United States Patent

[11] 3,586,186

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[21] Appl. No. **860,460**
[22] Filed **July 30, 1969**
Division of Ser. No. 675,502, Oct. 16, 1967, Pat. No. 3,482,712
[45] Patented **June 22, 1971**

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[54] METHOD OF VERIFYING ARTICLES IN A STORAGE AND RETRIEVAL SYSTEM

4 Claims, 17 Drawing Figs.

[52] U.S. Cl. **214/152,** 209/110.5
[51] **Int. Cl.** **B65g 1/06**
[50] **Field of Search** 214/16.4, 16.42, 152; 209/80.5, 110.5

[56] **References Cited**

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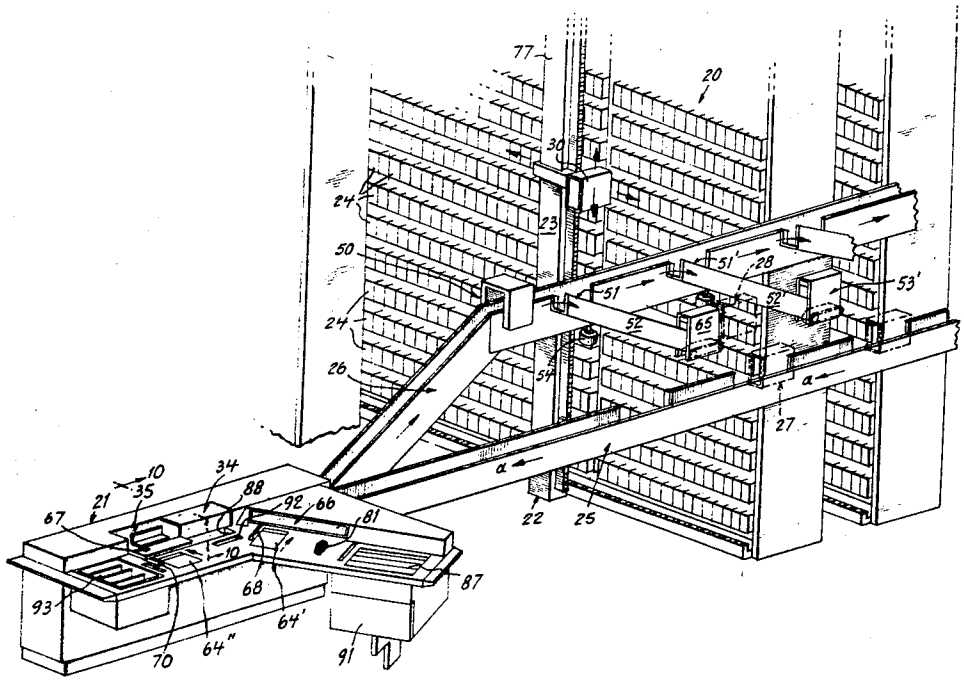
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Assistant Examiner—Raymond B. Johnson
Attorneys—Marshall M. Truex, Frank A. Seemar, H. Walter Clum and Thomas P. Murphy

ABSTRACT: An article handling system adapted to accommodate large quantities of discreet articles, such as documents or the like. The system includes an operator control area, a storage area, article carrying containers, article identification means, and means for transporting the article carrying containers between the control and storage areas. The specific apparatus contemplated operates in a unique manner to verify that the proper article carrying container is transported to and made accessible at the control area. Verification is carried out in a manner such that a discreet article cannot be filed and subsequently stored in a container to which it does not correspond.



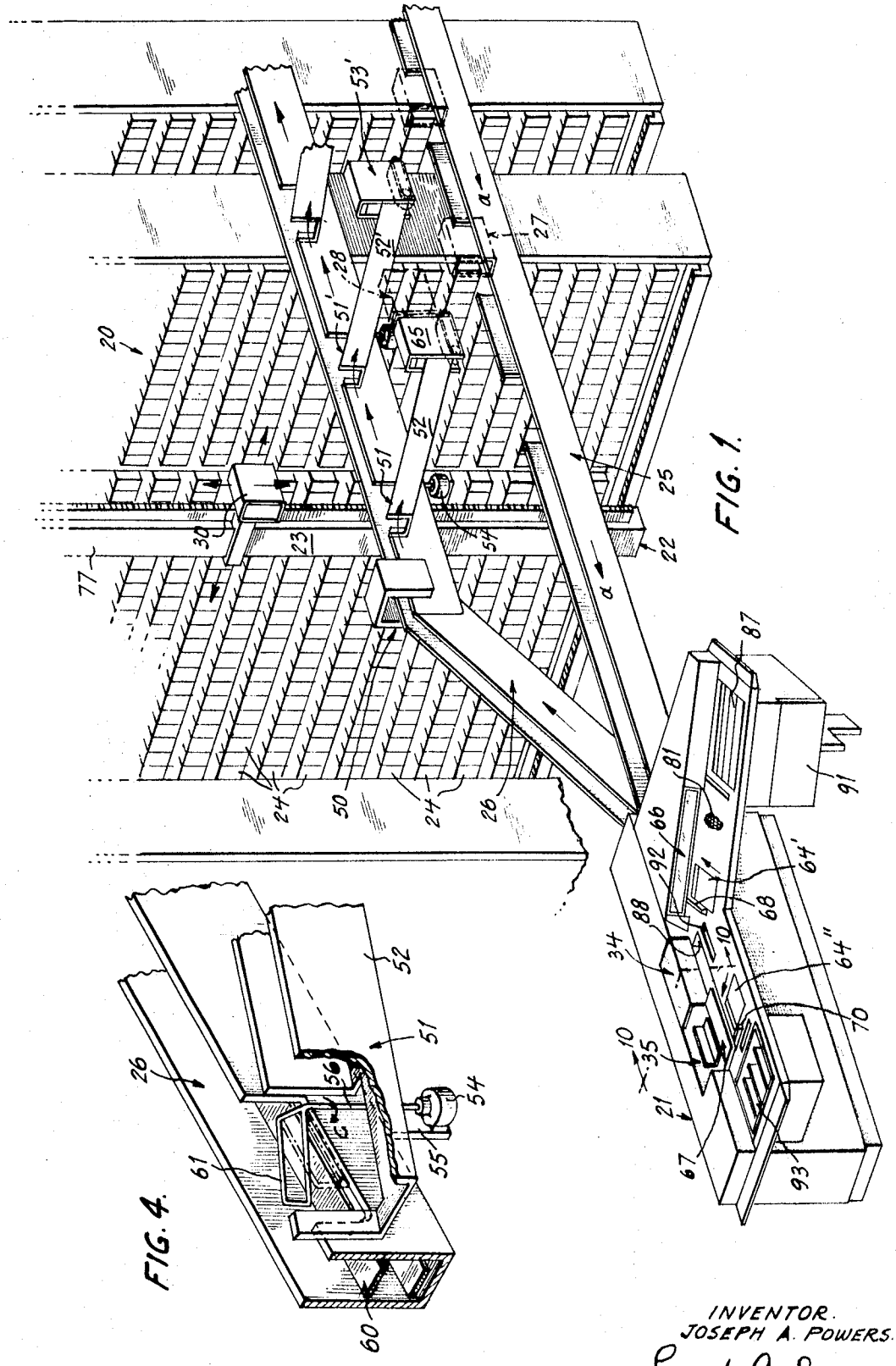


FIG. 1.

