May 14, 1968 R. T. PROULX ETAL 3,383,147

ROTARY FILING SYSTEM

Filed Oct. 14, 1966 5 Sheets-Sheet 1

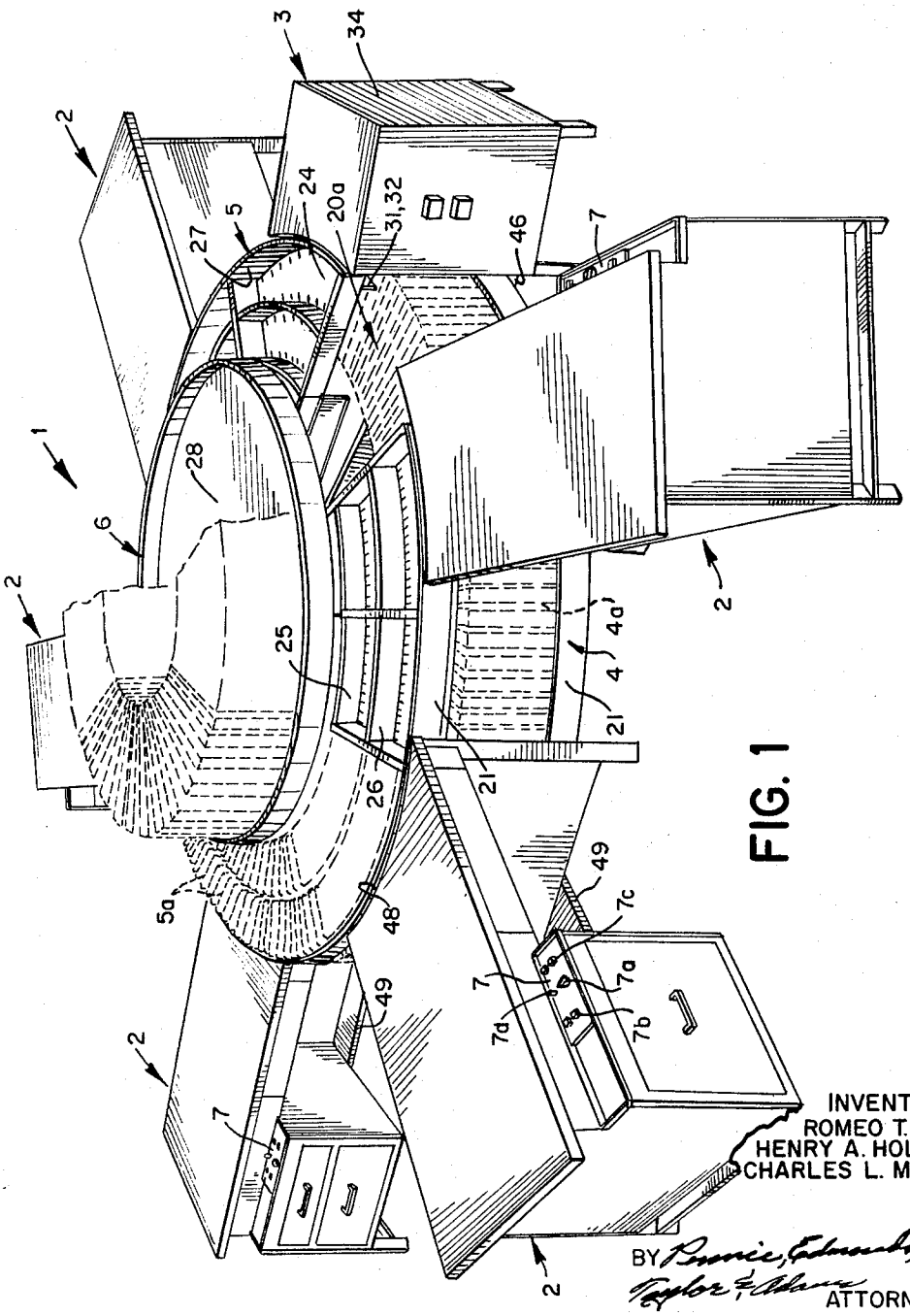


FIG. 1

May 14, 1968 R. T. PROULX ET AL 3,383,147

ROTARY FILING SYSTEM

