United States Patent [19]

Tomlinson

[11] **3,884,369**

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[54] **METHOD AND APPARATUS FOR UNLOADING AND STORING REELS AND THE LIKE**

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[52] **U.S. Cl.** **214/8;** 198/131

[51] **Int. Cl.** **B65g 57/16**

[58] **Field of Search** ..... 214/8, 16.4, 16.1 A; 198/28, 131, 103, 35; 211/1.5; 209/80.5

[56] **References Cited**

UNITED STATES PATENTS

2,869,738	1/1959	Nelson et al.	214/8
3,024,887	3/1962	Ingham, Jr.	198/131
3,033,342	5/1962	Kinnicutt, Jr.	214/8
3,042,185	7/1962	Welch, III	198/160
3,195,444	7/1965	McLean	214/8
3,240,356	3/1966	Hill	214/8
3,276,563	10/1966	Fitzgerald et al.	198/28
3,378,827	4/1968	Hertrich	214/16.4 R
3,383,147	5/1968	Proulx et al.	211/1.5 X
3,545,632	12/1970	Cooper	214/8
3,672,663	6/1972	Tomlinson	271/64
3,715,040	2/1973	Polus et al.	214/16.4 R

OTHER PUBLICATIONS

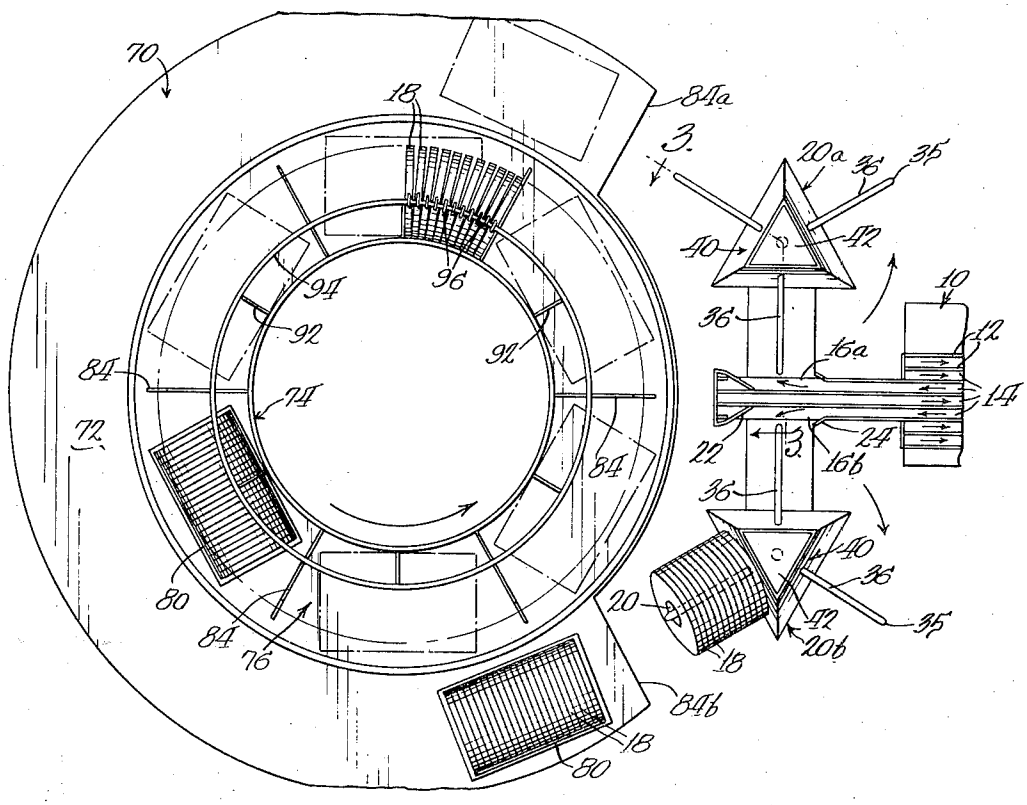
B. Demchyshyn, "Component Orienting Apparatus," June 1972, Vol. 15, No. 1, IBM Technical Disclosure Bulletin, p. 194–5.

