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(54) Automated portering system

(57) In a mail processing centre, each mail item passes successive stations, travelling from one station to the next on a selected one of a number of available routes. Each route has associated therewith a number of mail carriers. The mail carriers are capable of independent and unconstrained movement between the two mail processing stations defining the end points of the relevant route. Each mail carrier has a wheeled base part, which includes drive means, and one of a plurality of exchangeable mail carrying devices.

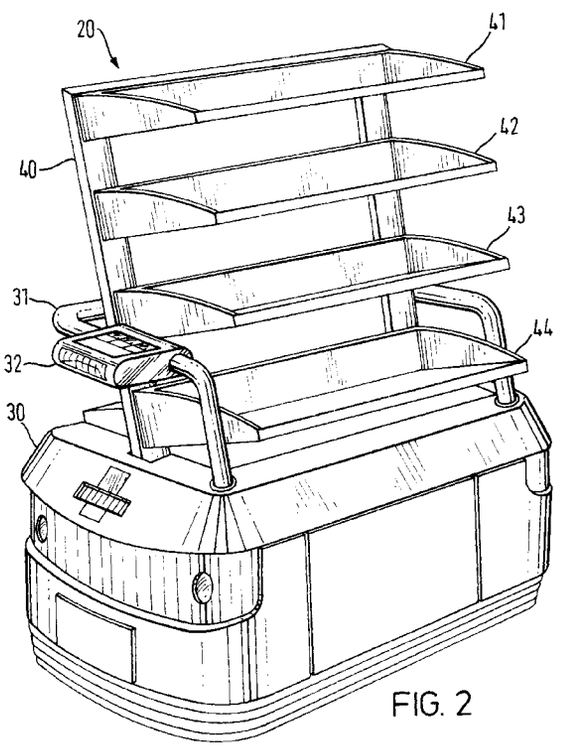

FIG. 2

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Description

This invention relates to an automated portering system, primarily though not exclusively intended for use in a mail processing centre such as a sorting office. Typically, sorting offices are now highly automated, and include a large number of processing stations, at which mail items are subjected to various processes. Thus, for example, at different stations, the mail items are divided according to desired class of service; franked, to cancel the postage stamps; oriented for OCR reading; analysed to determine whether OCR reading is possible; and various other steps. However, the mail items are commonly moved manually from one processing station to the next. Thus, items are manually loaded onto a wheeled device, manually moved to the appropriate next processing station, and manually unloaded for processing by that station.

To date, two different approaches have been tried to automate the portering of mail items from one processing station to the next.

In a first proposal, items are manually loaded onto a wheeled device, of which there may be many in a single mail processing centre, and the wheeled device is then transported to the next appropriate processing station by means of an automated guided vehicle (AGV), of which there will typically be only a few in the mail processing centre. This system has the disadvantage that mail can only be moved in relatively large batches, if the AGVs are to operate efficiently, which has the result that large quantities of mail are not undergoing processing at any given time, but are waiting for batch completion before they can be moved to the next stage. Moreover, the conventional AGVs are expensive, which means that, for reasons of costeffectiveness, there must be relatively few of them, which means that, even when processing of a batch of mail has been completed by a processing station, there must often be a delay before the next AGV becomes available.

The second class of proposal for automated systems includes tracked vehicles or conveyors. However, mail processing is not ideally suited to such a solution, because the process is relatively non-linear. Thus, a mail item is not simply moved from one processing station to the next, in a predetermined way; rather, its path depends upon the result of its processing at the different stations. Thus, for example, a processing station which determines whether items are suitable for machine reading must distinguish between those items which are suitable, and those which are not, and send the two different categories of mail item to different subsequent stations. Similarly, mail items which are in different service categories will follow different routes. This means that it is extremely difficult to organise an appropriate tracked system.

The present invention therefore relates to a system in which there are a relatively large number of independently movable vehicles, and to the vehicles themselves.

According to a first aspect of the invention, there is provided a mail processing centre, comprising a plurality of mail processing stations, the mail processing stations defining a plurality of possible routes therebetween, each route having associated therewith at least one mail carrier which is capable of independent and unconstrained movement between two mail processing stations.

