

ARTICLE STORAGE AND RETRIEVAL SYSTEM

Field of the invention

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This invention relates to an article dispensing system suitable for library operations and more particularly, it relates to a system and method for the automated dispensing and return of selected articles, such as CDs, CD-ROMs and paperbacks, from a library collection. Although it will be convenient herein to describe the invention with reference
10 to a library environment, it should be appreciated that the application of the invention can be extended to other applications for dispensing an article, such as for dispensing video tapes at a rental outlet.

Background of the invention

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Libraries have adopted multi-media in their collections and no longer confine themselves to just keeping books. This is reflective of the technological progress that has gained acceptance by the public. With the advent of multi-media technology, Compact Discs (CDs), CD Read-Only-Memories (ROMs), Video CDs (VCDs) and Laser CDs (LCDs)
20 have become popular and exist alongside books in the libraries as sources of information and entertainment. Libraries now have to use technology to improve their operations with regards to accessibility, productivity and efficiency.

In the main, loan access to articles in a conventional library is dependent on and limited
25 by the presence of a library attendant who processes the borrowing of articles made by borrowers. Such a conventional library requires the continuous presence of the said attendant for its operation. Hence it is a heavily dependent on manpower and also limits the operation of such a library to scheduled business hours.

30 The benefits that an automated self-service system for the borrowing or return of library collections can provide are the abilities to provide library services beyond the library's official operating hours, increased patronage and increased revenue to the library. The components of the system can be placed just outside the library or even in town centres. This will greatly enhance the accessibility of the library's facilities.

Automatic dispensing and retrieval machines exist in the art but they have their limitations.

- 5 Existing machines combine the functions of searching for titles of articles and dispensing of the articles in one machine. This is undesirable in certain situations such as in a library environment where there will be heavy utilization of the machine. It is likely that the user will take much time to search for and retrieve a title, resulting in a longer waiting time for other users. It would be desirable for the selection function to be remote from
10 the dispensing function.

- Next, the identification means employed by existing machines to identify each article requires the use of a distinctive optical code affixed to the container or the article. An optical code reader is incorporated into such machines for recognition of the optical
15 code. For example, US Patent No. 5,143,193 discloses the use of an optical code reader and corresponding optical identification affixed to the article/container. Such an optical identification system requires additional mechanisms for correct orientation and alignment between the optical tag and reader in order for correct identification. Such identification means are also prone to malfunction because optical tags can be rendered
20 unreadable by wear and tear, dirt and the like.

- Further, existing machines are limited to simple dispense and return operations. They are thus not suitable for library operations as a fully automated library would be required to perform the full range of customer services expected. This includes providing
25 information as to availability of titles, expected return dates for unavailable titles, making reservations, extending a loan period and so on. The ability to retrieve information from a central library database on a database server would be necessary.

Summary of the invention

- 30 It is an objective of the present invention to therefore provide a dispensing machine that dispenses articles (whether CD, CDROM, video tape or paperback, etc) on a loan basis after the user selects and reserves the articles. In the system according to the invention, the selection terminal is preferably remote from the dispensing mechanism which

dispenses the article although the selection terminal and dispensing mechanism can be located together. The invention also allows for self-return of articles borrowed, and for updating of lists of titles in an easy manner so that even non-technical library staff can undertake the task.

5 It is also an objective of the invention to provide an automated library machine which dispenses an article to be borrowed and/or accepts for storage an article to be returned, that does not require for a custom-built transport container via one embodiment of the invention. Instead, in this embodiment, the means of identification is preferably applied
10 directly to the article.

In one aspect of the invention, there is provided a system for the storage of a collection of articles and the dispensing of one or more articles from storage comprising:

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- a housing in which articles are storable;
 - a database containing a record of each article stored in the housing;
 - a dispensing mechanism operatively connected with the database for extracting individual articles from the housing for dispensing;
 - a selection terminal operatively connected with the database and the
20 dispensing mechanism and which is remotely located from the housing;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

25 Preferably, the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier tag associated with each article, which may be a unique radio frequency identifier tag affixed to each article.