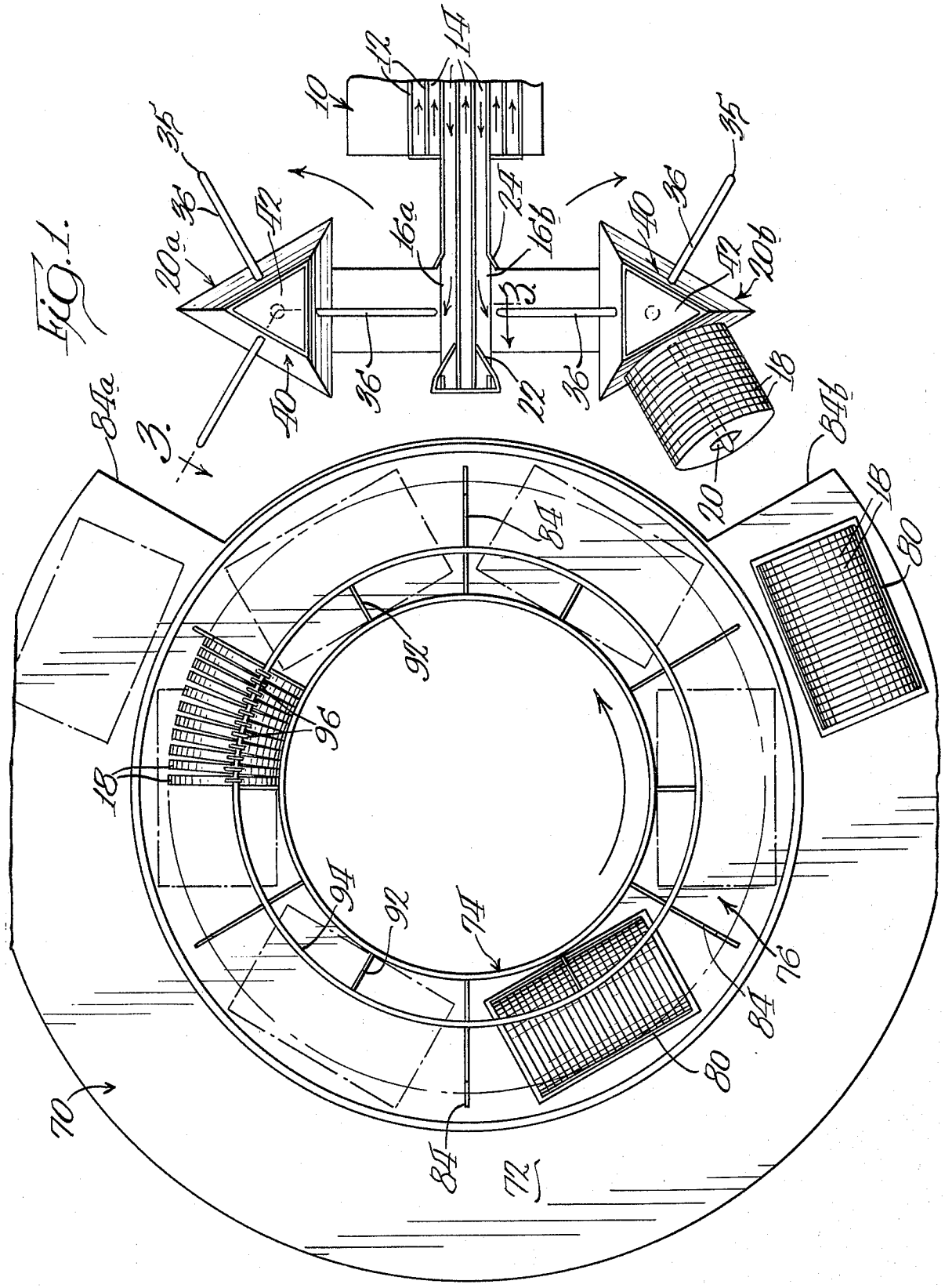
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[57] **ABSTRACT**

A method and apparatus is disclosed for unloading or collecting and storing a series of toroidal objects and similar articles, each having an opening therein in a fixed location, which are supplied singly and sequentially in an upright position on a conveyor. The apparatus comprises a rotatably mounted shaft having a plurality of downwardly slanted radial spindle arms, each of which may be positioned in the path of the opening of an object as it is deflected laterally off the conveyor. The objects are collected in a contiguous group on a first arm, and the spindle is then rotated until another arm is in loading position, whereupon the objects may be removed as a group from the first arm.

