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3,606,034

ARTICLE HANDLING APPARATUS

Filed June 4, 1969

2 Sheets-Sheet 1

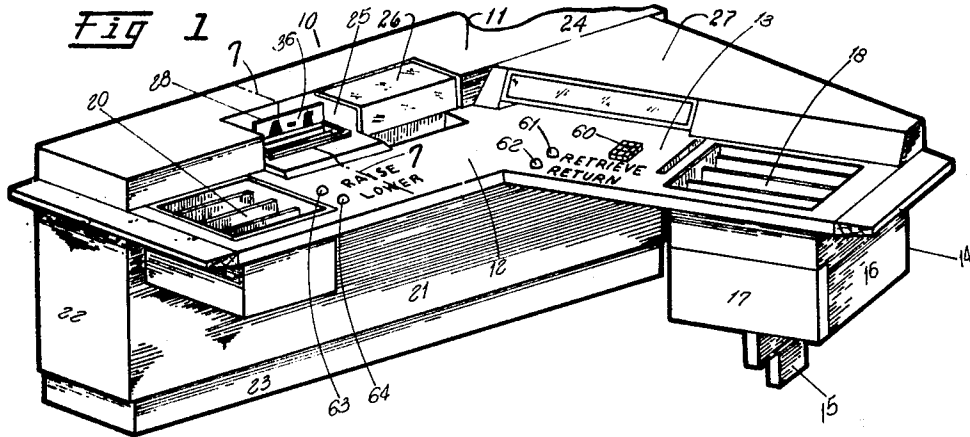


Fig 5

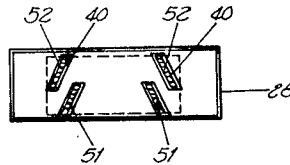


Fig 4

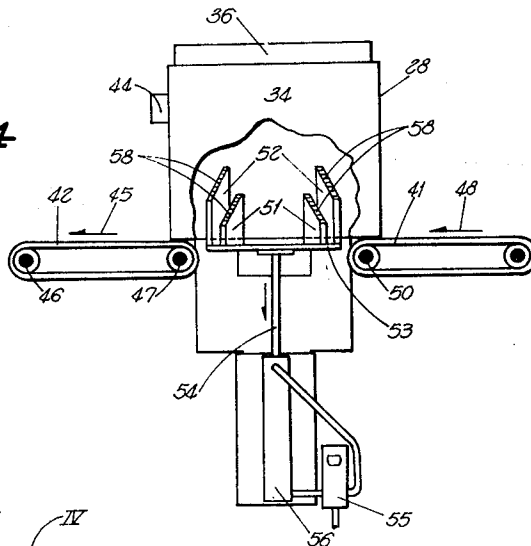


Fig 3

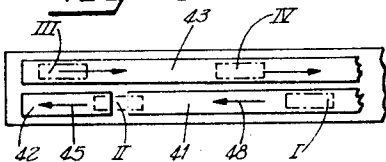
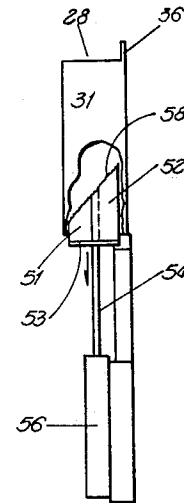


Fig 6



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2 Sheets-Sheet 2

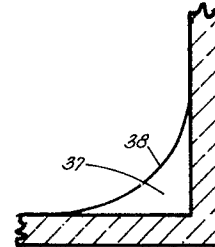
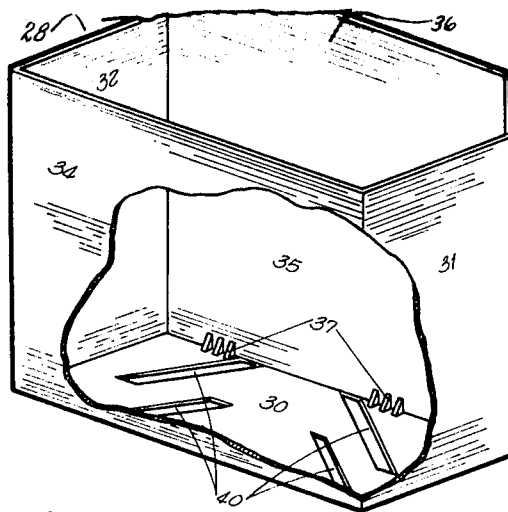