30 In the preferred embodiment of the invention, the selection terminal and the dispensing mechanism each include a user identifying mechanism to read identifying information presented by the user. The identifying mechanism may read an optical, magnetic and/or electronic signal. In use the dispensing mechanism will preferably only dispense each

selected article after the user presented to the dispensing mechanism the same identifying information provided to the selection terminal.

Preferably, the system provides to the user via the selection terminal information regarding the availability of each article. The system preferably also provides to the user via the selection terminal a record of one or more previous transactions of said user.

In another aspect of the invention, there is provided a system for the storage of a collection of articles and the dispensing of one or more articles from storage comprising:

- 10 - a housing in which articles are storable;
- a database containing a record of each article stored in the housing;
- a dispensing mechanism operatively connected with the database for extracting individual articles from the housing for dispensing;
- a selection terminal operatively connected with the database and the
15 dispensing mechanism;
- wherein the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier reader tag associated with each article;

20 whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

In a further aspect of the invention, there is provided a method of storage of a collection
25 of articles and dispensing one or more articles from the collection including:

- creation of a housing in which articles are storable and a database for containing a record of each article stored in the housing;
- operatively connecting to the database a dispensing mechanism for
30 extracting individual articles from the housing for dispensing;
- operatively connecting to the database and the dispensing mechanism a selection terminal which is remotely located from the housing;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

5 In yet another aspect of the invention, the invention provides a method of storage of a collection of articles and dispensing one or more articles from the collection including:

- creation of a housing in which articles are storable and a database for containing a record of each article stored in the housing;
- 10 - operatively connecting to the database a dispensing mechanism for extracting individual articles from the housing for dispensing;
- operatively connecting to the database and the dispensing mechanism a selection terminal;
- 15 - wherein the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier reader tag associated with each article;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing
20 mechanism.

The invention also provides for the use of the system or method as hereinbefore defined for storing a collection of articles and providing to the user of the system or method one
25 or more of the articles.

Moreover, the invention teaches the use of the system or method as hereinbefore defined at a rental outlet, wherein the articles that are stored and dispensed are video
tapes or video compact discs.

30 Brief description of the drawings

The drawings illustrate a preferred embodiment of the invention.

Figure 1 is a block diagram illustrating broadly the functional features of a system according to the preferred embodiment of the invention.

5 Figure 2 shows the process flow of the system according to the invention at the Browser Enquiry terminal.

Figure 3 shows the process flow at the Article Dispensing Machine (ADM) terminal.

10 Figure 4 is a schematic view of a self-service kiosk in accordance with the preferred embodiment of the present invention.

Figure 5 is a schematic view of the kiosk in Figure 3 with the side panels removed to reveal the internal retrieval mechanism of the kiosk.

15 Figure 6 is the top view of Figure 3, showing the concentric layout of a rack system of the invention.

Figure 7 shows a perspective view of an individual storage rack.

20 Figure 8 shows a perspective view of a conveying mechanism to be integrated with a robotic arm.

Figure 9 is a cross-sectional view of a robotic arm.

25 Detailed description of the preferred embodiment of the invention

For convenience, the preferred embodiment of the invention is described with reference to the dispensing of Compact Discs (CDs) only, but it is not intended that the invention be limited to dispensing of CDs. The invention may be suitably adapted to operate to
30 deal with other types of articles such as other electronic media, video tapes, books and magazines.

Figure 1 is a block diagram illustrating broadly the functional features of a system according to the preferred embodiment of the invention. The system consists of (i) a

selection terminal (hereinafter termed "the Browser Enquiry terminal"), where the user makes selections and reservations for the articles he wants to borrow, (ii) a dispensing mechanism (hereinafter termed "the Article Dispensing Machine (ADM)"), where the articles to be borrowed are dispensed to the user, and (iii) a central library database to which these terminals are operatively connected by a computer program to obtain information from a central library database on a database server regarding information on the availability of titles and other information held on it, such as the user's transaction history and loan status. Figures 4 to 9 illustrate an embodiment of the ADM. The Browser Enquiry terminal is not illustrated in the drawings as it may simply be in the form of a personal computer with a screen, keyboard or keypad, central processing unit and library card reader, which is electronically and operatively connected to the central library database and the ADM for communications purposes. The functions of the Browser Enquiry terminal may also be incorporated into the ADM.

