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(71) Applicant: Controlled Acces Storage Cabinets
Limited
North Walsham, Norfolk, NR28 9NZ (GB)

(72) Inventor: Dady, James Bannister,
c/o Manor Works
North Walsham, Norfolk, NR28 9NZ (GB)

(74) Representative: Flynn, Michael J.
William Jones Limited,
Willow Lane House,
Willow Lane
Norwich NR2 1EU (GB)

(54) An apparatus for controlling access to and monitoring of a storage area

(57) An apparatus to provide selective access to a number of areas and monitor objects stored therein The apparatus includes a remote data capture means (DM) to capture personal data about a person who wishes to access an area. Also included are means to store (Check 2), compare and process data on whether the person can be permitted to access the area and if so enable said access. Data capture means include finger

print, iris recognition or swipe cards. The length of time during which a person has access is monitored (K) and time limits for the access are preset, such that if the limit is exceeded the access is withdrawn or an alarm sounded (AL1). A back up power supply (BB1) ensures the apparatus functions in the event of a failure of the normal supply means (PS1) to monitor the presence or otherwise of stored objects are also included such as optical devices or mass measurement devices (40).

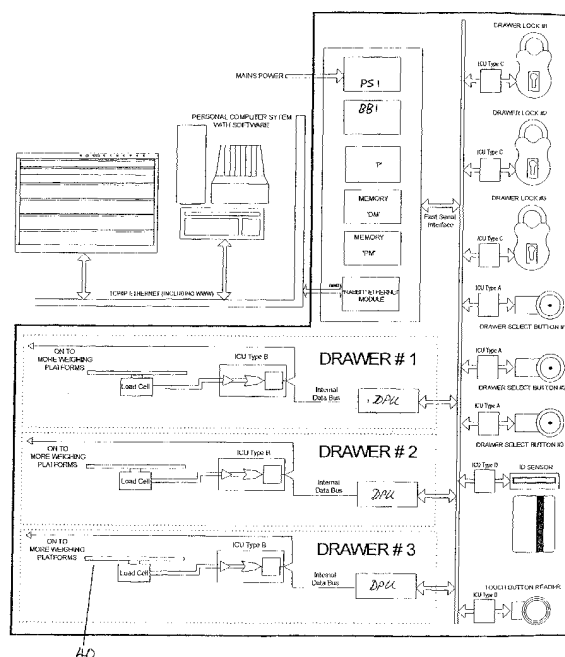


FIGURE 4

Description

Field of the Invention

[0001] The present invention relates to an apparatus for controlling access to a storage area through an access point and monitoring items stored in that area. More particularly the invention relate to an apparatus and a method which selectively restricts a person's access to a defined group only of a number of storage areas.

Background of the Invention

[0002] For the majority of commercial enterprises it is necessary to retain items in storage, usually on site. Such items can be products manufactured by those enterprises or alternatively equipment used in the course of making or supplying a product. Examples of the above items are raw materials, tools, drugs (in the case of a hospital or medical centre), legal or commercially sensitive documents.

[0003] The problem arises that amongst the items some will be required generally by the workforce, whilst for a number of items it is desirable that only a restricted section of the personnel should have access. In order to solve this problem, the usual solution is to categorise the items, each category being stored in an allocated area to which access can be controlled. The individual areas can be in the form of floor space, rooms, filing cabinets etc Restrictions then take the form of identity cards, keys, swipe cards which allow entry into the particular area.

[0004] This system has a number of disadvantages. Firstly, the number of categories into which items are placed needs to be fairly small to keep the number of storage areas to a minimum and avoid incurring undue cost, bureaucracy and space requirements. This can lead to items being less accessible than is practically useful or alternatively being accessible to a wider range of people than is desirable. Secondly, having areas to which access is restricted brings valuable items into that area, which means that should a fire break out these items could be collectively destroyed. Moreover, such restrictions can highlight to a wrongdoer an area which should be a useful target Consequently, the items being collected together means that they can be more easily stolen

[0005] An alternative to having separate storage areas is to employ personnel, such as store managers to oversee the distribution of items. This is expensive due to the high costs of retaining and training personnel and is potentially also open to abuse.

[0006] It is further useful to be able to monitor either access to or the presence in a storage area of a particular item, for example in terms of the person using the item or how often the item is used, or whether the item has been removed for whatever purpose. With such in-

formation the effective working practice of an employee can be monitored and also the usage of a particular item, knowledge of the latter being important, amongst other things, for stock control and substance abuse. Furthermore, the knowledge that an item is not actually present, before an individual goes to where that item is normally stored can save time.

[0007] It is an object of the present invention to seek to provide an apparatus and method which addresses the above problems and to provide controlled access to stored items. It is a further object of the present invention to seek to provide an apparatus and method which enables access to be monitored.