Filed Oct. 14, 1966 5 Sheets-Sheet 2

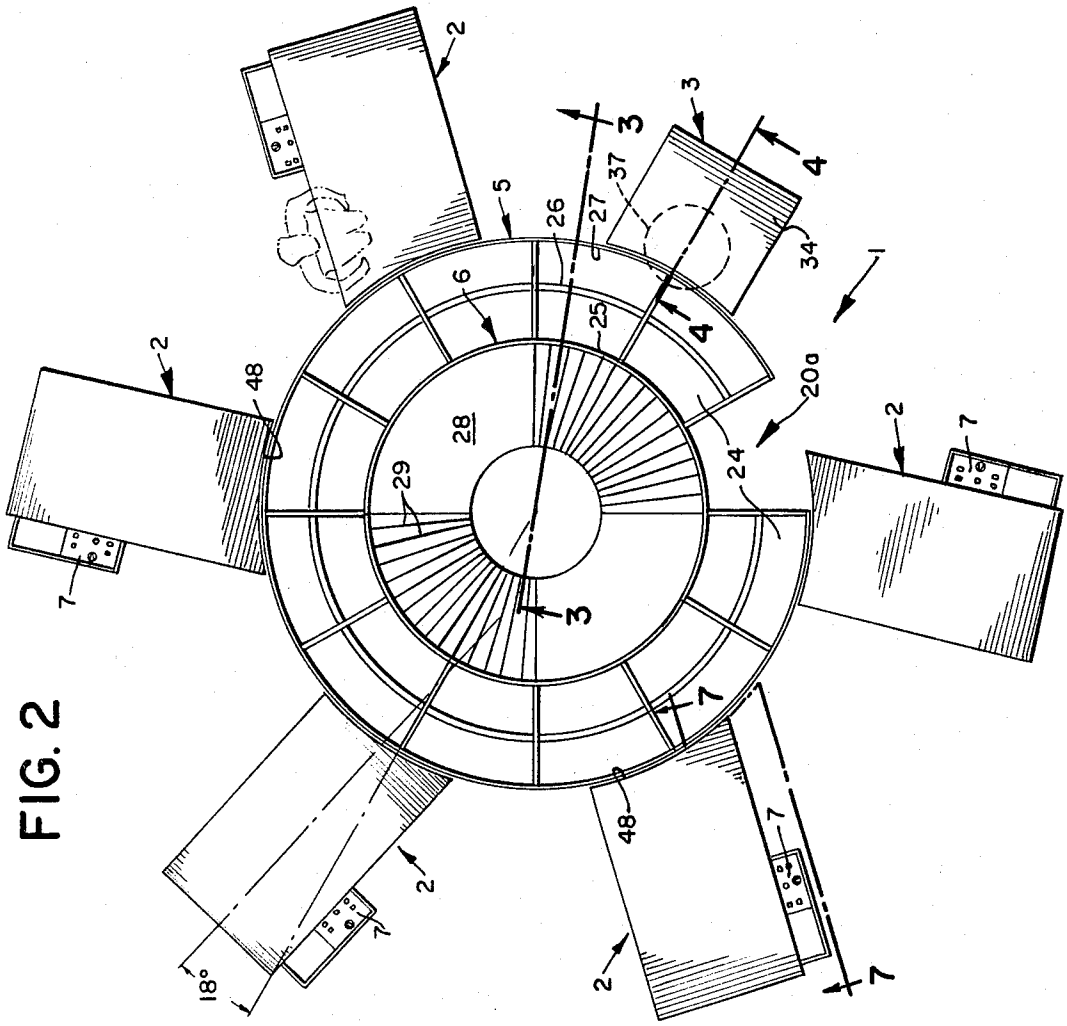


FIG. 2

INVENTORS
ROMEO T. PROULX
HENRY A. HOLZWARTH
CHARLES L. METZLER

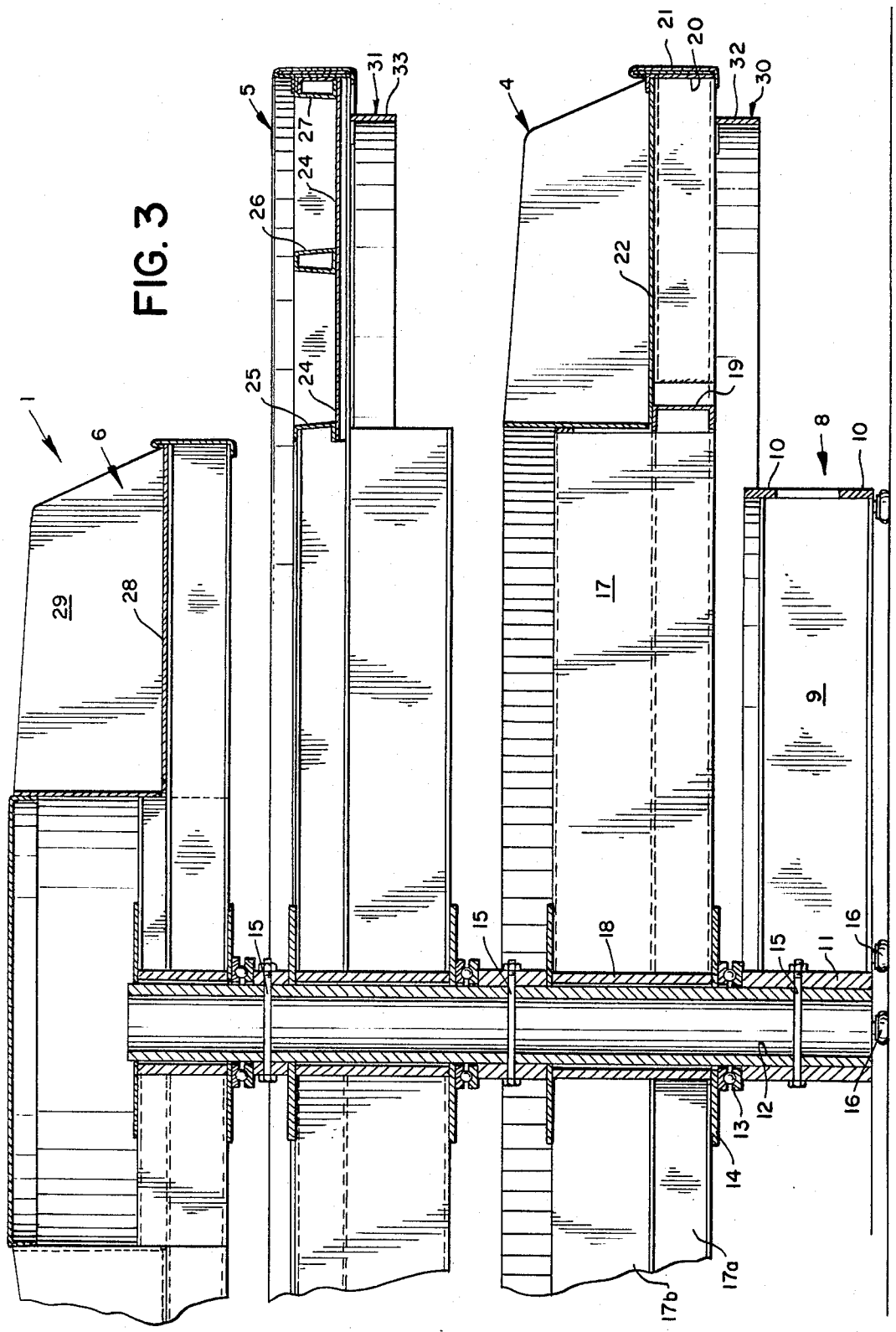
BY Pennie, Edmonds, Morton, Taylor & Adams ATTORNEYS