Figure 2 shows the process flow at the Browser Enquiry terminal. When the user accesses the Browser Enquiry terminal with his library card, the terminal will first check his library card by using a card reader. The card reader is preferably a laser barcode scanner, which reads the barcode, commonly found on the user's library card for identification. If the library card is not valid, the process may be terminated.

The terminal will then check whether there are any outstanding fines which have not been paid by the user or if the user has reached the limit of his loan entitlement. If there are outstanding fines, the user will be required to proceed to pay the fines to the library administration before he can proceed with the loan. If the loan entitlement limit has been reached, the user will be required to return at least one CD before proceeding with the loan. The process may then be terminated.

If there are no outstanding fines to be paid nor any chance of exceeding the loan entitlement limit, the user will be queried as to whether he would like to view records of the available CDs in the Article Dispensing Machine (ADM). If he does, the list of available CDs will be shown, and the user is given the option to reserve the CDs which he wants to borrow. If there are other outstanding CD loans, the user will be prompted to return the loaned CDs before he makes new loans. The user can proceed to the ADM

to collect the CDs to be loaned. The CDs may be reserved for a time limit which is prescribed by the library operator.

Due to the connection between the Browser Enquiry terminal to the central library database, the Browser Enquiry terminal is able to retrieve, amongst other things, the following information from the server with regards to the user's loan status:

- a) current CD loans (whether outstanding or not);
- b) reserved CDs for dispensing; and/or
- c) expected return dates for unavailable titles.

Figure 3 shows the process flow at the Article Dispensing Machine (ADM). The ADM has a library card reader 12 and checks the user's library card. If the library card is invalid, the process may be terminated. If the library card is valid, a touchscreen 16 of the ADM will show the number of CDs which have been reserved by the said user at the Browser Enquiry terminal. As previously stated, the functions of the Browser Enquiry terminal may be duplicated at the ADM touchscreen 16.

If there are outstanding CD loans, the user will be required to return the outstanding CDs at the ADM before proceeding with the new loans. The process for the return of the CDs is detailed below with reference to the operation of the ADM. Once the outstanding CDs are returned, the user can proceed with the new loans.

The ADM will then proceed to dispense the CDs which have been reserved by the user. For each CD reserved, the user will be prompted to confirm the title of the CD. If the title of the CD is correct, the CD will be dispensed. If after the CD is dispensed, the user identifies that the incorrect CD has been dispensed, the user is prompted to return the incorrect CD into the ADM. The user is then prompted again to confirm the title of the CD.

If the correct CD has been dispensed, the next CD is then dispensed and so on, until the last CD is dispensed to the user. The ADM will then print a receipt for the user as acknowledgement for the items loaned.

An inherent feature of the system is that the Browser Enquiry terminal and ADM are electronically linked to and integrated with the operator's central library database by means of a telephone line, optical cable, ethernet, wireless or other suitable data connection. The Browser Enquiry terminal will interface with the central library database so as to provide library operators with information as to inventory status, user transaction records, article reservations, due dates for returns and other related information.

The link to the central library database may be through a local-area network (LAN) or an internet connection, thus allowing library operators and users to send and receive article information and give reservation instructions to a machine which is remotely located. The LAN or internet connection may use an interface protocol, such as TCP/IP, serial or telnet.

Figure 4 is a schematic view of an embodiment of the ADM in the form of a self-service kiosk 10 having a housing 22 in accordance with the preferred embodiment of the present invention. The kiosk 10 has a card reader 12, a return slot 14, a touchscreen 16, a dispensing chute 18 and a front access door 20. The card reader 12 is preferably a laser barcode scanner, because library cards conventionally have bar codes for electronic identification of the card-holder. The card reader 12 identifies whether a user is a valid library member. The kiosk 10 may include viewing windows, such as a top viewing window 21a and side viewing window 21b illustrated in Figure 4.

The dispensing chute 18 dispenses CDs and the returning slot 14 allows the user to return loaned CDs or CDs which have been incorrectly dispensed. The kiosk may preferably include a receipt printer (not shown) to print receipts pursuant to transactions. It may be an impact or a thermal printer. A conveyor belt (not shown) is positioned within the ADM at the brim of the dispensing slot.

