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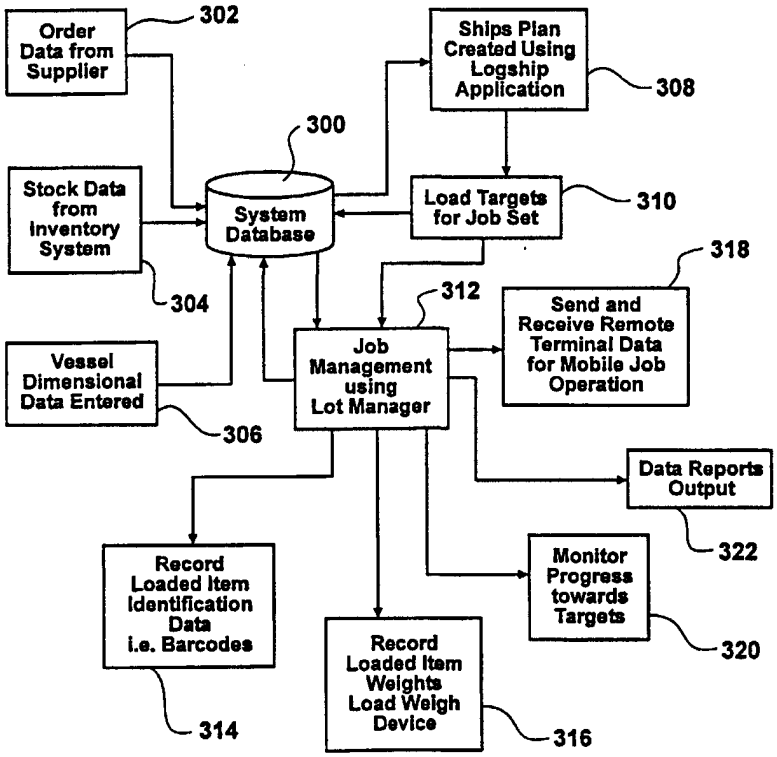
(54) Title: CARGO LOADING AND UNLOADING SYSTEMS

(57) Abstract

A system including a method and graphical user interface for planning, management and recordal of the loading or unloading of cargo onto or off a vessel such as a ship, aircraft or other carrier. Data relating to the dimensions of the available cargo carrying space is provided from which the system calculates the available volume and the profile of the available space. The profile and volume of the cargo item is also provided. From this information the system graphically portrays the real space consumed by the cargo in the cargo carrying space. This assists in eliminating planning errors or inaccuracies that lead to underloading or overloading. The system also provides real time updates of loading and unloading progress.



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Cargo Loading and Unloading Systems

Field of the Invention

This invention relates to methods and means for the planning, management and recordal of loading or unloading of cargo items to and from cargo carrying vessels such as ships, containers, aircraft, trains or road vehicles.

Background

Cargo planning, and cargo loading and unloading, are complex tasks that are performed manually by humans. Therefore, these tasks are often not performed optimally and are a considerable drain on time that could more usefully be spent performing other tasks.

Presently, loading cargo, particularly cargo which is loaded into ships, is a task which is performed manually. The task is very time consuming as it is frequently very complex. The problem involves the efficient allocation of different cargo types within spaces of varying shapes in the transport carrier. In particular, goods which are the property of one party, may need to be spread or distributed in various spaces within the vessel to maximise utilisation of the available space. This creates problems when it comes to loading and unloading cargo as the cargo which is the property of one party often needs to be sorted from that another party and the problem is further complicated when cargo's need to be delivered and loaded over a number of different ports of call.

Known loading and unloading methods are performed manually by use of sketches which frequently need to be amended and redrawn to distribute cargo efficiently within the constraints that include the size and shape of available spaces in storage compartments, the size shape of the individual cargo items, the maximum weight that is permissible within the selected cargo space, the overall weight of the loaded cargo, and the port where the cargo is to be loaded or off loaded.

In the case of loading or unloading a ship, which is an example that is referred to in the detailed description of a preferred embodiment of the present invention, drawings of the ship are used to provide an approximate indication of available storage space. The cargo is than distributed amongst the available space. A major difficulty is that the profile of the storage spaces is usually irregular which makes quick calculations of

available space extremely difficult. Also, cargo items are often of a shape that does not conform to the profile of the hull. This means that an accurate picture of the actual space occupied by the cargo when loaded is not obtained. This commonly leads to underloading or overloading, which adds considerably to costs.

It is an object of the present invention to provide improved methods or means for at least planning or recording or managing the loading and/or unloading of cargo items to or from a cargo carrying vessel, or to at least provide the public with a useful choice.

In one aspect the invention consists in a graphical user interface for indicating the location of one or more cargo items in at least one storage space of a cargo carrying vessel, the interface including
one or more storage areas defining the at least one storage space,
one or more selectively moveable representations of the one or more cargo items, and each representation being representative of the real space required for location of the one or more cargo items in the real storage space.

In a preferred embodiment each representation is moveable between the one or more storage spaces

In a preferred embodiment the user interface allows selective portrayal of the one or more storage space including the one or more cargo items in elevational view.

In a preferred embodiment the user interface allows selective portrayal of the one or more storage spaces including the one or more cargo items in plan view.

In a preferred embodiment the user interface allows selective portrayal of the one or more storage spaces including the one or more cargo items in a three-dimensional view.

In a further aspect the invention consists in a graphical user interface for providing an indication of the quantity of cargo loaded into, or unloaded from a cargo carrying vessel, the interface including
one or more storage areas defining the at least one storage space,
one or more selectively moveable representations of the one or more cargo items, and

each representation being representative of the real space consumed by location of the one or more cargo items in the real storage space.

In a preferred embodiment the user interface allows selective portrayal of the one or more storage spaces including the one or more cargo items in elevation view.

In a preferred embodiment the user interface allows selective portrayal of the one or more storage spaces including the one or more cargo items in plan view.

In a preferred embodiment the user interface allows selective portrayal of the one or more storage spaces including the one or more cargo items in a three-dimensional view.

In a further aspect the invention consists in a graphical user interface for arrangement and/or orientation of one or more cargo items in a storage space of a vessel, the interface including
a storage areas defining the storage space,
one or more selectively moveable representations of the one or more cargo items, and
each representation being representative of the real space required for location of the one or more cargo items in the real storage space.

In a preferred embodiment each representation is moveable within the storage space.

In a preferred embodiment the user interface allows selective portrayal of the storage space including the one or more cargo items in elevational view.

In a preferred embodiemnt the user interface allows selective portrayal of the storage space including the one or more cargo items in plan view.

In a preferred embodiment the user interface allows selective portrayal of the storage space including the one or more cargo items in a three-dimensional view.

In a further aspect the invention consists in a method of loading cargo items into a storage space of a cargo carrying vessel, each item of cargo having a unique identifier readable by a scanning means, the method comprising the steps of
applying the scanning means to one or more of the cargo items about to be, or in the process of being, or have been, loaded or unloaded,
passing the information obtained from the scanning means to a processing means,
processing the information to determine which item or items of cargo are about to be, or are being, or which have been, loaded or unloaded, and
displaying the information to a user.

In a further aspect the invention consists in a method of determining available storage volume in a storage space of a cargo carrying vessel, the method comprising the steps of
establishing a first reference point on or in the vessel,
recording a first dimension of the storage space at the first reference point,
selecting a second reference point a predetermined distance in a second dimension from the first reference point,
recording a first dimension of the storage space at the second reference point,
selecting a third reference point a predetermined distance in a third dimension from the first reference point,
recording a first dimension of the storage space at the third reference point, and
repeating the foregoing steps to amass information indicative of the spatial relationship of the boundaries of the storage space relative to the first reference point.

In a preferred embodiment the predetermined distance between the first reference point and subsequent reference points is a regular interval.

Alternatively the predetermined distance between the first reference point and subsequent reference points is selected according to the degree of change in the magnitude of the first dimension.

In a further aspect the invention consists in a method of determining whether any measurable stowage parameter of a vessel or cargo carrying region thereof will be exceeded by a given quantity of cargo, the method comprising the steps of;

providing data relating to a measurable parameter of the cargo and data relating to the measurable stowage parameter,
using one of the measurable parameters to calculate a value in measurable units which is in the same units as the other of the measurable parameters,
comparing the calculated value with the other measurable parameter, and
providing an indication to a user if the cargo measurement exceeds the stowage measurement as a result of the comparison.

In a preferred embodiment the measurable parameters may be expressed in any measurable quantity, including units, pieces, volume, or weight.

In a further aspect the invention consists in a method of providing a visual indication of the location of one or more cargo items in at least one storage space of a cargo carrying vessel, the method including the steps of:
calculating the volume of the storage space from data relating to the profile thereof,
providing the volume of the one or more cargo items, and
displaying a visual indication of the volume of cargo occupying the storage space, the indication being representative of the real space required for location of the one or more cargo items in the real storage space.

In a preferred embodiment the method includes the step of representing the storage space and the one or more cargo items in elevational and/or plan and/or three dimensional view.

In a preferred embodiment the method includes the step of representing the one or more cargo items in lots.

In a preferred embodiment the method includes the step of calculating the weight of the one or more cargo items and comparing the weight with predetermined parameters and displaying a warning if any of the parameters are exceeded.

In a further aspect the invention consists in a method of load planning using the graphical user interface and/or the method of any one of the preceding statements of invention.

In a further aspect the invention consists in a method of unload planning using the graphical user interface and/or the method of any one of the preceding statements of invention.

In a further aspect the invention consists in a cargo loading or unloading planning or monitoring system having,
a base station from which data relating to the loading or unloading operation may be monitored,
at least one agent station which transmits and/or receives selected data to or from the base station, the agent stations in use being provided adjacent to a cargo loading vessel,
the base station including means to select data relating to specified cargo items or groups of cargo items available to the agent station whereby an operator of the base station may control the cargo items or groups of cargo items which are actually loaded or unloaded at agent stations.

In a further aspect the invention consists in a cargo loading or unloading planning system including a base station,
at least one agent station in communication with the base station,
each agent station including data input means,
the data input means being selected from a scanning means which scans and receives data including a unique identifier relating to each cargo item or group of cargo items, or the data input means including a manual count of the cargo items or group of cargo items.

In a preferred embodiment the manual count may be performed by cumulative addition of separate items or group of items, the total of the addition process being transmitted to the base station.

In a preferred embodiment the transmission of data relating to a number of cargo items or groups of cargo items is transmitted to the base station upon a positive request by an operator of the agent station.

In a further aspect the invention consists in weight determining apparatus including lifting attachment means for attachment to lifting apparatus,

load attachment means for attachment to a load to be lifted by the lifting apparatus, a weight determining means for providing an indication of the weight for the load, and receiving means to receive a weighing instruction signal to the weight determining means to provide the weight indication to a transmission means to transmit the weight indication to a processing means.

In a further aspect the invention consists in weight determining apparatus including attachment means to attach the apparatus to a lifting apparatus,
a weight determining means for providing an indication of the weight for the load, and receiving means to receive a weighing instruction signal to the weight determining means to provide the weight indication to a transmission means to transmit the weight indication to a processing means.

The invention may also be said to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of the said parts, elements or features, and where elements or features are mentioned herein and which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

The invention consists of the forgoing and also envisages constructions of which the following gives examples.

Drawing Description

One preferred form of the present invention will now be described with reference to the accompanying drawings in which;

Figure 1 is a view of a visual display unit indicative of a first graphical interface in accordance with the present invention,

Figure 1A is a continuation of figure 1,

Figures 1B and 1C are a diagrammatic plan view and elevation respectively of a cargo carrying vessel,

Figure 1D is an example of vessel measurement data used in accordance with the present invention.

Figure 2 is a view indicative of a further graphical interface in accordance with the present invention,

Figure 2A is a continuation of figure 2

Figure 3 is a view of a visual display unit indicative of a further graphical interface in accordance with the present invention,

Figure 3A is a continuation of figure 3,

Figure 4 is a view of a visual display unit indicative of a further graphical interface in accordance with the present invention,

Figure 4A is a continuation of figure 4,

Figure 5 is a diagrammatic plan view of a cargo carrying vessel and cargo items to be loaded thereon,

Figures 6 and 6A are schematic diagrams of first and second embodiments of a weight determining apparatus in accordance with the present invention,

Figures 7A to 7F are screen shots of agent stations in accordance with the present invention,

Figure 8 is a screen shot of a graphical user interface in accordance with the present invention, and

Figure 9 is a schematic flow diagram illustrating operation of the cargo loading and unloading management system in accordance with the present invention.

Detailed Description of Preferred Embodiment

The present invention relates to a system for planning and management of the loading and unloading of various types of cargo to and from cargo vessels, such as ships, aircraft or other bulk cargo carrying apparatus.

Referring to figure 1, the present system utilises a graphical interface which provides various views representative of the spaces in the vessel in which cargo is to be loaded. In the illustration shown in figures 1 and 1a, the example refers to a seagoing vessel having five holds referenced 1-5.