FIG 2a

FIG 2

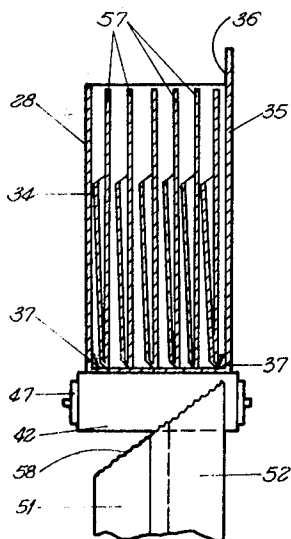


FIG 7

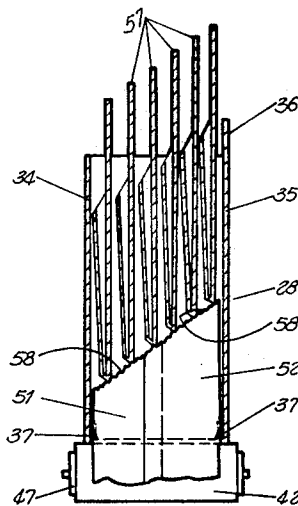


FIG 8

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ARTICLE HANDLING APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

A unique article carrying container and associated apparatus utilized therewith in a manual or automatic retrieval and storage system. The container is adapted to accommodate a plurality of substantially flat articles; such as documents, file folders, or the like. Appropriate means deliver a container to an operator console, whereupon the documents are automatically lifted from the container for convenient access. The upper edges of the articles are exposed in an echelon array to facilitate identification by means of associated indicia or coding means applied thereto. The lifting arrangement at the console comprises one or more fingers adapted for registration with a like number of cooperating slots in the container to effect engagement with the bottom edges of the articles accommodated by the retrieved container. Article guide means on the interior surface of the container prevent articles from becoming lodged between the fingers and the container walls under conditions where the fingers are protruding through the slots.

BACKGROUND OF THE INVENTION

The present invention relates to an article carrying container and more particularly to a unique container device used in a novel combination of apparatus for expediting and facilitating the handling of flat articles. Improved reliability is achieved at an operator console where any selected one or a plurality of stored articles is readily accessible.

It is well known in the article handling art to provide automatic equipment for selectively retrieving and ultimately refiling one or more of a plurality of stored articles. Likewise, it is not uncommon to semi-automatically or manually retrieve and refile articles in a manner similar to, but slower than, the automated methods. For example, equipment of this general nature is commonly found in library, warehouse and office storage systems as well as in banking, insurance and government institutions where efficient access to stored records is a continuously encountered problem.

Regardless of the nature of the business involved, or whether the retrieval method is automatic, manual or semi-automatic, there is usually a final step comprising delivery of the retrieved article or articles to a work station whereupon an operator or a machine takes or initiates appropriate action, i.e., inspection, use, or disposition in accordance with the nature of the retrieved article. Subsequently, in the case of nonexpendable articles, the retrieved article is refilled, randomly or at a predetermined address. The present invention particularly involves unique container structure and associated apparatus for handling articles subsequent to delivery of retrieved containers to a work station. In the principal embodiment, for exemplary purposes, the invention is described as it relates to the operator station for automated retrieval and filing apparatus for containers carrying a plurality of file folders for standard office records or the like.

To further illustrate the environment involving container handling apparatus wherein documents and/or file folders are retrieved (automatically or manually) from

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either an addressed or random storage array, reference is made to copending patent application, assigned to a common assignee, entitled "Automatic Article Handling System," filed Oct. 16, 1967 and bearing Ser. No. 675,453.

That application discloses and describes a new and useful system in which an operator work station is located remotely from the actual storage area. In systems of that type, many problems have been encountered in attempts to provide equipment that lends itself to efficient and convenient operator manipulation of the articles at such time as a container has been retrieved and delivered to the work station. To this end, it has been established that minimizing manual manipulation of the container increases reliability by reducing the occurrence of filing errors and thereby improving overall operation. For example, rather than removing the container and/or its contents from its retrieved position at the operator station, it is more beneficial to remove only the desired article (document, file folder or the like) from the container and retain such withdrawn article at the work station for necessary disposal. Meanwhile, the container may be refilled, thereby leaving the overall system free for the retrieval and general handling of other desired containers. When the removed article or articles are no longer needed, they are temporarily stored until the system becomes available for a refiling operation.