May 14, 1968 R. T. PROULX ETAL 3,383,147

ROTARY FILING SYSTEM

Filed Oct. 14, 1966 5 Sheets-Sheet 3

FIG. 3



May 14, 1968 R. T. PROULX ETAL 3,383,147

ROTARY FILING SYSTEM

Filed Oct. 14, 1966 5 Sheets-Sheet 4

FIG. 5

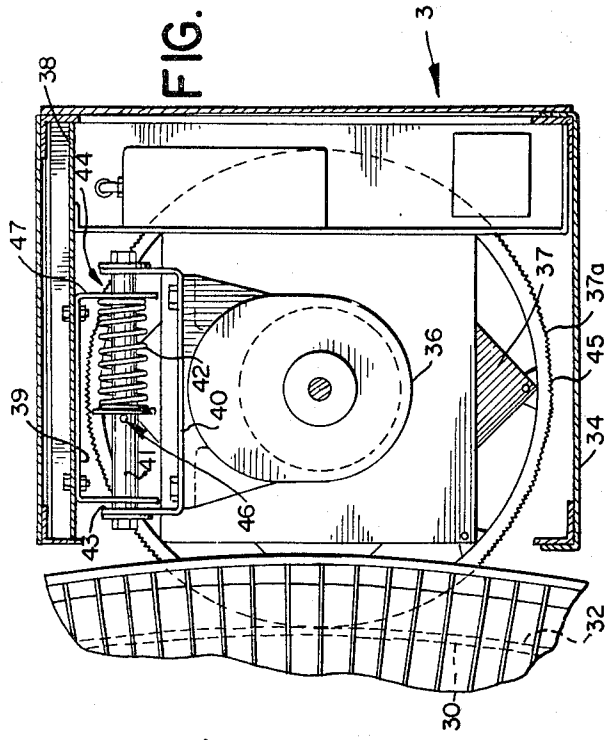


FIG. 6

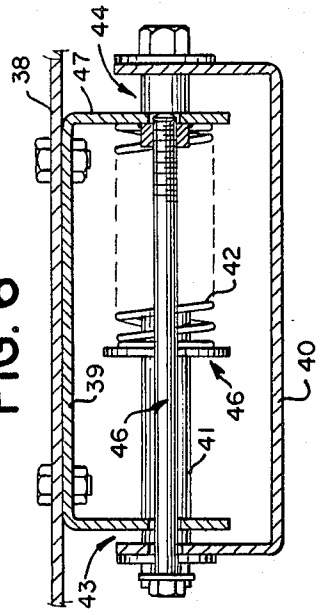
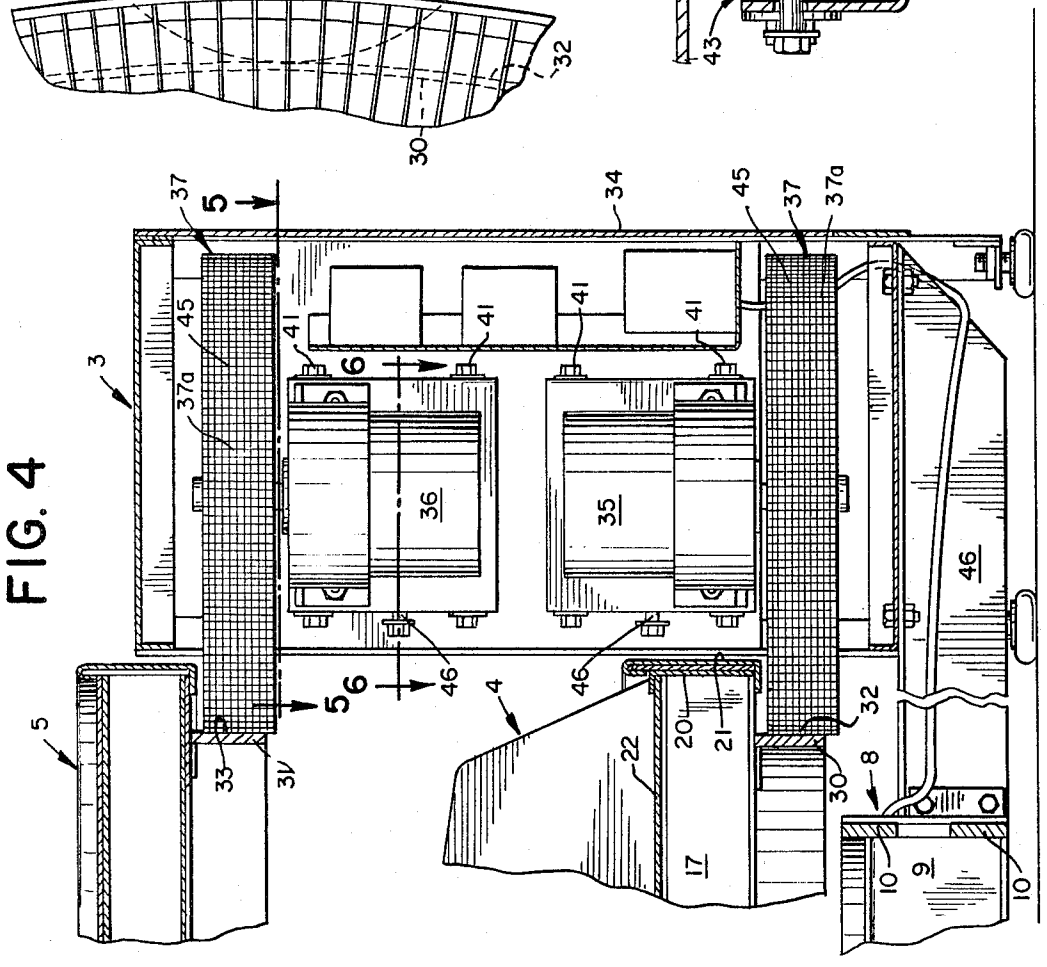


