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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number:	WO 90/01199
G07F 7/02, G07G 1/00	A1	(43) International Publication Date:	8 February 1990 (08.02.90)

(21) International Application Number: PCT/GB89/00863

(22) International Filing Date: 28 July 1989 (28.07.89)

(30) Priority data:

8817981.7	28 July 1988 (28.07.88)	GB
8821657.7	15 September 1988 (15.09.88)	GB
8822750.9	28 September 1988 (28.09.88)	GB

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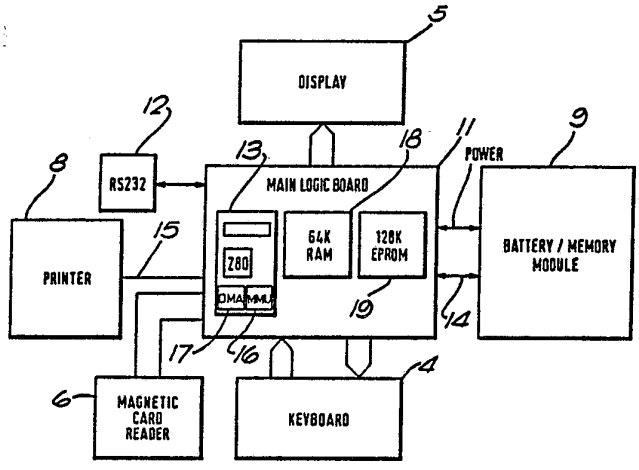
(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: TRANSACTION RECORDING APPARATUS



(57) Abstract

A transaction recording apparatus for use in for example in-flight duty free sales and other transactions on an aircraft is disclosed. The apparatus comprises a keyboard and a credit type card reader for inputting sales information and further comprises a main processor for analysing the inputted information. A printer is provided for printing inter alia sales receipts, sales summaries and stock order lists. A removable memory module is also provided and includes a memory in which information is stored and a rechargeable battery which provides power to the memory and to the recorder upon insertion therein. The module also includes a supervising and monitoring circuit for supervising the transfer of data between the memory and the main processor and for monitoring the power output from the battery.

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TRANSACTION RECORDING APPARATUS

The invention relates to a transaction recording apparatus and particularly, though not exclusively, to such an apparatus adapted for use in, for example, in-flight duty free sales and other transactions effected on an aircraft.

Customs regulations relating to the sale of duty free goods on board an aircraft are strict in that full and detailed records are required to be maintained which reveal the stock of goods held on the aircraft, the number and types of any goods being added to the existing stock, the number and nature of sales made during a flight, and so on. This is further complicated by the expectancy of passengers to be able to use any of a wide range of currencies and to be able to pay by cash or by credit card when purchasing goods and, especially where long haul flights are involved, by the aircraft calling at several different airports and undergoing several changes of cabin crew before returning to its home base. Moreover, sales incentive schemes with a commission basis are popular with crews and further increase the requirement for accurate transaction records to be maintained.

The presence of inaccuracies in stock and sales records is an area of great concern to airlines who are eager to be seen to be conforming to Customs regulations, since discrepancies in the documentation presented for inspection can result in Customs Officials grounding an aircraft until they are satisfied that the discrepancies have been accounted for. In addition, inaccurate records make successful inventory control difficult as well as causing problems when it comes to analysing the sale of various goods for promotional purposes and the like.

The present invention aims to solve the abovementioned and associated problems by providing an apparatus which inter-alia records the stock and sales of goods on board an aircraft.

According to one aspect of the invention there is provided a transaction recording computer apparatus comprising a display, a keyboard, a printer and a main computing means all provided in a housing, and wherein a computer memory means and a power supply means are provided in a module which is removably insertable into said housing to provide memory space and power to the apparatus.

According to another aspect of the invention there is provided a transaction recording apparatus for use in recording transactions made in flight on

board an aircraft for example, the transaction recording apparatus comprising means for inputting transaction data relating to sales made, data analysing means for analysing the inputted data and memory means for storing the analysed data, the memory means being arranged to be removable from the recording apparatus so that stored data can be extracted at a remote site for further analysis if required.

According to a further aspect of the invention there is provided a removable memory module for use in a transportable computer, the removable memory module comprising memory means for storing data from the computer and power means for providing power at least to the memory means to maintain the integrity of data in the memory means when it is removed from the computer.

The invention also provides an in-flight transaction recording apparatus comprising means for storing stock information relating to a stock of goods held on an aircraft;

means for storing sales information relating to goods sold on a flight;

means for calculating a bill in any of a plurality of different currencies;

means for printing receipts for goods sold;

means for recording monies received in the plurality of different currencies;

means for ordering replacement stock to replace the goods sold; and

means for providing a summary of the goods sold for further analysis.

Further inventive features are set forth with particularity in the appended claims.

The recorder is intended to be used in conjunction with bar trolleys on board an aircraft. A recorder, minus the battery/memory module, will normally be stored on a substantially permanent basis on board the aircraft and the battery/memory module will remain with the bar trolley to which it has been assigned until such time as the contents of the memory need to be examined or the battery requires recharging. In larger aircraft where there is more than one bar trolley a battery/memory module will be provided with each trolley and, advantageously, a corresponding number of recorders will remain on board the aircraft.

When the trolley is being loaded with duty free goods from a bonded customs warehouse, the battery/memory module will be loaded with corresponding data from a land based computer and will then be sealed in the trolley along with the duty free

goods. The data in the memory module might include for example item codes, the numbers of each item on the trolley, the cost of the goods in for example sterling, exchange rates, etc.

Once the bar trolley has been delivered to the aircraft and unsealed, the battery/memory module can be loaded into the recorder making it ready for use and enabling the flight number of the aircraft, the route of the aircraft, the name of a responsible member of the cabin crew, etc. to be entered in order to personalize the recorder to that particular flight and aircrew structure.

The recorder is made to be portable in order to make it more easy to use during the flight; the recorder can accompany the trolley as it is wheeled around the aircraft and sales can be entered as they are being made. Furthermore, by arranging the recorder to be internally powered, there is no drain on the resources of the aircraft. Indeed, the recorder electrics are totally isolated from the aircraft electrics.

In using the recorder, cabin crew will enter item codes and quantities corresponding to goods selected by the customer and the recorder will log the items sold, unless there are insufficient goods in stock when an appropriate warning will be given to the crew

member. Once the customer has made his selection, the total owing is displayed on the recorder's display and the customer can choose how he wishes to pay. The customer can pay by cash or credit/charge card and in any one of the numerous currencies acceptable to the airline. Once the customer has paid and his payment has been entered into the recorder a receipt will be printed by the recorder. If the customer has paid in cash the recorder will calculate how much change, if any, is due to him. If the customer pays by charge/credit card, the recorder will print an authorisation slip as part of the receipt to be signed by the customer.

With all sales completed, the recorder can be interrogated by the user to determine what stock is remaining and what quantities of goods need to be re-ordered to uplift the stock to the required levels. A printout of goods required will be provided by the recorder and this can be passed on as appropriate to order the goods. A summary of the sales can also be printed out for inspection by Customs Officials once the aircraft arrives at its destination or returns to its home base.

When all sales have been completed, orders and other documentation completed and any adjustments made to the information stored in the recorder's memory, to

account for breakages for example, the battery/memory module can be removed from the recorder and locked in the bar trolley to be returned to the customs bonded warehouse. The recorder minus battery/memory module is returned to its storage place on the aircraft.

On some flights, particularly long-haul flights, there will be a number of changes in the cabin crew using the recorder. The journey can be divided into sales sectors for the purpose of using the recorder. At the beginning of a new sales sector the recorder can be interrogated by the cabin crew to confirm that the contents of the bar trolley are in accordance with the information held in the recorder. Adjustments can be made to the information to take account of for example changes in the cabin crew at the start of a new sales sector in much the same way as when the bar trolley is first opened at the start of the journey.

Credit type cards or the like can be issued individually to the cabin crew containing information such as the holder's name and staff number and these cards can be used in a card reader provided on the recorder to input identifying information instead of having to key in the information through the keyboard.

The battery/memory module is connected to the rest of the recorder upon insertion in the recorder. A pair of connectors, one on the module and the other

inside the recorder, provide lines along which power can be transmitted from the battery and data can be transferred between the memory and the recorder. Transfer of data is supervised by a supervising processor within the battery/memory module which supervising processor converts the data into a suitable format for transmission to the processor within the recorder and converts data received into the appropriate format for storage. Data is transmitted along a serial link in order to cut down on the amount of connections between the memory module and recorder.

A controlling and monitoring circuit is also provided within the battery/memory module to supervise the output of power from the battery. The controlling and monitoring circuit will isolate the battery from all but a trickle current to retain the data in the memory in the event of a short circuit to protect both the battery from overheating and the recorder from damage from the short circuit. The controlling and monitoring circuit is also arranged to supply power to only the memory, in order to retain the data in the memory, if the power output from the battery falls below a predetermined level.