Summary of the Invention

[0008] According to a first aspect the invention there is provided an apparatus for providing selective access to a plurality of areas, the apparatus comprising:

a remote data capture means to capture the user's personal identification data,

a data storage unit to store data in respect of a user,

a comparator means to compare the data stored with the captured personal identification data;

an access determination means to determine to which area a user is permitted access;

an area access means to provide access to the user to those areas permitted to that user.

[0009] Preferably, the remote data capture means includes a reader for a finger print or for iris pattern or an identification card such as a swipe card, to ensure that the correct user is identified.

[0010] Advantageously, the apparatus includes a timer to ascertain the length of time a particular area is accessible. Such a restriction on time can increase security by curtailing the length of time an area is open. The apparatus can include means to automatically close an area should a pre-set time limit be exceeded.

[0011] Conveniently, the apparatus includes one or more visual indicators to indicate when a particular area is accessible and so enable the user more easily to make a selection.

[0012] Preferably, the apparatus is linked to an alarm system, the alarm system being activated upon incorrect access to an area. The appropriate security service can thereby be quickly alerted.

[0013] Advantageously, the apparatus includes a driver mechanism to drive the opening and closing of a locking mechanism to a particular area. Such an active locking mechanism would reduce the chances of forced entry to a particular area.

[0014] The apparatus can include a power supply

having a battery back up facility which is enabled in the event of failure of the power supply

[0015] The apparatus advantageously includes a determining means to determine the presence of an item. Such a means can assist either the security or stock control.

[0016] The determining means is optionally in the form of an optical scanning device to detect the presence or otherwise of an object.

[0017] The determining means advantageously includes weighing means. The weighing means detects the difference in mass between when the object is present and when the object is absent.

[0018] The identification, data storage and enabling and disabling of access to a particular area is controlled by suitable software, without the need for constant monitoring by specifically employed personnel.

[0019] According to a second aspect of the invention there is provided a method for providing selective access to a plurality of areas, the method including the steps of:

- (i) capturing a user's personal identification data;
- (ii) comparing the captured personal identification data with stored data;
- (iii) determining the areas to which a user has access;
- (iv) activating area access means to enable a user to access a particular area.

[0020] Advantageously, the method includes the further step of activating a visual signal to indicate that a particular area is accessible.

[0021] Conveniently, the method includes the step of measuring the length of time an area is accessed. The step of measuring the length of time optionally further comprises the step of disabling access should the length exceed a pre-set value.

[0022] Preferably, the method includes the step of identifying when unauthorised access to an area has been effected. Should such unauthorised access be identified, an alarm is activated.

Brief Description of the Drawings

[0023] The invention will now be described with reference to the accompanying drawings which show by way of example only an embodiment of the control circuitry and of the software of a controlled access storage system. In the drawings:

Figure 1 is a block diagram of the circuitry of a device;

Figure 2 is a block diagram of control software

which can be used in a storage device;

Figure 3 is a diagram of further control software;

Figure 4 is a diagram of the interaction between hardware and software in a storage device; and

Figure 5 illustrates an optical monitoring system.

Detailed Description of the Invention

[0024] Referring initially to Figure 1, a microprocessor P enables and disables access to a drawer L on, for example, a filing cabinet. The microprocessor P has ports to receive data and also to transmit instructions to ancillary units. A memory block PM, includes the programme memory and comprises the software controlling the system. The data related to authorised identity codes and drawer access tables - detailing whether a person has access to a particular drawer - are stored in a data memory DM. It is envisaged that access and authorisation to amend the data in the data memory DM will be restricted to a limited number of individuals.

[0025] A clock module K provides real time data to the microprocessor P such as that relating to the date and time. This allows firstly, access to be restricted to certain times if required. Secondly, a record of persons having access to the drawer or accessing the drawer can be maintained. The microprocessor P is connected to a port O1 which in turn is connected to the driver D1 of a solenoid S. The solenoid S, upon activation by the driver D1, releases a lock to the drawer L.

[0026] In an alternative embodiment, shown in Figure 1, a bi-directional motor D2 driving a motor M can be used to release the lock to the drawer L. Typically, a filing cabinet would employ either a solenoid or a bi-directional motor to work the locks, but not both.

[0027] A detector D ascertains the status of a lock and conveys the information to the microprocessor P via an input port I1. An indicator light LG gives a visual indication of the status of the lock on a particular drawer. The status of the light LG is controlled via an output port O3, by the microprocessor P, the microprocessor P deriving the status from the detector D. A button B, operable by the user, enables the user to select a drawer to which he desires access. The button B is connected to the microprocessor P via a further input port I2.

[0028] A further input port I3 enables data received from an identification input system ID to be transferred to the microprocessor P. It should be noted that, in the case of a filing cabinet having a plurality of drawers, each drawer L will have associated therewith an individual set of input and output ports, with the exception of I3. Normally each system would require only one port I3.

