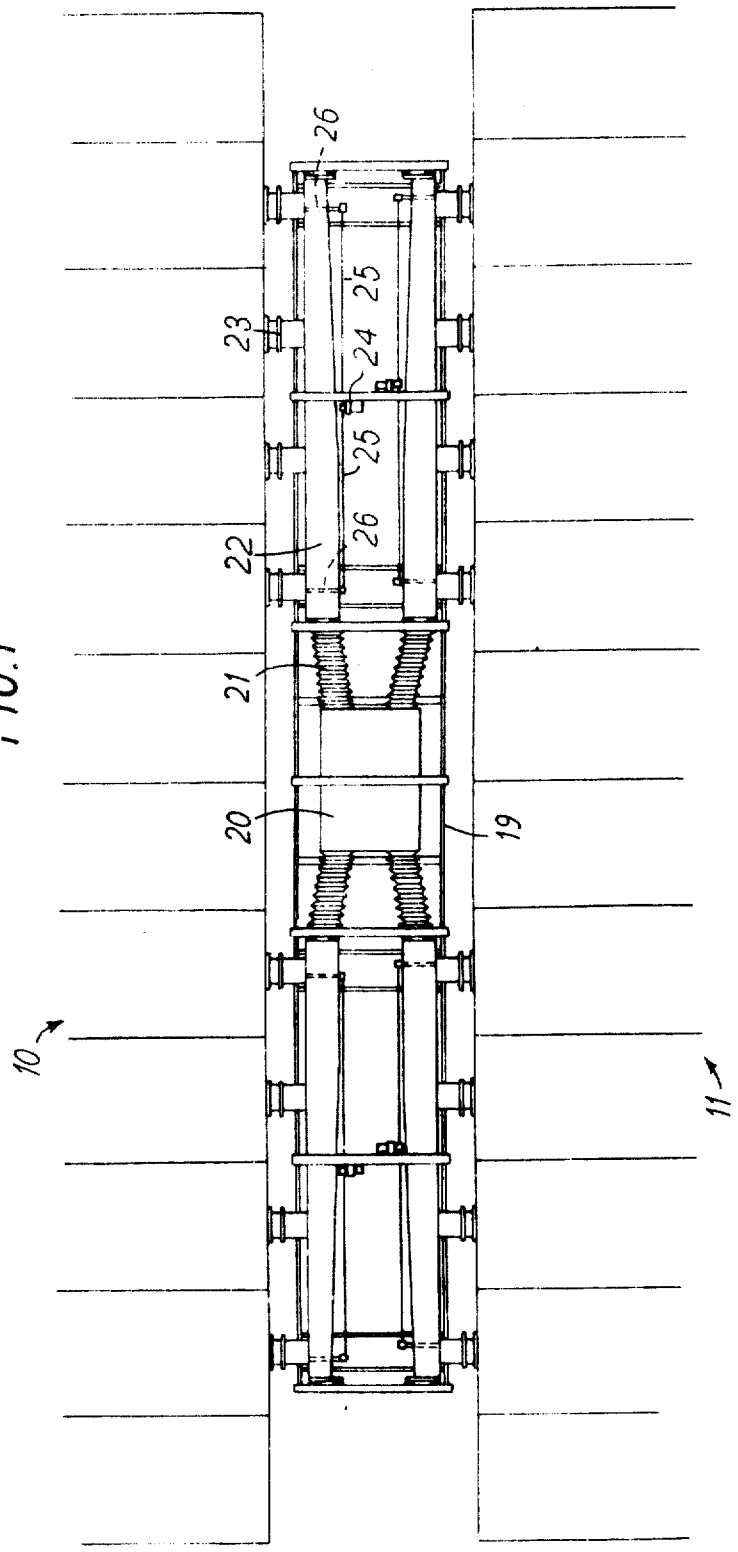
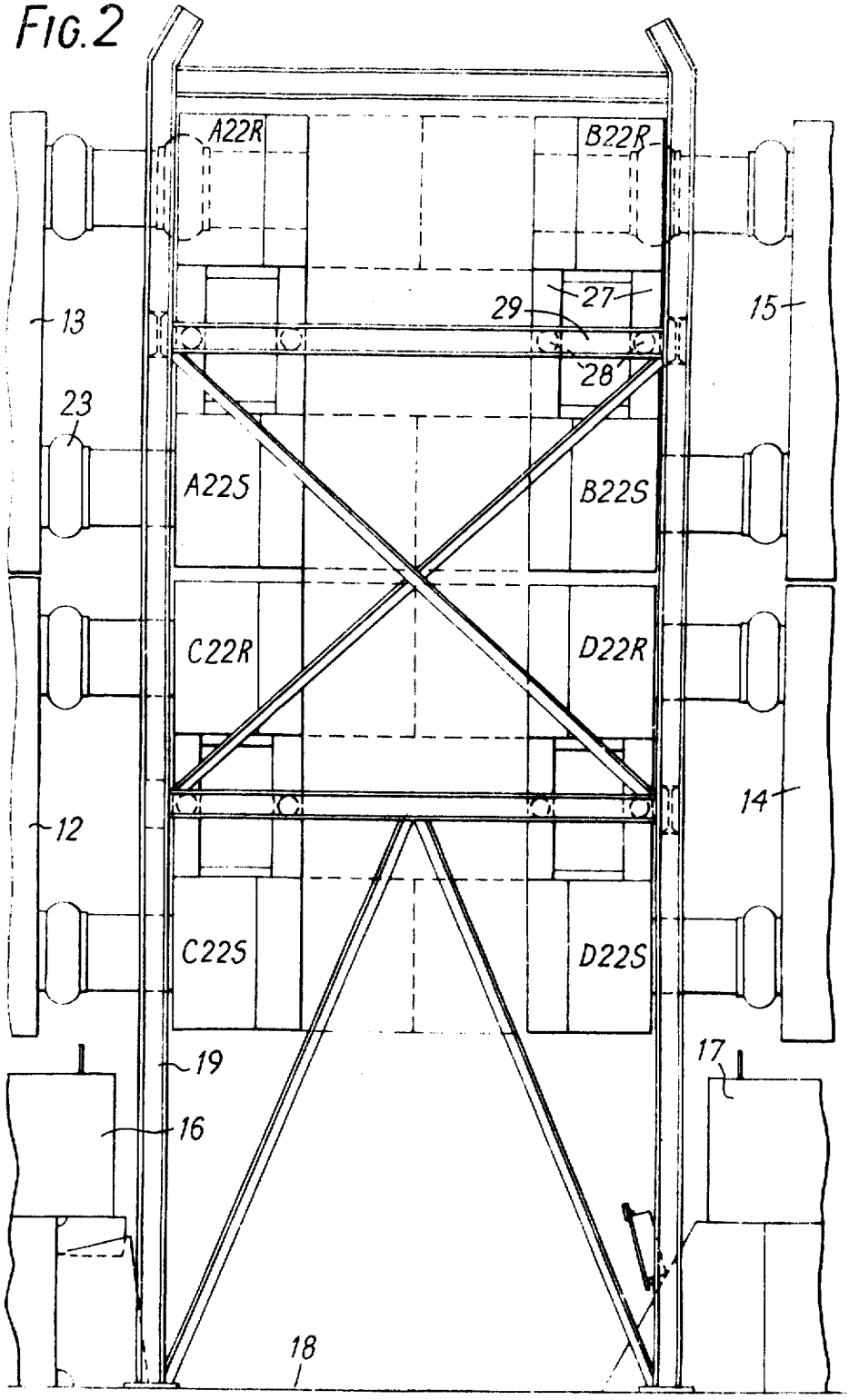