In order that the invention may be better understood an embodiment will be described, by way of

example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the recording apparatus;

Figure 2 is a perspective view showing the recording apparatus with the upper member of the case in an open position;

Figure 3 is a schematic view showing the connection between various parts of the recording apparatus;

Figure 4 is a schematic view of the parts of a battery/memory module;

Figure 5 shows part of a battery controlling circuit; and

Figure 6 shows the battery/memory module connected to a charging circuit.

Figure 7 is a flow diagram illustrating various facilities provided by the recording apparatus.

Referring to Figure 1 it will be seen that the transaction recorder generally indicated at 1 comprises an upper housing 2 and a base housing 3. The housings 2,3 should be of rugged construction and may be made from injection moulded plastics or die-cast aluminium for example, in order to withstand the rough handling that is likely during normal use on board an aircraft. It should be noted that the

recorder 1 will normally remain on the aircraft at all times and the housing is designed to be stored safely on board the aircraft when the apparatus is not in use. The showing of the transaction recorder in Figure 1 is obviously only schematic and a fuller appreciation of the form of the apparatus may be obtained from consideration of our British Registered Design No. 1053553 for "Transaction Recording Apparatus" filed 15 September 1988.

A keyboard 4 and display 5 are provided on the upper housing 2. The keyboard 4 is advantageously a waterproof membrane type keyboard capable of preventing the ingress of spilled fluids into the workings of the recorder, thereby helping to prevent damage from spilled drinks and the like. In this embodiment, the keys of the keyboard are laid out in a QWERTY format and additionally include special function keys such as currency and alternative currency keys as will be explained in greater detail hereinafter. The display 5 should be similarly waterproof and in this embodiment is a supertwist backlit liquid crystal display, displaying up to 8 lines by forty characters at a time.

A card reader 6, the track of which can be seen in Figure 1, is also provided in the upper housing 2 to enable the user to complete quickly transactions

where the customer wishes to pay by credit or charge card. The card reader is controlled by the main processor to read tracks one and/or two of any credit card being wiped through the reader from right to left or from left to right.

The upper and lower housing are hinged together at the front end 7 of the recorder 1, and a clip arrangement (not shown) to the rear of the recorder 1 holds the two housings together and enables quick access to the interior of the housing when required.

When the housing is opened, a microswitch (not shown) is actuated causing the recorder to switch on and a buzzer to sound thus indicating that the housing has been opened. In this way the users's attention is drawn to the fact that the housing has been opened and remedial action can be taken if so required. Switching the device on when the housing is opened also facilitates changing the paper roll in the printer since power will be supplied to the printer and the autofeed feature of the printer can be used to load the paper.

Turning now to Figure 2 it will be seen that a printer 8 and a battery/memory module 9 are provided within the lower housing 3 of the recorder. The printer 8 is a 26 column thermal printer and is driven directly by the main processing unit 10 located in the

upper housing 2 of the recorder 1 as will be explained hereinafter. In brief, data to be printed is loaded into the printer and under the supervision of a dedicated microprocessor within the printer the desired characters are printed onto thermally sensitive paper 10.

The battery/memory module 9 contains the batteries which power the recorder, and further contains memory which is used to store the controlling code program code for controlling operation of the recorder and to store data relating to goods stocked in the aircraft and sales made to passengers. As will be explained in greater detail hereinafter, the battery/memory module 9 is removably installable within the base housing 3 and memory and power connections therebetween are made upon insertion of the module 9 via complementary connectors in the base housing 3 and the module 9. Communication between the main processing unit and the memory is preferably via an RS232 serial interface. When the module 9 is removed from the base housing 3 all power to the main processing unit, the printer, etc., is removed, such power being derived from the batteries within the module 9. However, none of the information held in memory will be lost because all of the volatile memory is located within the module 9 which continues to be

powered by the batteries. Thus, when the module 9 is reinserted into the same or another recorder, the controlling program will recommence operation from the same place it was at when the module 9 was removed. In the event that the module is removed in the middle of an operation it is possible that information being stored in the memory at the instant that the module 9 was removed will be lost. However, the manner in which the program operates when the module is reinserted will make it clear to the operator that the module was removed mid-operation and remedial action, for example reperforming the interrupted operation, can be taken by the operator.

The main processor 10 can be reconfigured to behave as an interface between the battery/memory module 9 and a standard personal computer (PC) or any other suitable central processing system. By reconfiguring the main processor as an interface, information relating to sales and remaining stock can be quickly uploaded to the PC from the memory module 9 via a serial port connected to a jack socket 12a at the rear of the upper housing. In addition, new stock information can be downloaded into the memory if the module is to be used next on a different aircraft holding a different stock of goods.

The batteries in the battery/memory module are

rechargeable and the charging circuit (to be described hereinbelow) and the abovementioned PC can be arranged such that information can be uploaded and downloaded to and from the PC whilst the batteries are being recharged.

Operation of the recorder 1 and the interaction between the various parts which combine to make up the recorder will now be described in greater detail.

Referring now to Figure 3 the main processor 10 comprises a main logic board 11, a serial port 12, a display 5, a keyboard 4 and a magnetic card reader 6. The removable battery/memory module 9 and the printer 8 are connected via respective serial links 14,15 to the main logic board 11.

The main logic board 11 is the heart of the recorder and is based upon a Hitachi HD 64180 processor chip 13 which is derived from the Z80 processor with additional built-in memory management and direct memory access facilities 16 and 17. It will of course be appreciated that the invention can be realised equally well using any one of the many readily available microprocessor devices, the Hitachi device being cited only by way of example. The operating system, such as CP/M, requires an area of memory in which to create its own working environment and accordingly a RAM memory 18 is included on the

board 11 to provide environmental space for the operating system. A plug-in EPROM 19 is also included on the board 11 for optionally storing high level language programs, diagnostic programs and the like. Alternatively such programs may be stored in the battery/memory module 9.

When the apparatus is in use, data is transferred between the various components of the system shown in Figure 3. The keyboard is scanned using known methods and data retrieved therefrom is analysed by the processor 13 on the main logic board 11 and appropriate action is taken. Some of the keys on the keyboard are special function keys which when pressed will result in the processor performing predetermined tasks such as for example providing data for a printout of the stock currently held on the plane; preparing for printing of a receipt for goods sold; compiling data for printing an order sheet of more goods to be delivered; preparing for printing of customs documents; displaying menus of user selectable tasks; and so on.

When data is to be printed out the printer 8 is switched on under the control of the main logic board 11. The printer may be any one of a wide range of proprietary models of thermal printers which are currently available. The preferred printer is an

Enertec Alphagraph 2600 interfaced to the processor 13 by way of an 8038 microcontroller device and hybrid devices provided by the printer's manufacturer. The printer allows for either single or double ply paper to be used as the receiving medium for the printed information and it is envisaged that either type of paper may be adopted by the airline when using the device depending on the airlines internal operations procedures.

Provision of a microcontroller device allows for greater flexibility in controlling the printer since the microcontroller is able to select preferred features of the printer as and when the features are required under the control of the main processor 13. The ability to turn the printer off when not required is another advantage because the printer will not draw power from the batteries when information is not being printed. The microcontroller and hybrid devices also deal with conversion of the data from the format in which it is stored in memory and used by the main processor 13 into a format suitable for driving the printheads. For example data may be stored in ASCII format and this will have to be converted into the pixel format used by the printer to create the printed characters.

The serial port 12 can be used to connect the

main logic board 11 to, for example, another computer via the jack socket 12a at the rear of the upper housing. The serial port provides a link between the various components and another computer and is used to download data into the memory when a module is being prepared prior to a flight and to upload data from the memory to the computer for further analysis at the end of a journey.

Referring to Figure 4 it will be seen that the battery/memory module 9 can be regarded as being divided into two discrete areas, namely the power supply area 20 and the memory area 21. The memory area 21 is provided with a supervising processor 22 which is used to oversee the transfer of data from the memory to the main logic board 11. In order to simplify communication between the memory and the processor 13 on the main logic board, the supervising processor 22 is advantageously the same type as processor 13, namely a Hitachi HD 64180 processor chip.

The supervising processor 22 provides a degree of intelligence in the memory area 22 and reduces the likelihood of failure in the transfer of data between the memory and the main logic board 11 via the serial communication link 14.

In order to keep down the number of ancillary

components associated with the supervising processor 22, the memory mapping is arranged in an elementary fashion using the full address space of the processor 22. The processor is arranged to address four fields or blocks of memory. One address block is reserved for ROM 23 and RAM 24 which are used to store the supervising routines performed by the processor 22. The three remaining address blocks of the processor 22 are used for storing stock and sale data. The first two of these blocks are used to address static RAM (SRAM) devices 25 and 26. The final address block is normally left unassigned but may be used to address a further SRAM or EPROM device 27 if necessary. The SRAM or EPROM 27 may be used for example to replace the EPROM 19 on the main logic board 11.