5 Claims, 3 Drawing Figures




FIG. 1.
10
12
14
16a
16b
18
20a
20b
22
24
34
35
36
38
40
42
70
72
74
76
80
84a
84b
84
88
90
92
94
96

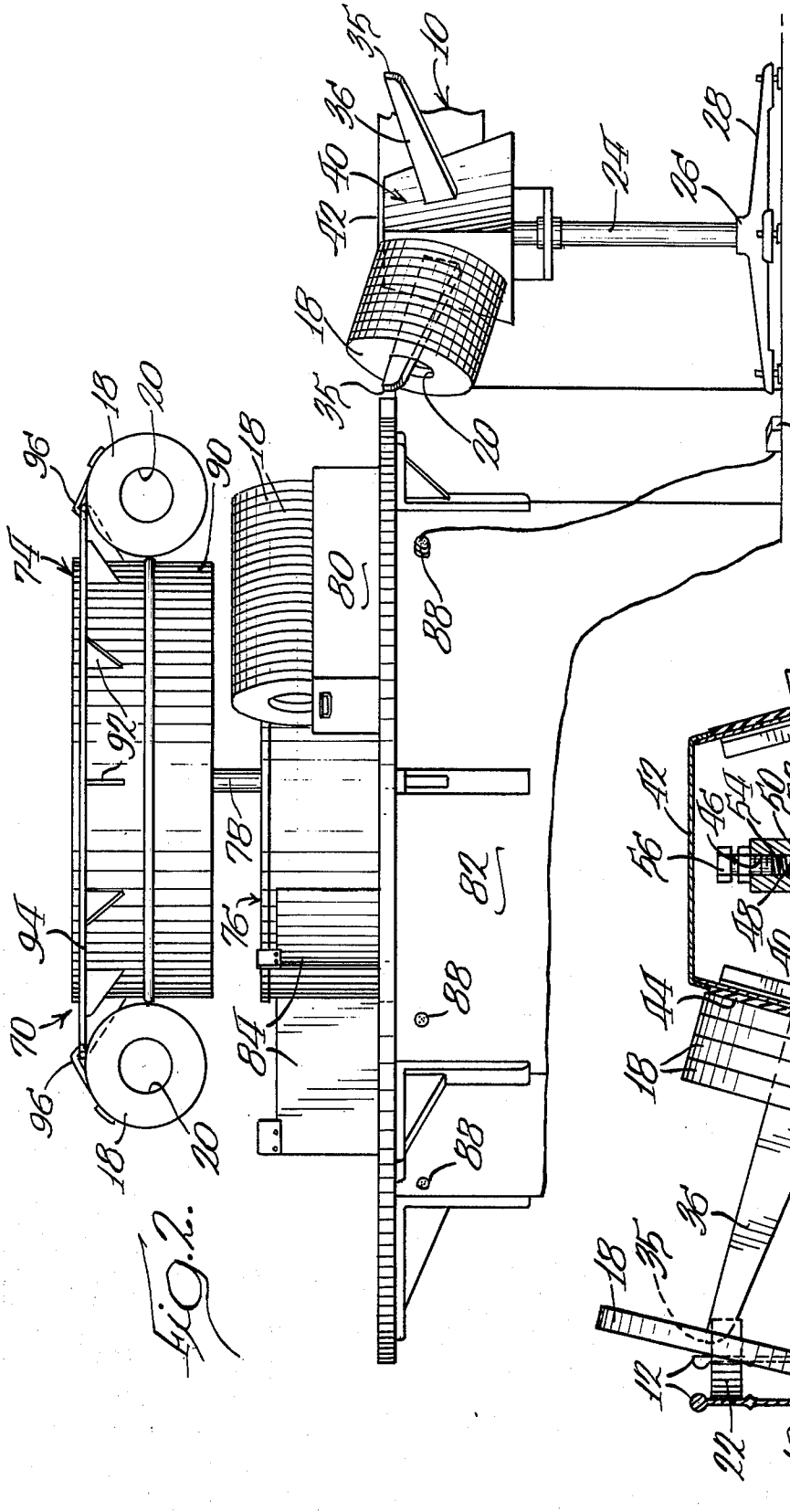


FIG. 2.