FIG. 4



May 14, 1968 R. T. PROULX ET AL 3,383,147

ROTARY FILING SYSTEM

Filed Oct. 14, 1966 5 Sheets-Sheet 5

FIG. 7

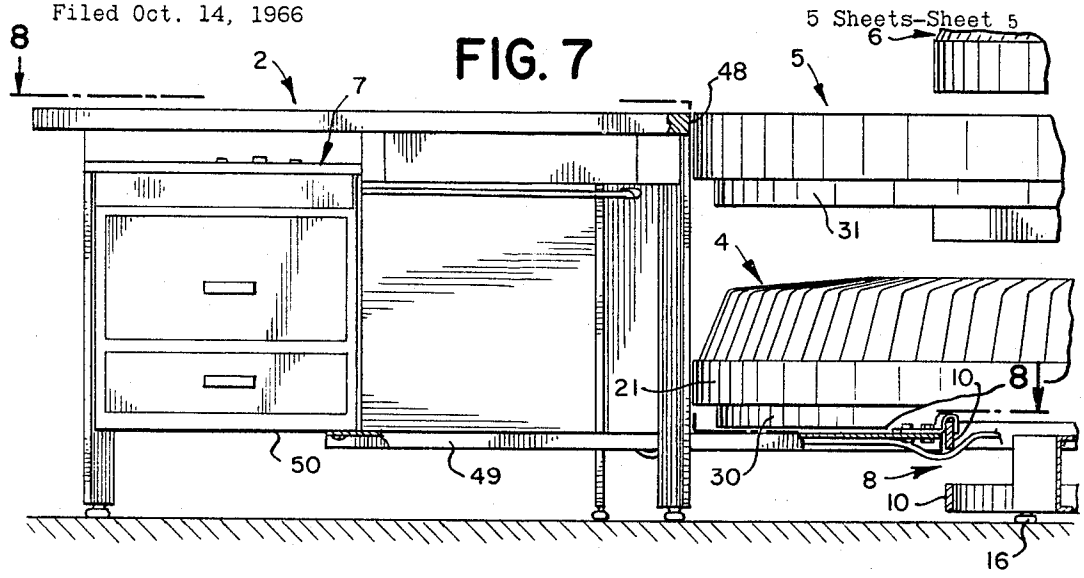


FIG. 8

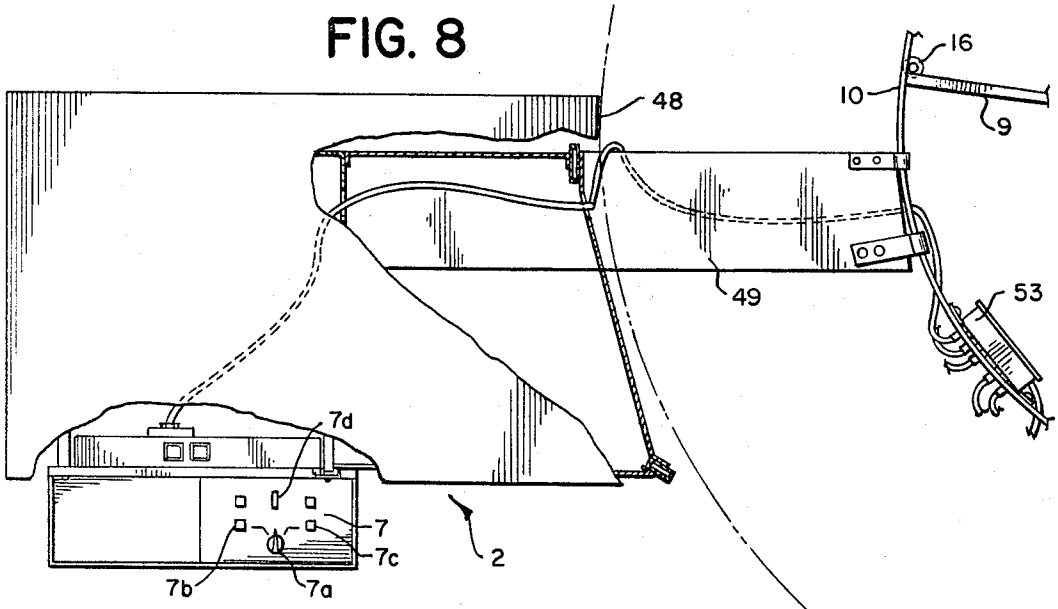
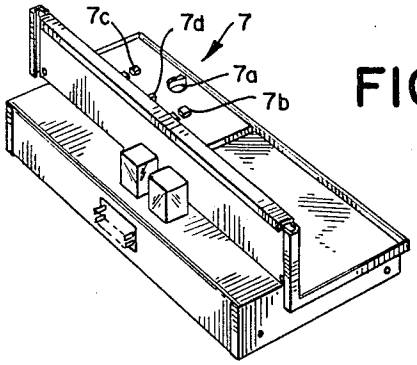