[0029] In use, a user selects a particular drawer or number of drawers to which he would like access by pushing the appropriate button B. The microprocessor P prompts the user to identify himself by inputting identi-

fication data using the system ID. The data can be in the form of a card, finger print, iris recognition or other methods known in the art. The microprocessor P compares the inputted identification data with that stored in its data memory DM. If the inputted data matches that in the memory DM, the microprocessor then determines, by means of the stored data, whether or not the user is permitted access to the particular drawer(s) in question. If the answer is again in the affirmative, the microprocessor causes the driver D1, D2 to release the lock on the drawer(s) L. The release of the lock causes a signal to be sent from the detector D to the microprocessor P which then switches the light LG on, communicating to the user that the lock has been released.

[0030] Control software suitable for use in the above described system is shown in Figures 2 and 3, but will now be described with reference primarily to Figure 2. The software is initiated from the START programme which initialises the system and runs a diagnostic self-test to ensure that the system is functioning within design parameters. When this stage is complete, the ID IN receives the identification data input via the ID function shown in Figure 1. The identification data is passed through a recognition unit Check 1 which decides if the data is suitable for passing on to the next stage. Should the data be unsuitable, Loop 1 is run and identification data input once more.

[0031] If the identification data is suitable, the programme branches to Fetch 1 which fetches authorised codes from the data memory DB 1 and then passes the identification data and the codes to Check 2. In Check 2 the identification data is compared with the code. If the comparison shows that the codes match, the authorised drawer selection associated with that code is output at Set 1 and the appropriate drawer lamps illuminated. The input IN1 which represents the particular drawer selected is read at Fetch 2 and the drawer unlocked via Set 2.

[0032] The status of the locking mechanism IN2 is monitored by the subroutine Fetch 3. The Timer T1 monitors the length of time which the drawer has been unlocked through execution of Loop 2. Should a pre-set time be exceeded, the Timer T1 causes the alarm AL1 to be activated.

[0033] In the event that the authorised code is not recognised, a Check 3 compares the code allocated with that of a supervisor. The code allocated to a supervisor enables the supervisor to access areas of the software and stored data, such as routines which program authorisation codes, which are normally withheld from other users. Should the Check 3 fail, the programme returns to the Loop 1 and is repeated.

[0034] Further details of the interaction, in use, between the software and the hardware is shown in Figure 4. The embodiment shown therein, is suitable for use when a monitoring system is employed incorporating determination of the presence or otherwise of an object in the storage area by evaluating weight exerted on one or more weighing platforms. Such an embodiment

could be used for example in a storage cabinet, housing a number of drawers, as exemplified on the following description.

[0035] In Figure 4, a microprocessor P is connected to a common internal data bus line, by which it controls the cabinet functions via a number of Drawer Processing Units (DPUs), which comprise a microprocessor with data and program memories and serial ports to connect to the microprocessor P. One DPU is assigned to each drawer.

[0036] Each DPU is connected to a further internal data bus line which connects to a number of Interface Control Units (ICUs).

[0037] All types of ICU embody a fast bi-directional serial port and a microprocessor. Each ICU is uniquely addressable by the microprocessor P by means of selector links on the printed circuit board. These ICUs are of several specific types to interface with the cabinet functions as follows in the description.

Type A : services a user push button and indicator lamp, and incorporates an input port, an output port, and lamp driver, and switch 'de-bounce' software, together with software to latch and flash the lamp,

Type B : services the weighing load cell of a sub-container, and incorporates a differential amplifier and A-D converter to provide a digital form of sub-container weight to the data bus. Internal software translates and encodes the load cell signal;

Type C : services a lock release mechanism and incorporates input and output ports and solenoid driver, together with software to operate the lock and report the lock status; and

Type D : services the ID sensor, and incorporates input and output ports, and specific software to interface with, and translate the codes produced by the particular sensor employed.

[0038] Where such a system is used therefore, whether or not a particular object is present can be determined by means of the weighing platforms. In summary, once the user has input his personal data into the computer system, the drawers of the cabinet to which he has access will become enabled. The user selects a particular drawer by pressing on the appropriate drawer select buttons. The signal from the button is passed via the associated ICU - Type A to the attached Drawer Processing Unit. The DPU communicates with the drawer lock via an ICU - Type C which causes the drawer to be released. Should the user remove or replace an item then this will be registered by the weighing platform and the change of state communicated via an ICU - Type B to the DPU. The DPU then passes this information to the Microprocessor P. Once the user has finished, the drawer can be closed by depressing the drawer select

button or by the pre-set time allowed for which a drawer can be open being exceeded.

[0039] Such a system can enhance the security of the overall storage area or can enable efficient stock control.

[0040] In Figure 5, the apparatus for optical scanning of contents consists of an optical system of mirrors 50 which is attached to a frame 51 above each drawer. A line light source 52 is fitted to the frame 51 above the leading edge of each drawer to illuminate the contents. The optical path reflects an image of objects 53 combined in a drawer through 90°, via a lens 54 onto image detectors 55. The image detectors 55 may be a CCD frame arrays (as used in a digital cameras) or CCD line arrays (as used in a computer scanners).