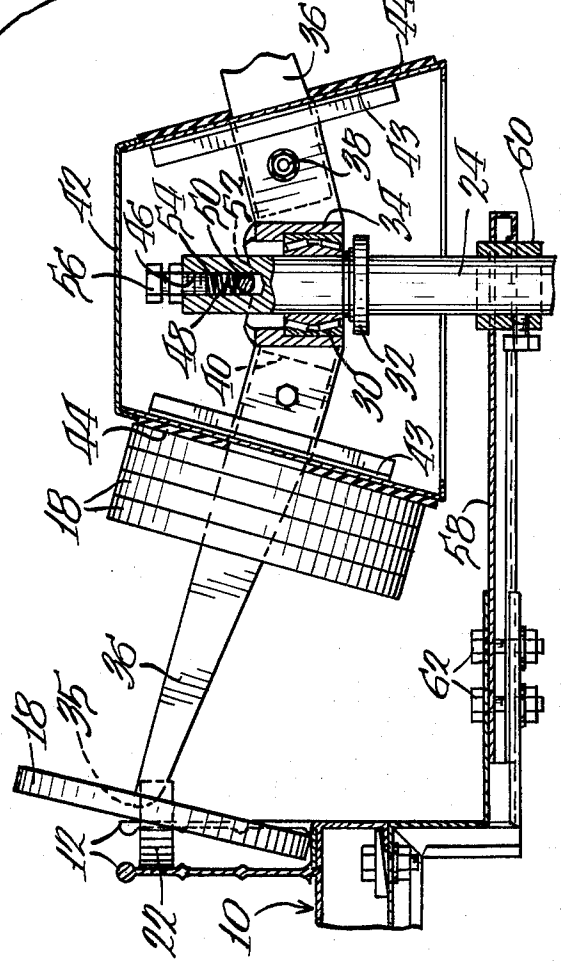


FIG. 3.

METHOD AND APPARATUS FOR UNLOADING AND STORING REELS AND THE LIKE

BACKGROUND OF THE INVENTION

The Welch U.S. Pat. No. 3,042,185, discloses a document conveyor comprising a plurality of narrow channels defined by upstanding parallel ribs. A moving belt in each channel carries one or a linear series of documents on their edges from one location to another. Each document, upon reaching the desired location, may be diverted and collected in a drop box or other collection device, such as the one shown in U.S. Pat. No. 3,672,663.

It has been found that a conveyor of the type described above may be used for conveying tape reels on their edges, such as reels of magnetic data tape used in computers. The problem arises, however, of how a single file of moving and relatively heavy objects may be collected at their point of destination in an orderly manner without the constant need for supervision and handling of individual objects.

SUMMARY OF THE INVENTION

The present invention provides a lateral deflection outlet on a linear conveyor which is in communication with a collection device. The reels or other objects have apertures therein in a fixed location and are carried on their edges in an upright position on the conveyor belt. The collection device comprises a plurality of spindle arms, one of which is positioned to engage through or thread the apertures of successive objects as they are deflected from the conveyor outlet. The spindle arms are slanted downward from the exit, and the objects slide down the arm and are thus collected in a contiguous, face-to-face manner until the length of the spindle arm is loaded. An empty arm may then be brought into loading position, whereupon objects collected on the filled arm may be removed as a compact group.

The collection device is most advantageously employed in connection with a storage and sorting device having disc-shaped shelves which rotate about a common axis.

THE DRAWINGS

FIG. 1 is a plan view illustrating the exit end portion of a conveyor, together with an object collection device and a rotary storage device.

FIG. 2 is a fragmentary side view of the apparatus shown in FIG. 1; and

FIG. 3 is a vertical sectional view taken substantially along section line 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, a suitable conveyor means, generally indicated at **10**, is provided for transporting a plurality of objects in a single file. The conveyor **10** may be of the type shown and described in Welch U.S. Pat. No. 3,042,185, incorporated herein by reference, and preferably comprises a plurality of parallel upstanding ribs **12** having a moving conveyor belts **14** disposed between adjacent ribs. Two of the conveyor belts move toward respective conveyor outlets **16***a* and **16***b*, whereas some or all of the other belts move in the opposite direction, as indicated by the arrows, enabling

utilization of the FIG. 1 apparatus as both a receiving and sending station.