According to a second aspect of the invention, there is provided a method of transporting mail between mail processing stations in a mail processing centre having a plurality of such stations, each station being intended to receive mail from, or send mail to, one or more other stations, each pair of stations, between which mail can pass, defining a route, the method comprising allocating to each route between two stations at least one mail carrier which is capable of independent and unconstrained movement.

According to a third aspect of the invention, there is provided an automated mail carrier, comprising:

(a) a wheeled base part, having:

means enabling wireless communication with a controller;
a motor and a power supply; and

(b) one of a plurality of exchangeable mail carrying devices.

For a better understanding of the invention, reference will now be made to the accompanying drawings, in which:

Figure 1 is a simplified schematic diagram of a part of an automated mail processing centre;
Figure 2 shows a mail carrier in accordance with aspects of the present invention;
Figure 3 is a block diagram of the control system of a carrier;
Figure 4 shows a carrier of the type shown in Figure 2 with a first alternative upper part; and
Figure 5 shows a carrier of the type shown in Figure 2 with a second alternative upper part.

Figure 1 is a simplified schematic representation of a part of a mail processing centre. Figure 1 shows a centre having six mail processing stations, but it will be appreciated that these represent only a fraction of the number of stations required for complete processing. Mail items are sent first to station 2, at which the required class of service is determined. If it is determined that, for example a standard service is required, items may be sent to processing station 4, at which they are temporarily stored. On the other hand, items which require a premium service may be sent immediately to station 6. Items may be retrieved from the store 4, and sent to station 6, as mail flows allow. At station 6, a determina-

tion is made as to whether a destination address on a mail item is readable by machine. If so, an item is sent to station 8 for machine reading. If not, it is sent to station 10, where a human operator reads a destination address, or a part thereof, and enters it into a computer system. Mail items from stations 8 and 10 are then sent to station 12 for sorting.

As mentioned above, Figure 1 represents only some of the processing functions required in an automated mail processing centre. However, it serves to illustrate the way in which items do not follow a predetermined route through the centre, but instead follow a route which is determined by the results of earlier processing stages.

As described above, the mail processing stations 2-12 define a large number of routes, over which mail items must be carried. In the simplified example of Figure 1, mail items must be carried over routes between stations 2 and 4, stations 2 and 6, stations 4 and 6, stations 6 and 8, stations 6 and 10, stations 8 and 12, and stations 10 and 12. In addition, mail items must also be carried to station 2, and away from station 12.

In the system in accordance with the present invention, each of these routes has associated therewith at least one, and probably more, mail carrier. Preferably, each mail carrier will be dedicated to a particular route for an extended time period, although in some cases it may be desirable for two routes to share a carrier, for example if there are only low mail flows on a particular route. More complex routes might go from one station, via a second, to a third, or might be circular. Routes may overlap over a part of their length.

Preferably, each route has at least two dedicated carriers. These carriers can then be programmed such that, as soon as a loaded carrier leaves a station to travel to the next station, an unloaded carrier arrives. This allows the most efficient handling of the mail items.

Advantageously, each station may be provided with means for supplying a control signal which summons an unloaded carrier to the station.

The carriers are capable of independent movement, i.e. they do not need to be towed, and are generally unconstrained, i.e. they are not physically constrained to run on rails or other tracks, but are controlled such that they navigate from a desired starting point to a desired destination. The carriers therefore simply run on the unmodified floor of the centre.

Figure 2 shows one of the carriers used to transport mail between the different stations. The carrier 20 has a base unit 30, and a removable shelving unit 40. The base unit is wheeled, and internally has an electric motor, and rechargeable batteries. A handrail 31 is provided on the upper surface of the base unit 30, and the unit also has a control panel 32 which may for example be located on the handrail. The control panel provides means for an operator to control the carrier, and also includes means for indicating to an operator the current status of the carrier. For example, the control panel includes means for disengaging the automatic control of the carrier, and separate means for disengaging the drive unit of the carrier, allowing an operator to use the handrail to position the carrier exactly as required. This is important because it allows the operator to position the carrier exactly as required, which is of assistance during loading and unloading operations. This function may also be available by means of a foot-operated switch on the base part 30 of the carrier.