FIG. 4.

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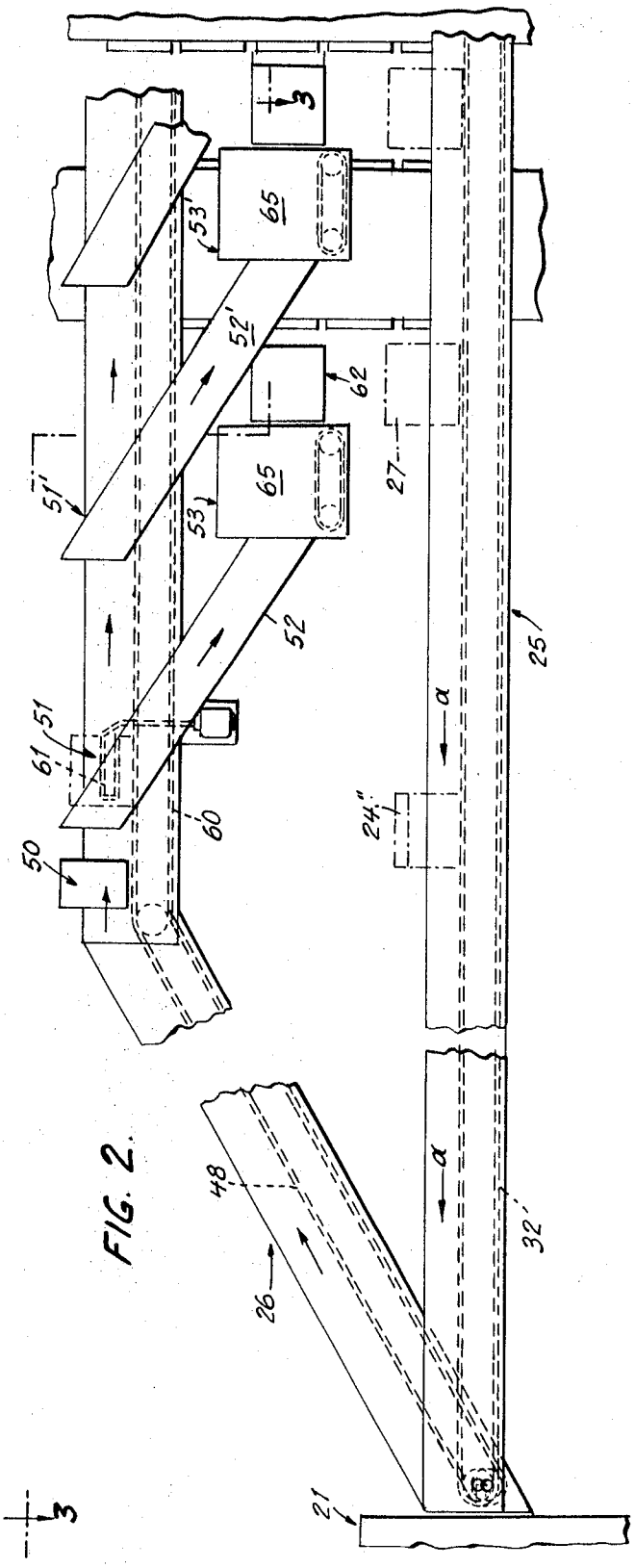

3
65
53
52'
62
65
53
27
51'
52
25
51
61
60
50
24"
a
48
26
32'
21
3

FIG. 2.

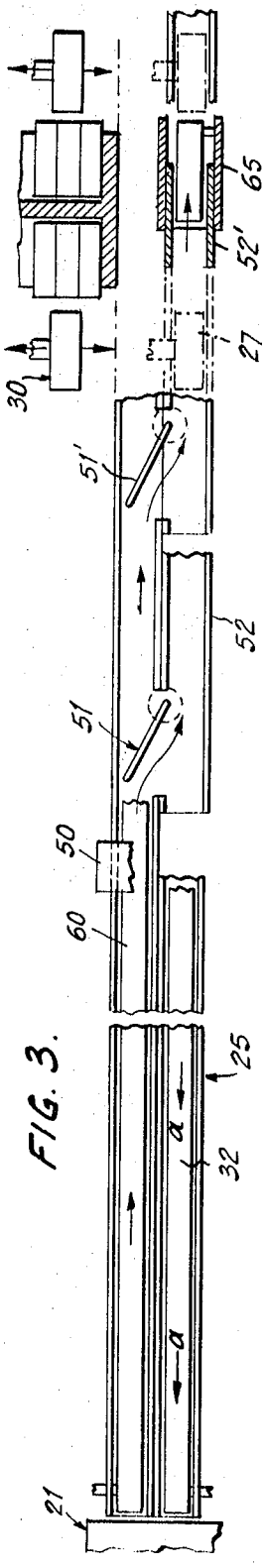

65
52'
27
30
51'
52
51
50
60
25
a
32
21

FIG. 3.

FIG. 5.