FIG. 1

FIG. 2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REFRIGERATION INSTALLATION FOR A CONTAINER SHIP

The present invention relates to a refrigeration installation for a container ship.

In container ships some of the containers are stacked in the holds of ships and are loaded and unloaded through hatches in the deck. It is also the practice to stack containers on the deck of the ship to a height of perhaps four or six containers. These containers on the deck rest on hatch covers which close the hatches through which the holds are loaded and unloaded.

It is known to provide a refrigeration installation below deck for the circulation of cold air through containers carried in the hold. Each of the containers has an inlet and an outlet disposed one above the other in an end wall of the container and extendable couplings are provided for connecting ducting mounted in the hold to the inlets and outlets of the containers. The provision of a comparable arrangement for the containers stacked on deck is more difficult because whereas the containers in the hold are guided into position and located by vertical guides, the containers being stacked on deck are not guided and are free to swing as they are lowered into position. There is thus a severe risk of damage to any equipment standing on the deck and the retractable couplings used for connecting the containers in the hold to the refrigeration system would give wholly inadequate clearance for the lowering of containers into position on the deck.

In accordance with the present invention there is provided a refrigeration installation on the deck of a container ship for circulating cold air through containers stacked on the deck the installation comprising a heat exchanger for cooling the air, a number of supply ducts leading from the heat exchanger and each having supply couplings for connection to a plurality of containers, a corresponding number of return ducts each having return couplings for connection to the containers, a frame supporting the supply and return ducts to extend generally horizontally and parallel to each other, each supply and return duct including at least one section of ducting slidable on the frame in a direction transverse to the duct to advance a coupling towards a container or retract the coupling within the frame, and driving means for effecting the sliding movements of the ducting sections.

With the ducting sections retracted, the couplings lie within the frame and are thus protected against damage while the containers are being loaded and unloaded. The couplings may themselves be extendable to complete the connections after the couplings have been advanced towards the container by sliding of the ducting sections.