The kiosk 10 may also include a back access door (not shown) to allow access to the internal mechanism. This is in addition to the front access door that primarily allows access to returned items, although limited access could also be provided to the internal mechanism.

Figure 5 is a schematic view of the kiosk 10 in Figure 4 with the side panels removed to reveal the internal retrieval mechanism of the kiosk 10. The kiosk 10 has a vertical column 24 wherein there is affixed a robotic arm 26 which has an end-effector 28. There are a series of CD racks 30 arranged concentrically using a circular rack system around the central column 24 for access by the robotic arm 26. Each CD rack 30 includes a plurality of individual CD compartments 32. There is only one CD rack illustrated in Figure 5, which is the rack designated for re-loading and removal of CDs by an operator. Once the CDs are loaded, the robotic arm 26 will remove CDs from the designated rack and insert the CDs into available compartments 32 on other CD racks 30. Access to the re-loading CD rack is usually by the back access door. The central database is updated after re-loading.

Figure 6 shows the arrangement of the CD racks 30 with respect to the central column 24 and robotic arm 26. The present invention therefore provides a tamper-proof housing 22 wherein articles are stored within a plurality of compartments 32 built into vertical racks 30 arranged substantially in a circular fashion. The robotic arm 26 which is linked to and controlled by the computer processor, is placed substantially at the centre of the circular rack arrangement to access each compartment 32 and to retrieve or place articles therein for storage.

Figure 7 shows a schematic view of a CD rack 30. Each CD rack 30 includes a series of individual CD compartments to store each CD. For convenience in removing the CD rack 30, pull handles 31 may be incorporated for use by an operator.

The identification means employed in the present invention are based on electromagnetic Radio Frequency Identifier (RFID) signals, thus eliminating the need for correct orientation and alignment of stored articles for recognition by the machine, as required in the case of optical readers. The risk of failed identification due to damaged or soiled optical tags is virtually eliminated. A tamper-proof RFID tag (not shown) is affixed directly onto each article using adhesives. The robotic arm is fitted with an RFID reader which detects and identifies the RFID tag on each article. Upon storage or retrieval of each article, the robotic arm re-programs the memory in the computer processing unit with information regarding the inventory status, and location of articles. The programming language is preferably in C or C++.

The robotic arm 26 will now be described. Figure 8 is a perspective view of a conveying mechanism to be integrated with the robotic arm 26. The robotic arm 26 (not shown on Figure 8) is affixed to a vertical column 24 which may extend substantially the full vertical length of the housing 22. The vertical column 24 is located within the inner diameter of the concentric stack of compartments 32 and is fixed for revolution about a vertical axis along a rotation arc 34 by use of a revolving assembly. The revolving assembly includes a gear member driven by a worm gear and a servomotor 36.

A vertical lift member (not shown) is mounted on the vertical column 24 and is movable substantially the full vertical length of the central column. The vertical lift (not shown) is driven by a motor, belt and counterbalance. In the preferred embodiment, the counterbalance travels through the vertical column 24 in opposition to the lift member.

Figure 9 is a cross-sectional view of a robotic arm 26 that is connected to the vertical column 24. The robotic arm 26 has an end-effector 38 that lifts library articles. The end-effector 38 is a tray-like extension from the robotic arm 26 for transporting articles. The end-effector 38 is thus used to retrieve and transport the CDs in jewel boxes 40 housed in the individual compartments 32. The end-effector 38 is attached to a block carriage 44 and shifts relative the housing of the robotic arm 26 by means of a shaft 46 and a shaft-drive 48. The movement of the shaft-drive 48 is effected by a rotary bar 50 and drives the end-effector 38 for relative movement with respect to the robotic arm 26.

As discussed above, the reader and tags utilise RFID technology. Thus, the robotic arm 26 has an identification mechanism in the form of a RFID reader unit 42 located within its housing. The RFID reader unit 42 is adapted to read the RFID information strip affixed onto each library article. The robotic arm 26 memorizes the locations of each library article using a computer processor built therein, based on the next available slots for inserting further articles.