The supervising processor 22 communicates with the main processor 13 via the serial communication link 14, the processors preferably being configured to provide asynchronous serial data to be transmitted via an RS 232 link running at 19.2Kbaud. Inverters are preferably provided on the serial link to protect the processors from damage by excessive voltages in the event of a fault developing.

The power supply area 20 of the battery/memory module 9 includes a 24 volt rechargeable source 28 and controlling and monitoring circuitry 29 which controls

and monitors the supply of power to the other parts of the recorder via power lines 30,31. The power lines 30,31 and the serial communication lines 14 connect to the other parts of the recorder via a five-way connector when the battery/memory module is inserted into the base housing 3. The source 28 consists of two 12v, 0.8Ah sealed lead acid batteries in series, feeding the controlling and monitoring circuity 29 which provides short circuit protection and a shut down function in the event that the voltage output falls below a predetermined level.

The preferred thermal printer 8 requires the positive rail of the 24 volt battery to be able to deliver high current pulses of the order of 5 to 7 amps for about 5mseconds when printing a solid black line. However, this is the maximum demand likely to be placed on the battery during normal operation and providing a power source with an impedance low enough for this demand without some form of protection could present a serious hazard in terms of damage to components of the recorder in the event of an accidental short circuit. The controlling circuit 29 is therefore made to be capable of distinguishing between a legitimate short 7 amp pulse drawn by the printer 9 and a 30 to 40 amp demand of significantly larger duration drawn under short circuit conditions.

Figure 5 shows the controlling and monitoring circuit 29 in greater detail. Increasing current is drawn from the batteries until a predetermined maximum is reached. The maximum current is determined by the voltage drop across the parallel resistors 32-35 which is seen at the base of transistor 36. These resistors are typically less than one ohm and the resistance of the boards copper track interconnecting these resistors may also contribute to the actual voltage drop which is seen at transistor 36.

As the current being delivered by the batteries 28 increases to around 6 to 7 volts, the voltage drop will similarly increase to around 0.55 volts turning transistor 36 on. As transistor 36 turns on MOSFET transistor 37 is turned off so that the voltage drop across it increases. To avoid transistor 37 being destroyed by the power that it would be required to dissipate, resistor 38 is arranged to shut down transistor 37 quickly when the voltage drop across it exceeds a relatively safe working limit. The safe working limit is typically between 0.5 and 3.5 volts depending upon the current passing through the MOSFET transistor. In order to maintain a trickle current sufficient only to supply power to the controlling processing and memory 25-27, MOSFET transistor 39 and resistor 40 are provided in parallel with resistors

32-35 and transistor 37. Resistor 40 is typically around 500 ohms and this limits the current that can pass through transistor 39, typically to less that 50 A. When the cause of the short circuit is removed, current can again flow through transistor 37 thus allowing the recorder to operate normally.

Power is delivered from the batteries directly to the main logic board 11 as a 24 volt supply and a 5 volt supply is derived from the 24 volt supply by way of a voltage converter circuit on the main logic board.

The 5 volt supply is used to power part of the logic circuity on the main logic board 11 the display 5 and printer 8. It is also routed back into the battery/memory module 9 via line 40 in Figure 4 where it is used to power the low voltage logic of the controlling and monitoring circuitry 29. Of course, there is no reason why the voltage converter circuit could not be included within the battery/memory module its exact location being determined as a matter of convenience when designing the layout of the circuit boards.

The control and monitor circuit 29 is also arranged to protect the integrity of data held in the memory by making it virtually impossible to completely discharge the batteries 28. As long as the voltage

output from the batteries is greater than about 16 to 17 volts transistor 41 will remain switched on by the voltage between resistors 42 and 43 and transistors 37 and 39 will also remain on. However, if the battery voltage falls below about 16 or 17 volts, the voltage between resistors 42 and 43 will fall to a level insufficient to maintain channel conduction in transistor 41 and said transistor will turn off. As a result of transistor 41 turning off transistors 37 and 39 will also turn off and this prevents further discharge of the batteries. Normally, the remaining power stored in the batteries 28 is sufficient to maintain the integrity of the data stored in the memory until such time as the batteries are recharged or an alternative power source is provided to facilitate extraction of the data.

A flying lead is provided within the housing to enable the batteries from another battery/memory module to be used to power the recorder in the event that the batteries in the original module become exhausted of power in the above described manner. The flying lead includes at one end a male connector which plugs into a female connector provided on the body of the battery/memory module. The other end of the flying lead is connected to the main logic board so that 24 volts is supplied to the voltage converter

circuit for conversion thereby to 5 volts as described hereinabove.

The batteries are charged in a charging rack arranged to receive the battery/memory module. The charging circuit in the charging rack comprises a charger regulator circuit 46 and a charger power supply 45 as shown in Figure 6. The battery connector 47 couples with a complementary connector 48 to complete the circuit between the regulator 46 and battery 9. The charger power supply comprises a mains transformer with a nominal voltage of 27 volts RMS. A bridge rectifier rectifies the output of the transformer and a reservoir capacitor smooths the rectified output. The regulator circuit provides an indication of the state of charge of the battery/memory modules by way of for example light emitting diodes which light to show that the modules are discharged or fully charged.

It should be noted that connector 47 in the charger is the same type of connector as that provided in the base housing 3 in order to ensure that the battery/memory module can be easily transferred between the charger and the base housing.

Returning to Figure 5, charging current will normally pass through MOSFET transistor 37 in the reverse direction to that in which current is

delivered from the batteries unless the battery is particularly flat, in which case transistor 37 will be switched off. If transistor 37 is off, current will initially bypass it via diode 50 until such time as sufficient voltage appears between resistors 42,43 to switch transistor 37 on.

Power to back up the memory is supplied to the SRAM devices from the batteries via a supervisor chip 51 such as a MAX 691 for example. The 24 volt output from the batteries is supplied via resistor 52 and diode 53 arranged to provide a current drain of around 70 A to the supervisor 51. The 5 volt supply VCC from the main logic board 11 is also supplied to the supervisor 51 which identifies which input is greater and switches the greater output through to the VCC lines of the memory chips 25,26,27.

The supervisor 51 constantly monitors VCC. If VCC falls below about 4.7 volts the supervisor 51 sends a RESET signal to the supervising processor 22. The chip enable output of the supervising processor 22 is simultaneously inhibited to prevent any further selection of RAM addresses. When VCC rises above about 4.7 volts the RESET signal is removed so that normal operation can recommence.

The supervisor 51 also constantly monitors operation of the supervising processor 22 by way of

line WDI to ensure that the processor is operating correctly. The processor 22 is programmed to output a signal to line WDI at least every 1.6 seconds. If a signal does not appear on WDI within 1.6 seconds the supervisor 51 will send a RESET signal to the processor 22 causing it to be reset.

The printer 8 in the base housing 3 is an off-the-shelf thermal printer capable of printing 7.5 lines of 26 columns per second. Print data is output from the main processor 13 under the supervision of the main processors BIOS (Basic Input Output System) which converts the print data from character form to pixel form.

The printer control circuitry is again microprocessor based and is arranged to switch on only when data is to be printed in order to conserve power in the batteries.

In order to reduce electromagnetic interference from the recorder and to meet FCC regulations part 15 much of the circuitry is shielded by electrical ground planes in the form of grounded metal plates and the like, and ferrite beads are inserted on lines at strategic locations within the various circuits.

As previously mentioned, the recorder as above described is intended to be used in conjunction with bar trolleys on board an aircraft. A recorder, minus

the battery/memory module, will normally be stored on a substantially permanent basis on board the aircraft and the battery/memory module will remain with the bar trolley to which it has been assigned until such time as the contents of the memory need to be examined or the battery requires recharging. In larger aircraft where there is more than one bar trolley a battery/memory module will be provided with each trolley and, advantageously, a corresponding number of recorders will remain on board the aircraft.

When the trolley is being loaded with duty free goods from a bonded customs warehouse, the memory module will be loaded with corresponding data from a land based computer and will then be sealed in the trolley along with the duty free goods. The data in the memory module might include for example item codes, the numbers of each item on the trolley, the cost of the goods in for example sterling, exchange rates, etc.

Once the bar trolley has been delivered to the aircraft and unsealed, the battery/memory module can be loaded into the recorder making it ready for use and enabling the flight number of the aircraft, the route of the aircraft, the name of a responsible member of the cabin crew, etc. to be entered in order to personalize the recorder to that particular flight

and aircrew structure.