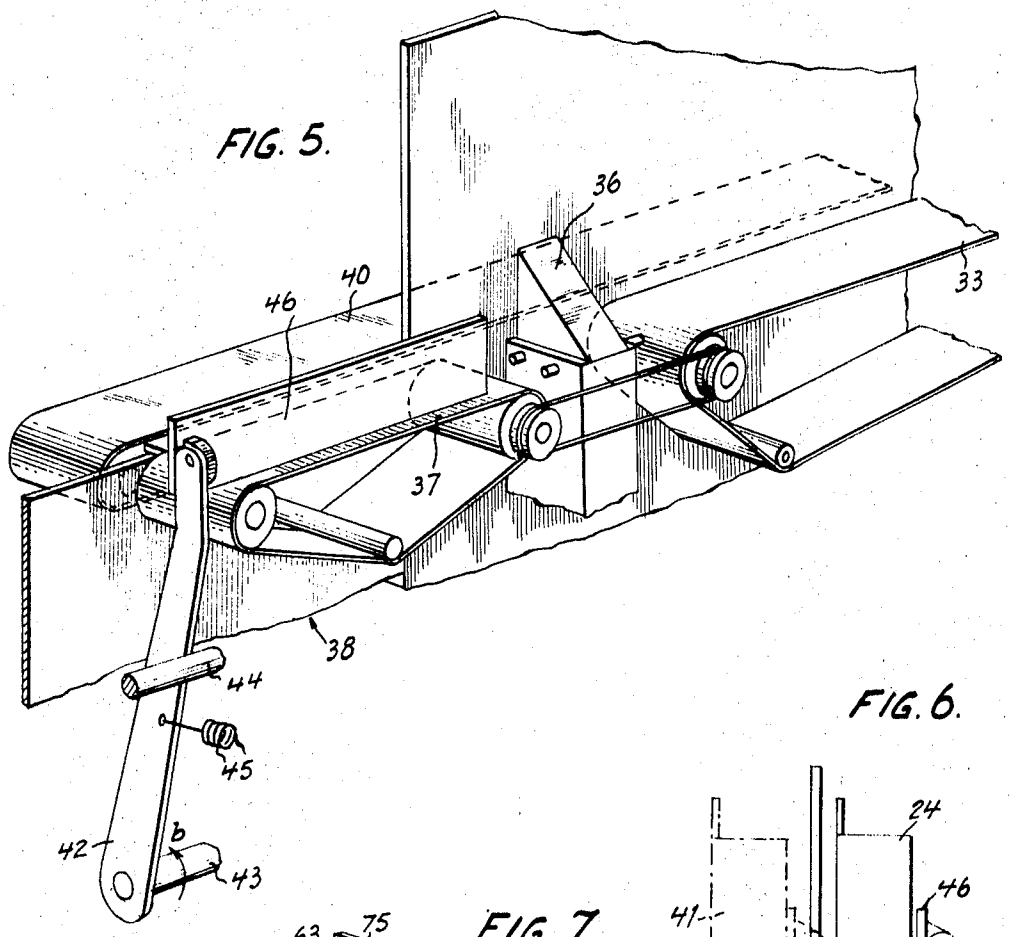


FIG. 6.

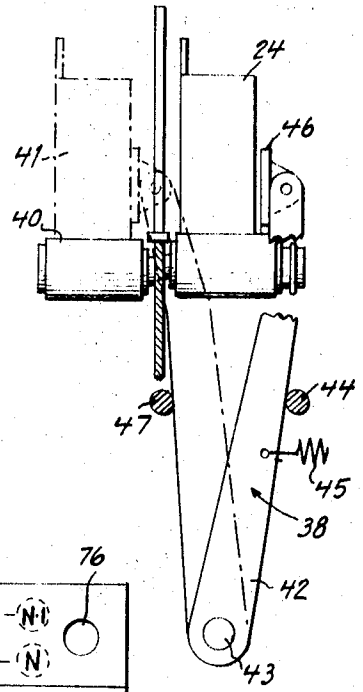


FIG. 7.

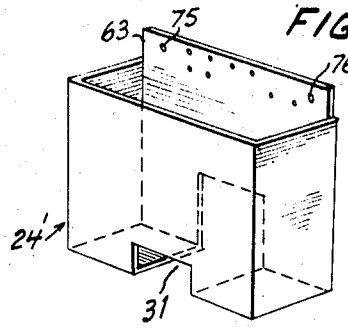
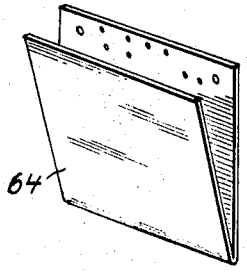


FIG. 9.



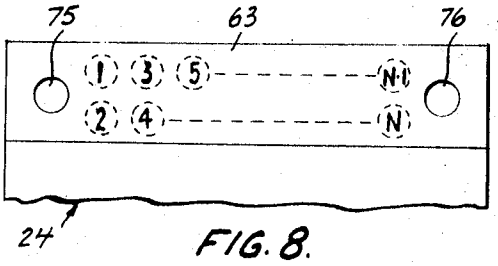


FIG. 8.

FIG. 10.

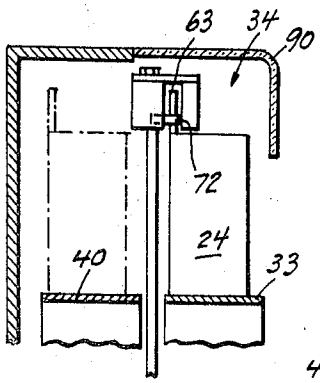
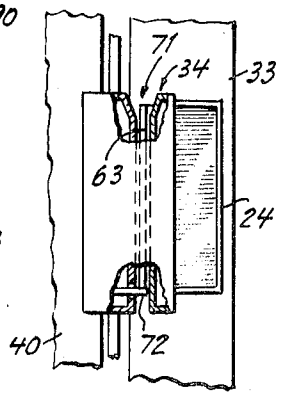


FIG. 11.



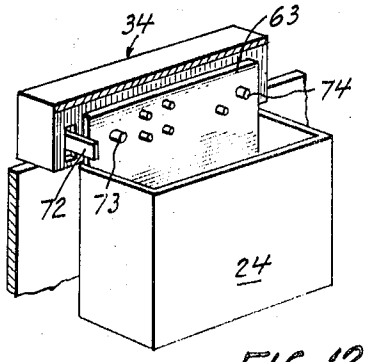


FIG. 12.

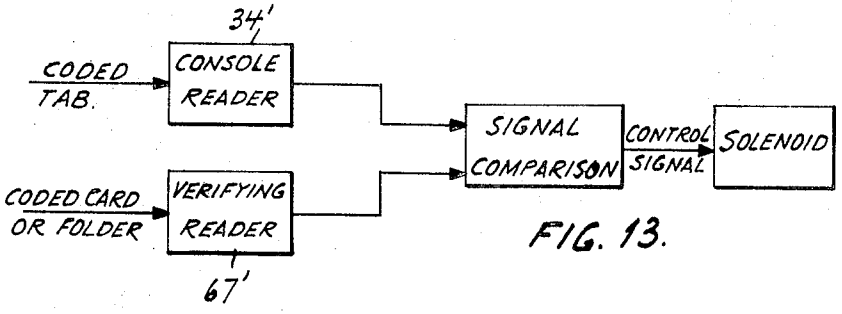


FIG. 13.