A principal object of the present invention is to provide improvements to the container and apparatus disclosed and described in copending U.S. patent application, assigned to the assignee of the instant application, entitled "Article Handling Apparatus," filed May 10, 1967 and bearing Ser. No. 637,446, now U.S. Pat. No. 3,476,265.

A further object is to provide a container of the class described wherein a unique design affords rigidity of structure without sacrificing economy and simplicity. Accordingly, conservation of space is realized in systems where containers are stored side-by-side on shelving. More specifically, the improved container eliminates the tendency to bulge, which has existed in the past where heavy or bulky articles were involved.

Another object is to provide an improved container adapted to cooperate with associated article handling apparatus in a novel manner whereby accurate and reliable operation is enhanced.

Still another object is to provide an improved combination comprising a novel article carrying container and associated container handling apparatus adapted to eliminate previous functional difficulties and thereby improve frictional wear characteristics.

SUMMARY OF THE INVENTION

The present invention contemplates a new improved article carrying container and associated apparatus of the type referred to in the above abstract. Flat articles are carried by the container via a transport mechanism to a work station whereupon the articles are lifted to visually display indicia thereon. Rapid access to any selected article within the retrieved container is facilitated by novel container structure adapted to prevent malfunctioning of the lifting mechanism.

In one embodiment, the novel structure of the present invention is adapted for use in an information storage and retrieval system of the nature disclosed in the above mentioned patent application, entitled "Automatic Article Handling System," wherein coded boxlike containers are delivered to and returned from a work area. Each container, as herein shown and described, may be utilized in the mentioned system to accommodate a plurality of file folders having specified documentary contents and a conventional identifying tab. The bottom wall of each container includes one or more slots adapted to receive co-

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operating finger means extending upwardly from a lifting mechanism at a work station. The finger means operatively register with the slots and one or more slanting serrated surfaces thereby sequentially engage the bottom edges of the file folders.

Thus, when a container is delivered to the work station, the lifting mechanism projects fingers through slots therein to engage the accommodated file folders and thereby display their respective identifying tabs in a convenient echelon array. This combination permits ready discovery of and access to the contents of the container without necessitating removal of such container from its position at the work station. Novel article guide structure in the container prevents malfunction of the lifting mechanism, i.e., under conditions of registration, the fingers engage all the articles in the container regardless of slight misalignment during insertion of the articles. More detailed functional and structural aspects of this feature will be defined hereinbelow.

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 sheet of drawings wherein one principal embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawing is for illustrative purposes only and is not to be construed as defining the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the console in an article handling system with which the improved container and apparatus embodying the present invention may be readily employed.

FIG. 2 is a partially cutaway perspective view showing the unique structure of the container.

FIG. 2a is a partial sectional elevation showing a fillet integrally disposed in the FIG. 2 container.

FIG. 3 is a diagrammatic illustration of a conveyor system readily adaptable for use in the console shown in FIG. 1.

FIG. 4 is a schematic front view showing the work station for the article handling system embodying the present invention.

FIG. 5 is a top view showing the container and the associated fingers at the work station.

FIG. 6 is a partially cutaway elevational view of the FIG. 4 apparatus.

FIG. 7 is a sectional view taken along line 7—7 of FIG. 1 to show an article carrying container at the work station.

FIG. 8 is a sectional view similar to the view of FIG. 7 but showing the elements at a later stage in the sequence of operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Now referring to the drawings for a more detailed description, a console, generally designated by reference numeral 10, is shown in FIG. 1 to illustrate by way of example an operator work station at which one embodiment of the present invention is readily employed. One or more persons may be stationed at console 10 for operating remote article storage and retrieval apparatus. For exemplary purposes, console 10 is of the nature adaptable for use with the type retrieval system disclosed in the above mentioned patent application, entitled "Automatic Article Handling System," wherein extraction and filing functions are carried out in response to operator commands at a similar console. As in most retrieval systems, articles are ultimately delivered to a work area, whereupon appropriate action or nonaction is taken. The present invention is directed to novel article handling apparatus adapted to function in a new and useful manner with regard to final delivery of the articles in the vicinity of such work area.