In addition, there may be provided, on the control panel or elsewhere, an automatic indication as to the length of time for which the carrier is scheduled to be stationary at a particular mail processing station. This may take the form of a continuously downcounting display, or may simply be an indication that, for example, the carrier is in its last minute at a station.

Thus, one of the advantages of the present invention, compared with previous automated portering systems, is that mail can be transferred in relatively small batches, without requiring long waiting times. To that end, the system might, for example, be controlled such that a carrier leaves a processing station at least every five minutes. Then, the control panel preferably gives a visual indication to the operator as to the length of loading time which remains available, either continuously or as the time period nears its end. Means are also preferably provided to give an audible indication as to when the loading time is about to end.

The shelving unit 14 includes four shelves 41, 42, 43 and 44, arranged for convenient loading and unloading by an operator. The arrangement of these shelves may advantageously be somewhat similar to the arrangement of shelves in a conventional manually operated carrier. Any convenient arrangement may be used.

Figure 3 is a schematic illustration of the control system 60 which is located in the base unit 30 of the carrier 20. The control system 60 includes a motor controller 61, which causes the carrier 20 to move by controlling its motor. The carrier 20 is also provided with a plurality of sensors 62, some of which are intended to allow the carrier to sense its position, for example by reference to preplaced markers, such as a magnetic underfloor grid, or optical markers such as tape guide paths located on the floor. Other sensors may be used to avoid collisions with movable obstacles, or moving obstacles such as other carriers or people. These sensors may simply stop the carrier when an impact is detected, or may slow it down when an obstacle is within a certain range.

The control system 60 also includes a radio transceiver 63 for receiving control signals from other carriers and from a central controller, and for transmitting signals. The different carriers, and the central system controller, together will radio transceivers which may be located at the different processing stations, together form a wireless LAN, which allows control of some or all functions of the carrier. A transceiver may also be located at, for example, a maintenance station to allow interrogation of the carrier for the purposes of diagnosis.

Such a system allows the carrier to communicate with the controller from any position within the centre. An alternative control system uses infrared control signals between the carrier and control points which may, for example, be located at the processing stations and connected to the central controller.

As mentioned above, the shelving unit 40 is demountable from the base part 30 of the carrier 20, and may be replaced by other types of mail carrying device, depending upon the type of mail items which it is intended to carry at a particular time. For example, instead of the shelving unit 40 shown in Figure 2, the base unit 30 of the carrier may be provided with a tray rack system 70, as shown in Figure 4, for carrying bundled letters and non-standard items such as small packets. Alternatively, as shown in Figure 5, the base unit 30 may be provided with an automatic levelling tray 80 for non-standard items. The intention is that a user of the carriers should keep a supply of base units and a supply of interchangeable units 40, 70, 80, which may be used as desired on the base units.

Claims

1. A mail processing centre, comprising a plurality of mail processing stations, the mail processing stations defining a plurality of possible routes therebetween, each route having associated therewith at least one mail carrier which is capable of independent and unconstrained movement between two mail processing stations.

2. A mail processing centre as claimed in claim 1, further comprising a central controller, wherein each mail carrier is able to communicate with the central controller.

3. A mail processing centre as claimed in claim 1 or 2, wherein the mail carriers are able to communicate with each other.

4. A mail processing centre as claimed in claim 2 or 3, wherein each mail processing station has wireless communication means, and each mail carrier is able to communicate with the mail processing stations defining the route on which it operates.

5. A mail processing centre as claimed in claim 2, 3 or 4, wherein the mail carriers are controlled such that, when a fully loaded mail carrier leaves a processing station, another unloaded mail carrier arrives at the processing station shortly thereafter.