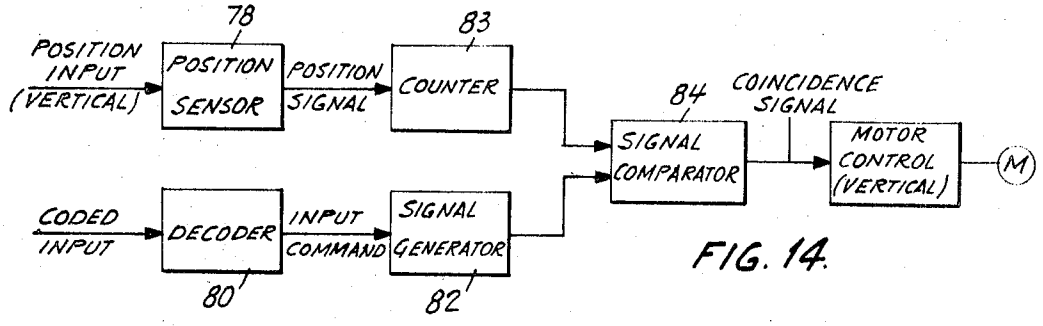


FIG. 14.

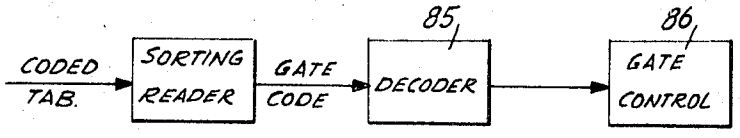


FIG. 15.

FIG. 16.

RETRIEVE MODE		
CONSOLE	EXTRACTOR	TRANSPORT
INPUT CLEAR	HOME POSITION	IDLE
CODED RETRIEVE COMMOND ENTERED	A SELECTED EXTRACTOR DRIVEN TO SELECTED ADDRESS BY HORIZONTAL AND VERTICAL DRIVE MECHANISM	
	CONTAINER EXTRACTED (LEFT OR RIGHT)	
	EXTRACTOR DRIVEN TO DISCHARGE POSITION	CONVEYOR BELTS START
INPUT CLEAR	CONTAINER DISCHARGED	
CONTAINER ARRIVES AT CONSOLE READER	EXTRACTOR RETURNS TO HOME POSITION	
VERIFY		
CONSOLE READER STOP RELEASED		
DOCUMENTS FANNED FOR ACCESS		IDLE

FIG. 17.

FILE MODE		
CONSOLE	EXTRACTOR	TRANSPORT
INPUT CLEAR CONTAINER AT WORK STATION	HOME POSITION	IDLE
INITIATE FILE COMMAND ENTERED		
DOCUMENT FANNER WITHDRAWN AND CONTAINER DEPOSITED ON FILE CONVEYOR		CONVEYOR BELTS START
INPUT CLEAR		CONTAINER ARRIVES AT SORTER READER
		SELECTED GATE AUTOMATICALLY ENERGIZED
		CONTAINER DEFLECTED TO APPROPIATE AISLE READER
	CONVEYOR TRANSFERRED FROM READER TO EXTRACTOR	
	EXTRACTOR DRIVEN TO SELECTED ADDRESS IN RESPONSE TO AISLE READER COMMAND	IDLE
	CONTAINER DISCHARGED TO STORAGE BAY (LEFT OR RIGHT)	
	EXTRACTOR RETURNED TO HOME POSITION	

METHOD OF VERIFYING ARTICLES IN A STORAGE AND RETRIEVAL SYSTEM

BACKGROUND OF THE INVENTION

This is a division of application Ser. No. 675,502, filed Oct. 16, 1967 now U.S. Pat. No. 3,482,712 granted Dec. 9, 1969.

The present invention relates to an article handling system of the nature described above and more particularly to new and useful improvements in article handling apparatus for retrieving and filing article carrying containers having a unique coding arrangement associated therewith for accurately verifying proper correspondence between any randomly selected article and its storage container.

In many present day large-scale article handling systems the quantity of articles has mushroomed to unprecedented amounts. This has forced rapid growth requirements on the industry and accordingly there have been many problems encountered in attempts to provide new, readily expandible equipment that retains the advantages inherent in known systems. For example, in the original document retrieval art problems are especially prevalent where great masses of documents must be kept as records, and stored for ready and rapid access. Incorrect filing of stored documents is one major problem that arises when attempts are made for the purpose of wholesale reduction of personnel requirements. In systems of this nature costly misfiling errors can more than cancel the realized savings in man-hours and cause nonreplaceable machine downtime. Further, in systems with extremely large storage areas it becomes an insurmountable task to seek out a misfiled document and thus irreplaceable documents may be in effect lost.

It is a feature of the present invention to obviate these problems, as well as others, while still making possible swift and reliable retrieval of original documents from remote storage. It will be clear from the description that follows that even though the preferred embodiment of the invention relates to an original document system it is by no means limited to a document handling system and is in fact adaptable to any system where a plurality of discreet articles are handled.

Without detailing the many other advantages of automatic document retrieval, it should be clear that the retention of original records is an essential prerequisite for present and future successful business in such fields as insurance and banking institutions as well as in public and private library and hospital facilities, government, educational and manufacturing complexes, and a host of other fields where records are relied on for continuous success. It also should be noted that the idea of storage of retrievable articles goes beyond mere records and documents in many of these fields, such as for example, books in libraries, merchandise in warehouses and parts and subassemblies in factories.

SUMMARY OF THE INVENTION

The present invention contemplates a new and useful article handling system comprising apparatus of the nature mentioned above. More particularly the invention is directed to a unique verifying arrangement for preventing delivery of an improper storage container to an operator control area from a remote storage area.

The system includes apparatus in which a plurality of discreet articles are remotely stored in any one of a plurality of articles carrying containers. Each particular article is assigned a code which corresponds to the code designation for the storage container with which it is associated. Each container in turn is assigned to a particular storage location referred to generally as the "address" of the container. Thus, the container address, the container and articles stored in the container are all identified by a like code designation. Likewise, the code may be applied to indexing cards for external referencing methods such as file cross-references systems, or the like.