FIG. 9



INVENTORS
ROMEO T. PROULX
HENRY A. HOLZWARTH
CHARLES L. METZLER

BY
Pennie, Edmonds, Morton, Taylor & Adams
ATTORNEYS

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Patented May 14, 1968

3,383,147

ROTARY FILING SYSTEM

Romeo T. Proulx, Copiague, and Henry A. Holzwarth, Bayside, N.Y., and Charles L. Metzler, Alpine, N.J., assignors to Visirecord, Inc., Copiague, N.Y., a corporation of New York

Filed Oct. 14, 1966, Ser. No. 587,644
11 Claims. (Cl. 312—197)

ABSTRACT OF THE DISCLOSURE

A rotary filing system having at least one tier rotatable about a vertical axis and adapted to carry on its upper, horizontal surface a plurality of divider elements between which file data may be disposed and indexed, the system including an electric power unit having a rotary member in frictional drive engagement with a peripheral surface of the tier for actuating the tier in response to controlling signals from an operation station.

This invention relates to a rotary filing system and more particularly to a motorized apparatus adapted to carry a large volume of indexed file data which is retrievable by a plurality of persons at control stations spaced around the apparatus.

A typical rotary filing system includes a wheel member which is rotatable about a vertical axis, the wheel having its circumferential area adapted to carry a multiplicity of spaced indexing or divider elements and a multiplicity of file data such as cards and books between the divider elements.

In the prior art there are systems where persons sit at spaced positions surrounding a wheel as described above, and retrieve data from different locations on the wheel as it rotates; thus each individual operator has the advantage of accessibility to a large volume of data while remaining at a single location. Where desks are provided for the operators, the desks are oriented with the longitudinal axis of each desk extending radially from the wheel's center. A person or operator in the normal seated position at such a desk would have her side to the wheel at the area where she would reach for data, this being the area of tangency between the desk and the wheel. Also in the prior art, there are multi-tiered systems wherein two or more of these file wheels are vertically spaced, and the wheels may be driven by an electric power unit. However, in all such powered systems, the wheels have been driven from a central area near the vertical axis by substantially large motors required for such large and heavy wheels. Consequently, each wheel would have a large, hollow center area in which the motor and associated drive elements were enclosed, rendering this area unavailable for file data.

The present invention introduces in a number of structural areas significant improvements, which when combined provide a filing system that is novel and far more efficient with respect to mechanical power and human energy requirements than all known filing systems. The new invention has a drive unit located outside the periphery of the file wheels instead of near the center axis area; and an electric motor in the drive unit rotates a drive member which is in frictional engagement with a peripheral area, such as the edge of the file wheel. By this arrangement the drive member applies to the periphery of the wheel a tangential force with a very large moment arm equal to the radius of the wheel. Since the torque is determined by the product of the tangential force times the moment arm, it is apparent that with this long moment arm, the required torque may be provided

by a motor having size and power greatly reduced from that of conventional systems, which utilize a central drive and an almost negligible moment arm.

Having the drive unit attached externally to the file wheel results in numerous other benefits; the unit is easily accessible for servicing and can be easily removed if necessary, or if it is desired to operate the system manually. Additionally, this external location permits the center of the wheel to be completely unobstructed for additional file data. The friction drive feature of this unit provides the further benefit of slippage or a clutch effect at the point of drive-engagement which protects the motor from overstrain when it starts to rotate and overcome the large inertia of the file wheel. Furthermore, when the motor power is switched off in order to stop the wheel, the continuous engagement of the drive means with the wheel provides a braking effect.

In the present invention the desks are oriented with the longitudinal axes of their generally rectangular tops, oblique (by about 18°) to a radial line of the wheel through the far corner of each desk. This is in contrast to the conventional orientation of desk top axes coincident with a radial line, wherein an operator sits with her side to the wheel and must turn when viewing or reaching file data. The new orientation provides the operator with both a wide span of vision of the data and access to the data without turning. The space adjacent the operator's chair is now clear for easy removal of file data from the lowest tier; furthermore, access is improved to and from the desks, particularly in a system having many desks, because the space between these oblique desks is increasingly wider as a chair is moved further back from its corresponding desk. Switches are installed at each desk for each operator to energize the power unit and rotate all of the tiers; the control circuit is designed to permit the power unit to react to control signals in the order received from the numerous operators.

Broadly stated the new filing system comprises at least one tier or wheel mounted on a base for rotation about a vertical axis. The upper horizontal surface of the wheel is adapted to carry a plurality of divider elements between which file data such as cards and folders are placed. Each wheel is driven by an electric motor power unit disposed near a peripheral surface of the wheel and in drive-engagement therewith. Preferably the drive-engagement will be frictional. In one version of the invention, a plurality of desks are movably disposed around the circumference of the wheel with the longitudinal axis of each desk oblique to a radial line of the wheel through each desk.