There are thus three distinct operational stages: a first stage in which a record is made in a separated battery/memory module of the contents of a bar trolley whilst the trolley is being loaded in the customs bonded store; a second stage in which the battery/memory module is incorporated in the recorder to enable transactions and movement of goods on board an aircraft to be recorded; and a third stage in which the battery/memory module is removed from the recorder and is returned with the bar trolley to the bonded store for analysis of the recorded transactions and for replacement stock to be ordered. In the first and third of these operations, when the battery/memory module is separated from the recorder on the aircraft, the battery/memory module can be accessed by any suitable computer system (possibly even including another recorder) ano no further description will be given of this. Whilst the battery/memory module is on the aircraft and in use in the recorder, the recorder operates in a manner which will now be described in detail with reference to Figure 7.

The battery/memory module will have been previously recharged and sales information etc. relating to the previous flight removed from the memory. The recorder resident on the aircraft is

loaded with the battery/memory module and when the recorder is switched on the display will show an initial menu through which the operating cabin crew members can sign on by swiping an identity card through the card reader or keying in their staff number and name. The serial number of the bar trolley is also inserted at this stage as is information relating to alternative currencies which will be accepted as payment for goods during the flight.

Thus, stock, currency and/or price information is first loaded into the battery/memory module by a responsible member of the cabin crew such as the Purser. As can be seen in Figure 7, the Purser must first sign-in to the memory by entering his staff number and his name as shown in box 60. This can be achieved by running a magnetic credit type card through the card reader 7 or by inputting the information through the keyboard 4 in response to questions displayed on the display screen 5. Next, flight information (i.e. the date, flight number, flight route and also the types of currency which passengers are likely to want to use) is input via the keyboard as shown in box 61.

Bar trolleys normally contain a standard range and quantity of goods and the opening stock list i.e. the stock of goods initially on the bar trolley is

checked at 62 to see that it accords with the goods actually on the trolley and the stock is uplifted so that the trolley contains the standard range and quantity of goods. If the stock does not accord with the standard range, adjustments to the data stored can be made at 63 and 64 so that the recorded data reflects the actual stock held. Similarly if the goods delivered to uplift the bar is lacking in certain lines this can be entered at 65,66 accordingly.

The contents of the bar trolley are again checked against the information stored in the memory to ensure that they tally. If there is a discrepancy a responsible member of staff can amend the stored stock information accordingly.

The full journey of the aircraft may be divided into a number of sectors on a long haul flight with changes of cabin crew and restocking of the bar trolleys between each sector of the journey. The recorder is programmed to enable a record to be made of charges of cabin crew and additions to the bar trolley stock between sectors.

As represented in stages 67 to 69 of Figure 7, sales are actioned by keying in an item code, which results in the recorder displaying the price and value in say sterling and an alternative currency. The

total sale value can be displayed and paid in a mixture of currencies with the system responding with the remaining balance in sterling and the nominated currency. On completion of the sale a receipt can be obtained from the printer.

At any time during the sales cycle the balance can be paid by Credit/Charge card. The card is inserted into the card reader and two copies of the receipt are automatically printed. One copy the customer signs and is retained by the cabin crew and the other copy is retained by the customer. The recorder can carry out checks on the Card Number and the Start/End Dates as required by the individual companies and display appropriate error messages. If the card reader fails to read the card correctly a special Function key can be used and the relevant information keyed in.

As part of sales promotions, discount cards or coupons are sometimes presented to customers for use in buying goods at a discounted price.

If a Discount Coupon is presented by a customer as partial payment for goods a preprogrammed Function key is pressed and the discount value is entered together with the identity of the coupon. The recorder will deduct the coupon value from the total sales value and display the balance to be paid.

In addition, the recorder is arranged to account for complementary issues of goods to customers and breakages so that all goods originally stocked in the bar trolley can be accounted for at the end of a journey.

At any time, a list of the current stock, the items sold and currency exchange rates can be printed out for inspection by the cabin crew, customs officials, etc. A new stock of goods can thus be ordered enabling the bar trolley to be topped up without having to go through the formalities of closing the bar beforehand. This is shown in boxes 70-74 of Figure 7.

At the end of the journey, or at a time when the sales are completed 75 the bar trolley is closed 76 and a summary of sales transactions can be both for use by the cabin crew 78 and 79 in a form acceptable to customs authorities 80. A sales account showing the total monies received in each currency is also produced for use by the cabin crew 81-83.

Once the bar has been closed a function on the menu enables the cabin crew to key in the amount of each currency held in the cash box and obtain a conversion to sterling. This function assists with the cashing up and the sterling total obtained should be the same as the combined cash totals of the

retained Sales Accounts.

A further function available from the initial menu, permits the Cabin Services Director or other supervisor to collate the Sale Totals from each of the bars and, after swiping each cabin crew members Identification Card through the card reader, the function provides a printout detailing the amount of commission payable to each cabin crew member on that aircraft for that sales sector. This information is stored for subsequent analysis.

Having completed these functions the recorder is switched off and the battery/module is removed. The module is replaced in the bar trolley together with a final Contents List and the bar trolley is locked and sealed with Customs Seals.

During the third stage of operation, once the trolley has been returned to the bonded stored, the memory module is removed from the trolley and the stored information is uploaded into a PC or other central processing system. The Final Count of the inventory in the bar trolley is keyed into a separate device on arrive in the Bonded Store and is also uploaded for analysis. The final contents of the bar are compared with the standard stock level for that Bar Type and a Bar Top Up List produced for the next journey.

CLAIMS:

1. A transaction recording computer apparatus comprising a display, a keyboard, a printer and a main computing means all provided in a housing, and wherein a computer memory means and a power supply means are provided in a module which is removably insertable into said housing to provide memory space and power to the apparatus.

2. A transaction recording computer apparatus according to claim 1 in which programs to be executed by the main computing means are adapted to be stored within the memory means, and the power supply means provides power to the memory means when the module is removed from said case.

3. A transaction recording computer apparatus according to claim 1 or claim 2 in which operation of the memory means and the power supply means is controlled by a supervising processing means in the module.

4. A transaction recording computer apparatus according to claim 3 in which the supervising processing means is adapted to communicate with the

main computing means to supervise the exchange of information between the main computing means and the memory means.

5. A transaction recording apparatus for use in recording transactions made in flight on board an aircraft for example, the transaction recording apparatus comprising means for inputting transaction data relating to sales made, data analysing means for analysing the inputted data and memory means for storing the analysed data, the memory means being arranged to be removable from the recording apparatus so that stored data can be extracted at a remote site for further analysis if required.

6. A transaction recording apparatus according to claim 5 in which the memory means includes power means for maintaining power to the memory means when the memory means is removed from the apparatus.

7. A transaction recording apparatus according to claim 5 or 6 in which the memory means includes supervising means for monitoring the power delivered by the power means and supervising transfer of data from the memory means to other parts of the recording apparatus.

8. A transaction recording apparatus according to claim 5 or 6 or 7 in which the memory means is arranged to store information relating to an initial stock of goods held on board an aircraft.

9. A transaction recording apparatus according to any of claims 5 to 8 in which the memory means is arranged to store information relating to goods sold during a flight.

10. A transaction recording apparatus according to any of claims 5 to 9 further comprising currency conversion means to enable transactions to be performed in any of a plurality of different currencies.

11. A transaction recording apparatus according to any of claims 5 to 10 further comprising input means for inputting data from a magnetic charge or credit card, smart card, or the like

12. A transaction recording apparatus according to any of claims 5 to 11 further comprising printing means, including controlling means for controlling the printing means, for printing out information based on

data stored in the memory means.

13. A transaction recording apparatus according to claim 12 in which the analysing means is arranged to assemble data for printing of a receipt at the end of a transaction.

14. A transaction recording apparatus according to claim 7 or any of claims 8 to 13 as dependent thereon, in which the supervising means is arranged to detect a short circuit and to isolate the power means in response thereto.

15. A transaction recording apparatus according to claim 7 or any of claims 8 to 14 as dependent thereon in which the supervising means is arranged to detect power from the power means falling below a predetermined level and to isolate the power means from all but the memory means in response thereto.

16. A transaction recording apparatus according to claim 6 or any of claims 7 to 15 as dependent thereon, in which the power means comprises a rechargeable battery.

17. A transaction recording apparatus according to

claim 16 in which the rechargeable battery is rechargeable via the supervising means.

18. A removable memory module for use in a transportable computer, the removable memory module comprising memory means for storing data from the computer and power means for providing power at least to the memory means to maintain the integrity of data in the memory means when it is removed from the computer.

19. A removable memory module according to claim 18 further comprising supervising means for supervising the transfer of data between the memory means and the computer.

20. A removable memory module according to claim 18 or 19 further comprising power monitoring means for monitoring the power means and limiting the power output therefrom in the event of an unacceptable increase in power output.

21. A removable memory module according to claim 20 in which the power monitoring means directs power only to the memory means in the event that the power output from the power means falls below a predetermined

level.