When a library user inserts his library card into the card reader 12, the system would recognise his bar code. If the library user had reserved an article at the Browser Enquiry Terminal, the system would have recorded his bar code at that point. A computer program will ensure that the ADM only dispenses each article selected where the bar

code on the user's library card presented at both the Browser Enquiry terminal and the ADM are the same. Once the system has recognised the user as a valid user, the user will conduct his transaction by using the touchscreen 16 of the ADM. When the user is borrowing an article, the robotic arm 26 will fetch the selected article from the appropriate compartment 32 as directed by the computer processor by identifying the article's RFID tag and verify via the article's RFID tag that it is correct. The end-effector 28 of the robotic arm 26 will then lift the article and place it on the conveyor belt (not shown). The conveyor belt will deliver the article to the dispensing chute 18. The inventory of the central library database is thereafter updated as explained above through an electronic connection and a receipt is generated for the user by the printer.

A user may return an article by selecting the appropriate option on the ADM. The system will then prompt the user to insert the article into the returning slot 18. The returning slot has a sliding door or cover member which is operated by a motor and linkage arrangement (not shown). The door of the returning slot remains locked in the closed position and will not open until the robotic arm 26 is ready to dispense or receive an article and the RFID reader reads the tag on the article. Upon reading the RFID tag, the motor is activated to operate the linkage and open the door. The user then returns the article through the returning slot onto the end-effector 28 of the robotic arm 26. The robotic arm 26 then places the articles into CD compartments 32 near to the returning slot 18, which have been designated as a buffers, or temporary holding compartments. This is to speed up the return process. Later, the robotic arm 26 may remove the articles from the buffer compartments into other available CD compartments 32. The robotic arm 26 will verify that the correct article has been returned by reading the article's RFID tag. The robotic arm 26 processes one returned CD at a time. The central library database is then updated through an electronic connection. The machine is thus able to identify the returned article by reading the RFID tag on the article. The receipt printer acknowledges transactions, be it loans or returns, by printing a receipt for the user's retention.

The application of the system of the current invention can be extended into other market applications for any article dispenser providing similar benefits as claimed in the invention, and is not intended to be limited only to the library environment. Specifically, with suitable adaptation, it can be used for dispensing video tapes at a rental outlet,

especially for after-hours transactions. The machine can also incorporate other identification devices or systems, such as bar codes, magnetic stripes, smart cards, contactless card readers or passwords, or any other identification device or system available.

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While a particular embodiment of the invention has been shown and described, it will be obvious to those skilled in the art that changes and modifications of the present invention may be made without departing from the invention in its broader aspects. As such, the scope of the invention should not be limited by the particular embodiment and specific construction described herein but should be defined by the appended claims and equivalents thereof. Accordingly, the aim in the appended claims is to cover all such changes and modifications as fall within the spirit and scope of the invention.

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Claims:

1. A system for the storage of a collection of articles and the dispensing of one or
5 more articles from storage comprising:

- a housing in which articles are storable;
- a database containing a record of each article stored in the housing;
- a dispensing mechanism operatively connected with the database for
10 extracting individual articles from the housing for dispensing;
- a selection terminal operatively connected with the database and the
dispensing mechanism and which is remotely located from the housing;

whereby an article is selectable from its record contained in the database using
15 the selection terminal for the article to be dispensed from the housing via the
dispensing mechanism.

2. A system according to claim 1, wherein the dispensing mechanism includes a
radio frequency identifier reader to read a radio frequency identifier tag
20 associated with each article.

3. A system according to claim 2, wherein the dispensing mechanism also accepts
the return of articles and identifies each article returned by reading a unique radio
frequency identifier tag affixed to each article.

4. A system according to any preceding claim, wherein the selection terminal and
the dispensing mechanism each include a user identifying mechanism to read
identifying information presented by the user.

5. A system according to claim 4, wherein the identifying mechanism reads an
30 optical, magnetic and/or electronic signal.