The objects to be transported and collected as described in the preferred embodiment are disc-shaped tape reels **18** each having an axial circular aperture **20** therein, but it will be appreciated that the method and apparatus of the present invention may be applied to any toroidal object or any other object having at least one aperture therein in a fixed or known location, provided that the aperture, when supported in an upright position on an edge, is spaced from said edge.

It will also be noted that the width of each channel between adjacent conveyor ribs **12** is wider than the thickness of the object but is narrower than the diameter or length and width of the object, whereby the object may be carried only on its narrow edge with its aperture disposed across the longitudinal axis of the conveyor channel. The object is prevented from tilting excessively or falling over to one side by virtue of the vertical height and confinement of the ribs **12**, which serves to guide and laterally support the object in an upright position as it moves with the conveyor belt.

In the embodiment shown in FIG. **1**, two separate conveyor belts communicate with respective outlets **16***a* and **16***b* and respective collection devices **20***a* and **20***b* located on opposite sides of the conveyor. Since the outlets and collection devices are identical, only the outlet **16***a* and collector **20***a* will be described in detail for the sake of brevity.

The outlet **16***a*, as shown in FIGS. **1** and **3**, is formed by an open segment in the outermost rib **12** of the conveyor in which the objects are moving. The forward end of the open segment is blocked by an outwardly slanted guide finger **22** extending diagonally across the channel near the top thereof. The rear edge of the outlet **16**a is defined by a second guide finger **24** extending outward from the rear edge of the open segment near the bottom of the outermost conveyor rib. The length of the open segment is longer than the object being transported. As each object encounters the guide finger **22**, it is displaced laterally and caused to tilt over its supported edge toward the open segment between both guide fingers **22** and **24** and out of the conveyor. The reel is caused to tilt over about its lowermost edge because the guide finger **22** engages an upper portion of the reel and deflects such portion outwardly.

As shown in FIGS. **1–3**, the collection devices **20***a* and **20***b* each comprise an upstanding support, such as a vertical shaft **24** supported in an upright or vertical position by reception in a socket fitting of a floor pedestal **26**, which pedestal may have a plurality of radially extending, floor-engaging legs **28** for stability. The top of the shaft **24** is provided with a roller bearing **30** supported on a collar **32** secured around the shaft. The outer race of the bearing **30** is secured to a cylindrical member **34** which may rotate relative to the fixed shaft **24** about its axis and the coincident shaft axis.

A plurality of radially extending spindle arms **36** are mounted in a regularly spaced relationship on the member **34** and slope upwardly therefrom. Each of the arms is preferably in the form of a truncated pyramid with the portion of least cross section being at the free end **35**. The arms may be rendered individually removable by means of attachment by bolts **38** or the like, to stub supports **40** extending from the cylindrical member **34**. The top of the shaft **24** and the associated bearing assembly and bolts **38** may be covered by an in-

verted cup-shape cover 40 having a removable top 42 and having suitable openings in the sides thereof through which the arms may project. The outside side surfaces 43 (FIG. 3) of the cover surrounding each arm are preferably flat, disposed perpendicular to the slope of the respective arms, and may carry a resilient pad 44 to prevent damage to objects being loaded thereon.

As shown in FIGS. 1 and 3, the free end of each of the arms 36 is positionable to a location closely adjacent the conveyor outlet 16*a*, with the free end 35 being in register with the aperture 20 of the reel 18 as it is tilted or deflected out of the outlet. As shown in FIG. 3, the arms 36 slope downward from their free end, such that the apertures of successive reels will become threaded or impaled on the arm which is in loading position and will slide down the arm by gravity until a number of reels are collected on the arm in a contiguous stacked, face-to-face relationship. The capacity of each arm will of course be determined by the length thereof.

After the desired number of reels have been collected on one arm or after the entire length of the arm has been filled, the arms 36 and cylindrical member 34 are rotated until an empty or partially filled arm is in register with the outlet 16*a*. In order to insure the proper degree of rotation of the spindle and correct rotational positioning of each arm, a detent mechanism is provided between the shaft 24 and the cylindrical member 34. The top of shaft 24 has an axial bore 46 formed therein in communication with a radial slot 48 through which a pin 50 extends. The pin 50 extends outward at opposite sides of the shaft and is vertically movable in the slot 48. The top surface of the cylindrical member has a plurality of shallow V-shaped notches 52 which are engaged by the pin when each of the arms reaches the correct loading position. The pin is urged downward by engagement with a helical spring 54 located in the bore 46 above the rod and held under compression by an adjustable bolt 56. The detent device serves to facilitate correct positioning of each of the arms in unloading position and serves to hold the arms in proper position as they are being loaded.