The vertical lines in between the holds represent the internal barriers or bulkheads within the ship which separate one hold from the next. The bold dark line referenced 6 is representative to the deck of the vessel. Therefore, the diagrammatic view illustrated in figures 1 and 1a is that of the vessel in side elevation and in cross section. Hold 1 is the hold nearest the bow of the vessel and hold 5 is the hold nearest the stern.

In order to obtain the diagrammatic representation illustrated in figures 1 and 1a, data is firstly entered which is representative of the vessel in which the cargo is to be loaded, and which is representative of the cargo.

Initially, a database is established, using a known database application, for example Microsoft Access. A standard programming language for obtaining information from and updating the database such as SQL may be used.

In order to obtain the required data about the vessel which is to transport the cargo, measurements of the cargo vessel are obtained.

The present invention uses a method of collecting data directly from the plans for the vessel. As illustrated in figure 1b, a starting point for measurements is established. This could be any point in a hold or on the deck of the vessel, but is preferably an easily recognised starting point such as the base of the first hold, as indicated by point 10 in figure 1B. At this point, which is preferably the starting point for at least the first hold by convention in the method, the width W (figure 1B) of the hold is measured at height H (figure 1C) from the plan and recorded. Such recordation is preferably

achieved by direct entry of the data into the system of the present invention i.e. by keying the data into a database used in accordance with the present invention on a personal computer which may include a laptop, notebook or hand-held computer.

The measurements as made directly from the plan may be used, or alternatively the measurements from the plan may be scaled prior to entry to provide an actual measurement of the dimension in metres or feet for example. If measurements are taken directly from the plan, then these can be scaled by the system of the present invention to give an appropriate dimension in a measurement such as metres or feet.

Thus the data recorded at point 10 may be represented as distance = 0, height = 0, width = X, where X is a number indicative of the actual measurement of the width of the hold at point 10. Once this first measurement has been taken, a further point may be selected, for example a point vertically below point 10 at a preselected or predetermined distance and the width at this point may be recorded. An example of such a point is illustrated as point 11 (refer figure 1C). It will be seen that these measurements can be used to provide a profile of the variation of width in the hold over vertical distance in the hold at one end of the hold. By progressing along the hold in predetermined increments, further profiles of the variation in width relative to height of the hold may be obtained at these further points. One such further point is referenced 12 in figures 1B and 1C.

The system can, in effect, record the data as a matrix as illustrated in figure 1D where the columns D, H and W refer to the distance, height and width respectively at points along any one hold.

The progressive points of distance and height which are used to collect data are preferably selected at predetermined intervals, for example 0.1 metres. However, it will be seen that any other number of preselected points may be used.

A further feature of the method by which data is collected in accordance with the invention of the present system is to only record the distance and height measurements at which there is a significant change in the width profile of the hold. This is feasible because in many cases with vessels such as ships, the profile of the sides of the vessel, and therefore the profile of the sides of the hold, can be relatively

uniform, particularly midships. Therefore, only taking measurements at points where there is a significant change in the width of the hold can significantly reduce the amount of data that needs to be collected and therefore the time required to enter data relating to any particular vessel. Furthermore, the sheer volume of data is reduced which results in a saving in memory in the system and can assist in calculations of the volume of the hold being performed more quickly.

When measurements are taken at points where there is a significant difference or change in the width of the hold, the system is programmed to perform a linear interpolation between the points of change and create data at predetermined points undisbursed between the given measurements at which change occurs. Therefore, referring to figure 1B, one measurement of the width may be taken at point 14, and then another measurement taken at point 16. In that instance, the computer could interpolate to some midpoint, for example point 18 or any other number of points between points 14 and 16 at predetermined spacings, and calculate an approximate width of the hold at that point based on the assumption that the sides of the hold vary linearly between the two known points of change.

It will be seen that this method of obtaining data regarding the profile of the hold is applicable to the whole ship, not just in an individual hold, so that the area of available deck space may be calculated for placement of cargo upon the deck if required. Also, data indicative of the relative positions of the holds in relation to each other may be obtained. It will also be seen that the system of measuring could be achieved in any other way, for example by starting the measurements at a point in an upper corner of a hold and progressing along the side of the hold using the same basic method.

The array of data collected about the storage spaces of the vessels is then stored and allocated either uniquely to the particular vessel, by name of the vessel or to the class of vessel.

When the volume of the storage space of the vessel needs to be calculated, the data collected is used to incrementally calculate the available volume of storage space.

Providing measurements of the storage space in order that a profile can be generated provides the significant advantages that

1) the system can take account of the various shapes of cargo so as to determine whether the cargo can fit in the available space, and

2) that the actual level to which a hold will be filled by a particular cargo volume can be portrayed

rather than working out the volume of the available space as compared to the volume of cargo desired to be loaded which can provide a misleading indication of the location of cargo within a hold or the like

Once the particular vessel type is known, and the data regarding the storage space dimensions is available, data relating to the cargo which is designed to be loaded is entered.

In most cargo loading applications, the cargo which is to be loaded is defined in "lots" which may belong to one or more proprietors, which have been organised in the form of a group of cargo items for which a contract has been entered into for carriage to a particular destination.

The data that is required to be entered regarding the cargo may include the volume and type of product that comprises each lot. For example, as can be seen in figures 4 and 4a lot 10 comprises materials of varying lengths (refer to the "Lth" columns).

Once the data regarding each lot has been entered, the user brings up the "cargo lineup" window shown in figures 1 and 1a, and "drags" each lot, or parts thereof using a computer mouse for example, into the holds of the vessel. Alternatively, keyboard commands may be used to manipulate the location of the cargo. The user can split each lot into various quantities and distribute these throughout the loading space in the vessel. This can be seen by looking at some of the lots, for example lot 10 which can be seen distributed on the deck above holds 1 and 3 and below the deck at the bottom of hold 2.

To move lots, or parts of lots between various storage spaces, the user simply "clicks" on the square representing the relevant lot or part thereof and "drags" that part to the desired location.

Importantly, the representation in figures 1 and 1a is a scale representation of the height taken up by the particular volume represented by the cargo in each square. Therefore, it is readily apparent to the user if the cargo which the user places within a particular hold will not fit in the hold. It is also readily apparent during loading whether the correct volume of cargo has been loaded. During unloading, it is readily apparent as to where a particular type of cargo, or cargo belonging to a particular proprietor, should be.

The system is able to calculate a scale height of the cargo stored in any hold by taking account of the nature of the cargo and the volume of cargo space usually taken up by such cargo as compared with the available volume in that part of the hold of the vessel. For example comparing that part of lot 6 in hold 4 (JAS 1666 in quantity) compared with the same quantity of lot 6 in hold 2, can be seen at the height of that same quantity of material in hold 2 is much greater than the height of the same of quantity of material in hold 4. This is because the vessel is narrower near the bow than it is near the stern.

The user interface in figures 1 and 1a also has the advantage that each particular square is colour coded. The colour coding can be selected easily by the user to immediately convey important information. In the illustration shown in figures 1 and 1a, the squares are colour coded by destination port. Thus it can be seen that all of the cargo destined for the port Taichung is one colour, whereas the cargo destined for the other two ports – Kunsan and Pusan are in two separate colours.

Alternatively, the user can select colour coding by other parameters, for example loading port, lot number, proprietor or cargo type.

As well as calculating the volume taken up by the cargo as it is being arranged in the plans shown in figures 1 and 1a, the system also calculates the weight of the cargo and provides warning when the weight in any one hold exceeds a predetermined safety limit, or when the weight on the deck space above each hold exceeds any predetermined safety limits. The system also provides information as to the weight distribution throughout the vessel so that the load planner can ensure that there is not a dangerous or undesirable weight distribution or that the load is such that the vessel is unacceptably low in the water. These factors can be critical to safety, performance of the vessel, and to access to desired ports.

The desired measurement of cargo, whether it be by volume, or weight or units or pieces (as in the case of containers for example) can be calculated by the system from any measurable input to obtain a measurement against which any of the stowage parameters, such as weight, volume, or units or pieces can be compared. Also, the stowage parameter can be manipulated by the system to compare with the cargo measurement. If the cargo measurement exceeds the stowage measurement, this is displayed or otherwise indicated to the user.

Referring to figure 2, a further interface is shown representing a front elevation within a particular hold of the vessel, in the example, hold 4, is shown. As illustrated, there are dimensions provided (for example in meters) across the floor of the hold and vertically up the side of the hold. These enable a good indication as to the space required for various items of cargo.

The cargo illustrated in figure 2 comprises logs and it can be seen that indications are provided as to where the logs belonging to various lots begin and end. Lots 1 and 2 are illustrated in figure 2 and it can be seen that the volume (1080 JAS) is indicated as the volume of each lot. Furthermore, it will be seen that the logs come in different lengths, and the graphical user interface allows the length of various logs to be shown so the user may establish a "best fit" of the cargo given the particular shape of the cargo. Furthermore, as indicated in the right hand side of the figure, the user may "rotate" the cargo so that, in this case the logs are shown end on as being stacked transversally across the ship at the right hand side of the hold. Therefore, a three dimensional indication of the volume of the cargo relative to a three dimensional indication of the volume of the hold or other storage space (such as the deck) is provided, so that a user may accurately position cargo in the storage space.

Furthermore, although not shown in figures 1, 1a or 2, the ship overall, including various levels of the hold and the deck may be shown in plan view i.e. looking straight down into the hold or onto the deck. The vessel may also be represented in a three-dimensional view. This is possible because data as to the three dimensional shape of the storage space is available, having been entered into the system as described with reference to figures 1B and 1C, and data for cargo of irregular shapes can be entered in the same way. Data for other cargo items, such as logs, can be established from

information already provided in relation to each log. Thus, taking a cargo of logs as an example, each log is usually provided with a unique identification, which may be represented in a bar code (see further below). In practice the significant dimensions of each log are recorded and associated with the unique identifier. The information may be provided in the form of electronically recorded data which may be accessed by the system of the present invention. Therefore, information as to the dimensions of each log is available to the system, so that each log may be accurately portrayed in three dimensions relative to the available storage space.

Referring to figure 3, a user interface is shown whereby each of the lots to be loaded or unloaded is indicated in the left hand most column 30 together with a three letter reference indicating the port at which the lot is to be loaded or was loaded. The number of units in each lot is recorded in columns 32 together with the units of measurement in columns 34. The destination for this is in column 36.

In column 38, which is referenced "ToGo", the number of units in each lot which are still to be loaded or unloaded is recorded.

Therefore, column 38 provides an indication in real time, while loading or unloading occurring as to the amount of work which has been performed, and the amount which is still outstanding. The way in which data as to the quantities of material loaded or unloaded is gathered is explained further below.

In column 40 "LoadStatus" provides a summary of the present status of the loading or unloading operation. Therefore, lots 4 and 10 are finished and are colour coded as such. Lots 5, 6 and 8 are still being loaded or unloaded, so they are labeled "working". Lot 7 is complete and lot 9 has been cancelled. Lot 11 is waiting for work to commence.

Turning now to figures 4 and 4a, it can be seen that a summary of the loading or unloading operation is provided in the lower most window referenced 50 for lot 10 in this example (but any other lot may be selected) showing in which hatch and in which level the cargo is comprising the lot being loaded, and the difference between the quantity of material which is actually loaded and that which is planned.

From the information gained as to the quantity of cargo, and volume consumed by such cargo as was actually loaded, an accurate representation using the graphical interface as shown in figures 1 and 1a may be derived as to the real or true status of the load which has been loaded onto the ship. Such a diagram of the actual ship loading may be used to plan an unloading operation and to maintain a status report of the unloading operation as described as to reference figure 3 at the destination port.

It will also be seen in figures 4 and 4a that all the information may be selected including the gang that performed the loading or unloading operation at 52, the hatch or hatches in which the gang was working at 54, together with the level 56 and the lot or lots 58.

Referring now to figure 5, a real time, or near real time data acquisition system for loading or unloading operations is achieved by recording each cargo item which is transferred to or from the cargo carrying vessel. Therefore, in figure 5, there are a number (in this example three but many more may be used) discrete collections of cargo items, generally referenced 60, 62 and 64 which are to be transferred into cargo storage areas or holds 70, 72 and 74 of a cargo carrying vessel 66.

In practice, each cargo item (in this example logs are shown, but other cargo types may be used) has a unique identifier in the form of a barcode which is read or scanned by a barcode reader. Three barcode readers relating to each collection or lot of cargo items are generally illustrated 80, 82 and 84 and have corresponding transmission means (preferably radio frequency transmission, but alternatively cables, or a combination of both if desired). The transmission means are generally referenced 90, 92 and 94 and transmit information to a receiving means 96 which in turn provides the information to a computer 98.