To further illustrate the environment of the present invention reference is made to my copending U.S. Pat. application entitled "Article Handling Apparatus" bearing Ser. No. 618,119, filed on Feb. 23, 1967, and assigned to a common assignee, wherein a retrieval system is illustrated which is readily adapted for utilization as part of the overall system necessary for carrying out the automatic retrieval and filing of articles with the present invention. Insofar as the specific system is concerned the general combination comprises an article handling system capable of handling a plurality of article carrying containers having a distinct structure for enabling verification that the proper container is retrieved and subsequently stored. The system disclosed in my above referred to copending application is capable of functioning in the requisite manner, i.e., the containers of the nature disclosed may be retrieved and/or filed by transporting means between storage and control areas.

The system of this invention is particularly adapted to obviate misfiling of the nature discussed hereinabove by preventing access to a retrieved container until the article identification code is read by an appropriate reader and proper correspondence between the article and retrieved container is verified. In one embodiment the articles comprise file folders and the containers include a coded tab corresponding to the file folder tab. The coded address provided on the container tab comprises a predetermined pattern of punched holes and each file folder stored therein is provided with the same code. As a further convenience the container and folder tabs may be provided with a color code for concurrent visual verification. Thus, a folder reader receives address information from the folder while a container reader receives address information from the container and if the address information provides the necessary coincidence the system control means permits the container to be transported to the access area at which the folder may be filed therein. Likewise, a similar coincidence function is utilized in retrieval of a container having a complete complement of folders to which access is desirable. For container retrieval a coded index card is utilized for verification and functions in the manner described with respect to the folder tab discussed above. The several operational steps involved as well as the various systems components employed are set forth in further detail hereinafter, and the various modes of operation will become apparent along with the varying scope of the many system elements.

Accordingly it is a principal object of the present invention to provide an efficient information handling system that is capable of providing automatic verification. The improved system comprises apparatus which operates in a unique manner and includes a novel container, making possible a new article retrieval and filing arrangement which achieves unprecedented economy and efficiency without sacrificing accuracy, flexibility and expansion capability.

The foregoing and other objects, features and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, in conjunction with the accompanying sheets of drawings wherein one principal embodiment of the invention is illustrated by way of example. It is to be expressly understood however, that the drawings are for illustrative purposes only and are not to be construed as defining the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an improved article-handling system embodying the present invention.

FIG. 2 is a partial side view of the system shown in FIG. 1.

FIG. 3 is a sectional view taken along line 3–3 of FIG. 2.

FIG. 4 shows in detail a gating mechanism employed in the system shown in FIG. 1.

FIG. 5 is a cutaway view of the console shown in FIG. 1.

FIG. 6 is a side elevation of the container transfer mechanism shown in FIG. 5.

FIG. 7 is a perspective of the unique article-carrying container which is part of the novel combination of the present invention.

FIG. 8 illustrates in detail the coded portion of the container shown in FIG. 7.

FIG. 9 shows a coded folder addressed for storage in the container of FIG. 7.

FIG. 10 is a sectional view taken along line 10–10 of FIG. 1.

FIG. 11 is a partially cutaway plan view of the apparatus shown in FIG. 10.

FIG. 12 is a partial perspective view of a container tab at a reader station.

FIG. 13 is a block diagram of the novel verification means of the present invention.

FIG. 14 is a block diagram of a portion of the control apparatus for the present system.

FIG. 15 is a block diagram of the electromechanical sorter employed in the present system.

FIG. 16 is a chart illustrating the retrieve mode of the present system.

FIG. 17 is a chart illustrating the file mode of the present system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A. General System

Now referring to the drawings for a more detailed description, an article-handling system is shown in FIG. 1 to illustrate by way of example an embodiment of one type of system in which the present invention may be employed. The reference numerals 20, 21 and 22 generally designate article-storage apparatus, a control console and transport apparatus, respectively, the latter of which is interposed between the storage area and the control console and is employed in the manner to be described for the conveyance of selected articles. Henceforth the articles being handled will be referred to as containers for the purpose of the exemplary system. Prior to describing the specific structure of the system shown in FIG. 1, the general operational aspects of the system will be set forth to show the interrelationship between various components of the system. Specific operational steps employed by an operator making use of the general system as well as the present invention will be set forth in the section hereinbelow designated "OPERATION."

Input commands are provided at console 21 in response to which an extractor mechanism 23 withdraws any one of the many containers 24 in accordance with the particular command entered at the console. The selected container is then deposited on a first conveyor 25 in transport apparatus 23, for delivery to console 21 and appropriate followup action. When it is no longer necessary to have access to a retrieved container 24, it is automatically returned to its position in the storage apparatus via a second conveyor 26, in transport apparatus 22.

Storage apparatus 20 includes a plurality of multibay tiers arranged in opposing relationship and defining aisles in the face-to-face fashion of library book stacks. Each aisle is provided with an extractor mechanism 23 (only one of which is diagrammatically illustrated) which is positionable in horizontal and vertical directions adjacent any one of the storage bays, each of which is assigned a predetermined address readily identifiable by an appropriate code. The exterior mechanism is adapted to remove and restore rectangular containers from and to their storage position. One specific mechanism for carrying out this function is described in my above-mentioned copending application bearing Ser. No. 618,119, hereinafter referred to as my extractor application. It should be noted that the term "extractor" is used throughout this description and the description of my extractor application in a broad sense in that it is intended to encompass a mechanism which files as well as extract containers. Phantom outlines 27 and 28 (FIG. 1) of extractor 23 illustrate respectively two further positions employed during retrieve and file functions of the system.

Referring more specifically to the retrieve mode of the system, phantom outline 27 shown in FIGS. 2 and 3 further illustrates the position at which the extractor shuttle 30 cooperates with conveyor 25 to transfer a container thereto for delivery to console 21. Console 21, details of which are shown in FIGS. 1, 5 and 6, is adapted for providing access to a retrieved article after which it is returned to the file portion of the system and thereby transferred to conveyor 26 for ultimate return to its home storage location.

Now turning to the specific containers of the present invention, reference is made to FIG. 7 which illustrates in perspective a rectangularly shaped container 24' comprising a box being accessible at the top thereof and also including a slotted portion 31. The purpose of this slot is described in my copending application entitled "Article Handling Apparatus," filed May 10, 1967 and bearing Ser. No. 637,466, referred to hereinafter as my copending console application. The latter application is also assigned to a common assignee. Although the container referred to in my console application is specifically adapted to accommodate file folders for retaining documents and records or the like, it should be noted that my console application is merely referred to for the purpose of further illustrating a retrievable article adaptable for use with the console of the present system.