In order to assure correct spacing between the unloading device and the conveyor, the shaft 24 and the conveyor are preferably held at a fixed distance from each other by an adjustable length bracket 58, one end of which is secured by a collar 60 to the shaft, and the other end secured to the conveyor. The bracket 58 is preferably made from telescoping sections held together by suitable fasteners, such as bolts 62, which feature allows adjustment in bracket length.

The unloading or collection device 20 is advantageously employed in connection with a reel storage-retrieval and sorting device generally indicated at 70 in FIGS. 1 and 2. The storage device allows for rapid handling, identification, sorting and other necessary manipulation of a large number of objects in a small space and preferably is in the form of a multi-tier rotary file.

The rotary file is preferably located closely adjacent the collection device and comprises a fixed work shelf 72, and two more tiers, such as upper tier 74 and lower tier 76, which are mounted for rotation about a central shaft 78. The tiers 74 and 76 are designed to store either single reels or a plurality of reels held in storage baskets 80, and the tiers may be either power driven or manually rotatable.

The file 70 comprises a cylindrical body 82 having the shaft 78 disposed centrally therein, and the work shelf 72 is in the form of a partial annulus extending outwardly from the body. The work shelf is cut away in that area thereof adjacent the conveyor to define edges 84*a* and 84*b* which are disposed substantially perpendicular and adjacent to one of the arms of the respective collection devices 20*a* and 20*b*. In this manner, the reels on a filled collection arm may be unloaded as a group directly onto a shelf, and the group may be placed in a basket 80 or on one of the tiers.

The lower tier 76 is preferably flush with and spaced inward from the work shelf 72 and comprises an annular shelf mounted for manual rotation around the shaft 78 and having a plurality of fixed radial dividers 84 defining adjacent spaces to hold individual baskets 80. The lower tier is preferably manually rotatable but contains an electrical braking device (not shown) operated by one or more foot switches 86 which may be connected in several sockets 88 located around the body 82 (FIG. 2).

The upper tier 74 preferably comprises a cylindrical body 90 having a plurality of struts 92 extending therefrom which support a circular rod 94. The individual reels 18 may be provided with a strap 96 having a hook at the end thereof which engages over the rod 94 for hanging storage of individual reels, and the body 90 may be provided with a resilient bumper 98 which is engaged by edges of the reels which are hanging from the rod. The upper tier is preferably continuously rotated by a motor (not shown) to expose successive hanging reels or storage locations to an operator.

It may be seen that the storage retrieval device accommodates quick and convenient storage of reels, either individually or in groups, and the multiple tier arrangement facilitates the arranging of the reels in any desired order, as well as for the rapid identification of any single reel or group.

What is claimed is:

1. Apparatus for collection and storage of a plurality of objects having an aperture therein in a fixed location comprising conveyor means for moving said objects in an upright position along a given path to an unloading location, collection means spaced on one side of said unloading location, said collection means having at least two sloping arms adapted to engage through the aperture of each object at said unloading location, support means for supporting the lower ends of said arms in a spaced radial relationship, said support means being rotatable to move either of said arms into a position adjacent said unloading location, with the other arm being spaced away from said location, means for tilting each object over laterally toward said collection means at said unloading location, whereby to engage said object on said collection means, and storage means adjacent said collection means for storing a plurality of said objects, said storage means comprising a plurality of storage tiers mounted for rotation about a common axis and being located adjacent to the other of said arms to facilitate the unloading of objects therefrom.

2. The apparatus of claim 1 wherein a resilient pad is provided at the lower ends of said arms, said objects being collected on said arms in a stacked, face-to-face relationship.

3. The apparatus of claim 1 wherein means are provided for releasably holding said arms in position adjacent said loading location.

4. The apparatus of claim 3 wherein said means for releasably holding said arms comprises a spring-loaded detent mechanism associated with said support means.

5. The apparatus of claim 1 wherein the means for tilting each object comprises a deflection member disposed diagonally across the conveyor means at the unloading location.

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