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Console 10 includes a main body portion 11 with a work table 12 extending therefrom to facilitate manipulation of retrieved articles. A forwardly extending portion 13 of work table 12 extends over a supporting pedestal 14, comprising a supporting foot 15, and a storage section 16, including a drawer 17 and an open sectionalized compartment 18 accessible through a cutaway portion of table 12. The other end of table 12 is also provided with an opening for permitting access to a similar sectionalized compartment 20. Main body portion 11 is enclosed by a front panel 21, and an end panel 22, a base kick plate 23, and a top panel 24, all of which are visible in FIG. 1. A similar back panel (not shown) completes the enclosure. The right end (not shown) is at least partially open for reasons rendered obvious from the following description of the conveyance mechanism.

Referring in further detail to console 10, an access opening 25 is provided in top panel 24, through which opening the operator is permitted to receive and deposit articles such as documents, or the like. Opening 25 is sufficiently large to permit an article carrying container (of the nature described hereinbelow) to pass therethrough. A transparent section 26 is provided adjacent opening 25 to enable the adjacent area of main body portion 11 to be visible to an operator at his normal work position, i.e., sitting or standing in the vicinity of table 12 adjacent opening 25. A compartment 27 is adapted to enclose electrical circuitry and related components utilized in the operation of console 10. Such circuitry and components may include keyboard mechanisms, motor control circuits, solid state switching mechanisms, etc., all of which are not directly related to the present invention and therefore will not be described in detail. It should be noted that regardless of the particulars of the associated storage and retrieval system, the function and resulting operation of the present invention is not affected.

At the heart of the present invention is a rectangular container 28, shown in FIG. 2 employed to carry articles to and from access opening 25. Container 28 generally comprises an open-ended, boxlike device defined by a bottom wall 30 and first and second upwardly extending side walls 31 and 32 respectively. The side walls cooperate with a front wall 34 and a rear wall 35 to form an article accommodating compartment. A tab 36 extends upwardly from rear wall 35 and, if desired, appropriate identifying notches, marks, holes, etc. may be applied thereto. A randomly selected container 28 is shown at rest in access opening 25 of console 10 (FIG. 1), which container includes an identifying tab 36 visibly extending for convenient alpha-numeric identification or other general indexing of the container contents. Container 28 is conveyed to access opening 25 by means of a conveyor system including conventional belts, pulleys and drives therefor, which container has physical dimensions adapted to cooperate with the physical dimensions and characteristics of the articles accommodated therein. Accordingly, the console opening dimensions are established to accommodate the container.

A plurality of integral fillet segments, generally designated by reference numeral 37, are disposed at the juncture between upstanding rear and front walls, 35 and 34, and adjacent bottom wall 30. A detailed view of a fillet segment in FIG. 2a, shows the concave nature of surface 38 of a particular fillet 37. It should be noted that surface 38 could be straight without affecting the scope of the present invention. In the embodiment described, two groups of three fillets 37 each are shown spaced along the juncture between rear wall 35 and bottom wall 30. Here again, insofar as the scope of the present invention is concerned, the number of groupings of the fillets is not critical. Two like groups of fillets (not shown in FIG. 2) are disposed in opposition along the juncture between front wall 34 and bottom wall 30. To complete the container structure, two pairs of di-

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verging slots, all of which are generally referred to by reference numeral 40, are disposed in bottom wall 30 and extend in a general back to front direction without interrupting the portions of bottom wall 30 along which fillets 37 are disposed.

Now referring to FIG. 3, a conveyor system adaptable for use in console 10 is diagrammatically illustrated. Roman numerals I, II, III and IV designate various positions in the path of travel of a selected container. At position I, the container is traveling to the left on a belt 41. The container is stopped at position II spanning the space between belt 41 and a second belt 42, which position corresponds to the container position in access opening 25, as shown in FIG. 1. Subsequently, as discussed in the operational description below, the container continues leftwardly on belt 42, a relatively short distance, until it is transferred to a third belt 43, moving to the right, whereupon the container moves from transferred position III to positions IV and finally out of the console and back to the storage area from whence it was originally retrieved.