6. A system according to claims 4 or 5, wherein in use the dispensing mechanism will only dispense each selected article after the user presents to the dispensing mechanism the same identifying information presented at the selection terminal.
- 5 7. A system according to any one of the preceding claims, wherein the system provides to the user via the selection terminal information regarding the availability of each article.
- 10 8. A system according to claim 7, wherein the system provides to the user via the selection terminal a record of one or more previous transactions of said user.
- 15 9. A system according to any one of the preceding claims, wherein the housing includes a plurality of storage racks, each storage rack including a plurality of storage compartments and the housing has an access door that provides access to designated storage compartments for re-loading or removal of articles by an operator, said storage compartments holding the articles prior to their removal from the housing or transport to other available storage racks in the housing.
- 20 10. A system according to claim 9, wherein the dispensing mechanism includes a robotic arm with a radio frequency identification reader associated with it to add to or remove articles from the storage racks.
- 25 11. A system according to claim 10, wherein the robotic arm includes an end-effector that is movable relative to the robotic arm to accommodate each article during transport to and from the storage racks.
- 30 12. A system according to claim 10 or 11, including a conveying mechanism to transport articles from the robotic arm to the user during the dispensing operation.
13. A system according to any one of claims 3 to 12, wherein the housing includes a plurality of storage racks each having a plurality of storage compartments, and the storage racks include a buffer portion of compartments for temporary storage

of articles during return by a user, for transfer to other available compartments in the storage racks.

14. A system for the storage of a collection of articles and the dispensing of one or more articles from storage comprising:

- a housing in which articles are storable;
- a database containing a record of each article stored in the housing;
- a dispensing mechanism operatively connected with the database for extracting individual articles from the housing for dispensing;
- a selection terminal operatively connected with the database and the dispensing mechanism and which is remotely located from the housing;
- wherein the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier reader tag associated with each article;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

15. A system according to claim 14, wherein the dispensing mechanism also accepts the return of articles and identifies each article returned by reading a unique radio frequency identifier tag affixed to each article.

16. A system according to claim 14 or 15, wherein the selection terminal and the dispensing mechanism each include a user identifying mechanism to read identifying information presented by the user.

17. A system according to claim 16, wherein the identifying mechanism reads an optical, magnetic and/or electronic signal.

18. A system according to claim 16 or 17, wherein in use the dispensing mechanism will only dispense each selected article after the user presents to the dispensing mechanism the same identifying information presented at the selection terminal.

19. A system according to any one of claims 14 to 18, wherein the system provides to the user via the selection terminal information regarding the availability of each article.
- 5 20. A system according to claim 19, wherein the system provides to the user via the selection terminal a record of one or more previous transactions of said user.
- 10 21. A system according to any one of claims 14 to 20, wherein the housing includes a plurality of storage racks, each storage rack including a plurality of storage compartments and the housing has an access door that provides access to designated storage compartments for re-loading or removal of articles by an operator, said storage compartments holding the articles prior to their removal from the housing or transport to other available storage racks in the housing.
- 15 22. A system according to claim 21, wherein the dispensing mechanism includes a robotic arm with a radio frequency identification reader associated with it to add to or remove articles from the storage racks.
- 20 23. A system according to claim 22, wherein the robotic arm includes an end-effector that is movable relative to the robotic arm to accommodate each article during transport to and from the storage racks.
- 25 24. A system according to claim 22 or 23, including a conveying mechanism to transport articles from the robotic arm to the user during the dispensing operation.
- 30 25. A system according to any one of claims 15 to 24, wherein the housing includes a plurality of storage racks each having a plurality of storage compartments, and the storage racks include a buffer portion of compartments for temporary storage of articles during return by a user, for transfer to other available compartments in the storage racks.

26. A method of storage of a collection of articles and dispensing one or more articles from the collection including:

- creation of a housing in which articles are storable and a database for containing a record of each article stored in the housing;
- operatively connecting to the database a dispensing mechanism for extracting individual articles from the housing for dispensing;
- operatively connecting to the database and the dispensing mechanism a selection terminal which is remotely located from the housing;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

27. A method according to claim 26, wherein the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier tag associated with each article.

28. A method according to claim 27, wherein the dispensing mechanism also accepts the return of articles and identifies each article returned by reading a unique radio frequency identifier tag affixed to each article.

29. A method according to any one of claims 26 to 28, wherein the selection terminal and the dispensing mechanism each include a user identifying mechanism to read identifying information presented by the user.

30. A method according to claim 29, wherein the identifying mechanism reads an optical, magnetic and/or electronic signal.