The computer 98 in use contains software which embodies the present invention including the graphical user interfaces referred to above. Upon receipt of the barcode information by the computer 98, the computer looks up the database relating to the cargo items comprising each lot and individual records the transfer of each cargo item whether it is scanned by the barcode scanners 80, 82 or 84. Therefore, in use, as each item of cargo is transferred to the crane or other apparatus for loading onto the ship, the user uses the barcode scanner to record the barcode for the cargo item so that this information is provided to the computer to maintain an up to date status report

of the cargo loading operation. The time at which each barcode is scanned is recorded so it has a time stamp for productivity information. It will be seen that when a number different "gangs" or loading operators are working on the one vessel, the use of a number of barcode scanners (for example 1 scanner for each "gang") allows a continuous update be provided as the work which is being performed, or has been performed, by each gang in relation to each lot of cargo. From knowing the hatch or deck area that each gang is working on, it can be confirmed by the system that the cargo item has been located in the correct place according to the cargo loading plan of figures 1 and 1a.

Referring to figure 6, a crane represented diagrammatically by boom 100 is shown having a diagrammatic hook 102 suspended therefrom which is used to carry a lifting cage or other cargo containment apparatus such as a rope or strops 104 in or on which one or more items of cargo 106 is carried. In accordance with one aspect of the present invention, the hook 102 includes a form of weight determination means 108 which may comprise any known means of determining weight. For example, the determination means 108 may comprise electrical circuits which gauge the stress or strain placed on the hook once the load 106 is lifted. The determination means provide an indication to a processing means 110 which records the weight indication at a predetermined time which is governed by a triggering apparatus 112. Preferably, the triggering apparatus 112 is located remotely from the hook, but the processing means 110 is located substantially adjacent to or as part of the hook apparatus.

The preferred form of weight determining apparatus is shown schematically in figure 6A. Referring to that figure, the weight determining apparatus is shown in a housing 116 which is connected between hooks 102 one of which connects the apparatus 116 to the crane and the other of which connects the apparatus 116 to the load 106. Therefore, the apparatus can be easily connected or disconnected to or from the crane assembly. The weight determining apparatus includes weight determination means such as a load cell, or hydraulic or electric/electronic weight indication apparatus, such as apparatus 108 of figure 6, for example. The apparatus 116 preferably includes processor means such as processor 110 of figure 6, and triggering apparatus 112 of figure 6.

The trigger means 112 may be connected a transmission line so it has a wire or the like to the crane apparatus, but preferably transmits an RF signal or another electro-magnetic signal, such as a light signal, infrared signal, or the like which is received by the processing means 110 and causes a record of the weight indication to be made and to be transmitted by the processing means 110 to a base station 114.

The apparatus of figures 6 and 6A thus allows a load of cargo to be lifted by crane, and when the load is stabilised, the operator, upon observing that the load is substantially stationary, uses the trigger means to command that a "snap shot" of the load indication at that time be processed by the processing means 110 and preferably transmitted to the base station 114. If preferred, the processing means 110 may store a number of indications of load before transmitting these, but in order to maintain a track of the real time load status, it is preferred that immediate transmission of the load indication is provided to the base station 114. Load monitoring is discussed further below in more detail.

Referring now to figures 7A to 7F, a succession of screen shots of various agent terminals is provided which illustrate the use of agent stations which are intended to be used in conjunction with the scanning apparatus described with reference to figure 5.

Thus referring to figure 7A, the agent who has the terminal in communication with, and preferably located adjacent to its relevant scanner has the first screen on which a job number, to identify the overall loading operation, can be entered. Information relating to the gang, or group of persons who will perform the loading operation is entered and a start date and time are entered. These dates may be prompted automatically by the system. As indicated at the base of the screen, the user may press the "enter" key to select various prompted information and provide this to a base station which coordinates the information received to provide an indication of the overall status of the actual loading operation. This diagram is referred to with reference to figure 8 below.

Turning to figure 7B, the next screen shows an operator entering data regarding the particular cargo items or group of cargo items to be loaded. In this instance, gang 2 is working on lot 3 to load data in to hatch 1 at deck level. It can be seen that data is entered relating to the principal (Ppl), grade of material (Grd) and type and length (T1,T2 and Lth).

Turning to figure 7C, it will be seen that the operator can confirm details regarding the gang, lot, destination for the cargo in the vessel and the quantity of cargo to be loaded is presented as a target loading for the vessel and the hatch.

Referring to figure 7D, the vessel target figure corresponds to the total amount of cargo (whether measured in volume or pieces or in other measurement for example) that is to be loaded on to the vessel. This volume may be distributed over a number of different loading operations, so the present invention provides a "hatch" target which is the target for the present gang working to load a particular hatch or part of the vessel. In figure 7E, a telescreen is shown in which a hatch target is illustrated together with the volume actually loaded (under the heading Ldt).

One further significant feature illustrated in figure 7D is the provision of the "add" field in which volume can be added manually in terms of pieces (Pcs) or tickets (Tkts) by the user simply pressing the "enter" key to add up the cargo items and then transmitting the number of items that have been listed in that given list operation by pressing the "F6" key. This transmits data to the base station for processing.

In figure 7F statistics relating to the communications that have occurred between the agent terminals and the base terminal are shown.

It can be seen that the information provided by weighing each lift of cargo items using the apparatus described in figure 6 can be helpful in keeping a tally of the loading situation. Therefore, as well as the information referred to in figures 7A to 7F, information transmitted to an agent terminal from the crane weight determining apparatus can be used to indicate the weight of the cargo items listed as compared with their number or volume. This can be particularly useful as cargo weight can change with other variables such as weather conditions. If the cargo weight as loaded on to the ship is increasing faster than expected in the plan, then the system, or the planner through manual intervention, may reassess the expected volumes to be loaded on to the vessel so as to prevent any time being wasted through the vessel being "closed off" by the captain for example, midway through the previously planned loading operation.

Turning to figure 8, a screen shot of the information available to the user of the base station is shown. In the left hand column 200, the job identification number is shown and underneath are the gangs that are working in the shift (relating to the shift period

identified in field 202) with the agent stations identified as terminals 1 through 9 represented by the symbol of the scanner.

As described previously, the lot number and cargo items relating to each lot together with the principal for each lot is identified in columns 204 to 216.

The "spec" column 218 identifies the quantity of the cargo item to be loaded and the next adjacent column records the units of measurement (for example cubic metres). The volume of the total material actually loaded is indicated in the "Spt.d" column and the amount of this material that is left to load is identified in the "Sptgo" column. A warning is provided to the operator by the system when only a certain volume of cargo is left to be loaded. This volume is selected in the "SW" column.

The next column "Tgt" records the target volume of cargo relating to each particular hatch. As described previously with reference to figures 7A to 7F, there is a target volume for the vessel and a separate target for a given hatch. The amount of the target volume which has actually been entered is listed in the "Tgtd" column. This figure is based on the volume figures received from the agent stations. The target volume remaining is shown in the "Tgtgo" column. Also, a warning is provided based on a selective volume to go in the "Tw" column. Columns 220, 222 and 224 relate to the hatch, level and gang respectively for the cargo items. Column 226 is one for which the operator of the agent station can work on. All of the cargo for which "NO" is entered is unavailable to the agent stations, so data relating to these cargo items cannot be loaded or manipulated by the agent stations until selected by a user of the base station. This prevents information overload and confusion amongst agent stations and allows the operator of the base station to have more control over the loading process.

Finally, the last column 228 has symbols which indicate the cargo being actively loaded at any time. In this case, only lot 10 lengths 5.4 and 7.3 are being actively loaded. The 5.4 lengths hatch target has already been met and slightly exceeded, so the symbol has a vessel 230 shown. Because the hatch target has not been exceeded for the 7.3 metre length, a hatch symbol 232 is shown.

Referring to figure 9 the overall operation of the system according to the preferred embodiment of the invention described herein is illustrated. The system has a

database 300 which is used to record and organise the information required by the system.

When an order to ship goods is received, the data is entered into the database as shown at 302. As described above, in many bulk cargo carriers such as seagoing ships, the cargo will comprise more than one order, so information regarding stock form the existing inventory must also be present in the database as shown at 304.

Vessel dimensional data must also be present in the database. If data relating to the vessel type is not already in the database, then it must be entered at 306.

From this data, the application creates a plan of the ship at 308 including the location of cargo within the ship for optimal carrying capacity within constraints of safety, the order in which unloading is required, and the type of cargo.

Following the ship plan, loading or unloading targets are established at 310 based on the volume of cargo and its placement in the ship. As indicated by the arrows in figure 9 the targets may change depending on the real time progress of the loading or unloading operation.

The system includes a further application 312 which manages the loading or unloading operation and provides progress and performance data. This application monitors and records each cargo item as it is being loaded or unloaded by optionally recording an identifier such as a barcode at 314 and/or weighing each item at 316. Such identification recording and weighing may be performed at a number of locations simultaneously by sending and receiving information to and from remote terminals as shown at step 318.

The progress toward loading or unloading targets is monitored at 320, and data output reports are generated at 322.

It will be seen that the present invention provides considerable advantages over existing manual systems in that it saves a considerable amount of time and provides accurate and reliable data.

Claims

1. A graphical user interface for indicating the location of one or more cargo items in at least one storage space of a cargo carrying vessel, the interface including
one or more storage areas defining the at least one storage space,
one or more selectively moveable representations of the one or more cargo items, and
each representation being representative of the real space required for location of the one or more cargo items in the real storage space.

2. An interface as claimed in claim 1 wherein each representation is moveable between the one or more storage spaces and changes as required to remain representative of the real space required for location of the one or more cargo items in the real storage space.

3. An interface as claimed in claim 1 or claim 2 including means to indicate the quantity of cargo items loaded into, or unloaded from, the cargo carrying vessel.

4. An interface as claimed in any one of the preceding claims including means to indicate the arrangement and/or orientation of the one or more cargo items in the storage space.

5. A method of providing a visual indication of the location of one or more cargo items in at least one storage space of a cargo carrying vessel, the method including the steps of:
calculating the volume of the storage space from data relating to the profile thereof,
providing the volume of the one or more cargo items, and
displaying a visual indication of the volume of cargo occupying the storage space, the indication being representative of the real space required for location of the one or more cargo items in the real storage space.

6. A method as claimed in claim 5 including the step of calculating the weight of the one or more cargo items from the known volume and comparing the weight

with predetermined parameters and displaying a warning if any of the parameters are exceeded.

7. A method as claimed in claim 5 wherein the volume of the one or more cargo items is calculated from a known weight for the one or more cargo items.

8. A method as claimed in claim 7 wherein the known weight is obtained by the step of weighing the one or more cargo items prior to loading or unloading the one or more cargo items into or from the vessel.

9. A method as claimed in claim 7 or claim 8 wherein the step of weighing the one or more cargo items includes the steps of lifting the one or more cargo items, providing an instruction to weigh the one or more cargo items, and providing an indication of weight in response to the instruction.