The filing system presently disclosed is particularly well adapted for use as a telephone information retrieval center. Each desk or operation station includes a telephone by which the operator receives requests for information. The enormous amount of indexed data is accessible to the operators in a matter of seconds by merely causing the appropriate file wheel to rotate. After the operator has communicated the information to the inquiring party, the data card from which the information was obtained may be set aside for subsequent refiling, while the operator is ready for another request.

A preferred embodiment of the invention is described below with reference to the following accompanying drawings:

FIG. 1 is a front perspective view of a 5-desk rotary filing system,

FIG. 2 is a plan view of FIG. 1,

FIG. 3 is a partial sectional view of the tiers, taken along line 4—4 of FIG. 2,

FIG. 4 is a partial sectional view of the drive unit, taken along line 4—4 of FIG. 2.

FIG. 5 is a plan view of the drive unit, taken along the line 5—5 of FIG. 4,

FIG. 6 is a partial sectional view of the drive unit mounting structure, taken along the line 6—6 of FIG. 4,

FIG. 7 is a partial front view of a single desk and the associated tiers,

FIG. 8 is a partial plan view of FIG. 7, and

FIG. 9 is a rear perspective view of a modular control panel.

Referring to the drawings, FIG. 1 and FIG. 2 show in perspective and plan view a preferred embodiment of the invention, which includes a central filing unit **1** surrounded by five desks **2** and an independent drive unit **3**. As a general description of this embodiment, the central unit comprises three vertically spaced tiers or rotatable file wheels **4**, **5**, and **6**, each being adapted to carry a series of indexed file data. In the drive unit **3** are two independent but similar subassemblies; each has a drive wheel that is driven by an electric motor and reduction gears and each wheel is in frictional engagement with one of tiers **4** or **5** for rotating same. Tier **6** is revolved manually, but could easily be power operated through its center structure. Each desk is provided with a control panel **7** having electric switches for an operator to actuate the power unit, thereby rotating the tiers clockwise or counterclockwise as selected; thus data anywhere around the circumference of the wheel can be retrieved from any desk or station. The various control units **7** are coordinated through a relay system connected between the various desk switches and the power unit. When a first operator activates one tier through a switch on her desk control panel, the remaining operators cannot interfere with this selection, and subsequent request signals of other operators are transmitted by the relay system to the drive unit in the order they are received.

As shown in FIG. 3, the three rotatable tiers are supported on a base structure **8**, which comprises a rigid subassembly of four spokes **9** oriented horizontally with a 90° angle between adjacent spokes, and a pair of vertically spaced rims **10** which circumscribe the spokes. At the center of the sub-assembly is a sleeve bearing or collar **11** which has a vertical axis for receiving and supporting a central post **12**. Above collar **11** is a thrust bearing **13** which supports the lower bearing plate **14** of the lowest tier **4**. Tiers **5** and **6** are mounted and supported in a similar manner; however each tier is supported independently of the others by the use of a pin or bolt **15** traversing the post **12** and the collar below each tier. Extending downward from the base sub-assembly are eight levelers **16** or vertically adjustable feet for horizontally orienting the system at the time of final assembly.

The tiers are similar in basic structure, and thus only the lower tier will be described in full detail. The wheel of this tier has twelve spokes **17** radiating from a central collar or sleeve **18**. Each spoke is a beam constructed of a channel-section **17*a*** for the full length of the spoke, with a vertical, flanged plate **17*b*** attached to the channel's web portion at the radially inner portion of the spoke. A first ring **19** (which may be circular or a regular polygon) is concentrically located on the wheel, intersecting each spoke intermediate its ends; and a second similar ring **20** circumscribes the spokes with all the spoke and ring junctions being permanently attached by welding, riveting, or other means. Circumscribing the outer ring is a dress band **21** which provides an attractive outer appearance by covering the structural joints. There is provision for removing from the outer ring **20** a section between two adjacent spokes, thus establishing a gap **20*a*** in the circumference of the wheel as shown in FIGS. 1 and 2. The resulting configuration has a minimum cross-sectional dimension that is considerably less than the full diameter of the wheel. Consequently, this approximate eight-foot diameter wheel can be maneuvered through a standard door frame, thus permitting a nearly complete prefabrication of the wheel prior to conveyance to its destination for final assembly with the system. The outer portions of the spokes support horizontal plates **22** forming a washer-shaped desk surface. And on this lower-tier wheel are attached the multiplicity of removable, vertical fin or divider elements. The spaces between these fins are recesses adapted to carry data in book form **4*a***.

As indicated above, the middle and lower tiers have similar basic structure; however, the middle tier **5** is adapted to carry a multiplicity of index cards **5*a*** disposed upon its upper horizontal surface **24**. This surface is formed by sub-assemblies in the form of sections of a washer fastened between pairs of spokes. Each section comprises a base **24**, two spaced side walls and inner, outer, and middle arcuate walls **25**, **26**, and **27**, the combination forming two adjacent circular grooves for containing data cards. On the base in each groove is a pair of concentric circular paths of perforations arranged in radial pairs for receiving the tabs of vertical fins or divider elements for indexing the multitude of data cards.

The upper tier **6** is similar to the others in basic structure and has a horizontal deck **28** around the outer periphery. On this deck are placed removable, vertical, fin divider elements **29**. By varying the number or arrangement of these fins, the usable deck space atop this tier can take numerous shapes. As seen in FIG. 2, the upper tier has a partial-washer configuration of vertical fins and book files, and a separate V-file in the remaining space. It would be possible to remove all fins leaving a completely flat, unobstructed deck.