Upon arrival of a container 28 at position II (illustrated in FIG. 4), a latch 44 (schematically shown) is operative to restrain leftward motion of the container, whereby it rests straddling the space between belt 41 and belt 42. Belt 42 is driven in the direction of arrow 45 on rollers 46 and 47 and belt 41 is likewise driven in the same direction, as indicated by directional arrow 48. Only one roller, 50, is shown in the drive for belt 41; however, any appropriate number of drive and idler rollers may be employed in a conventional manner to support and convey articles. Lifting means are operatively disposed below the path of travel and adjacent the vicinity of position II. Appropriate guide means (not shown) are employed to provide guidance and support for a container at position II. For example, the operator work station may include ledges extending in parallel to support the outermost edge portions of the bottom wall of containers at the access opening and spanning the space between belts 41 and 42. Other assisting means may be utilized for guidance and drive such as bearing rollers, which idle or are driven and operatively engage the container side walls as the forward end of the container is passing from the position on belt 41 above roller 50 to the position shown in FIG. 4.

The lifting means includes two pairs of fingers, generally designated by reference numerals 51 and 52, mounted on a base plate 53 which is reciprocally driven by a piston rod 54 which is operated in a conventional manner by a fluid pressure valve 55 which selectively cooperates with a cylinder 56. The fingers 51, 52 are mounted on plate 53 whereby registration with slots 40 is effected with minimal clearance as illustrated in FIG. 5, under conditions where a container 28 is at rest at the operator work station position which corresponds to the position identified by Roman Numeral II.

The lifting means shown in FIGS. 4-6 cooperate with container 28 in a manner whereby flat articles, such as file folders, disposed in the container may be partially lifted therefrom. More specifically, driven fingers 51, 52 register with slots 40 (FIG. 5) under conditions where container 28 is stopped by latch 44 at position II. Now referring to FIG. 7, container 28 and a plurality of articles 57 accommodated therein are shown at position II prior to registration of driven fingers 51, 52 with slots 40 (see FIG. 2). In FIG. 8, the elements are shown after fingers 51, 52 have been driven into registration with slots 40. Each finger 51, 52 has the general configuration of a ramp and includes a slanted serrated surface 58. It should be noted that the angle of surface slope of each finger is such that the surfaces are in a common slanted plane with respect to the bottom wall of the container. Each finger registers with a cooperating slot in the bottom wall of container 28 in a manner whereby all file folders or flat articles therein are engaged by at

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least two fingers. The two slots extending in diverging relationship from rear wall 35 terminate in the intermediate portion of the bottom wall, while the two slots extending in a diverging relationship from the intermediate portion of the bottom wall to front wall 34 commence at a point which effectively gives rise to an overlapping relationship of the two diverging pairs of slots. This relationship is illustrated in FIG. 5, wherein fingers 51, 52 are shown in relationship to slots 40 prior to being driven upwardly into engagement with a plurality of file folders 57, as shown in FIG. 8. As mentioned hereinabove, fingers 51, 52 in their uppermost position lift file folders to an echelon array bringing the tabs thereof into view. At this stage, if desired, the container may be lifted from its rest position on belts 41 and 42, by merely driving plate 53 into engagement with the bottom surface of bottom wall 30. Accordingly, the belt drives may continue during lifted conditions without causing frictional wear on the bottom surface of the lifted container.

It should be noted that fillets 37 (see FIGS. 2, 7, and 8) prevent the bottom edges of file folders 57 from resting in the bottom corners of container 28, as illustrated by FIG. 7, thereby assuring engagement between serrated surfaces 58 and the folders as shown in FIG. 8. A specific aspect of this function resides in the fact that a folder that engages surface 38 of a row of fillets slides by virtue of gravity inwardly and comes to rest at a minimum spaced distance from the end of the slots and thereby assures engagement with the end of the oncoming finger as it passes through such slot. The space between the fingers and the inside surfaces of the container wall is difficult and impractical to eliminate due to existing manufacturing tolerances during fabrication of the fingers and slots. Furthermore, exact registration would give rise to frictional engagement between the container and fingers which is undesirable.