[0041] Rotary encoders are attached to each drawer, and provide synchronisation of the drawer contents images with the image detectors. Velocity limiters, consisting of braking mechanisms are attached to each drawer. The scanning systems are controlled by a separate microprocessor systems, which communicate with the main cabinet microprocessor P via fast serial links.

[0042] When a drawer is selected for opening by the cabinet control system the light source is energised, and the separate microprocessor is reset. As the drawer is opened pulses from the rotary encoder signal the separate microprocessor to read a frame or line from the image detector. The velocity limiter keeps the drawer opening velocity within the capacity of the system to read the images.

[0043] Software within the separate microprocessor accumulates the separate frames or lines and produces a composite image for surveillance by an external computer, and by comparison with previous images to identify which items have been removed or replaced.

[0044] In order to provide control over larger numbers of smaller items it is sometimes convenient to provide small sub-containers within each drawer of the cabinet, and to provide separate controlled access to same. It is also desirable to be able to weigh the contents of the sub-containers as a control of the material stored.

[0045] The method for this option is to provide sub-containers that incorporate electrical locks, and ICUs, and which may be unplugged and removed from the drawer, retaining the data relating to the contents in the ICU memory. The method allows sub-containers to be moved from one drawer or cabinet to another, and to external storage and control systems, (e.g. 'CAN BAN') without loss of information relating to the contents, and remaining locked until accessed by the new host system.

[0046] The sub-containers are each mounted on a base incorporating a standard load cell to allow the sub-containers to be individually weighed.

[0047] Power for the system is provided by a mains power unit PS1 (Figure 1). A rechargeable battery BBI, linked to the power unit PS1, provides power in the event of a mains electricity failure.

[0048] Although the system as described above is exemplified for use with a filing cabinet having a number of drawers, the system could also be employed to control access to the storage areas without any inventive input. For example, the system could control the opening of a number of doors to allow entry to one or more areas. Alternatively, the system could permit a user to selectively access a number of areas of a computer programme.

[0049] The system can also include means to enable the computer to be connected to further computer units or systems outside the particular storage area(s). Such outside units or systems could be part of an overall control for a network of sites or housed within a unit responsible for security.

[0050] It will of course be understood that the invention is not limited to the specific details described herein, which are given by way of example only, and that various modifications and alterations are possible within the scope of the invention.

Claims

1. An apparatus for providing selective access to a plurality of areas, **characterised in that** the apparatus comprises

a remote data capture means to capture the user's personal identification data;

a data storage unit (DM) to store data in respect of a user;

a comparator means (Check 2) to compare the data stored with the captured personal identification data;

an access determination means to determine to which area a user is permitted access;

an area access means (Set 2) to provide access to the user to those areas permitted to that user.

2. An apparatus according to Claim 1, **characterised in that** the remote data capture means (ID IN) includes a reader for a finger print or for iris pattern or an identification card such as a swipe card.

3. An apparatus according to Claim 1 or Claim 2, **characterised in that** the apparatus includes a timer (K) to ascertain the length of time a particular area is accessible.

4. An apparatus according to Claim 3, **characterised in that** the apparatus comprises means to automatically close an area should a pre-set time limit be

exceeded.

5. An apparatus according to any preceding claim, **characterised in that** the apparatus includes one or more visual indicators (LG) to indicate when a particular area is accessible and so enable the user more easily to make a selection.

6. An apparatus according to any preceding claim, **characterised in that** the apparatus is linked to an alarm system (AL1), the alarm system (AL1) being activated upon incorrect access to an area

7. An apparatus according to any preceding claim, **characterised in that** the apparatus includes a driver mechanism (D2) to drive the opening and closing of a locking mechanism to a particular area.

8. An apparatus according to any preceding claim, **characterised in that** the apparatus can include a power supply (PS1) having a battery back up (BB1) facility which is enabled in the event of failure of the power supply.

9. An apparatus according to any preceding claim, **characterised in that** the apparatus includes a determining means to determine the presence of an item.

10. An apparatus according to Claim 9, **characterised in that** the determining means is in the form of an optical scanning device to detect the presence or otherwise of an object.

11. An apparatus according to Claim 9 or Claim 10, **characterised in that** the determining means includes weighing means (40) to detect the difference in mass between when the object is present and when the object is absent.

12. A method for providing selective access to a plurality of areas, the method including the steps of:

(i) capturing a user's personal identification data;

(ii) comparing the captured personal identification data with stored data;

(iii) determining the areas to which a user has access;

(iv) activating area access means to enable a user to access a particular area.

13. A method according to Claim 12, **characterised in that** the method comprises of activating a visual signal to indicate that a particular area is accessible.

14. A method according to Claim 12 or Claim 13, **characterised in that** the method comprises the step of measuring the length of time an area is accessed.