Each wheel is caused to rotate by frictional engagement of its drive-band with a drive-wheel of the power unit. The drive-band is a circular rim **30** on tier **4** (**31** on tier **5**), which is concentrically mounted below the wheel, and has its vertical outer circumferential surface **32** (**33**) exposed for drive engagement. In each band is a removable portion corresponding to the removable structural portion of the wheel.

The power unit **3** is shown in detail in FIGS. 4, 5 and 6. There is a cabinet housing **34** containing a frame on which are mounted two electric motors with reduction gears **35**, **36** having vertical axes of rotation. Each motor is rated at about ⅙-horsepower and is operable from a 115 line voltage, A.C. power source. Identical drive wheels **37** are driven by the motors; however, only the upper wheel will be described in detail. This wheel's peripheral surface **37*a*** is in frictional engagement with drive band or rim **31**. The motor **36** and drive wheel **37** are mounted as an integral unit and are spring-biased radially inward toward the drive band **31** to maintain frictional contact despite possible irregularities in roundness of the rim.

The motor mounting and biasing means are clearly shown in FIGS. 5 and 6. In the partial plan view in FIG. 6, vertical mounting plate **38** is clearly shown as a portion of the frame. Rigidly attached to this plate is a vertical channel member **39** with two vertically spaced horizontal bolts traversing the flanges of the channel. The motor **36** is mounted to a second channel **40** which is disposed vertically with its flanges adjacent to and outside the flanges of channel **39**, and these flanges are also traversed by the bolts **41**.

Enclosing the shank of each bolt **41** is a compression spring **42** maintained in position by a washer and pin **46**. When the system is assembled the drive wheel **37** is in contact with drive band **31**, and spring **42** is compressed so that the drive member **37** is biased toward the wheel for reasons explained above. Channel **39** is rigidly positioned and its flange **47** is the base wall against which the spring bears. In case of irregularities in roundness of the drive-rim **31**, wheel **37** would be moved radially inward or outward causing the integral unit of wheel **37**, reduction-gear motor **36** and channel **40** to move accordingly. This movement is permitted by the gaps **43** and **44** between adjacent flanges of the mating channels **39** and **40**. At all times spring **42** remains compressed so that a nor-

mal force and resulting frictional engagement is maintained at the tangent point of contact between drive wheel **37** and rim **31**.

An alternative type drive unit would utilize a belt for the friction contact with the drive rim of the file wheel. In this case, the belt would circumscribe two or more wheels, at least one of which is driven by the electric motor. Two wheels would be biased radially toward the drive rim, pressing a portion of the belt between these wheels against the rim, thus automatically adjusting and maintaining the frictional drive-engagement. In a third version the motor is rigidly mounted and the drive wheel alone is biased against the drive rim. These various types of drive means all provide the slippage and clutch effect, that reduces strain on both the motor and the other mechanical elements, particularly during the start of rotation.

As shown in FIG. 5, on the drive wheel **37** there is a band of friction material **45** which may be removed, when worn and replaced by a new band. Additional features include removable panels on the power unit cabinet providing ready accessibility for adjustment and repair. And near the base of the cabinet and frame is a horizontal arm **49** which extends below the lower tier **4**, and attaches rigidly to the base **8**. This arm establishes a fixed radial distance between the base and the power unit, such that the drive-wheel and drive-band are maintained in contact and the spring mount is properly flexed, thus insuring continuous pressure contact of these elements. Also this power unit and arm may be moved circumferentially around the base and lower tier to any desired position not already occupied by a desk. In another version of the filing system the power unit may be positioned underneath one of the desks; this makes available extra space for the existing desks or for additional desks. In a further modification the power unit may be placed between two spaced, tandem file wheel assemblies.

Included in this filing system is an electric circuit, the first portion of which uses line current at approximately 115 volts, A.C. for operation of the motors in the drive unit. A power supply means in this circuit reduces voltage to about 24 volts for operation of switches and lights on each control panel **7** and a relay control means. In this system the numerous operators will direct the file wheel to rotate by operating switches on their respective desk control panels. The control means is adapted to transmit these directions to the drive unit in the order received, so the file wheels will be rotated in response to only one station at a time. As shown in FIG. 8, the control panel includes a switch *7a* by which an operator selects one of the tiers to be rotated. When the switch is turned to the right, for example, light *7b* or *7c* becomes lit to indicate that the corresponding tier is free or in use. When the tier and its circuit are free, the operator moves lever *7d* to cause clockwise or counterclockwise rotation of that tier. This low voltage in the control circuit eliminates danger to the operators and aids in long life of the circuit elements, particularly the switches and relays which are subject to a great number of actuations. In the event of electric-power failure or a defect in the power unit, this filing system has the advantage of being operable manually with the power unit either remaining engaged or being easily disconnected.

There may be any number of desks in the system depending on the diameter of the tiers and the dimensions of the desks. The embodiment as shown in FIGS. 1 and 2 has 5 equally spaced similar desks **2**, plus the drive unit **3**. The central longitudinal axis of each desk is oblique by about 18° to a radius of the tier extending through the far corner of the desk. The side **48** of each desk adjacent the file wheel is concave conforming to the circular arc of the tier. As shown in FIGS. 7 and 8, each desk has a horizontal arm **49** which extends from the lower part of the desk **50**. The arm maintains the desk in its proper position adjacent to and slightly spaced from the file wheels, while permitting each desk to be movable to any circumferential position.