The operation of the above described article handling apparatus can best be explained by following the flow of a document, or the like, through an exemplary retrieval sequence in a typical information storage system. For the purposes of this description, it is assumed that the information system involved comprises a business wherein the documents pertaining to each customer or client record are retained in a folder identified by a tab bearing the surname of the customer. For example, if an employee needs the "Brown" file to review a particular document therein, a request would be transmitted to the console, whereupon certain steps would be undertaken by a console operator. The console controls shown in FIG. 1 are diagrammatic in nature to aid in the explanation of the overall system. These controls include a data entry keyboard 60, a "retrieve" push button 61 and a "return" push button 62 on extending portion 13 of work table 12. The controls further include on the left side of work table 12, a "raise" push button 63 and a "lower" push button 64 for controlling the lifting means.

Referring again to the "Brown" illustration, retrieval of the requested file may be initiated by entering appropriate data at keyboard 60 whereupon the container carrying the "Brown" file is identified, and the information can then be stored or the retrieval apparatus (not shown) can be programed or otherwise prepared as required according to the system employed. The operator then presses retrieve button 61, and the selected container is subsequently conveyed along conveyor belt 41 (see FIG. 3) to position II where container travel is blocked by latch 44 disposed in the path of the container to retain the container in the position shown in FIG. 1. It should be understood that insofar as the present invention is concerned, the container 28 may be manually delivered to positions I and/or position II. Regardless of the retrieval mode, upon arrival of the selected container at position II, the file folders in container 28 are raised in an echelon array (see FIG. 8) in the access opening 25 in console

10. This raising operation may be initiated by pressing raise button 63. Alternatively, the operation may be automatically initiated when a container is urged against latch 44. In either instance, the lifting means described hereinabove are utilized and the "Brown" file folder is conveniently displayed to the operator for ready access as illustrated by the lifted relationship between the selected container and the contents thereof. It should be noted that the container may be identified by coding or other indicia on its tab. For example, the letters "A-C" may appear on the tab, and accordingly, folders therein relate to files for customers or clients with surnames beginning with the letters "A" through "C." The "Brown" folder is then available for removal and may be placed in storage compartment 20, if retention is desired. Subsequently, the container is lowered by pressing button 64. The container may be held in such lowered position (shown in FIG. 1) or, alternatively, if continuous use of the console is required, the container may be returned to storage for later recall for refiling of documents and/or folders. In the present illustration, return of the container is initiated by pressing button 62.

More specifically, operation of the lifting apparatus can be described by reference to FIG. 4 of the drawing. Belt 41 delivers a selected container 28 to position II (FIG. 3) whereupon latch 44 retains the container against forward motion as mentioned above. Lifting fingers 51, 52 are then driven upwardly to engage the lower edges of the file folders or the like retained in container 28. Now referring to FIG. 7, the lifting member is shown as it approaches the lower edges of a plurality of file folders 57, shown in section. The lifted position is illustrated in FIGS. 4 and 8. FIG. 4 also shows that during engagement with the folders, and prior to the uppermost excursion of the serrated slanting surface portions 58 of lifting fingers 51, 52, the container may be lifted from belts 41 and 42, by virtue of engagement between plate 53 and the bottom surface of bottom wall 30. (The latter mentioned lifting position is not shown in FIG. 4.) The lifting action is desirable to minimize abrasion between the bottom surface of container 28 and the moving belts 41 and 42, which in some instances may continue to be driven in directions 45 and 48 respectively, during the time file folders 57 are lifted from container 28 as shown in FIG. 8.

Conventional sensing means, such as a microswitch, may be associated with latching means 44 whereby the sensing of a container at position III enables a control unit to cooperate with piston valve mechanism 55 resulting in linear drive of plate 53, via rod 54 operatively coupled to cylinder 56. As mentioned above, a retrieved container 28 may be returned to the storage area by entry of the appropriate command at the console. Alternatively, the container may be retained at access opening 25 of console 10 until appropriate action is taken with respect to the withdrawn document. In the latter instance, transparent section 26 is provided to make the operator aware that a later called document container is available and awaiting action.

Many advantages of the present invention have been explicitly and implicitly set forth in the above description. Prevalent among these advantages is the ability for an operator to automatically display a plurality of retrieved document file folders so that each of the identifying tabs are readily visible. It should again be emphasized that this permits the minimum amount of handling of the container that accommodates the folders.