6. A mail carrier as claimed in one of claims 2 to 5, wherein the mail carriers are controlled such that, when a mail carrier has been unloaded at a processing station, a fully loaded mail carrier arrives at the processing station shortly thereafter.

7. A method of transporting mail between mail processing stations in a mail processing centre having a plurality of such stations, each station being intended to receive mail from, or send mail to, one or more other stations, each pair of stations, between which mail can pass, defining a route, the method comprising allocating to each route between two stations at least one mail carrier which is capable of independent and unconstrained movement.

8. A method as claimed in claim 7, wherein the mail carriers are controlled such that, when a fully loaded mail carrier leaves a processing station, another unloaded mail carrier arrives at the processing station shortly thereafter.

9. A method as claimed in claim 7 or 8, wherein the mail carriers are controlled such that, when a mail carrier has been unloaded at a processing station, a fully loaded mail carrier arrives at the processing station shortly thereafter.

10. An automated mail carrier, comprising:

    (a) a wheeled base part, having:

        means enabling wireless communication with a controller;
        a motor and a power supply; and

    (b) one of a plurality of exchangeable mail carrying devices.

11. A mail carrier as claimed in claim 10, wherein the power supply comprises removable batteries.

12. A mail carrier as claimed in claim 10 or 11, comprising means for disengaging automated control to allow manual movement of the carrier.

13. A mail carrier as claimed in claim 10, 11 or 12, comprising means for indicating the remaining time for which the carrier will remain at a station.

14. A mail carrier as claimed in claim 11, comprising means for indicating that the carrier is about to move.

15. A mail carrier as claimed in one of claim 10 to 14, wherein the exchangeable mail carrying devices include a shelving unit, a rack system for holding trays of mail items, and a container for non-standard mail items.

16. A mail carrier as claimed in one of claims 10 to 15,

wherein the wheeled base part further comprises means for detecting a position of the carrier.

17. A mail carrier as claimed in one of claims 10 to 16, wherein the wheeled base part has means which allow wireless communication with the controller from any position.

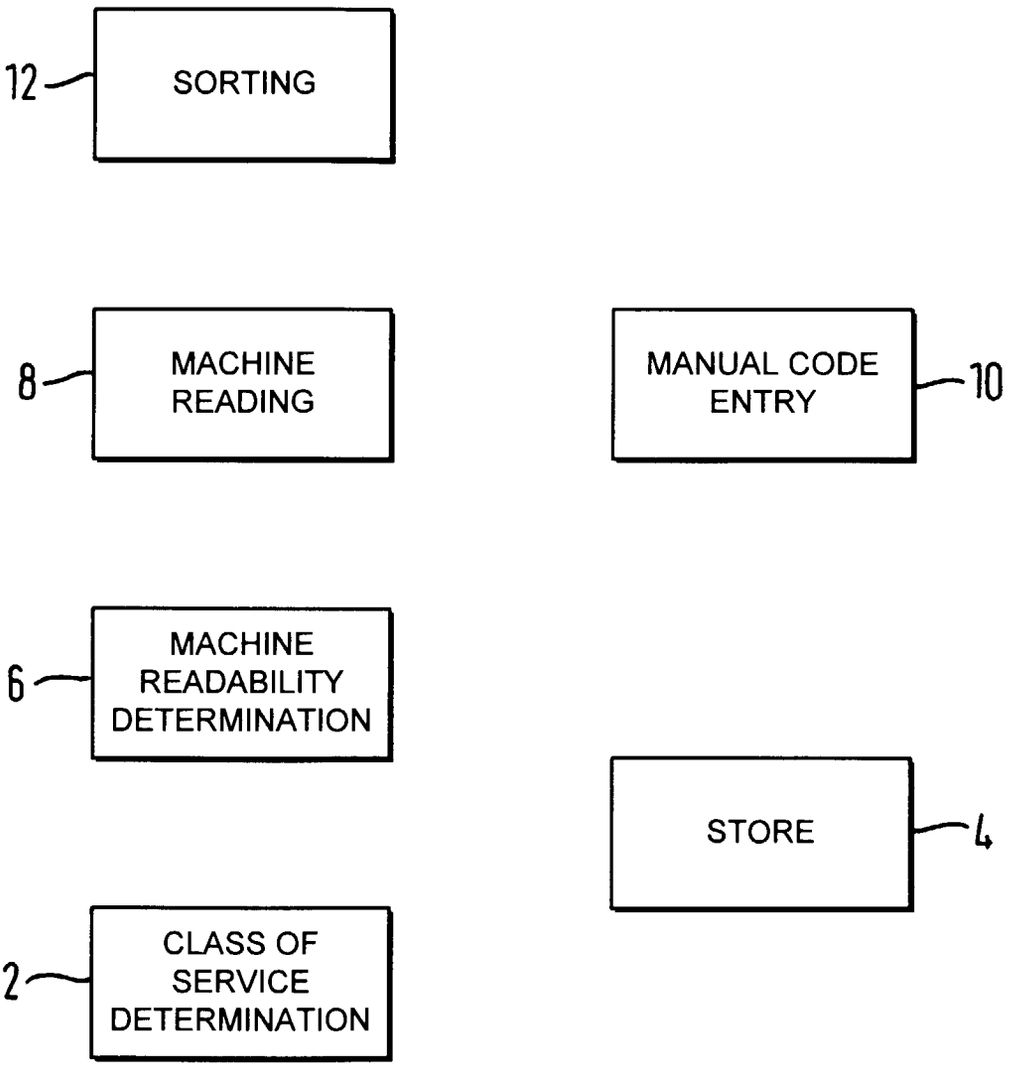
12
SORTING
8
MACHINE READING
MANUAL CODE ENTRY
10
6
MACHINE READABILITY DETERMINATION
STORE
4
2
CLASS OF SERVICE DETERMINATION