15. A method according to Claim 14, **characterised in that** the method comprises the step of disabling access should the length exceed a pre-set value.

16. A method according to any one of Claims 12 to 15, **characterised in that** the method comprises the step of identifying when unauthorised access to an area has been effected.

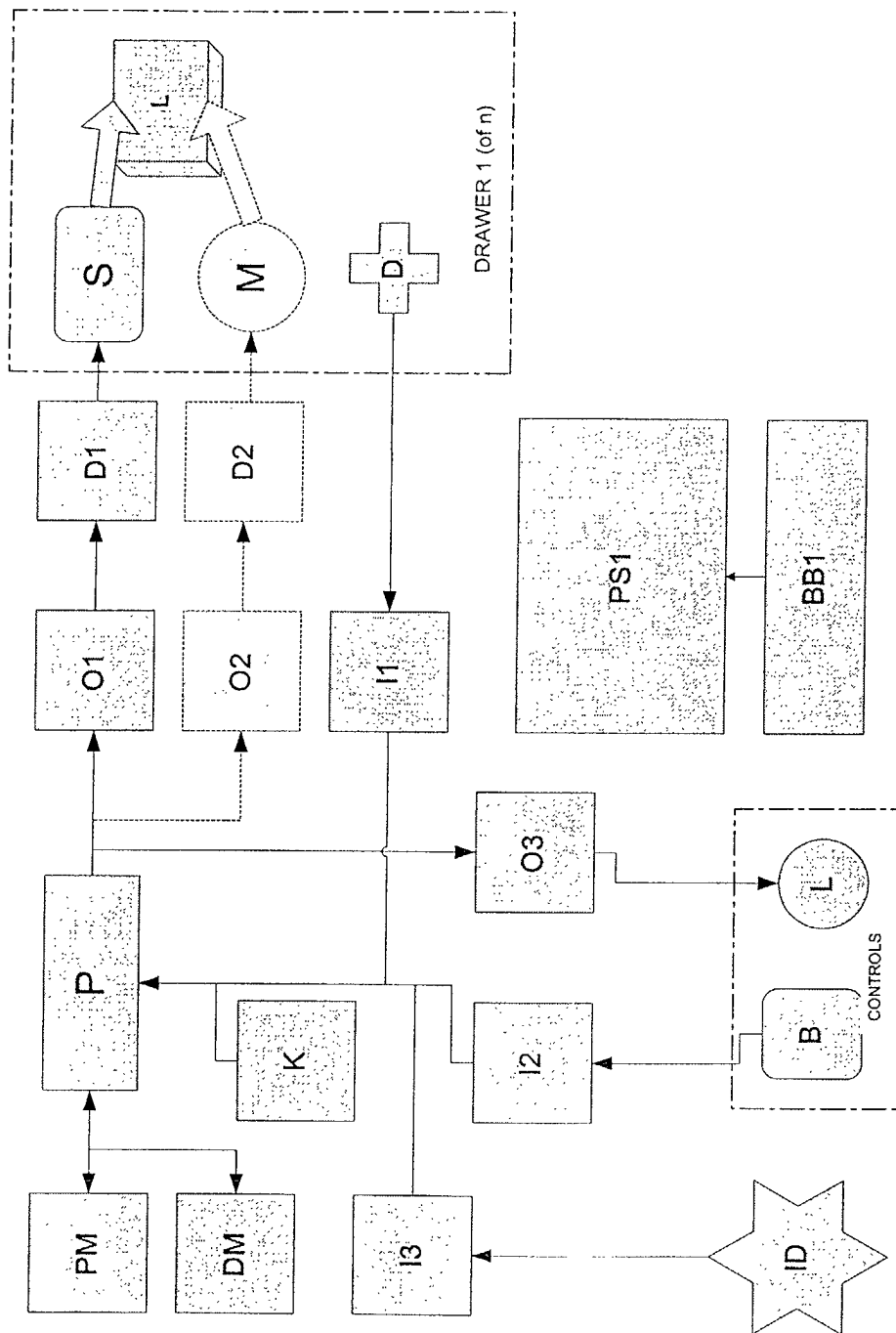


FIGURE 1

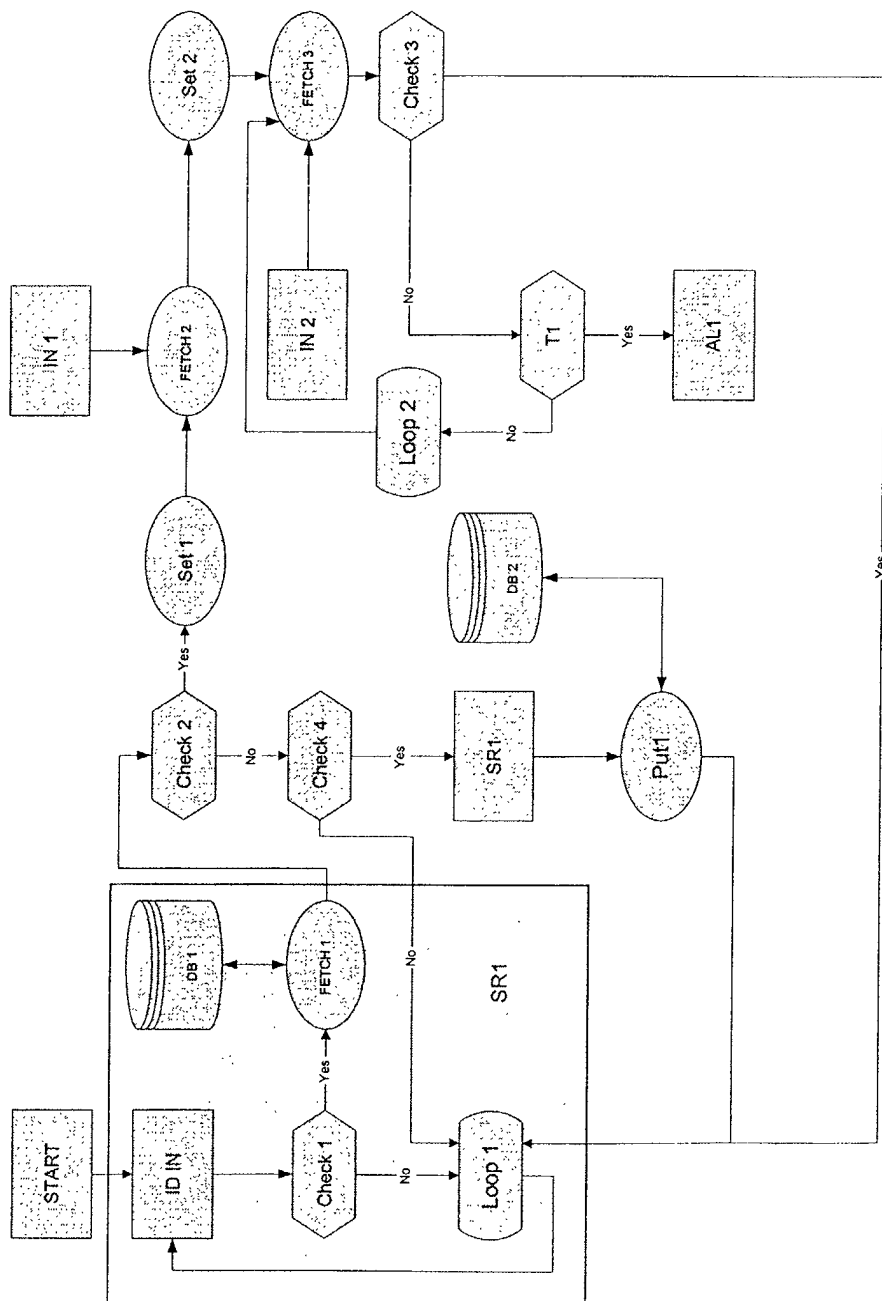
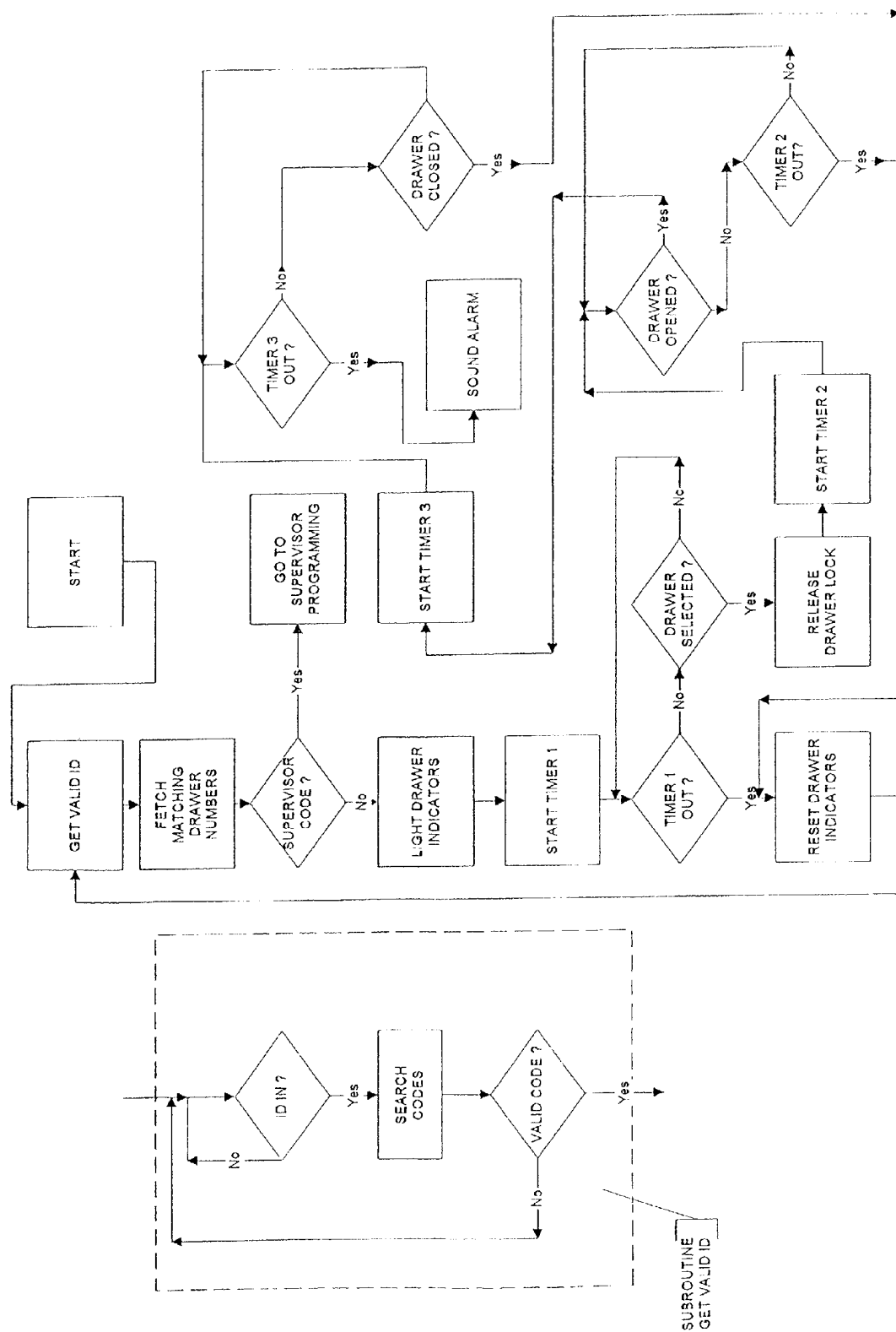