31. A method according to claim 29 or 30, wherein in use the dispensing mechanism will only dispense each selected article after the user presents to the dispensing mechanism the same identifying information presented at the selection terminal.

32. A method according to any one of claims 26 to 31, wherein the information regarding the availability of each article is accessible by the user via the selection terminal.
- 5 33. A method according to claim 32, wherein a record of one or more previous transactions of said user is accessible by the user via the selection terminal.
34. A method according to any one of claims 26 to 33, wherein the housing includes a plurality of storage racks, each storage rack including a plurality of storage
10 compartments and the housing has an access door that provides access to designated storage compartments for re-loading or removal of articles by an operator, said storage compartments holding the articles prior to their removal from the housing or transport to other available storage racks in the housing.
- 15 35. A method according to claim 34, wherein the dispensing mechanism includes a robotic arm with a radio frequency identification reader associated with it to add to or remove articles from the storage racks.
36. A method according to claim 35, wherein the robotic arm includes an end-effector
20 that is movable relative to the robotic arm to accommodate each article during transport to and from the storage racks.
37. A method according to claim 35 or 36, including a conveying mechanism to
25 transport articles from the robotic arm to the user during the dispensing operation.
38. A method according to any one of claims 28 to 37, wherein the housing includes a plurality of storage racks each having a plurality of storage compartments, and the storage racks include a buffer portion of compartments for temporary storage
30 of articles during return by a user, for transfer to other available compartments in the storage racks.
39. A method of storage of a collection of articles and dispensing one or more articles from the collection including:

- creation of a housing in which articles are storable and a database for containing a record of each article stored in the housing;
- operatively connecting to the database a dispensing mechanism for extracting individual articles from the housing for dispensing;
- operatively connecting to the database and the dispensing mechanism a selection terminal which is remotely located from the housing;
- wherein the dispensing mechanism includes a radio frequency identifier reader to read a radio frequency identifier reader tag associated with each article;

whereby an article is selectable from its record contained in the database using the selection terminal for the article to be dispensed from the housing via the dispensing mechanism.

40. A method according to claim 39, wherein the dispensing mechanism also accepts the return of articles and identifies each article returned by reading a unique radio frequency identifier tag affixed to each article.

41. A method according to claim 39 or 40, wherein the selection terminal and the dispensing mechanism each include a user identifying mechanism to read identifying information presented by the user.

42. A method according to claim 41, wherein the identifying mechanism reads an optical, magnetic and/or electronic signal.

43. A method according to claim 41 or 42, wherein in use the dispensing mechanism will only dispense each selected article after the user presents to the dispensing mechanism the same identifying information presented at to the selection terminal.

44. A method according to any one of claims 39 to 43, wherein the system provides to the user via the selection terminal information regarding the availability of each article.

45. A method according to claim 44, wherein the system provides to the user via the selection terminal a record of one or more previous transactions of said user.
- 5 46. A method according to any one of claims 39 to 45, wherein the housing includes a plurality of storage racks, each storage rack including a plurality of storage compartments and the housing has an access door that provides access to designated storage compartments for re-loading or removal of articles by an operator, said storage compartments holding the articles prior to their removal
10 from the housing or transport to other available storage racks in the housing.
47. A method according to claim 46, wherein the dispensing mechanism includes a robotic arm with a radio frequency identification reader associated with it to add to or remove articles from the storage racks.
- 15 48. A method according to claim 47, wherein the robotic arm includes an end-effector that is movable relative to the robotic arm to accommodate each article during transport to and from the storage racks.
- 20 49. A method according to claim 47 or 48, including a conveying mechanism to transport articles from the robotic arm to the user during the dispensing operation.
- 25 50. A method according to any one of claims 40 to 49, wherein the housing includes a plurality of storage racks each having a plurality of storage compartments, and the storage racks include a buffer portion of compartments for temporary storage of articles during return by a user, for transfer to other available compartments in the storage racks.
- 30 51. Use of the system or method as defined in any one of the preceding claims for storing a collection of articles and providing to the user of the system or method one or more of the articles.

52. Use of the system or method as defined in any one of claims 1 to 50 at a rental outlet, wherein the articles to be stored and dispensed are video tapes or video compact discs.