10. Any novel feature or combination of features disclosed herein.

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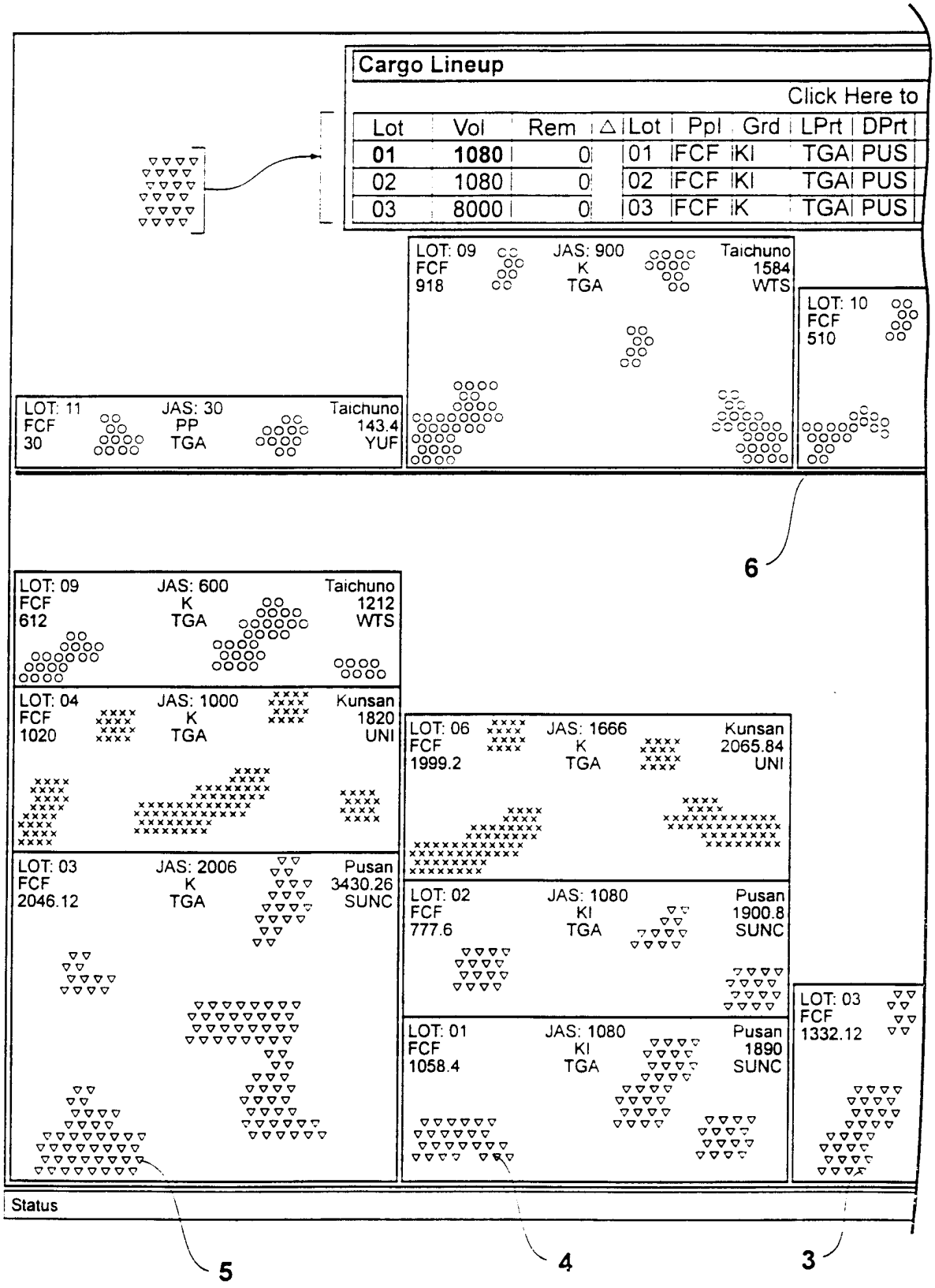
Cargo Lineup
Click Here to
Lot Vol Rem Δ Lot Ppl Grd LPrt DPrt
01 1080 0 01 FCF KI TGA PUS
02 1080 0 02 FCF KI TGA PUS
03 8000 0 03 FCF K TGA PUS
LOT: 09 FCF 918 JAS: 900 K TGA Taichuno 1584 WTS
LOT: 10 FCF 510
LOT: 11 FCF 30 JAS: 30 PP TGA Taichuno 143.4 YUF
6
LOT: 09 FCF 612 JAS: 600 K TGA Taichuno 1212 WTS
LOT: 04 FCF 1020 JAS: 1000 K TGA Kunsan 1820 UNI
LOT: 06 FCF 1999.2 JAS: 1666 K TGA Kunsan 2065.84 UNI
LOT: 03 FCF 2046.12 JAS: 2006 K TGA Pusan 3430.26 SUNC
LOT: 02 FCF 777.6 JAS: 1080 KI TGA Pusan 1900.8 SUNC
LOT: 01 FCF 1058.4 JAS: 1080 KI TGA Pusan 1890 SUNC
LOT: 03 FCF 1332.12
Status
5
4
3

FIG. 1

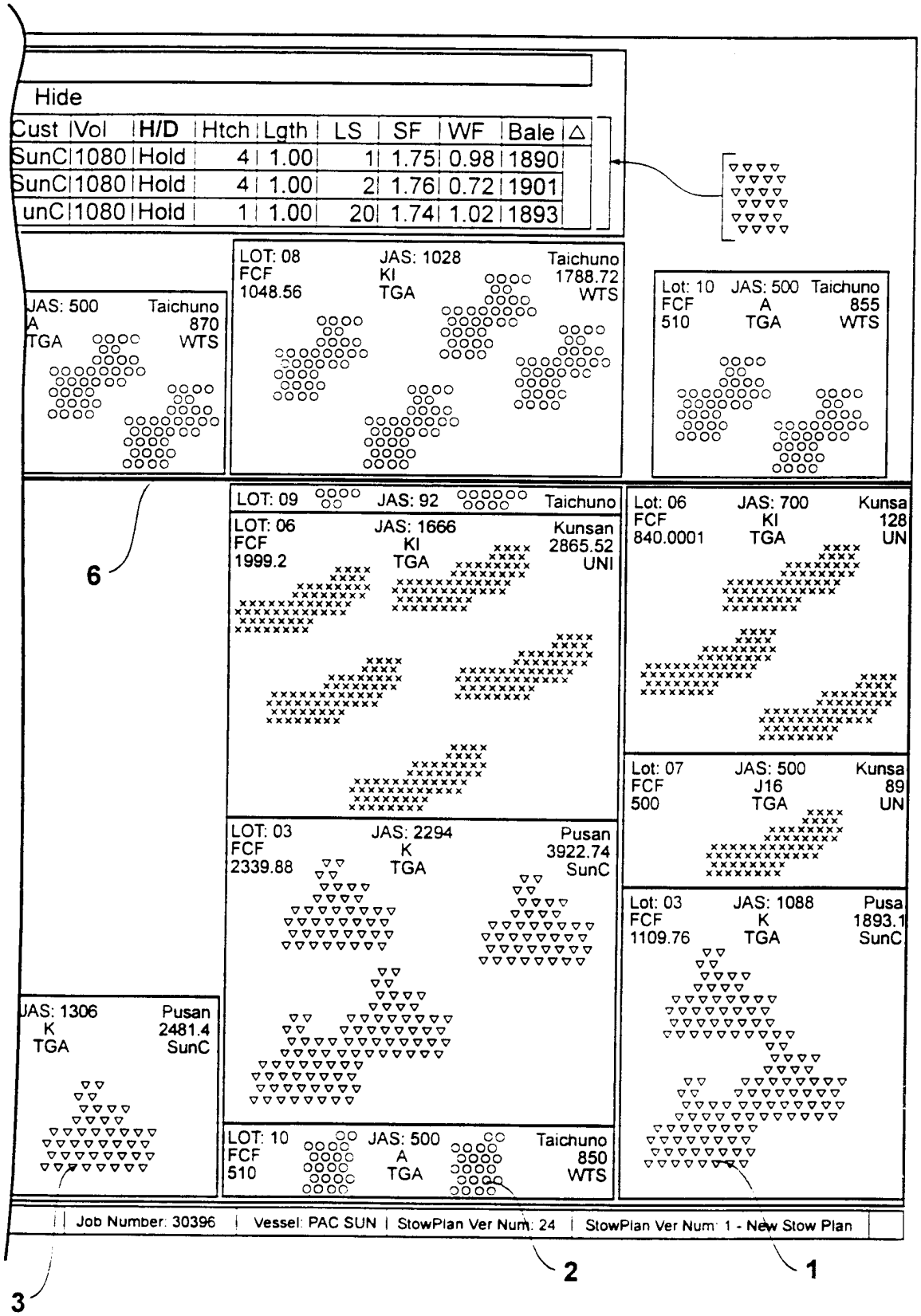
Hide
Cust Vol H/D Htch Lgth LS SF WF Bale
SunC 1080 Hold 4 1.00 1 1.75 0.98 1890
SunC 1080 Hold 4 1.00 2 1.76 0.72 1901
unC 1080 Hold 1 1.00 20 1.74 1.02 1893
JAS: 500 Taichuno
A 870
TGA WTS
LOT: 08 JAS: 1028 Taichuno
FCF KI 1788.72
1048.56 TGA WTS
Lot: 10 JAS: 500 Taichuno
FCF A 855
510 TGA WTS
6
LOT: 09 JAS: 92 Taichuno
LOT: 06 JAS: 1666 Kunsan
FCF KI 2865.52
1999.2 TGA UNI
Lot: 06 JAS: 700 Kunsa
FCF KI 128
840.0001 TGA UN
Lot: 07 JAS: 500 Kunsa
FCF J16 89
500 TGA UN
LOT: 03 JAS: 2294 Pusan
FCF K 3922.74
2339.88 TGA SunC
Lot: 03 JAS: 1088 Pusa
FCF K 1893.1
1109.76 TGA SunC
JAS: 1306 Pusan
K 2481.4
TGA SunC
LOT: 10 JAS: 500 Taichuno
FCF A 850
510 TGA WTS
Job Number: 30396 | Vessel: PAC SUN | StowPlan Ver Num: 24 | StowPlan Ver Num: 1 - New Stow Plan
3
2
1

FIG. 1A

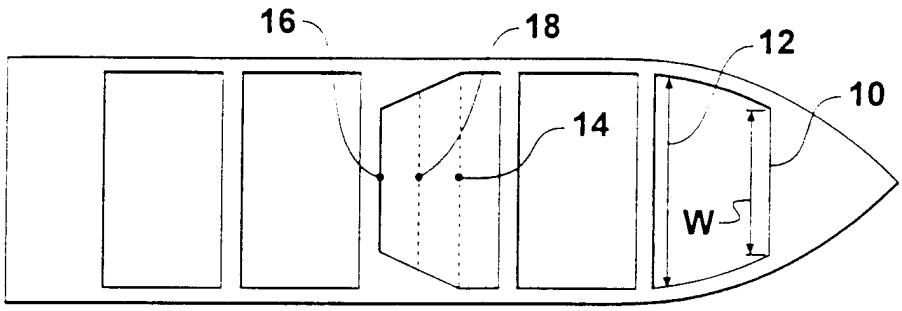

FIG. 1B

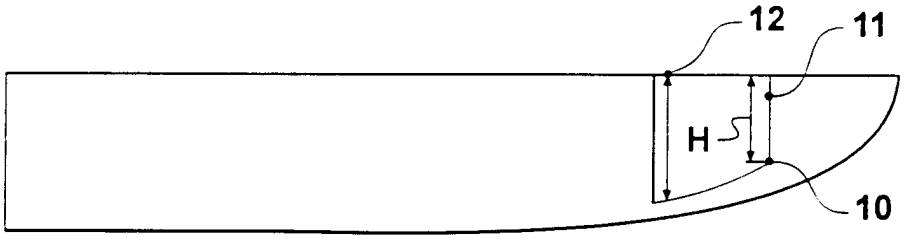

FIG. 1C

D	H	W
0	0	4
0	1	5
10	0	4
10	1	5
10	2	6
⋮	⋮	⋮

FIG. 1D

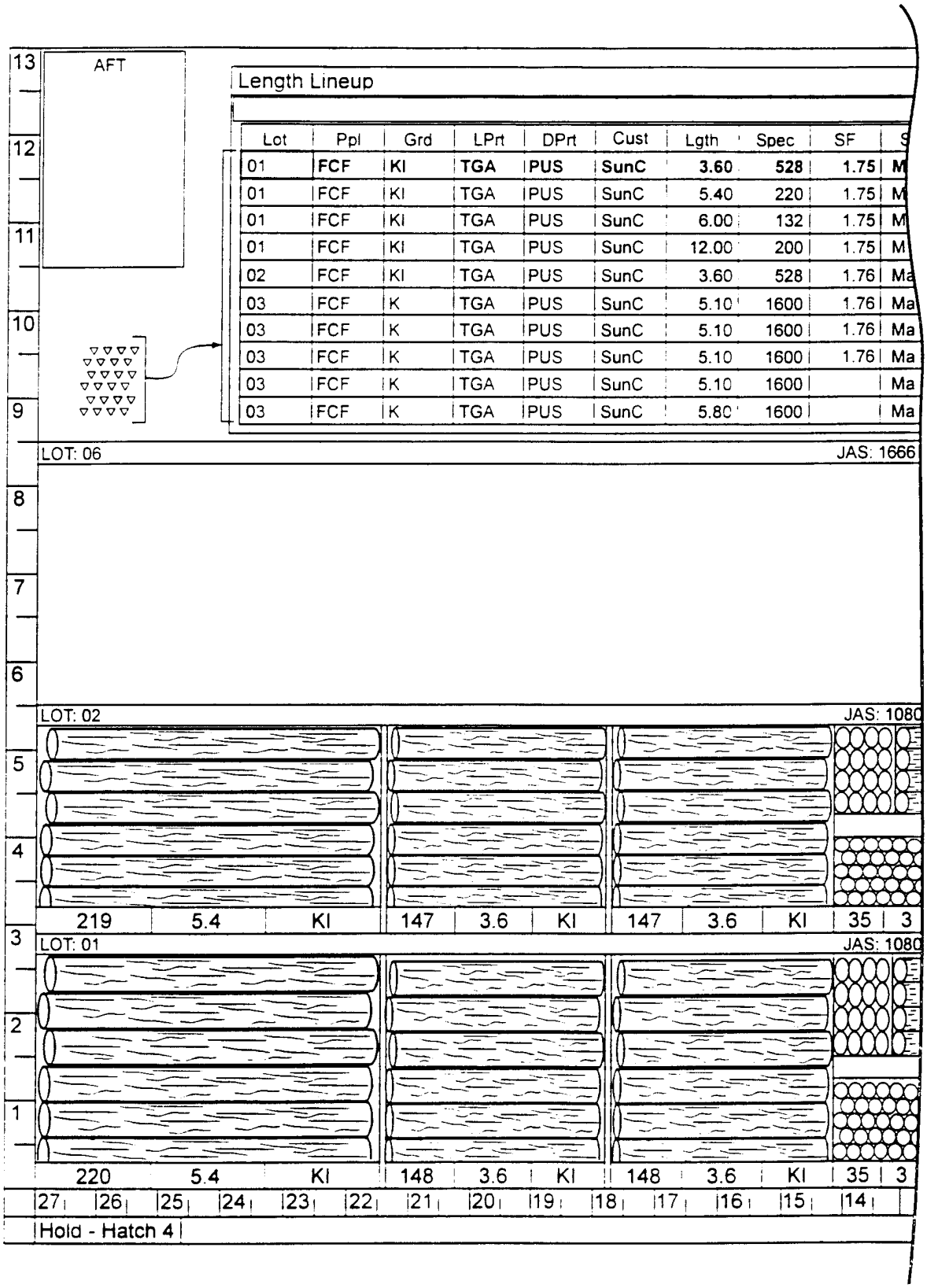
AFT
Length Lineup
Lot Ppl Grd LPrt DPrt Cust Lgth Spec SF
01 FCF KI TGA PUS SunC 3.60 528 1.75
01 FCF KI TGA PUS SunC 5.40 220 1.75
01 FCF KI TGA PUS SunC 6.00 132 1.75
01 FCF KI TGA PUS SunC 12.00 200 1.75
02 FCF KI TGA PUS SunC 3.60 528 1.76
03 FCF K TGA PUS SunC 5.10 1600 1.76
03 FCF K TGA PUS SunC 5.10 1600 1.76
03 FCF K TGA PUS SunC 5.10 1600 1.76
03 FCF K TGA PUS SunC 5.10 1600
03 FCF K TGA PUS SunC 5.80 1600
LOT: 06
JAS: 1666
LOT: 02
JAS: 1080
219 5.4 KI 147 3.6 KI 147 3.6 KI 35 3
LOT: 01
JAS: 1080
220 5.4 KI 148 3.6 KI 148 3.6 KI 35 3
27 26 25 24 23 22 21 20 19 18 17 16 15 14
Hold - Hatch 4