FIG. 1

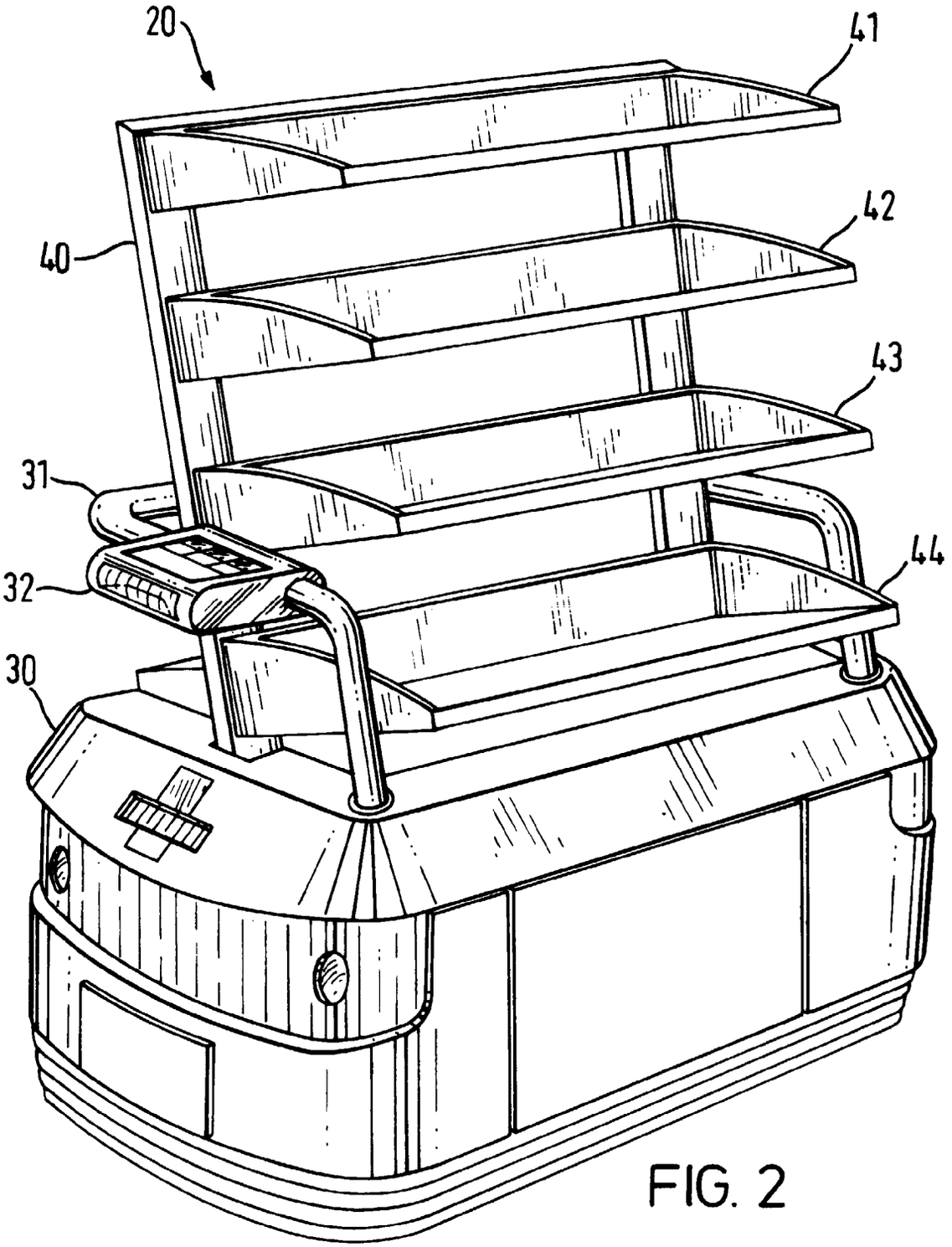

FIG. 2