Other advantages include conservation of operator time due to reliable accessibility to files without interruption of smooth continuity between operational steps, i.e., the operator is assured that all documents are visible during each lift operation. A further advantage is realized in that the relatively small and slanted container slots avoid difficulties which could arise during transfer to storage shelves under slightly misaligned vertical conditions, i.e., a large transverse slot parallel with the shelf edge could abut with

such edge during transfer to the shelf. Still further advantages of the slotted container reside in the resulting rigidity as well as the elimination of frictional edges disposed perpendicular to the path of travel along conveyor belts or rollers.

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 will now be readily understood by those skilled in the art.

What is claimed is:

1. In article handling apparatus, the combination comprising,

- (a) a storage area,
- (b) an operator work station,
- (c) a plurality of substantially flat articles, each including top and bottom edges,
- (d) a container comprising a bottom wall, a front wall, a rear wall, and first and second side walls, all of which walls are joined to form a compartment adapted to accommodate said articles in a side-by-side relationship and extending substantially between said side walls in an upright manner,
- (e) said bottom wall having a plurality of slots therein extending generally in a transverse direction with respect to said front and rear walls,
- (f) means for transporting said container and accommodated articles from storage to the work station,
- (g) lifting means disposed at said work station comprising a plurality of movably mounted fingers disposed to register with a cooperating like plurality of said slots and means for imparting motion to said fingers to effect such registration and thereby permit engagement with the bottom edges of said accommodated articles extending adjacent said slots whereby all of said accommodated articles are partially lifted from said container,
- (h) said plurality of cooperating slots comprising two diverging pairs of openings in said bottom wall in a manner whereby the bottom edge of any of said flat articles extends across at least two of said openings, and
- (i) means for preventing any of said accommodated articles from remaining between the walls of said container and said fingers under conditions where said fingers are engaging said bottom edges to lift said articles.

2. Article handling apparatus as set forth in claim 1 wherein each of said fingers includes a flat face portion slanted with respect to said bottom wall to thereby enter said cooperating slot in an angular relationship, said finger thereby adapted to engage said bottom edges to sequentially display said top edges in an echelon type array under conditions where said articles are partially lifted.

3. A container adapted to accommodate a plurality of substantially flat articles, said container comprising,

- (a) a bottom wall,
- (b) a front wall,
- (c) a rear wall,
- (d) first and second side walls,
- (e) said walls joined to form a compartment for accommodating the articles in a side-by-side relationship under conditions where the articles extend between said sidewalls in an upright manner,
- (f) said bottom wall having a plurality of cooperating slots comprising two diverging pairs of openings arranged in a manner whereby substantially any end-to-end straight line along said bottom wall extends across at least two openings, and
- (g) integral fillet means disposed at predetermined intervals at the juncture between said bottom wall and said vertically extending front and rear walls, whereby all flat articles accommodated in the vicinity of

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either such front or rear wall is spaced therefrom by said fillet means.

4. A container as set forth in claim 3, wherein said slots terminate contiguously with said juncture between said bottom wall and said vertically extending walls, thus defining an abutment between said juncture and said termination; and

said integral fillet means comprise a plurality of segments each of which includes a relatively narrow flat surface extending between a vertical wall and said bottom wall and embraces a portion of the surface of the bottom wall, the horizontal width dimension of such portion not exceeding the perpendicular distance between said juncture adjacent said fillet and the edge of said slot.

5. A container adapted to accommodate a plurality of substantially flat articles, said container comprising,

- (a) a bottom wall having opposing front and rear edges,
- (b) a front wall extending upwardly from said front edge,
- (c) a rear wall extending upwardly from said rear edge,
- (d) first and second side walls extending between said front and rear walls to form a compartment for accommodating the articles in a side-by-side relationship under conditions where the articles extend between said sidewalls in an upright manner,

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- (e) said bottom wall having at least one slot therein extending generally in a transverse direction and terminating contiguously with the junctures between said bottom wall and said vertically extending front and rear walls,

- (f) abutments defined by said junctures and said terminations, and

- (g) integral fillet means disposed at predetermined intervals at the junctures between said bottom wall and said vertically extending front and rear walls, said fillet means comprise a plurality of segments each of which extends in a generally front to back direction and embraces a portion of the surface of the bottom wall, the horizontal width dimension of such portion extending beyond said abutments, whereby a flat article accommodated in the vicinity of either such front or rear wall is spaced therefrom by said fillet means.

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WILLIAM T. DIXSON, JR., Primary Examiner

U.S. Cl. X.R.

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