FIG. 2

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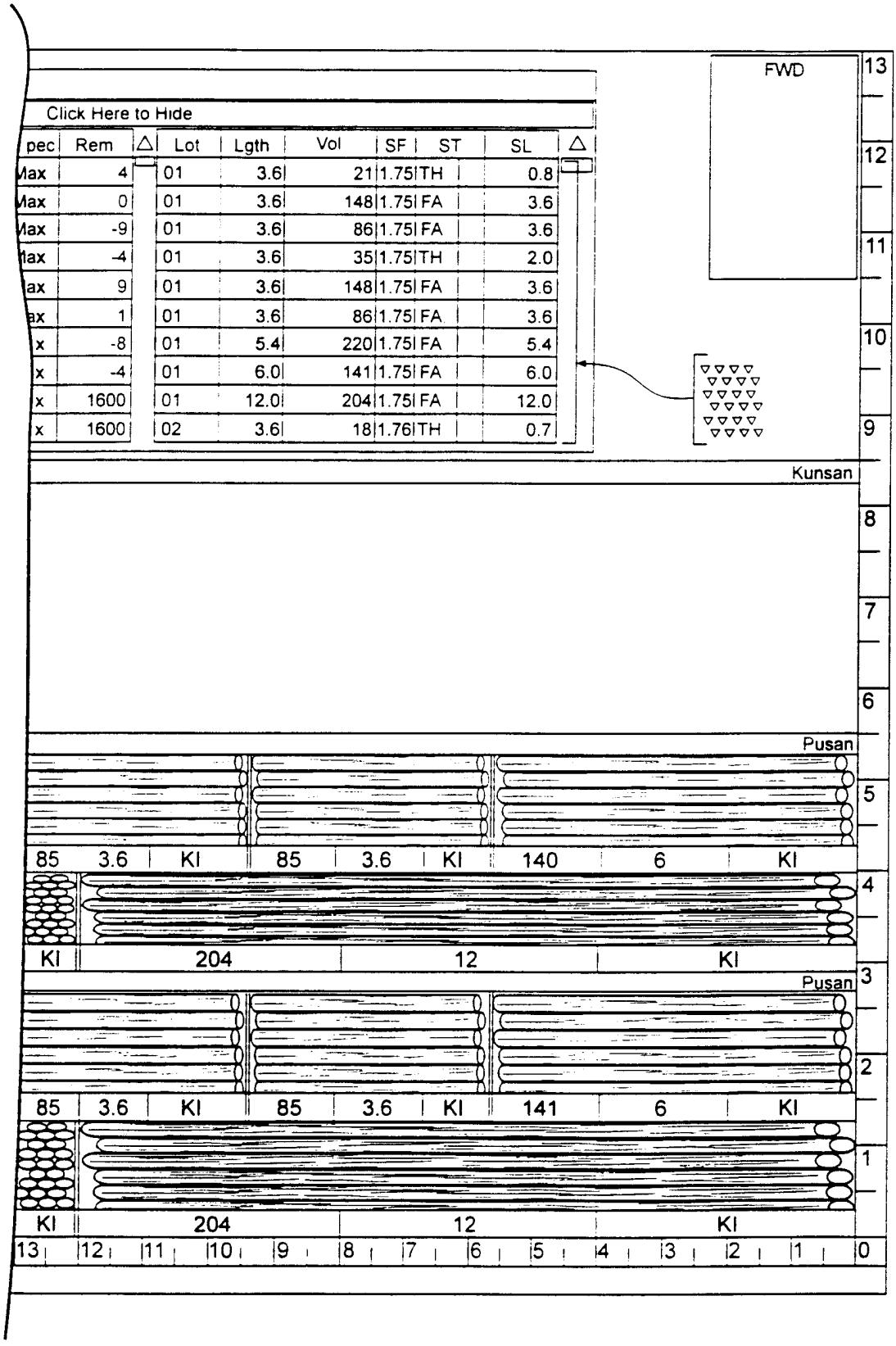
Click Here to Hide
pec | Rem | Lot | Lgth | Vol | SF | ST | SL
Max | 4 | 01 | 3.6 | 21 | 1.75 | TH | 0.8
Max | 0 | 01 | 3.6 | 148 | 1.75 | FA | 3.6
Max | -9 | 01 | 3.6 | 86 | 1.75 | FA | 3.6
lax | -4 | 01 | 3.6 | 35 | 1.75 | TH | 2.0
ax | 9 | 01 | 3.6 | 148 | 1.75 | FA | 3.6
ax | 1 | 01 | 3.6 | 86 | 1.75 | FA | 3.6
x | -8 | 01 | 5.4 | 220 | 1.75 | FA | 5.4
x | -4 | 01 | 6.0 | 141 | 1.75 | FA | 6.0
x | 1600 | 01 | 12.0 | 204 | 1.75 | FA | 12.0
x | 1600 | 02 | 3.6 | 18 | 1.76 | TH | 0.7
FWD
Kunsan
Pusan
85 3.6 KI 85 3.6 KI 140 6 KI
KI 204 12 KI
Pusan
85 3.6 KI 85 3.6 KI 141 6 KI
KI 204 12 KI
13 12 11 10 9 8 7 6 5 4 3 2 1 0

FIG. 2A

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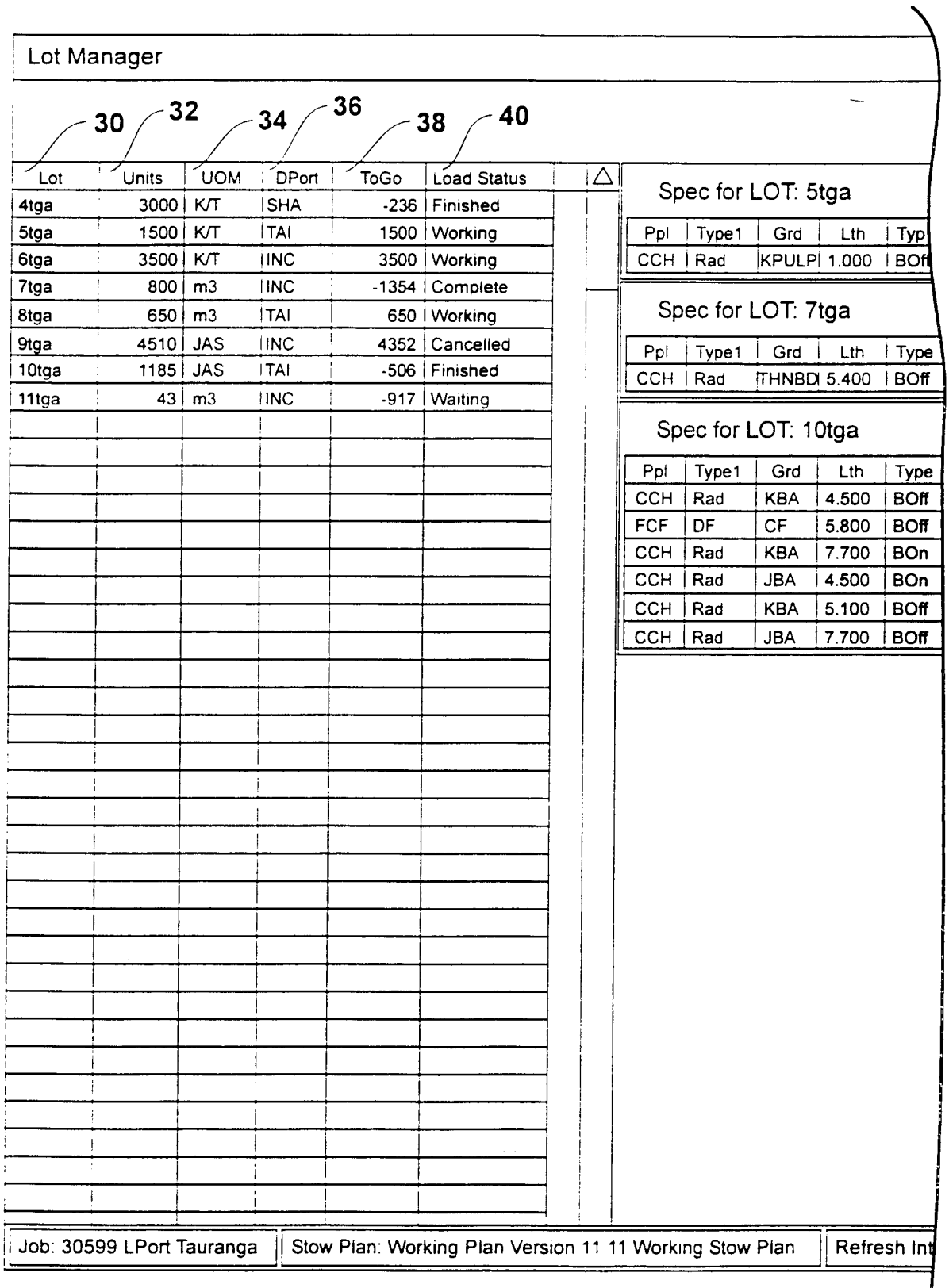
Lot Manager
30
32
34
36
38
40
Lot | Units | UOM | DPort | ToGo | Load Status
4tga | 3000 | K/T | SHA | -236 | Finished
5tga | 1500 | K/T | TAI | 1500 | Working
6tga | 3500 | K/T | INC | 3500 | Working
7tga | 800 | m3 | INC | -1354 | Complete
8tga | 650 | m3 | TAI | 650 | Working
9tga | 4510 | JAS | INC | 4352 | Cancelled
10tga | 1185 | JAS | TAI | -506 | Finished
11tga | 43 | m3 | INC | -917 | Waiting
Spec for LOT: 5tga
Ppl | Type1 | Grd | Lth | Typ
CCH | Rad | KPULP | 1.000 | BOff
Spec for LOT: 7tga
Ppl | Type1 | Grd | Lth | Type
CCH | Rad | THNBD | 5.400 | BOff
Spec for LOT: 10tga
Ppl | Type1 | Grd | Lth | Type
CCH | Rad | KBA | 4.500 | BOff
FCF | DF | CF | 5.800 | BOff
CCH | Rad | KBA | 7.700 | BOn
CCH | Rad | JBA | 4.500 | BOn
CCH | Rad | KBA | 5.100 | BOff
CCH | Rad | JBA | 7.700 | BOff
Job: 30599 LPort Tauranga
Stow Plan: Working Plan Version 11 11 Working Stow Plan
Refresh Int