Throughout this system modular construction and design features have been used. The power unit **3** is independent and may be used optionally. The desks **2** may be arranged in many different convenient configurations around the file wheels or may be completely removed. Replaceable control cables **52** are provided for connection between each control panel **7** and the central junction box **53** (see FIGS. 8 and 9). Even the desks may be provided with a variety of supplementary filing systems.

We claim:

1. A rotary filing system for carrying a plurality of divider elements between which file data such as cards and folders are filed and indexed for easy and rapid accessibility, the system being operable from at least one operation station adjacent to and radially spaced from the periphery of the system, comprising

(a) a base,

(b) at least one tier carried by the base, the tier comprising a wheel which is rotatable about a vertical axis, has an upper horizontal surface adapted to carry the divider elements and data, and has a peripheral drive-surface,

(c) a power unit disposed adjacent the periphery of the tier and comprising

(1) a frame,

(2) an electric motor carried by the frame, and

(3) a drive means including a rotating member being carried by the frame, actuated by the motor, and spring-biased in frictional drive-engagement with the peripheral drive-surface of the wheel, said drive-engagement rotating the wheel clockwise or counter-clockwise to any selected circumferential position and providing a clutch effect by permitting slippage of the contacting surfaces when rotation of the wheel is initiated, and

(d) circuit means for controlling the power unit.

2. A rotary filing system for carrying a plurality of divider elements between which file data such as cards and folders are filed and indexed for easy and rapid accessibility, the system being operable from at least one operation station adjacent to and radially spaced from the periphery of the system, comprising

(a) a base,

(b) at least one tier carried by the base, the tier comprising a wheel which is rotatable about a vertical axis, has an upper horizontal surface adapted to carry the divider elements and data, and has a peripheral drive-surface,

(c) a power unit disposed adjacent the periphery of the tier and comprising

(1) a frame,

(2) an electric motor carried by the frame, and

(3) a drive means carried by the frame including at least two wheels rotatable about their respective, spaced vertical axes with at least one of said wheels actuated by the motor and a belt circumscribing the wheels and in drive-engagement therewith, the belt being in frictional drive-engagement with the peripheral drive-surface of the wheel, to rotate the wheel clockwise or counter-clockwise to any selected circumferential position, and

(d) circuit means for controlling the power unit.

3. A rotary filing system for carrying a plurality of divider elements between which file data such as cards and folders are filed and indexed for easy and rapid accessibility, the system being operable from at least one operation station adjacent to and radially spaced from the periphery of the system, comprising

(a) a base,

(b) at least one tier carried by the base, the tier com-

prising a wheel which is rotatable about a vertical axis, has an upper horizontal surface adapted to carry the divider elements and data, and has a peripheral drive-surface,

(c) a power unit disposed adjacent the periphery of the tier and comprising

(1) a frame,

(2) an electric motor carried by the frame, and

(3) a drive means which is carried by the frame, actuated by the motor, and in drive-engagement with the peripheral drive-surface of the wheel, to rotate the wheel clockwise or counter-clockwise to any selected circumferential position, and

(d) circuit means for controlling the power unit, the circuit means comprising a switch means at each operation station for energizing the circuit and control means for receiving a plurality of input signals from the stations and communicating the signals in the order received to the power unit, such that each tier is caused to rotate by only one station at a time.

4. A rotary filing system for carrying a plurality of divider elements between which file data such as cards and folders are filed and indexed for easy and rapid accessibility, the system being operable from at least one operation station adjacent to and radially spaced from the periphery of the system, comprising

(a) a base,

(b) at least one tier carried by the base, the tier comprising a wheel which is rotatable about a vertical axis, has an upper horizontal surface adapted to carry the divider elements and data, and has a peripheral drive-surface, the wheel having a removable section to provide a gap in its circumference with a resulting configuration and minimum cross-sectional dimension that it is easily transportable through a standard door frame,

(c) a power unit disposed adjacent the periphery of the tier and comprising

(1) a frame,

(2) an electric motor carried by the frame, and

(3) a drive means which is carried by the frame, actuated by the motor, and in drive-engagement with the peripheral drive-surface of the wheel,

to rotate the wheel clockwise or counter-clockwise to any selected circumferential position, and

(d) circuit means for controlling the power unit.

5. A system according to claim **1** wherein

(a) each tier's peripheral drive-surface is a circular band carried by the wheel in concentric relationship thereto, and

(b) the drive means is a wheel which is rotatable about a vertical axis and has a circumferential surface in frictional engagement with the band.

6. A system according to claim **3** further comprising a plurality of said operation stations, each station including a desk having a generally rectangular top with a central longitudinal axis, said axis being non-colinear with any radial line from the center of the tier through the desk.

7. A system according to claim **3**, operable from line voltage power source, further comprising a power supply means for deriving from the line voltage a substantially lower voltage for operation of the switch means and the control means.

8. A system according to claim **6**, wherein each desk and the power unit are detachably joined to the base and adjustably located at selected circumferential positions around the tier.

9. A system according to claim **6**, wherein the oblique angle formed by the desk axis and the radial line is between about 10 to 25 degrees.

10. A system according to claim **6**, wherein the side of each desk adjacent to the tier is concave conforming to the circular curvature of the tier.

11. A system according to claim **3**, wherein the switch means at each desk, the control means, the power unit, and the desks are modular units that are readily removable and replaceable.

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CASMIR A. NUNBERG, *Primary Examiner.*