With reference again to FIG. 2 the extractor shuttle 30 when at phantom position 21 is adapted to deposit a container on conveyor belt 32, which belt is moving in the direction depicted by the various directional arrows designated by letter "*a*." *When a container being retrieved, e.g., phantom outline 24'', reaches console 21, it is transferred to conveyor belt 37 (FIG. 5) and is subsequently stopped at a verifier reader station 34. Assuming now that the container*'s identity is verified (explained hereinafter), it then becomes accessible at work station 35 whereupon the documents are conveniently fanned by element 36 which is driven upwardly for registration with container slot 31 as described in my console application, identified above. From the work station the container passes upon appropriate command, to a conveyor belt 37 (FIG. 5) whereupon transfer mechanism 38 physically transfers it to its initial position with respect to a conveyor belt 40, which latter position is illustrated by phantom outlined 41 (FIG. 6). Transfer mechanism 38 includes a pivot arm 42 securely mounted to rotatably driven shaft 43, and biased against stop 44 by spring 45 under nonoperative conditions. When shaft 43 is rotated in direction "*b*," an impelling arm 46 operatively engages container 24 FIG. 6 and urges it to phantom position 41 at which time a second stop member 47 prevents further rotation of pivot arm 42 which is subsequently returned to its nonoperative position by spring 45 when the rotative force is removed from shaft 43.

Subsequently, during file mode, belt 40 transfers a container at position 41 to belt 48 (FIG. 2) which then conveys the container to be filed into a reading station 50, at which station a sorting function takes place, i.e., the container address is determined insofar as the storage aisle is concerned, and in response to the aisle determination a simple gating sequence is initiated. Now referring to FIGS. 2 and 3 and assuming for exemplary purposes that the home bay for the container being filed is in the first aisle, a gating mechanism 51 is pivoted to the position shown (FIG. 3) and the oncoming container is diverted down a chute 52 to a reading station 53. Likewise a gating mechanism 51' and chute 52' are provided for containers destined for a bay in the second aisle, and like arrangements are provided for as many further aisles as are desired.

Gating mechanism 51 is shown in detail at FIG. 4 and comprises drive means 54, such as a motor, mounted on a bracket 55 and adapted to be energized for rotation of shaft 56 in direction "*c*." Extending outwardly from shaft 58 and over belt 60 is deflector arm 61 which, under conditions where drive means 54 is energized, is disposed in the path of oncoming containers. In the nonoperative condition of gating

mechanism **51**, deflector arm **61** is urgedly returned to the position illustrated by broken lines in FIG. **4**. Thus, when drive means **54** is not energized, shaft **56** is urged to its initial position under the influence of a biasing spring, or the like in a well-known manner.

After the sorting function is accomplished, the reading station **54** (described in further detail hereinafter) determines the precise location in the aisle to which the container is destined, whereupon appropriate positional information is passed to the control mechanism for the extractor, which then is moved to position **62** illustrated in FIG. **2**. The extractor withdraws the container from the reader in the same manner as it withdraws a container from its storage position. Ultimately, the extractor is positioned opposite the appropriate tier address for discharge of the "in transit" container to its home storage bay.

B. Addressing

The unique container **24'** referred to above and shown in FIG. **7** includes a tab portion **63**, shown in detail in FIG. **8**, for receiving indicia representative of the container's home storage bay. The particular coding technique utilized in this invention is one in which holes are provided on the container in a predetermined pattern and all the folders (one of which is shown in FIG. **9** and referred to by reference numeral **64**) assigned to that particular container are accordingly provided with the same coded pattern. It will become readily apparent, however, that folder **64** and container tab **63** by their very nature may be coded by any known technique such as, varying shaped holes, colored spots, magnetic particles, bumps, notches, electrostatic spots, etc.

For exemplary purposes the file folder **64** in FIG. **9** and the container **24'** in FIG. **7** are provided with identical codes. Referring to the FIG. **8** container tab, one array of possible holes is shown. Any number ("*n*") of conveniently patterned holes may be employed as suggested by the phantom presentation depicted. For explanatory purposes the disclosed system embodying the present invention utilizes one convenient addressing arrangement which contemplates two equal rows of eight holes, i.e., "*n*" is equal to 16. Hole "1" is present in all patterns to provide a strobing pulse for the sensing means. Holes "2" through "10" are employed to provide a digital code indicating the horizontal position of the container address. By using a means that individually senses the absence or presence of holes "2" through "10," any one of **512** horizontal positions can be designated, i.e., two raised to the ninth power. Likewise, holes "11" through "15" can be utilized to identify 32 possible vertical positions. Lastly, by using hole "16" to indicate either the left or right tier in a particular aisle a container can readily be coded with a specific address in the information-handling system's storage apparatus discussed above. Depending on the desired physical size of the system, the total requirement for number of holes on the tab will vary. Of course, the container tabs and the tabs of the folders assigned thereto must necessarily be in correspondence. It should be noted that this coding system is not limited to one in which a folder must be used, but any article may be stored that lends itself to storage in a container and to which an identifying coded tab may be attached. Also, any desirable external indexing system may be employed by merely providing cards with a similar pattern of holes corresponding to the container address for which external cross-indexing is desired.

The coding arrangement above described is directed to a one aisle system. In the event more than one aisle is contemplated, the aisle information can likewise be related to a particular sector in the address code. This information is then read and utilized as input for carrying out the sorting function, referred to above. For example, holes "18" and "19" can be utilized to indicate in which of four aisles the container storage address is located. This information is also necessary in determining which extractor mechanism is to be utilized during a retrieve mode operation.

C. Reading

The information-handling system as referred to hereinabove necessarily requires in several areas an important reading function to be carried out. More specifically, reading devices are shown in FIG. **1** and include a reader **53** (or **53'**) disposed as the reading station at the bottom of each chute and adapted to receive a container **24** that has been routed to the associated chute for eventual delivery to the container's home storage bay. These readers (designated by reference numeral **65**) are referred to as "address readers" hereinafter and are adapted to sense the particular coded address on the container tab whereupon the information may be readily utilized to initiate the actual control commands given to the extractor mechanism.

Other readers generally shown in FIG. **1** include a console reader **34**, a sorting reader **50**, a folder reader **66**, and a verifying reader **67**. These readers can be categorized as container readers and card readers, the latter of which include folder reader **66** and verifying reader **67**. These readers are adapted to read (or sense) the apertures in a file folder tab of the nature shown in FIG. **9**, when inserted along guide means **68**, **70** (FIG. **1**) as illustrated at console **21** by exemplary folders **64'** and **64''**. The card reader category comprises readers which will sense a card-type input regardless of its associated body portion. Input devices of this type are common in the electronic data processing industry and are an accurate means of transferring coded information to an electronic processor. For example, some card readers accomplish reading with a set of pins which move up through card holes to contact switches. This method is particularly well adapted to the present system in that it lends itself to static reading as opposed to dynamic wherein moving cards are read.