FIGURE 2



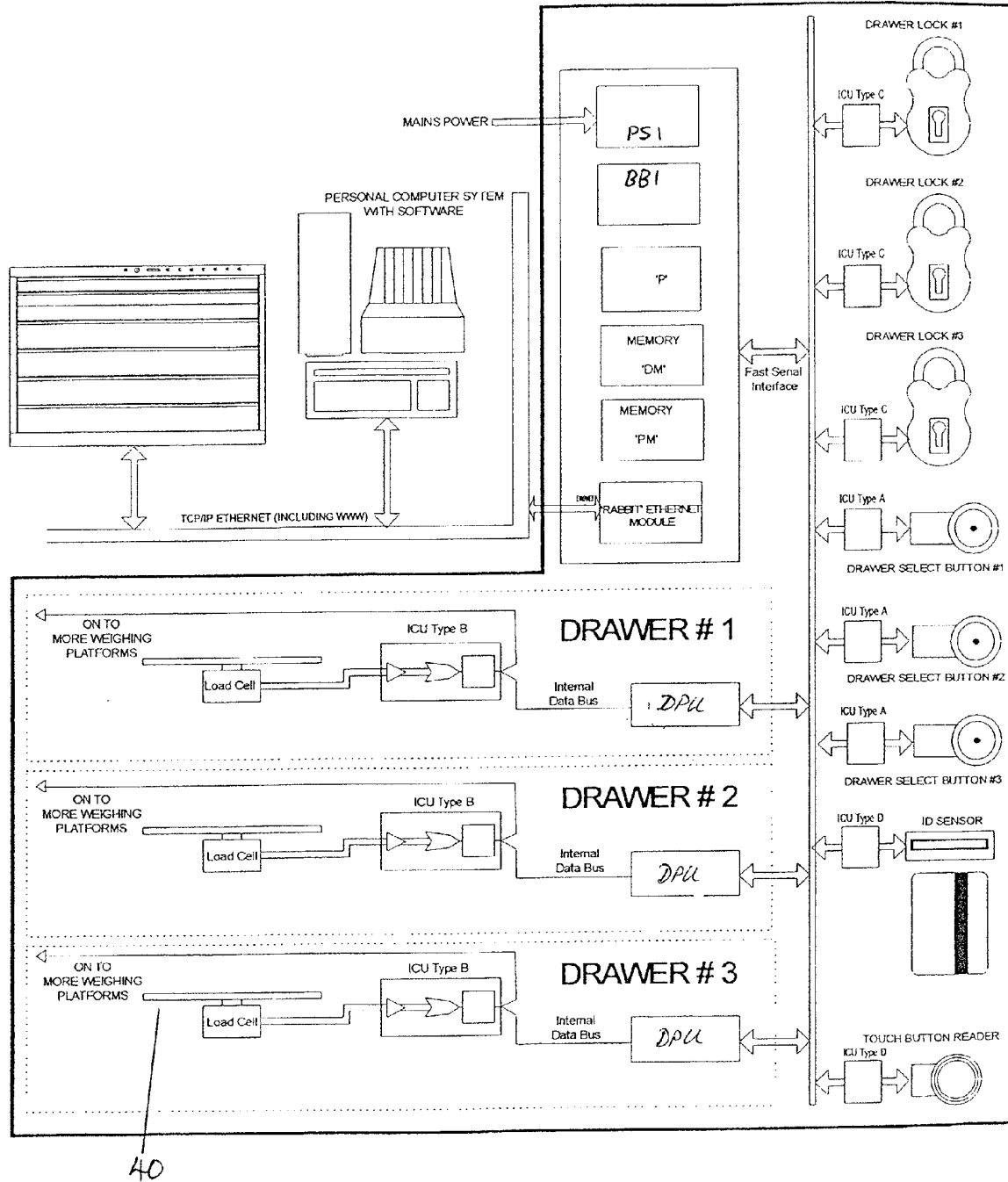