22. A removable memory module according to any of claims 18 to 21 in which the power means comprises rechargeable batteries.

23. A removable memory module according to claim 22 in which the rechargeable batteries are arranged to be recharged under the supervision of the supervising means.

24. A removable memory module according to any of claims 19 to 23 in which the supervising means comprises a processor which interfaces the memory means to the computer.

25. An in-flight transaction recording apparatus comprising means for storing stock information relating to a stock of goods held on an aircraft;

means for storing sales information relating to goods sold on a flight;

means for calculating a bill in any of a plurality of different currencies;

means for printing receipts for goods sold;

means for recording monies received in the plurality of different currencies;

means for ordering replacement stock to replace the goods sold; and

means for providing a summary of the goods sold for further analysis.

26. An in-flight transaction recording apparatus according to claim 25 further comprising means for completing transactions by way of a credit or charge card, smart card, or the like.

27. An in-flight transaction recording apparatus substantially as herein described with reference to the accompanying drawings.

28. A removable memory module substantially as herein described with reference to Figures 4 to 6 of the accompanying drawings.

29. A method of recording in-flight transactions substantially as herein described with reference to Figure 7 of the accompanying drawings.

FIG. 1

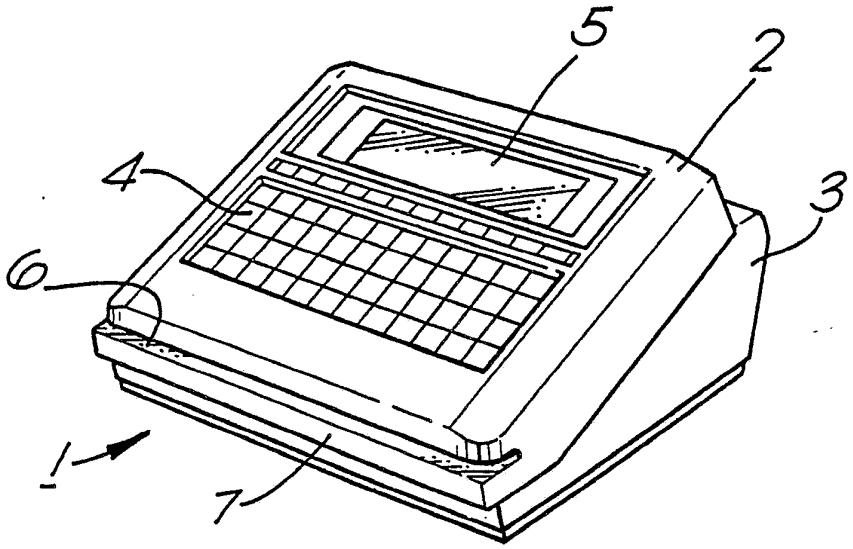


FIG. 2

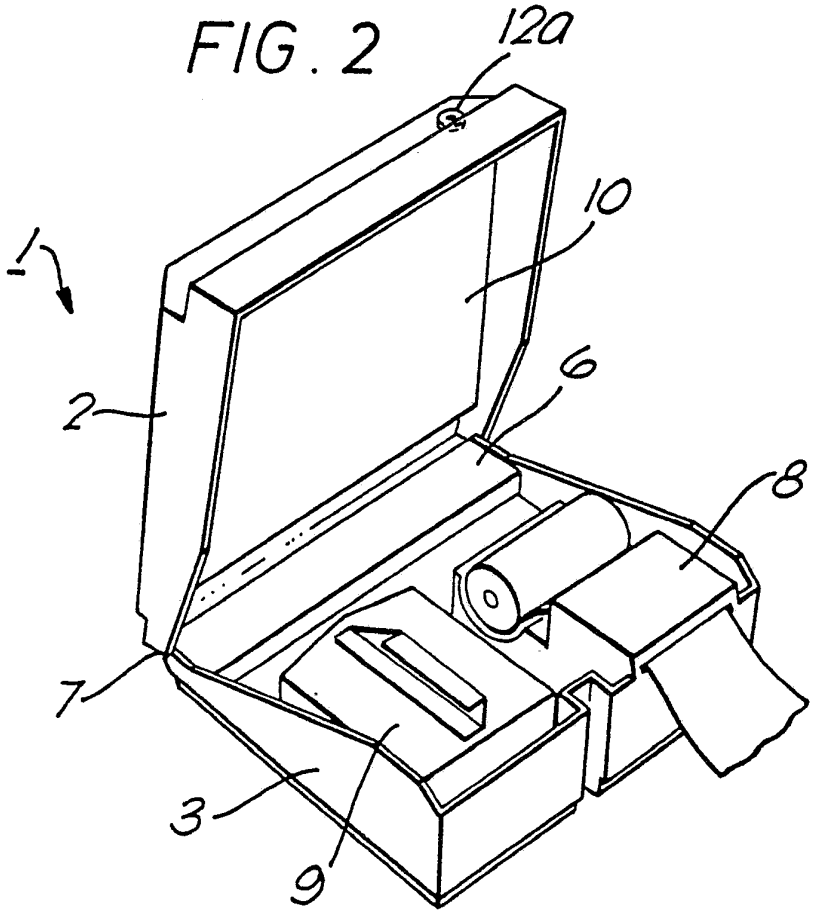


FIG. 3

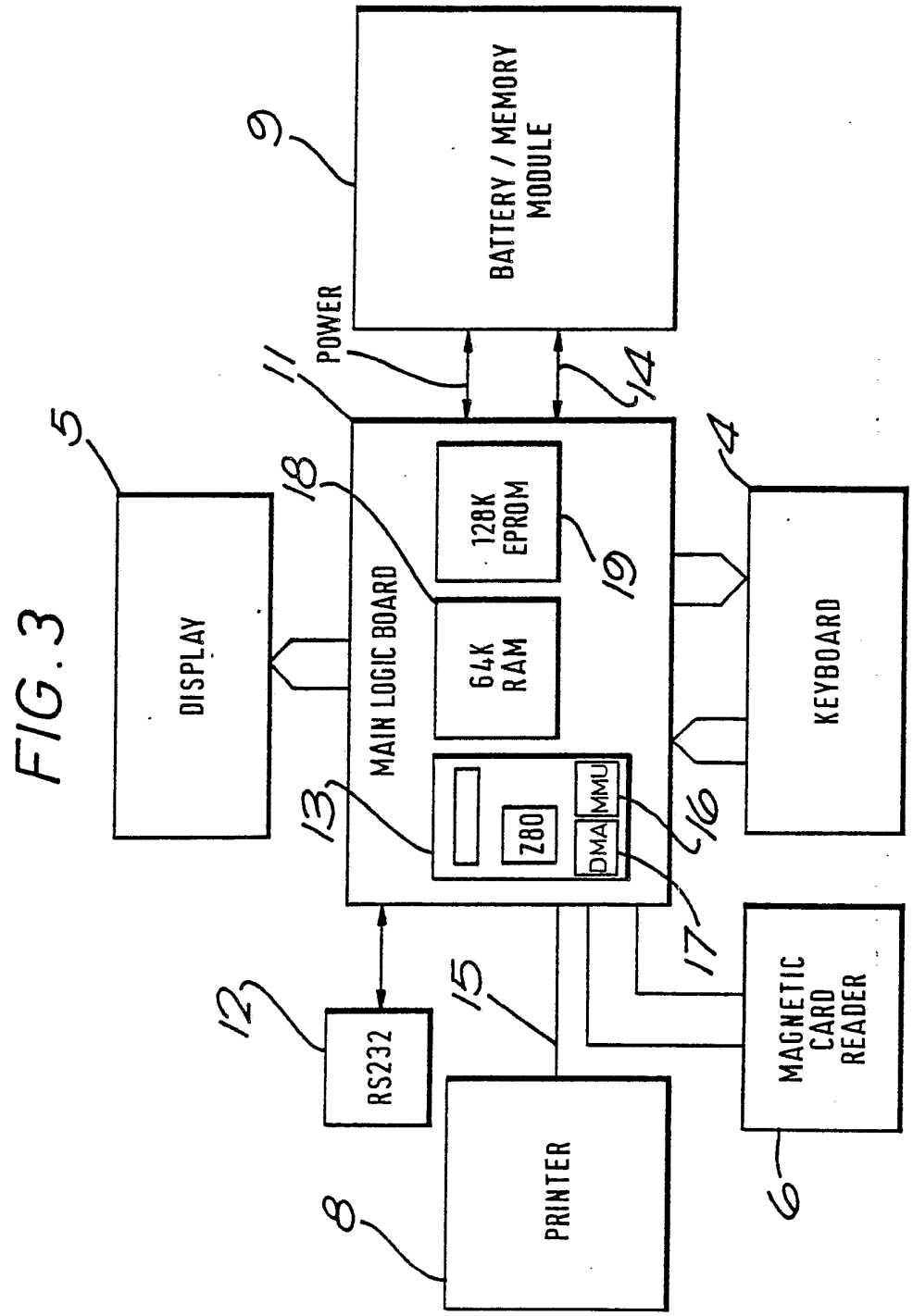
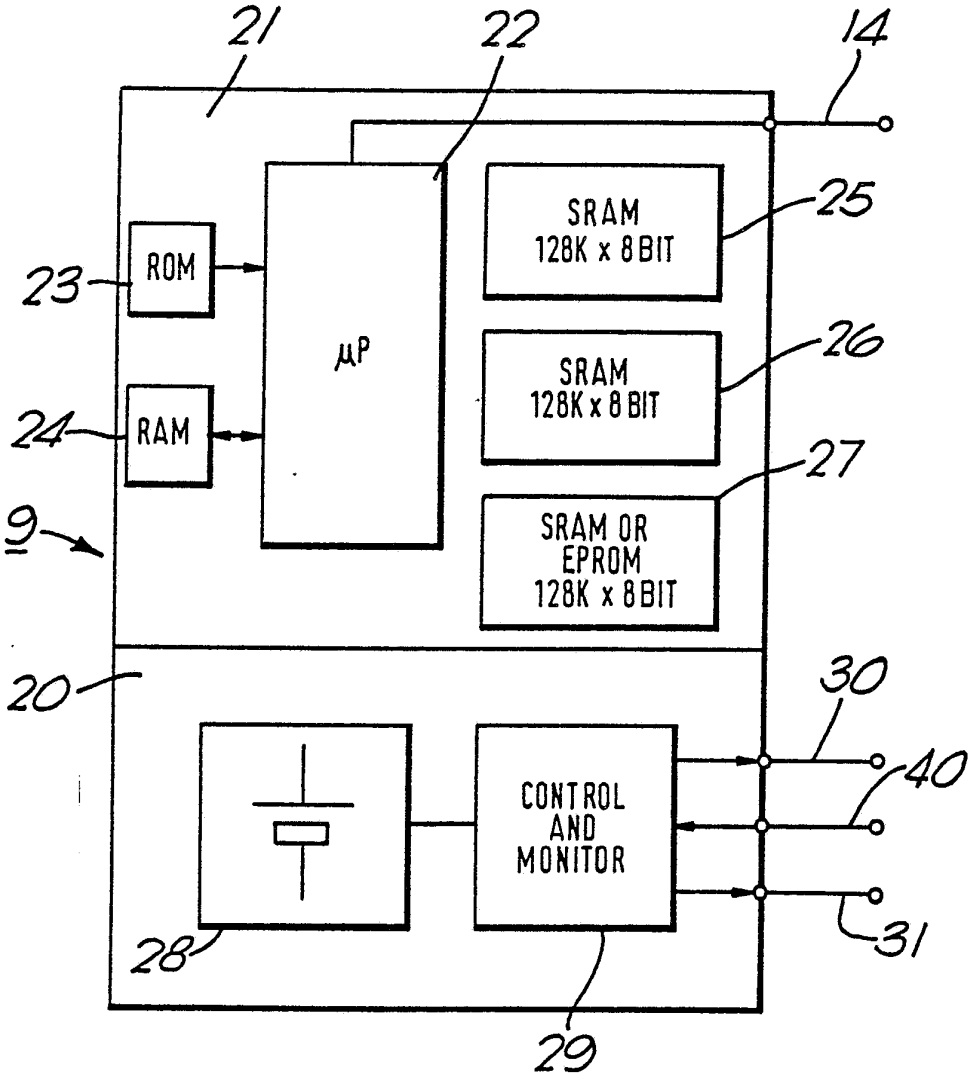

BATTERY / MEMORY MODULE
9
POWER
11
14
MAIN LOGIC BOARD
128K EPROM
19
64K RAM
18
Z80
DMA
MMU
13
16
17
DISPLAY
5
KEYBOARD
4
RS232
12
PRINTER
8
15
MAGNETIC CARD READER
6

FIG. 4


21
22
14
ROM
23
RAM
24
μP
SRAM
128K x 8 BIT
25
SRAM
128K x 8 BIT
26
SRAM OR
EPROM
128K x 8 BIT
27
9
20
30
40
CONTROL
AND
MONITOR
31
28
29

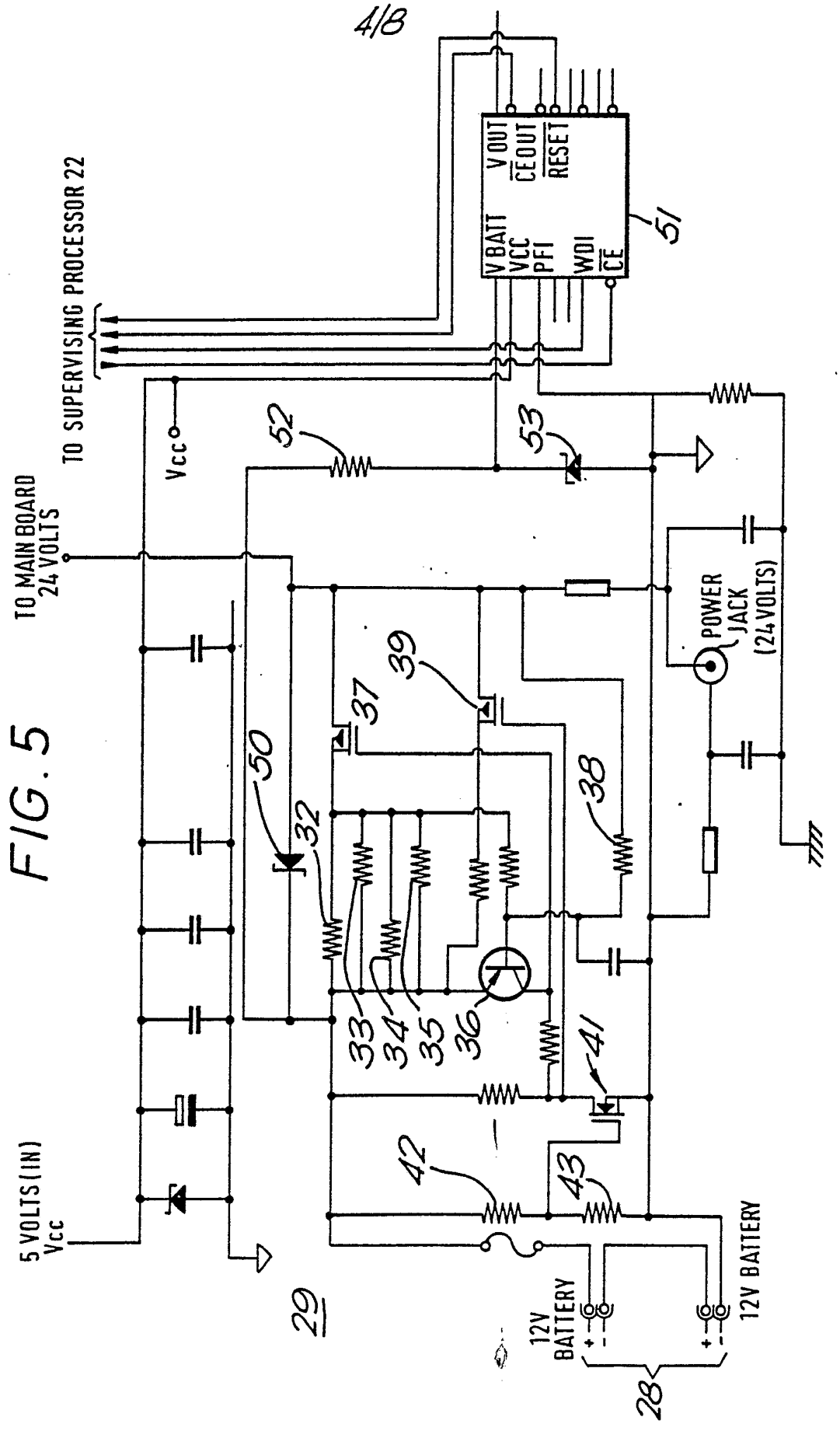

4/8
V OUT
CE OUT
RESET
V BATT
VCC
PFI
WDI
CE
51
TO SUPERVISING PROCESSOR 22
Vcc
52
53
TO MAIN BOARD 24 VOLTS
POWER JACK (24 VOLTS)
39
37
50
32
38
33
34
35
36
41
42
43
5 VOLTS (IN) Vcc
29
12V BATTERY
12V BATTERY
28