FIG. 3

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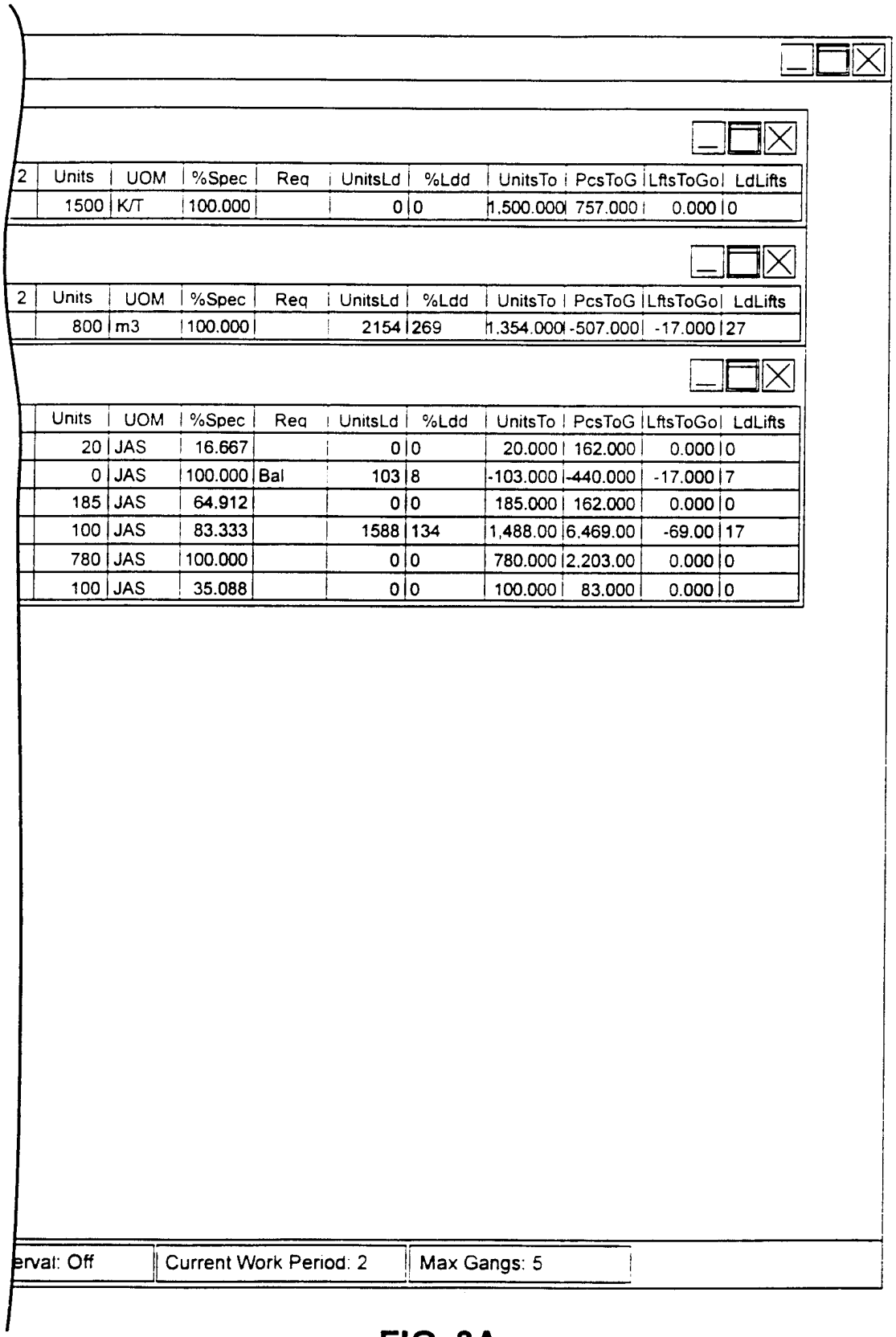


2	Units	UOM	%Spec	Req	UnitsLd	%Ldd	UnitsTo	PcsToG	LftsToGo	LdLifts
	1500	K/T	100.000		0	0	1,500.000	757.000	0.000	0

2	Units	UOM	%Spec	Req	UnitsLd	%Ldd	UnitsTo	PcsToG	LftsToGo	LdLifts
	800	m3	100.000		2154	269	1,354.000	-507.000	-17.000	27

	Units	UOM	%Spec	Req	UnitsLd	%Ldd	UnitsTo	PcsToG	LftsToGo	LdLifts
	20	JAS	16.667		0	0	20.000	162.000	0.000	0
	0	JAS	100.000	Bal	103	8	-103.000	-440.000	-17.000	7
	185	JAS	64.912		0	0	185.000	162.000	0.000	0
	100	JAS	83.333		1588	134	1,488.00	6.469.00	-69.00	17
	780	JAS	100.000		0	0	780.000	2,203.00	0.000	0
	100	JAS	35.088		0	0	100.000	83.000	0.000	0

FIG. 3A

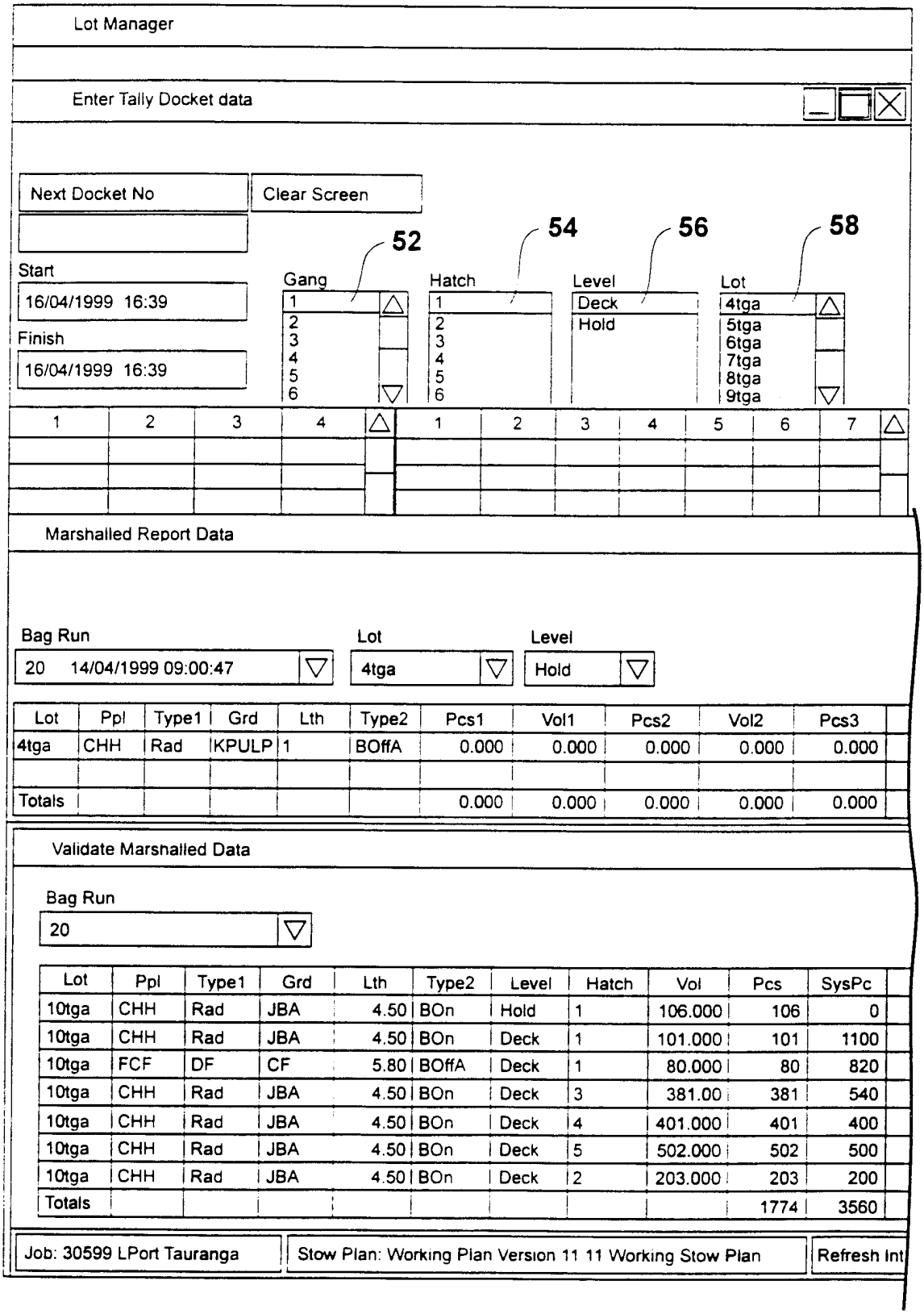

Lot Manager
Enter Tally Docket data
Next Docket No
Clear Screen
Start
16/04/1999 16:39
Finish
16/04/1999 16:39
52
54
56
58
Gang
Hatch
Level
Lot
1
2
3
4
5
6
Deck
Hold
4tga
5tga
6tga
7tga
8tga
9tga
Marshalled Report Data
Bag Run
20 14/04/1999 09:00:47
Lot
4tga
Level
Hold
Lot Ppl Type1 Grd Lth Type2 Pcs1 Vol1 Pcs2 Vol2 Pcs3
4tga CHH Rad KPULP 1 BOffA 0.000 0.000 0.000 0.000 0.000
Totals 0.000 0.000 0.000 0.000 0.000
Validate Marshalled Data
Bag Run
20
Lot Ppl Type1 Grd Lth Type2 Level Hatch Vol Pcs SysPc
10tga CHH Rad JBA 4.50 BOn Hold 1 106.000 106 0
10tga CHH Rad JBA 4.50 BOn Deck 1 101.000 101 1100
10tga FCF DF CF 5.80 BOffA Deck 1 80.000 80 820
10tga CHH Rad JBA 4.50 BOn Deck 3 381.00 381 540
10tga CHH Rad JBA 4.50 BOn Deck 4 401.000 401 400
10tga CHH Rad JBA 4.50 BOn Deck 5 502.000 502 500
10tga CHH Rad JBA 4.50 BOn Deck 2 203.000 203 200
Totals 1774 3560
Job: 30599 LPort Tauranga
Stow Plan: Working Plan Version 11 11 Working Stow Plan
Refresh Int

FIG. 4

Ppl	Type1	Grd	Lth	Type2	Units	UOM	%Spec	Req	UnitsLd	%Ld	Units To
CHH	Rad	KPULP	1.000	BOffA	1500	K/T	100.000		0	0	1,500.000

Ppl	Type1	Grd	Lth	Type2	Units	UOM	%Spec	Req	UnitsLd	%Ld	Units To
CHH	Rad	THNBD	5.400	BOffA	800	m3	100.000		2154	269	1,354.000

Ppl	Type1	Grd	Lth	Type2	Units	UOM	%Spec	Req	UnitsLd	%Ld	Units To
CHH	Rad	KBA	4.500	BOffA	20	JAS	16.667		0	0	20.000
FCF	DF	CF	5.800	BOffA	0	JAS	100.000	Bal	103	8	-103.000
CHH	Rad	KBA	7.700	BOn	185	JAS	64.912		0	0	185.000
CHH	Rad	JBA	4.500	BOn	100	JAS	83.333		1588	134	1,488.00
CHH	Rad	KBA	5.100	BOff	780	JAS	100.000		0	0	780.000
CHH	Rad	JBA	7.700	BOff	100	JAS	35.088		0	0	100.000

Vol3	Pcs4	Vol4	Pcs5	Vol5	Total Pcs	Total Vol
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000