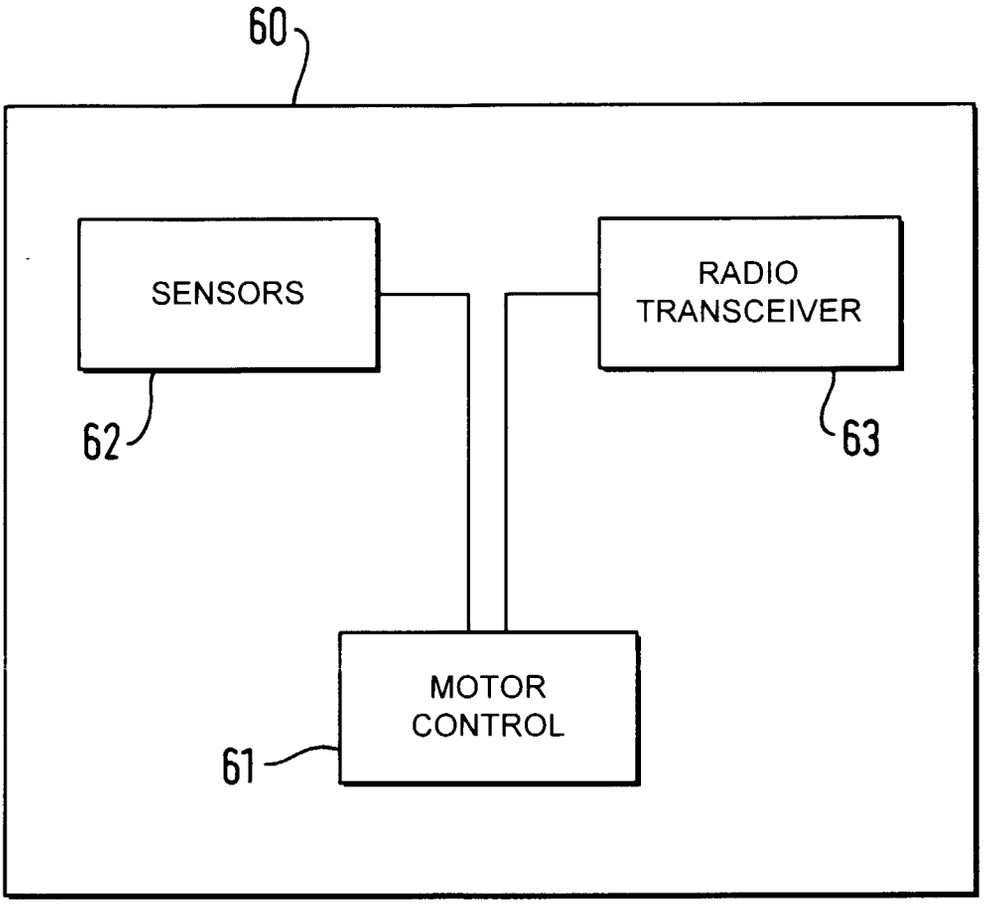

FIG. 3

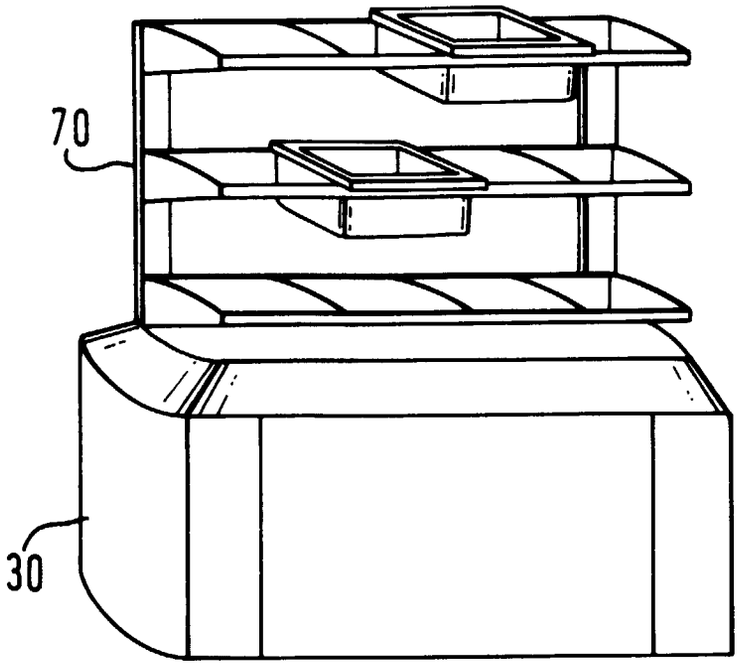