FIG. 5

FIG. 6

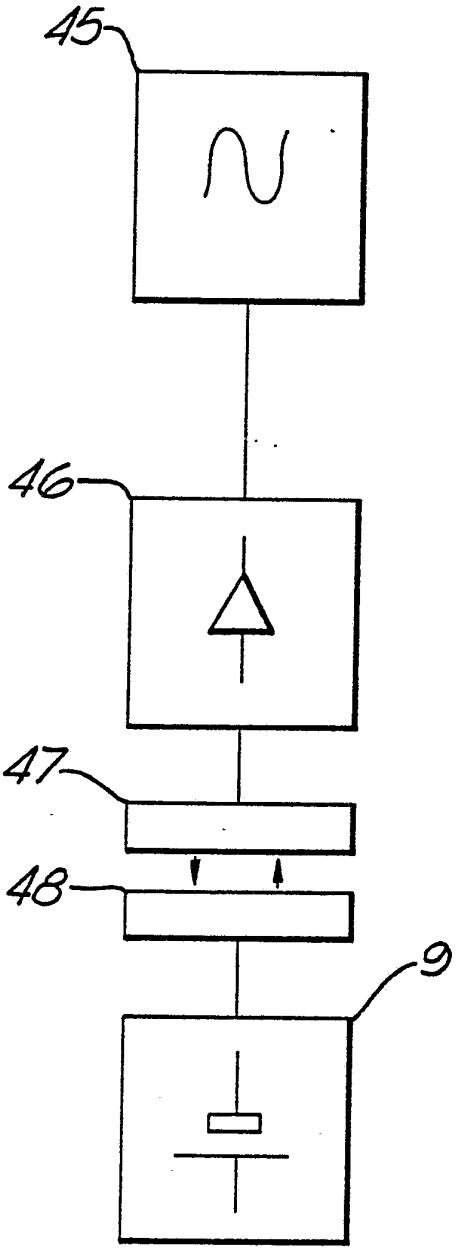
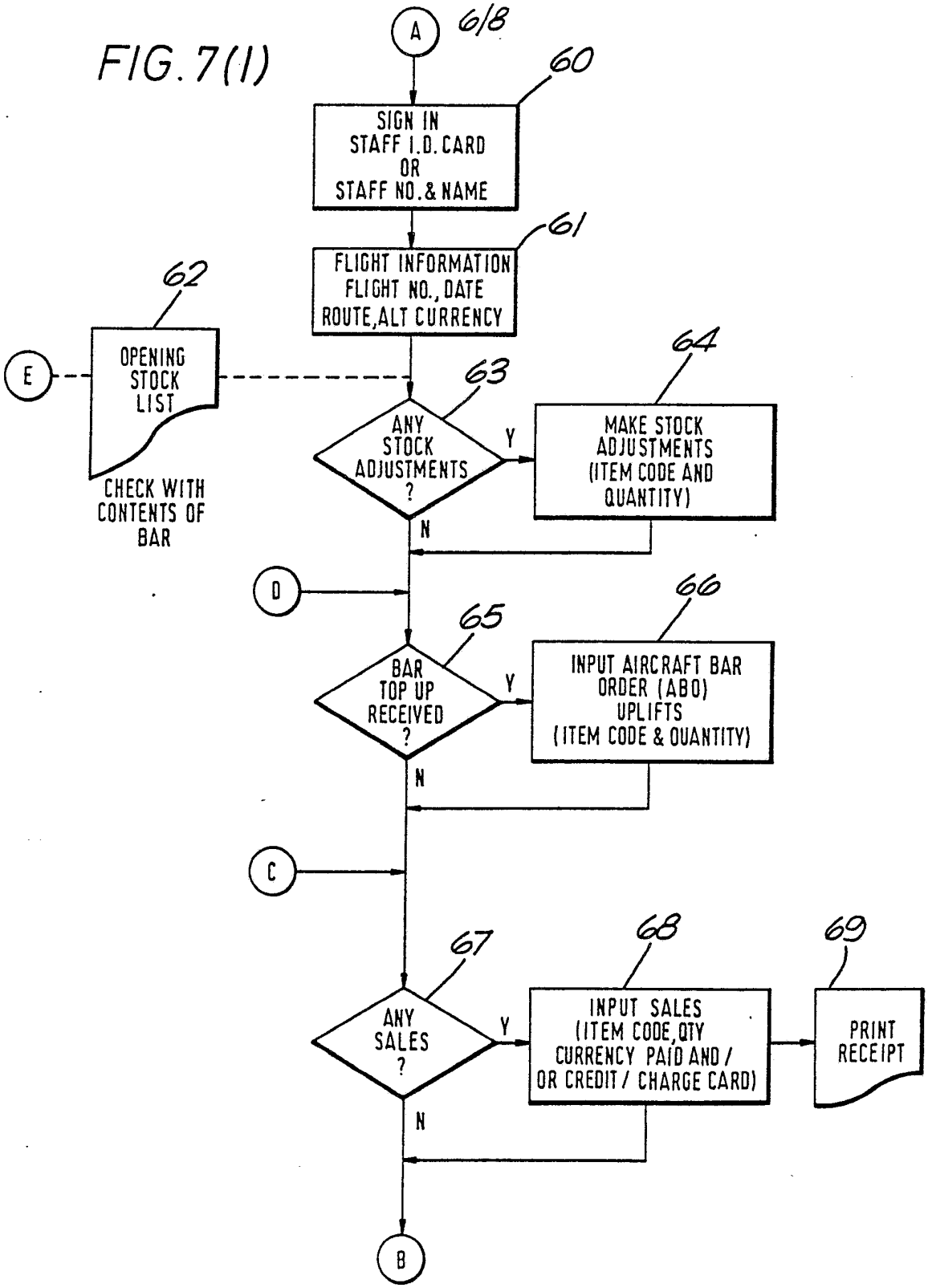


FIG. 7(1)


A
6/8
60
SIGN IN
STAFF I.D. CARD
OR
STAFF NO. & NAME
61
FLIGHT INFORMATION
FLIGHT NO., DATE
ROUTE, ALT CURRENCY
62
E
OPENING
STOCK
LIST
CHECK WITH
CONTENTS OF
BAR
63
ANY
STOCK
ADJUSTMENTS
?
Y
64
MAKE STOCK
ADJUSTMENTS
(ITEM CODE AND
QUANTITY)
N
D
65
BAR
TOP UP
RECEIVED
?
Y
66
INPUT AIRCRAFT BAR
ORDER (ABO)
UPLIFTS
(ITEM CODE & QUANTITY)
N
C
67
ANY
SALES
?
Y
68
INPUT SALES
(ITEM CODE, QTY
CURRENCY PAID AND /
OR CREDIT / CHARGE CARD)
69
PRINT
RECEIPT
N
B