FIGURE 4

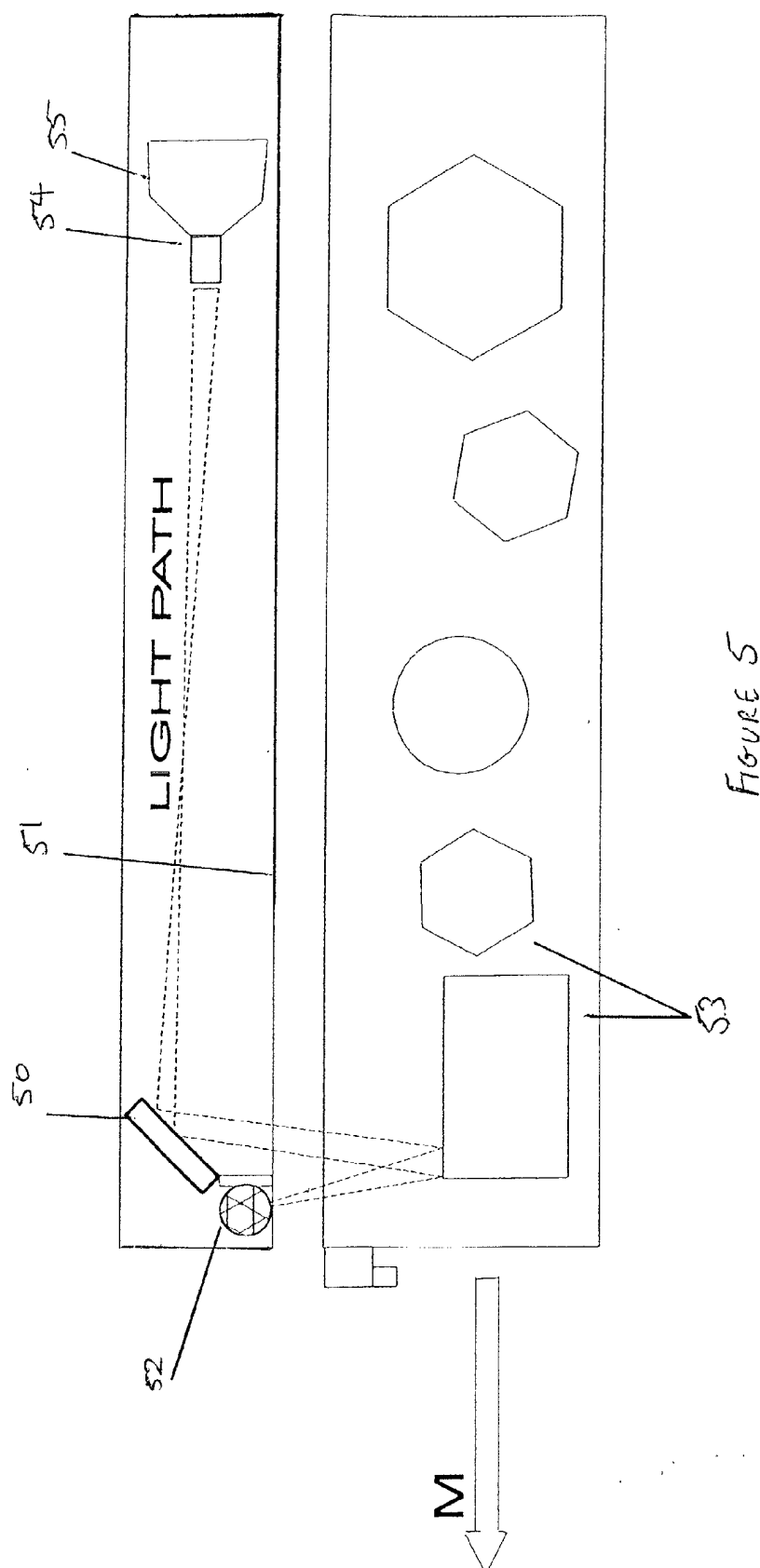


FIGURE 5