50

Diff	OK	△
106		
-999	✓	
-740	✓	
-159	✓	
1	✓	
2	✓	
3	✓	
1786		

erval: Off | Current Work Period: 2 | Max Gangs: 5

FIG. 4A

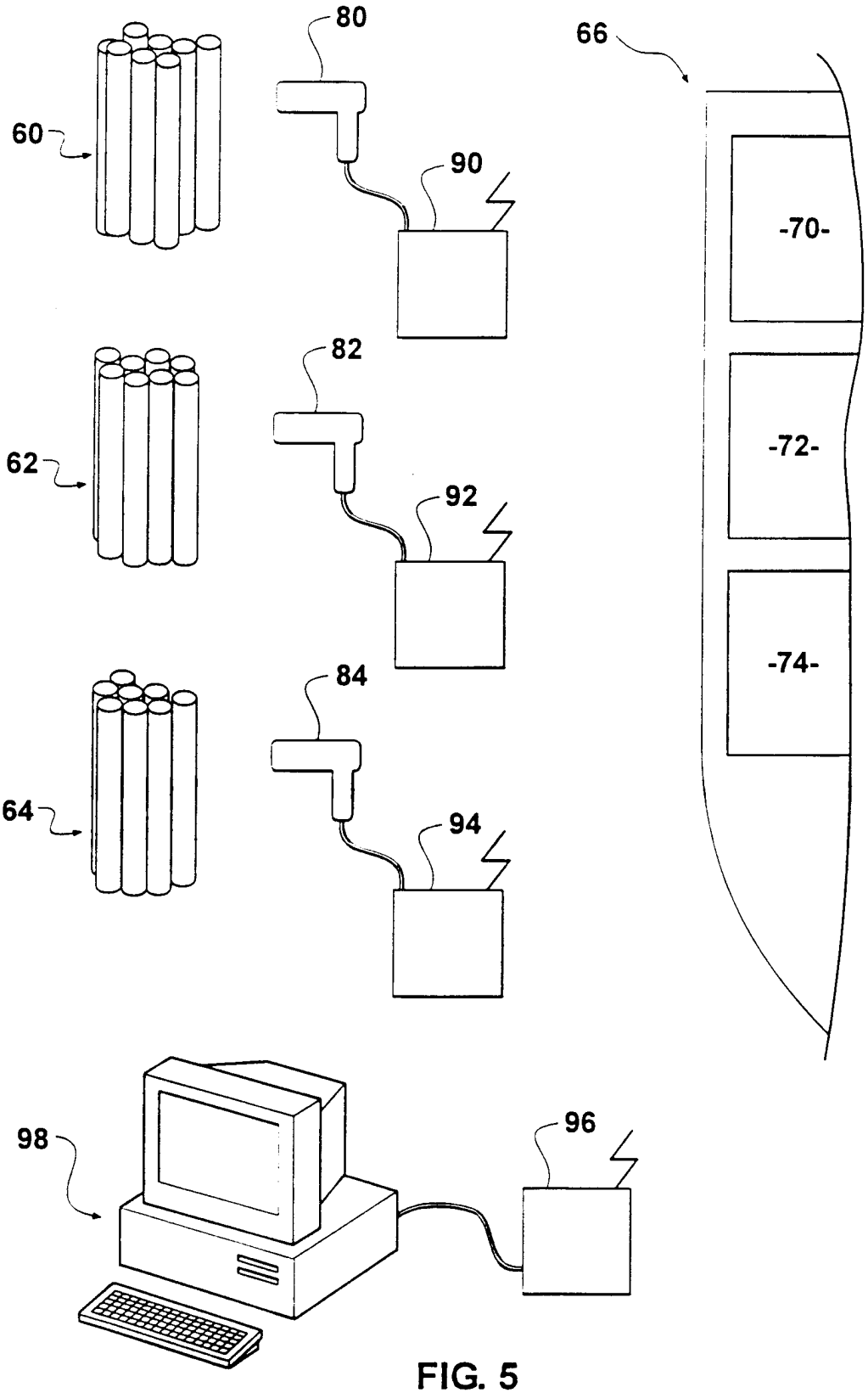


FIG. 5

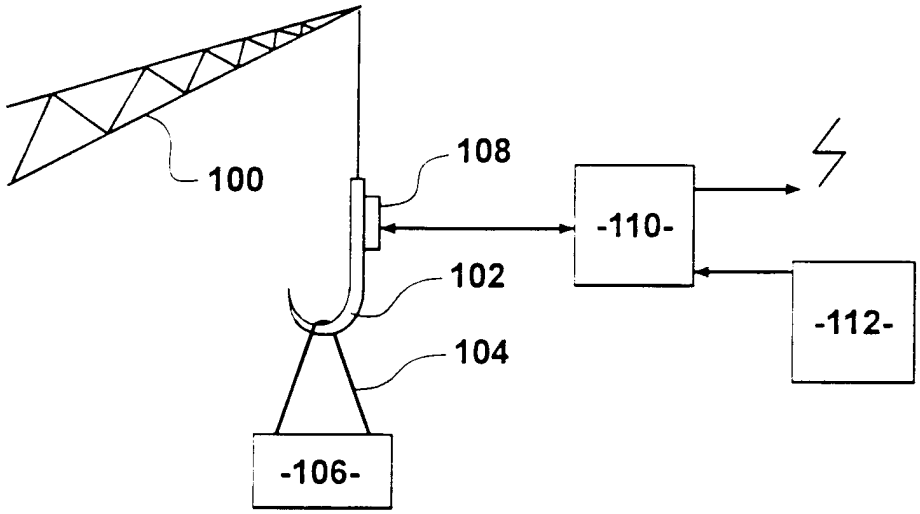


FIG. 6

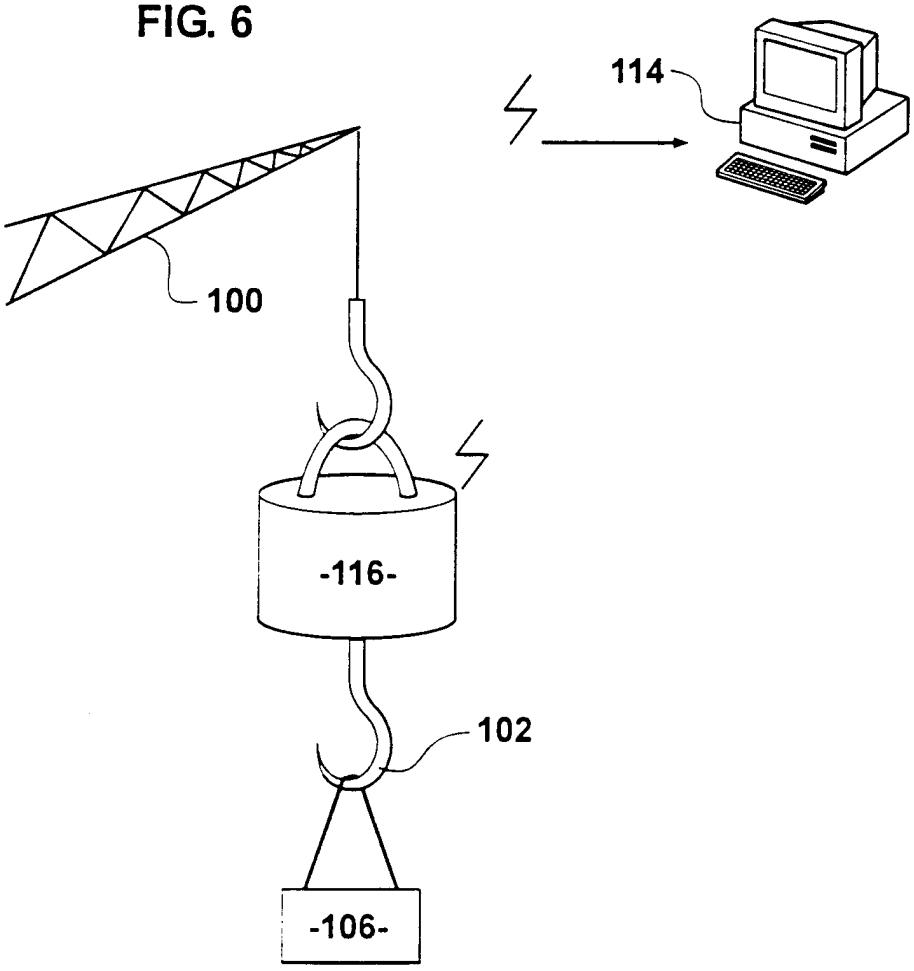
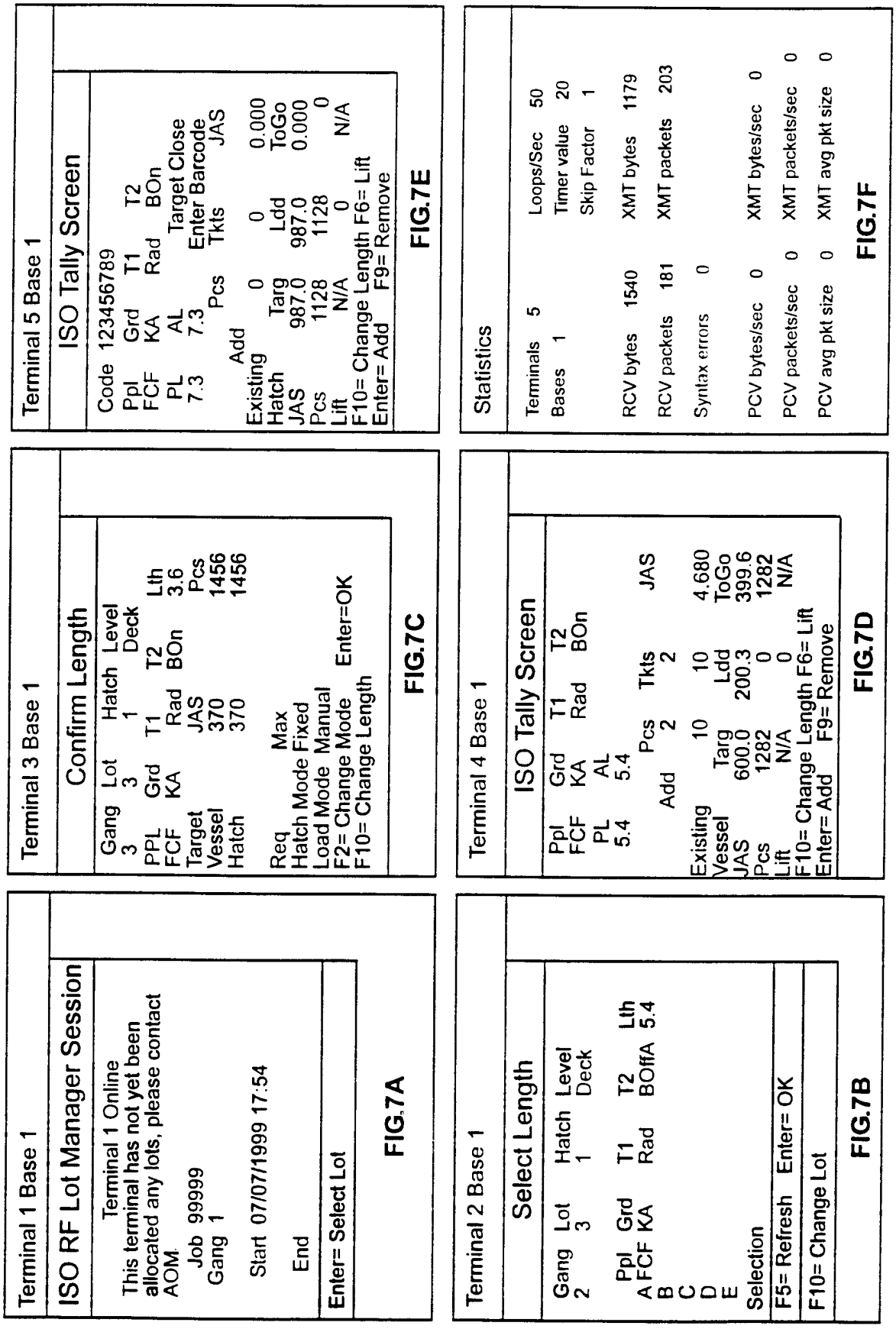
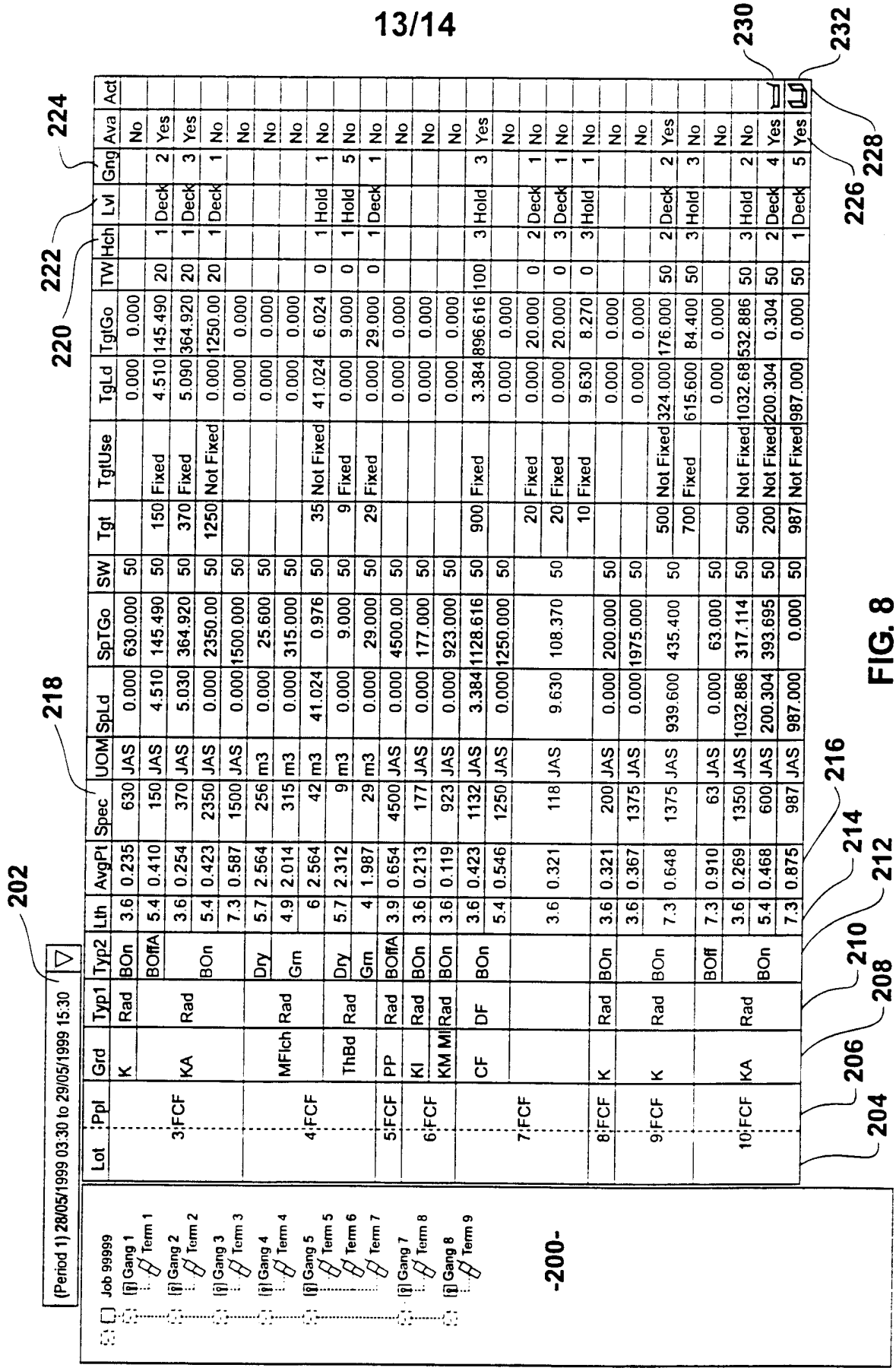