Other exemplary contemporary reading devices adaptable for use in the present system make use of wire brushes which touch a steel roll whenever a hole is presented. This method, of course, is not limited to static reading. Another well-known reading technique is accomplished with photocells, which technique lends itself readily to both the card and container readers of the present system. In this method a source of light is placed on one side of the card (or tab) path and photocells are located on the opposite side. When the aperture pattern moves into the read station, light passes through the holes to photocells whereupon electronic data pulses are developed.

The container readers, of which console reader **34** is shown in detail in FIGS. **10**, **11** and **12**, are adapted to receive a container tab and statically sense the coded pattern in a manner similar to that used for the card readers at the container reading stations conventional microswitch sensing means (not shown) are provided for operating a solenoid actuator to drive mechanical stop means into the path of the particular container being guided to the reading station. Examples of roller and belt guiding mechanisms for the container tab are illustrated in my extractor application, referred to above, wherein the container is guided to the extractor cavity at which position its presence is sensed by a microswitch for providing an appropriate electrical signal. The console reader diagrammatically illustrated in FIG. **10** shows a diverging slot **71** (FIG. **11**) for receiving a container tab **63** as it is conveyed along belt **33** to the console reader **34**. All other container readers disclosed are similar in that they receive a container supported in the like manner on conveyor means in the various conveyance assemblies. It should be apparent that any necessary combination of rollers could be utilized to facilitate the guidance of tab **63** to the mouth of diverging slot **71**. Upon such entry the tab's presence is sensed (e.g., a microswitch) and stop means **72** thrust outwardly in response to actuation of solenoid drive means, or the like. Under these conditions, stop means **72** is disposed in the path of the tab to accurately bring the container and tab to rest at the reader station whereupon enlarged alignment pins **73** and **74** (FIG. **12**) project into enlarged alignment apertures **75** and **76** (FIG. **8**) to facilitate the associated reader function. A pin-type reader is then used to sense the presence of apertures, the physical position of which

pins are then used to provide appropriate signals corresponding to either a "hole" or "no holes" conditions.

D. Verifying

In a system of the magnitude herein discussed, it becomes essential to verify that the container delivered to the console is in fact the container the console operator has requested. The various operational steps described in the next section of this description point out the various retrieval sequences that may be taking place and thereby necessitate such verification, but for the purposes of this part of the description and in light of the previous comments relating to verification, suffice it to say that verification is a desirable and quite often necessary (depending on system size, retrieve frequency, etc.) function of an article handling system of the nature described.

The diagram shown in FIG. **13** illustrates the specific elements employed in the verification apparatus. The console reader **34'** accepts the coded tab of the unique container at the reader station described above. Simultaneously, the verifying reader **67'** is receiving a coded card or folder which is assumed by the operator to correspond with the container. Such assumption is based on logical operational steps, i.e., placement of folders in sequence after they have been read. If identical codes are presented by the folder and container, a signal-comparison network presents a control signal to the solenoid which releases stop means **72** (FIGS. **11** and **12**) and thereby permits the container to be delivered to the access opening at work station **35**, whereupon the folder may be returned to the appropriate container. The signal comparison network receives a separate pulse corresponding to each aperture that is sensed in the coded patterns of both the folder and container tab. The overall signal (representative of the address) can be readily compared in this manner and thereby sensing the absence of coincidence between a corresponding pair. By standard logic circuitry, a control signal can be initiated in response to the absence of any signal representing a noncoincident counterpart of any of the pairs being sensed. Thus, the identity of the container delivered at the console is verified.

E. Control

An extractor **23** is operable in the aisle of the system shown (FIG. **1**) and a similar mechanism is operable in each of the other aisles in the system. For the purposes of this description, only extractor **23** will be described in detail insofar as its control is concerned. In my extractor application the manner in which a package is received or discharged is illustrated. The extractor is driven to any of the positions adjacent the many bays by selectively driving the horizontal and vertical drive motors. The horizontal motor positions a control column **77** in any of the predetermined positions adjacent the side-by-side columns of bays and the vertical motor drives the extractor vertically on column **77** to any of the predetermined positions adjacent the stacked rows of bays. Insomuch as the vertical and horizontal control arrangements are similar and independent, only the details of one will be described.

A block diagram of the vertical motor control arrangement is illustrated at FIG. **14**. Assuming the extractor has a home reference position from which the various bay locations are counted, the vertical position input is merely an electrical count of the number of rows that are traversed when the extractor moves from its home position which in the case of the first aisle for this example will be phantom position **28**, adjacent reader **65**. It can be noted that the extractor is actually disposed past the end of the storage tier when in its home position. This situation is readily accommodated by assuring that motion past the tier is in exact multiples of the bay width. Turning again to FIG. **14**, the position input is the actual vertical position to which the extractor is driven. This positional information provides an input for position sensor **78** which merely counts the number of shelves (or vertical bay position) past which the extractor is driven, and generates a position signal in the form of consecutive pulses.

Now returning to the commands which activate the extractor drive mechanisms, it will be broadly assumed, for the purpose of this portion of the description, that a coded address on a container selected to be retrieved will include a specific sector relating to vertical positioning information and that when a command is generated at the console the coded pattern of positional information appears on a corresponding card or associated folder. The code is read at the console and the vertical position information is decoded by decoder **80** which yields a signal corresponding to the vertical position of the bay at which the requested container is stored. Of course, regardless of the mode, the extractor may be similarly positioned in response to the presence of a coded input at any other input means, such as an input entered at a manual keyboard **81** (FIG. **1**) or the like. Regardless of the input means, the input command is decoded and fed to a signal generator **82** which generates a signal analogue, e.g., a predetermined discreet voltage level corresponding to ascending vertical rows. Meanwhile, the vertical motor is energized and the extractor begins to ascend, which in turn initiates the generation of position pulses which are counted by a counter **83** which also generates a step voltage output which ascends in discreet increments corresponding to the pulses being counted. The step voltage ascends in increments equal to the change of voltage level generated by signal generator **82** in response to the input command from decoder **80**. Accordingly, two input levels are fed to a signal comparator **84** which senses the presence of the input signal levels and produces an output in response to simultaneous entry of like signals. Output from the comparator is coupled to the motor control and deenergization takes place in response to the coincidence signal. Thus, the motor is accurately controlled to drive the extractor to any selected position. Likewise, the motor can be reversed in a well-known manner and returned to the level of conveyor **25** or reader **65** it being under, of course, that a similar horizontal drive arrangement is utilized in the same manner for driving the extractor and control column from side-to-side.