Preferably the refrigeration installation stands on the deck in the space between neighbouring hatch covers on which the containers are stacked.

In a preferred embodiment a ducting section of a supply duct and a ducting section of a return duct are coupled to a common drive system and the two ducting sections have the same number of couplings arranged for attachment to the vertically separated inlets and outlets of a number of containers stacked side by side.

The invention will now be described in more detail with the aid of an example illustrated in the accompanying drawings, in which:

FIG. 1 is a diagrammatic plan view of a refrigeration installation in accordance with the invention between two rows of containers, and

FIG. 2 is a more detailed end elevation of the installation of FIG. 1.

In FIG. 1 there are shown two rows **10** and **11** each consisting of twelve stacks of containers side by side. Each stack may contain as many as six containers but in FIG. 2 only two containers **12** and **13** are shown in the stack from the row **10** and only two containers **14** and **15** in the stack from the row **11**. The container stacks of the rows **10** and **11** are carried on hatch covers **16** and **17** respectively and in the space on the deck **18** between the hatches there is mounted a generally rectangular framework **19** which supports and protects the refrigeration installation. In the example shown the rows **10** and **11** and the framework **19** extend across the width of the ship's deck.

The refrigeration installation provides for the circulation of cold air through eight of the twelve containers of each row, consisting of a group of four adjacent containers on each side of the centre line, the two central containers and the two outside containers being used for general cargo which does not require cooling. The installation comprises a cooler **20** mounted at the centre of the framework **19**. The cooler **20** includes a heat exchanger for cooling the air to be supplied to the containers, and pumps for circulating the air and may also include refrigeration equipment for generating the cold fluid which is circulated through the heat exchanger to cool the air. Alternatively the refrigeration equipment can be below deck and supply a cooling system in the hold as well as the one on deck.

From the cooler **20** there extend pairs of supply and return ducts arranged with the return duct above the supply duct. Each duct, as can be seen in FIG. **1**, comprises a flexible hose **21** connecting the cooler **20** to a straight rigid ducting section **22**. Each of the ducting sections **22** carries four extendable couplings **23** which serve to couple the supply or return duct to the inlets or outlets of four containers. Each of the ducting sections **22** is slidably mounted in the frame **19** for movement transverse to its length in order to advance and retract the couplings **23** with respect to the containers. Motors **24** coupled to the ducting sections **22** by shafts **25** and screw jacks **26** serve to effect the movements of the ducting sections **22**.

In FIG. **2** the ducting sections **22** are divided into pairs indicated by the prefixes A, B, C, and D, each pair consisting of a supply ducting section indicated by the suffix S and a return ducting section indicated by the suffix R. Each pair, such as the ducting sections A **22S** and A **22R**, serves four containers positioned side by side (see FIG. **1**) and for this purpose the ducting section A **22S** carries four couplings **23** and the ducting section A **22R** carries four couplings **23** positioned directly above the corresponding couplings of the ducting section A **22S**. The ducting sections of each pair, for example the sections B **22R** and B **22S** are rigidly connected by cross members **27** which carry rollers **28** which run in channels **29** forming part of the framework **19**. Each pair of ducting sections can thus be slidably extended or retracted by means of the corresponding motor **24**. The retracted positions of the ducting sections are indicated in broken lines and for the sections A **22R** and B **22R** the retracted positions of the couplings are also shown. It will be seen that in the re-

tracted position the couplings lie wholly within the frame 19 and are thus protected against damage by impact with the containers during loading and unloading.

We claim:

1. In a container ship having a refrigeration installation for circulating cold air through containers stacked on the deck, the improvement comprising a heat exchanger for cooling the air, a number of supply ducts leading from the heat exchanger and each having supply couplings for connection to a plurality of containers, a corresponding number of return ducts each having return couplings for connection to the containers, a frame supporting the supply and return ducts to extend generally horizontally and parallel to each other, each supply and return duct including at least one section of ducting slidable on the frame in a direction transverse to the duct to advance a coupling towards a container or retract the coupling within the frame, and driving means for effecting the sliding movement of the ducting sections.

2. The combination of claim 1 wherein the frame extends across the width of the deck of the ship and stands on the deck in a position between neighbouring hatch covers on which the containers are stacked.

3. The combination of claim 1, wherein a ducting section of a supply duct and a ducting section of a return duct each have the same number of couplings, each coupling of the supply duct is in vertical alignment with a coupling of the return duct, and a common drive means is coupled to said supply and return ducting sections.

4. The combination of claim 1, wherein each of said supply and return ducts includes a flexible hose coupling said ducting section to said heat exchanger.

5. The combination of claim 1, wherein each of the couplings is extendible to effect connection to the container.

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