FIG. 4

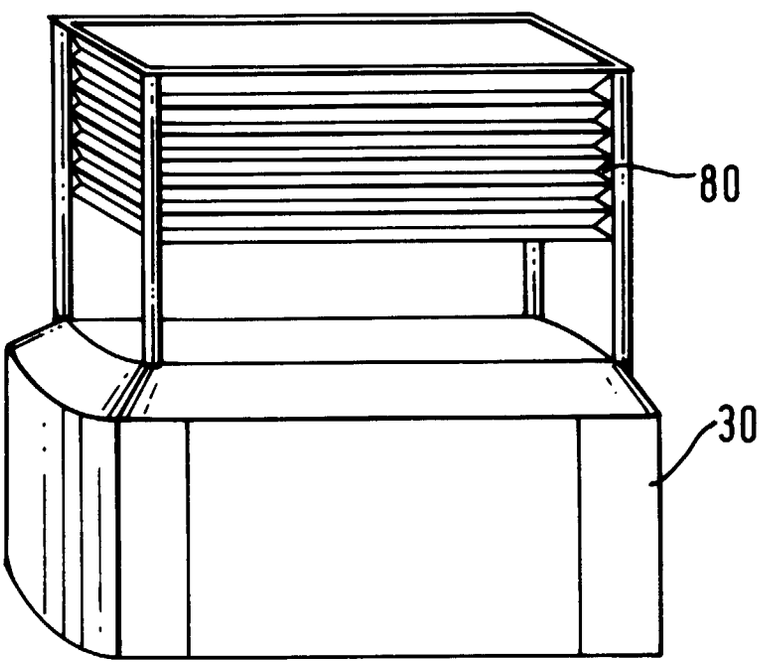

FIG. 5