For the purpose of expediency, the circuits in each of the above-mentioned blocks will not be described in further detail. Circuitry well known in the art may readily be employed to function in the prescribed manner in accordance with the explained input and output functions attributed to such blocks. It is to be understood that this reasoning applies equally well to the various sections of the present system that are illustrated throughout this description by blocks or brief, generally acceptable symbols, phrases, or the like.

In the file mode of the disclosed system, the input commands are initiated in a manner similar to those mentioned above, i.e., A coded address is fed to the system which corresponds to a particular storage bay in the system. If a container is being filed it is automatically returned via conveyor **26** to sorted reader **50** which determines by the tab code on such container the aisle of the container home address. The sorter reader **50** thus physically receives the coded tab (FIG. **15**) and provides output corresponding to the code information for the particular gate that must be controlled to divert the container to the appropriate chute. The gate code is decoded by decoder **85** which develops an output pulse for selectively controlling the various gate drive mechanism, all of which are included in a gate control **86**, coupled to the decoder, which employs simple logic components capable of selecting a particular control.

F. Operation

In the disclosed system in which the present invention operates control is maintained by an operator stationed at console **21** (FIG. **1**). Many operational procedures of the overall system are possible with unlimited combinations of variations according to prevailing conditions, size of the system, type of business involved, etc. The modes of procedure now to be set forth are merely exemplary in nature to illustrate the environment in which the present invention

may be found. The two principal modes of the system are generically referred to as the "retrieve" and "file" modes, however, in most circumstances the operator operates the system in both modes in a consecutive manner. FIGS. **16** and **17** set forth in chart form the general sequence of operational steps that take place throughout the system in retrieve and file modes, respectively. The system's operation will first be explained from the operator's standpoint, i.e., the actual steps that take place at the console. The three principle situations that give rise to operation in the retrieve mode are: (1) the operator wishes a container to be retrieved for inspection of the contents thereof and removal of one or more particular articles, such as file folders, therefrom, (2) the operator wishes a container to be retrieved for filing of a new folder into the system. The four main conditions under which the file mode takes place include filing after any of the three listed retrieve modes of operation have been completed or when a new container is introduced into the system for automatic storage at a bay known to be vacant.

Now it will be assumed that an operator has received the "-Smith" folder for refiling into the appropriate storage container. Refiling orders can be retained temporarily in console file **87**. The folder is removed from file **87** and the tab thereof is inserted into reader **66** along guide **68** (FIG. **1**). The machine has now been commanded to retrieve the container which has a coded address identical to the code on the "-Smith" folder tab. During automatic retrieval the operator puts the folders in temporary hold recess **88** in console **21** and performs other tasks until the container becomes visible through transparent wall **90** of console reader **21**. Presumably the "Smith" container has been retrieved, however, in the event that more than one container request has been lodged, it will not be apparent that the proper container is presented without a visible inspection. To obviate the necessity for a visible inspection and to eliminate the possibility of operator error, the disclosed system includes a novel verifying feature which eliminates the possibility of misfiling. To this end, the retrieved container awaits the operator's next step of removing the "Smith" folder from recess **88** and the insertion of the tab thereof into verifying reader **67** along a guide **70** (FIG. **1**) releasing the "Smith" container from console reader **34**. The operator who then has the proper "Smith" file in his or her hands is able to file it in the container which next appears at access opening **35**, thus eliminating the probability of misfiling.

In the event the retrieve mode is initiated for the retrieval of a folder already in storage, an operator card is inserted into reader **66** for system command input. The card can be stored in any convenient manner, e.g., in console drawer **91** will appropriate indexing for ready access. Each stored container thus has a card with the identical address code pattern thereon. (In the alternative it should be noted that the input command can be manually introduced at keyboard **81**.) When the container is en route to the console, the card is conveniently held in recess **92** for temporary storage. Appearance of the container at transparent wall **90** again initiates the verifying sequence, which is carried out with the coded card being held in recess **92**, in the same manner as if it were the "Smith" folder discussed above. When the container becomes accessible, the desired folder is removed and placed in active file **93** for necessary action by the requester. It should be noted that the necessity and convenience of verification become apparent when considering the mentioned steps concerning the cards, viz both cards and folders may be held for verifying retrieved containers and without the verifies apparatus it can only be presumed that the first arrival at the console is the first-ordered container.

During file mode a container is returned to the system automatically from the console and follows a series of events which are apparent when viewing the FIG. **17** chart which is self-explanatory. It should be noted that reference to my two above-mentioned copending applications will aid in the clarification and thereby supplement the steps set forth in the charts of FIGS. **16** and **17**.

Many advantages of the present invention have been explicitly and/or implicitly set forth in the above description. Prevalent among these advantages is the flexibility of the novel verification apparatus to be employed in systems of varying size and nature without sacrificing economy, accuracy, speed and simplicity. It should be reemphasized that the disclosed system is merely one arrangement in which the present invention may be readily adapted.

Although a specific embodiment of the invention has been illustrated and described in detail by way of example, it is to be understood that the invention is not limited thereto. Various changes may be made in the design and arrangement of parts without departing from the spirit and scope of the invention as defined by the appended claims, as will now be understood by those skilled in the art.

I claim:

1. Method of handling articles in an automatic article-handling system of the type including a plurality of file folders for carrying documents or the like, the steps comprising,

a. reading the address-identifying indicia on the tab of a file folder,

b. retrieving an associated article-carrying container in accordance with the information on said tab,

c. reading the address-identifying indicia carried by the article-carrying container to determine the physical location with which the container is associated,

d. reading the indicia on the file folder simultaneously with the reading function being carried out with respect to said container, and

e. permitting the container to be readily accessible to an operator under conditions where the indicia on the container and the indicia on the file folder correspond, thereby verifying that the file folder can only be filed in the proper container.

2. The method as set forth in claim **1** and further comprising, storing the container at said physical location with which it is associated.

3. The method as set forth in claim **2** and further comprising,

conveying the container from its position of ready accessibility to its storage location identified by appropriate address indicia carried by the container, and

sorting the container in accordance with the address-identifying indicia carried thereby to determine the appropriate route along which the container is to be conveyed.

4. The method as set forth in claim **3** and further comprising

reading the address-identifying indicia carried by the container subsequent to the sorting step whereby the container is stored at its proper physical location when not in use.