FIG. 6A


Terminal 1 Base 1
ISO RF Lot Manager Session
Terminal 1 Online
This terminal has not yet been allocated any lots, please contact AOM.
Job 99999
Gang 1
Start 07/07/1999 17:54
End
Enter= Select Lot
Terminal 3 Base 1
Confirm Length
Gang Lot Hatch Level
3 3 1 Deck
PPL Grd T1 T2 Lth
FCF KA Rad BOn 3.6
Target JAS Pcs
Vessel 370 1456
Hatch 370 1456
Req Max
Hatch Mode Fixed
Load Mode Manual
F2= Change Mode Enter=OK
F10= Change Length
Terminal 5 Base 1
ISO Tally Screen
Code 123456789
Ppl Grd T1 T2
FCF KA Rad BOn
PL AL Target Close
7.3 7.3 Enter Barcode
Pcs Tkts JAS
Add 0 0 0.000
Existing 0 Targ Ldd ToGo
Hatch 987.0 987.0 0.000
JAS 1128 1128 0
Pcs N/A 0 N/A
Lift
F10= Change Length F6= Lift
Enter= Add F9= Remove
FIG.7A
FIG.7C
FIG.7E
Terminal 2 Base 1
Select Length
Gang Lot Hatch Level
2 3 1 Deck
Ppl Grd T1 T2 Lth
A FCF KA Rad BOffA 5.4
B
C
D
E
Selection
F5= Refresh Enter= OK
F10= Change Lot
Terminal 4 Base 1
ISO Tally Screen
Ppl Grd T1 T2
FCF KA Rad BOn
PL AL
5.4 5.4
Pcs Tkts JAS
Add 2 2
Existing 10 10 4.680
Vessel Targ Ldd ToGo
JAS 600.0 200.3 399.6
Pcs 1282 0 1282
Lift N/A 0 N/A
F10= Change Length F6= Lift
Enter= Add F9= Remove
Statistics
Terminals 5 Loops/Sec 50
Bases 1 Timer value 20
Skip Factor 1
RCV bytes 1540 XMT bytes 1179
RCV packets 181 XMT packets 203
Syntax errors 0
PCV bytes/sec 0 XMT bytes/sec 0
PCV packets/sec 0 XMT packets/sec 0
PCV avg pkt size 0 XMT avg pkt size 0
FIG.7B
FIG.7D
FIG.7F



Lot	Ppl	Grd	Typ1	Typ2	Lth	AvgPt	Spec	UOM	SpLd	SpTGo	SW	Tgt	TgtUse	TgLd	TgtGo	TW	Hch	Lvl	Gng	Ava	Act
	3 FCF	K	Rad	BOn	3.6	0.235	630	JAS	0.000	630.000	50			0.000	0.000					No	
		KA		BOffA	5.4	0.410	150	JAS	4.510	145.490	50	150	Fixed	4.510	145.490	20	1	Deck	2	Yes	
			Rad		3.6	0.254	370	JAS	5.030	364.920	50	370	Fixed	5.090	364.920	20	1	Deck	3	Yes	
				BOn	5.4	0.423	2350	JAS	0.000	2350.00	50	1250	Not Fixed	0.000	1250.00	20	1	Deck	1	No	
					7.3	0.587	1500	JAS	0.000	1500.000	50			0.000	0.000					No	
	4 FCF	MFlch	Rad	Dry	5.7	2.564	256	m3	0.000	25.600	50			0.000	0.000					No	
				Gm	4.9	2.014	315	m3	0.000	315.000	50			0.000	0.000					No	
					6	2.564	42	m3	41.024	0.976	50	35	Not Fixed	41.024	6.024	0	1	Hold	1	No	
		ThBd	Rad	Dry	5.7	2.312	9	m3	0.000	9.000	50	9	Fixed	0.000	9.000	0	1	Hold	5	No	
				Gm	4	1.987	29	m3	0.000	29.000	50	29	Fixed	0.000	29.000	0	1	Deck	1	No	
	5 FCF	PP	Rad	BOffA	3.9	0.654	4500	JAS	0.000	4500.00	50			0.000	0.000					No	
	6 FCF	KI	Rad	BOn	3.6	0.213	177	JAS	0.000	177.000	50			0.000	0.000					No	
		KM Mi	Rad	BOn	3.6	0.119	923	JAS	0.000	923.000	50			0.000	0.000					No	
	7 FCF	CF	DF	BOn	3.6	0.423	1132	JAS	3.384	1128.616	50	900	Fixed	3.384	896.616	100	3	Hold	3	Yes	
					5.4	0.546	1250	JAS	0.000	1250.000	50			0.000	0.000					No	
					3.6	0.321	118	JAS	9.630	108.370	50	20	Fixed	0.000	20.000	0	2	Deck	1	No	
												20	Fixed	0.000	20.000	0	3	Deck	1	No	
												10	Fixed	9.630	8.270	0	3	Hold	1	No	
	8 FCF	K	Rad	BOn	3.6	0.321	200	JAS	0.000	200.000	50			0.000	0.000					No	
	9 FCF	K	Rad	BOn	3.6	0.367	1375	JAS	0.000	1975.000	50			0.000	0.000					No	
					7.3	0.648	1375	JAS	939.600	435.400	50	500	Not Fixed	324.000	176.000	50	2	Deck	2	Yes	
												700	Fixed	615.600	84.400	50	3	Hold	3	No	
	10 FCF	KA	Rad	BOff	7.3	0.910	63	JAS	0.000	63.000	50			0.000	0.000					No	
				BOn	3.6	0.269	1350	JAS	1032.886	317.114	50	500	Not Fixed	1032.68	532.886	50	3	Hold	2	No	
					5.4	0.468	600	JAS	200.304	393.695	50	200	Not Fixed	200.304	0.304	50	2	Deck	4	Yes	
					7.3	0.875	987	JAS	987.000	0.000	50	987	Not Fixed	987.000	0.000	50	1	Deck	5	Yes	

FIG. 8

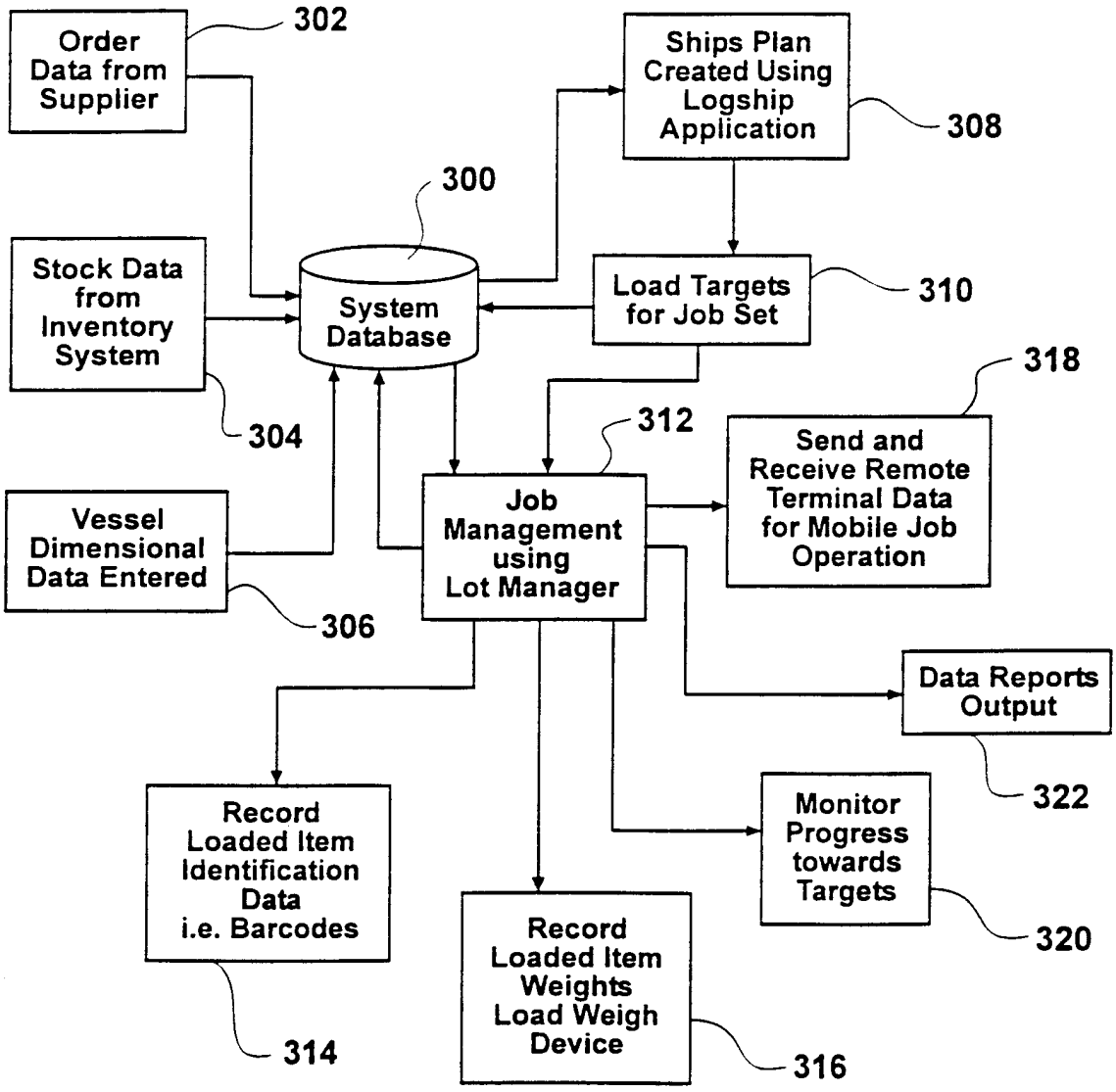

Order Data from Supplier
302
Ships Plan Created Using Logship Application
308
300
Stock Data from Inventory System
System Database
Load Targets for Job Set
310
318
304
312
Send and Receive Remote Terminal Data for Mobile Job Operation
Vessel Dimensional Data Entered
Job Management using Lot Manager
306
Data Reports Output
322
Record Loaded Item Identification Data i.e. Barcodes
Monitor Progress towards Targets
320
Record Loaded Item Weights Load Weigh Device
314
316

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ00/00058

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G06F 17/60 G06F 19/00 B65G 67/60 B65G 67/00 B63B 25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
KEYWORDS

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 93/14463 A (DURACELL INC.) 22 July 1993 Whole document	
A	WO 95/15533 A (BURKE) 8 June 1995 Whole document	
A	Derwent Abstract Accession No. D0473 D/14, Class Q35, SU 749762 A (SHVAGERUS) 28 July 1980 Whole document	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 July 2000	10 JUL 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **ROSEMARY LONGSTAFF** Telephone No : (02) 6283 2637

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ00/00058

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :

because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos : 10

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

The claim is not clear.

3. ☐ Claims Nos :

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT	International application No. PCT/NZ00/00058

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Derwent Abstract Accession No. 94-235805, Class Q35, DE 4301460 A (KARDEX ORGANISATIONSSYSTEME GMBH) Whole document	
A	Patent Abstracts of Japan, JP 08108911 A (SUZUKI SHOICHIRO TANAKA MINORU) Whole document	

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/NZ00/00058

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	9314463	AU	33208/93	EP	576646	MX	9207601
		US	5291396	US	5493491		
WO	9515533	AU	13338/95	US	5848399	US	6026377

END OF ANNEX