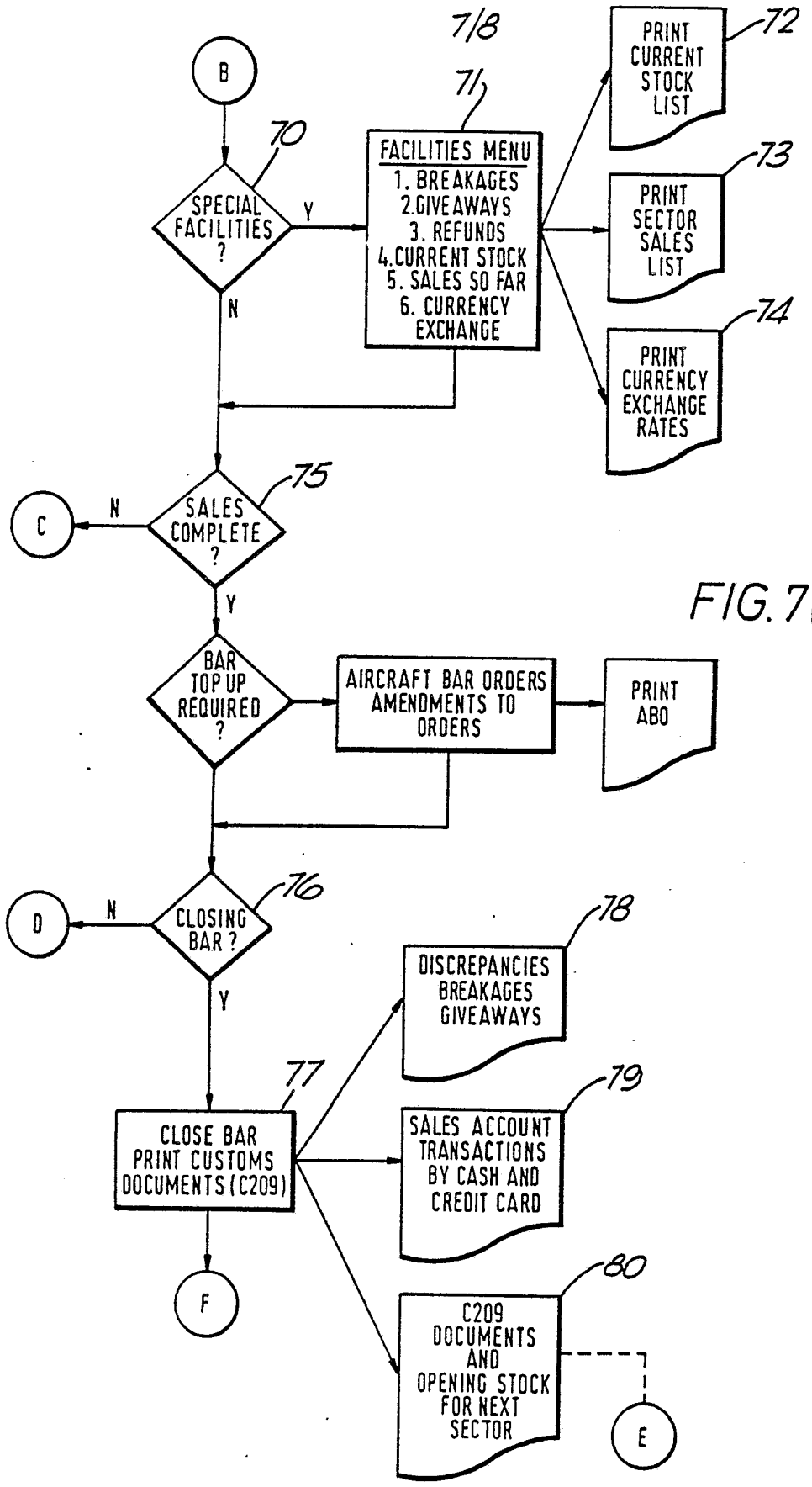

7/8
B
70
SPECIAL FACILITIES ?
Y
N
71
FACILITIES MENU
1. BREAKAGES
2.GIVEAWAYS
3. REFUNDS
4.CURRENT STOCK
5. SALES SO FAR
6. CURRENCY EXCHANGE
72
PRINT CURRENT STOCK LIST
73
PRINT SECTOR SALES LIST
74
PRINT CURRENCY EXCHANGE RATES
75
SALES COMPLETE ?
N
C
Y
BAR TOP UP REQUIRED ?
AIRCRAFT BAR ORDERS AMENDMENTS TO ORDERS
PRINT ABO
76
CLOSING BAR ?
N
D
Y
77
CLOSE BAR PRINT CUSTOMS DOCUMENTS (C209)
78
DISCREPANCIES BREAKAGES GIVEAWAYS
79
SALES ACCOUNT TRANSACTIONS BY CASH AND CREDIT CARD
80
C209 DOCUMENTS AND OPENING STOCK FOR NEXT SECTOR
F
E

FIG. 7(II)

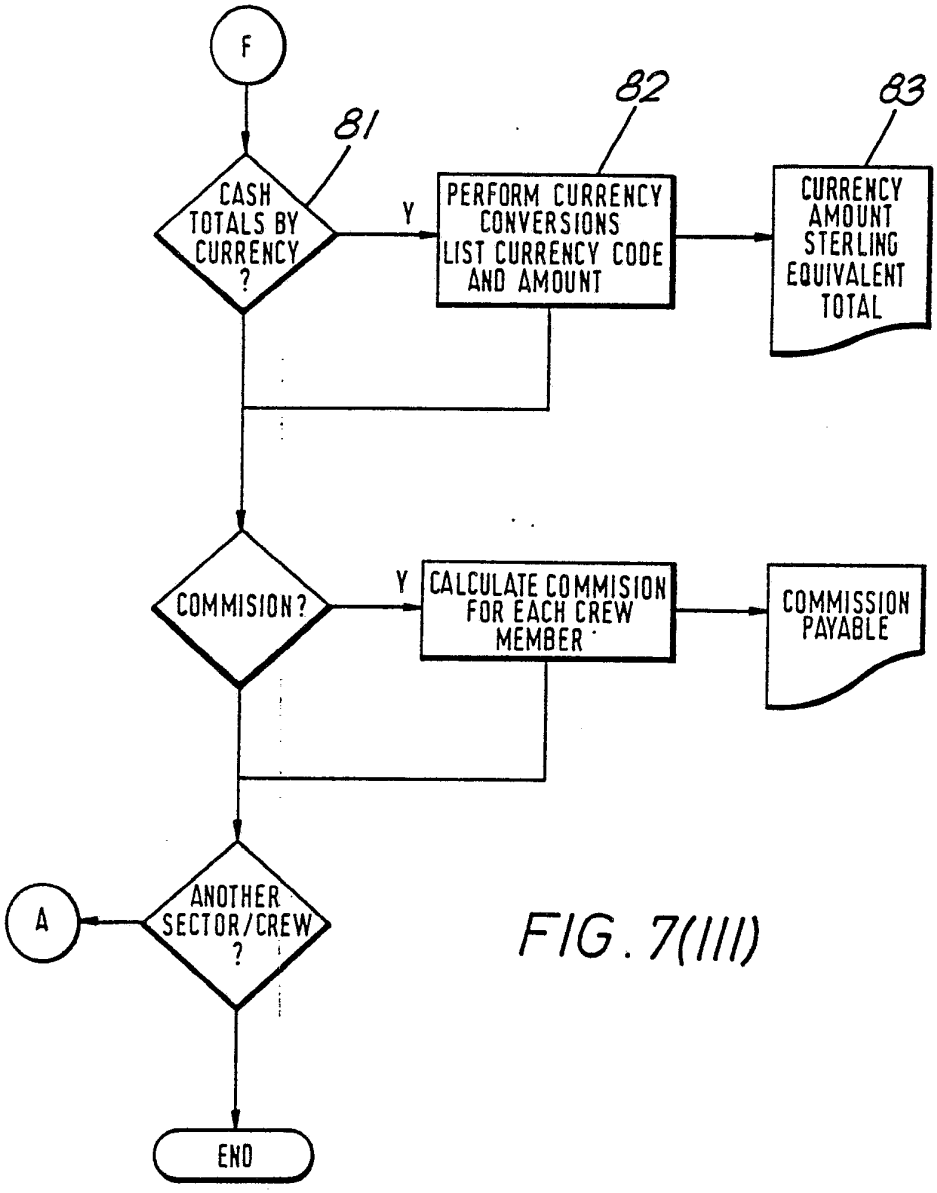

F
81
82
83
CASH TOTALS BY CURRENCY ?
Y
PERFORM CURRENCY CONVERSIONS LIST CURRENCY CODE AND AMOUNT
CURRENCY AMOUNT STERLING EQUIVALENT TOTAL
COMMISION?
Y
CALCULATE COMMISION FOR EACH CREW MEMBER
COMMISSION PAYABLE
ANOTHER SECTOR/CREW ?
A
END

FIG. 7(III)

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 89/00863

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: G 07 F 7/02, G 07 G 1/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	G 07 G, G 07 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
P,X	GB, A, 2205428 (BOBOWICZ et al.) 7 December 1988, see the whole document --	1-5,8-13, 25,26
A	WO, A, 87/06377 (AVICOM-INTERNATIONAL) 22 October 1987, see the whole document --	1-26
A	US, A, 4115870 (LOWELL) 19 September 1978, see the abstract; figures 1-5; column 1, line 20 - column 2, line 13; column 3, line 13 - column 4, line 7; claims 1-13 --	1-26
A	US, A, 4220991 (HAMANO et al.) 2 September 1980, see the abstract; figures 1-7, 20-24; column 1, lines 28-62; column 2, line 58 - column 7, line 58; claims 1-27 --	1-4,6,7,12, 14-24
A	EP, A, 0265894 (MITSUBISHI DENKI) 4 May 1988, see the abstract; figures 2-10; claims 1-7 -- ./.	1-4

* Special categories of cited documents: [10]

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

"E" earlier document 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

"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

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
25th October 1989	27. 11. 89.
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	T.K. WILLIS

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4328544 (BALDWIN et al.) 4 May 1982, see the abstract; figures 1-5; claims 1-7	1
A	US, A, 4396985 (OHARA) 2 August 1983, see the whole document	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 8900863 SA 30266

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 17/11/89
The European 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	Publication date	Patent family member(s)	Publication date
GB-A- 2205428	07-12-88	None	
WO-A- 8706377	22-10-87	EP-A- 0293366	07-12-88
US-A- 4115870	19-09-78	None	
US-A- 4220991	02-09-80	JP-A- 54054551	28-04-79
		JP-A- 54054554	28-04-79
		DE-A,B,C 2840980	19-04-79
EP-A- 0265894	04-05-88	JP-A- 63113665	18-05-88
		JP-A- 63113696	18-05-88
		JP-A- 63113666	18-05-88
US-A- 4328544	04-05-82	CA-A- 1150412	19-07-83
US-A- 4396985	02-08-83	JP-A- 56101264	13-08-81