

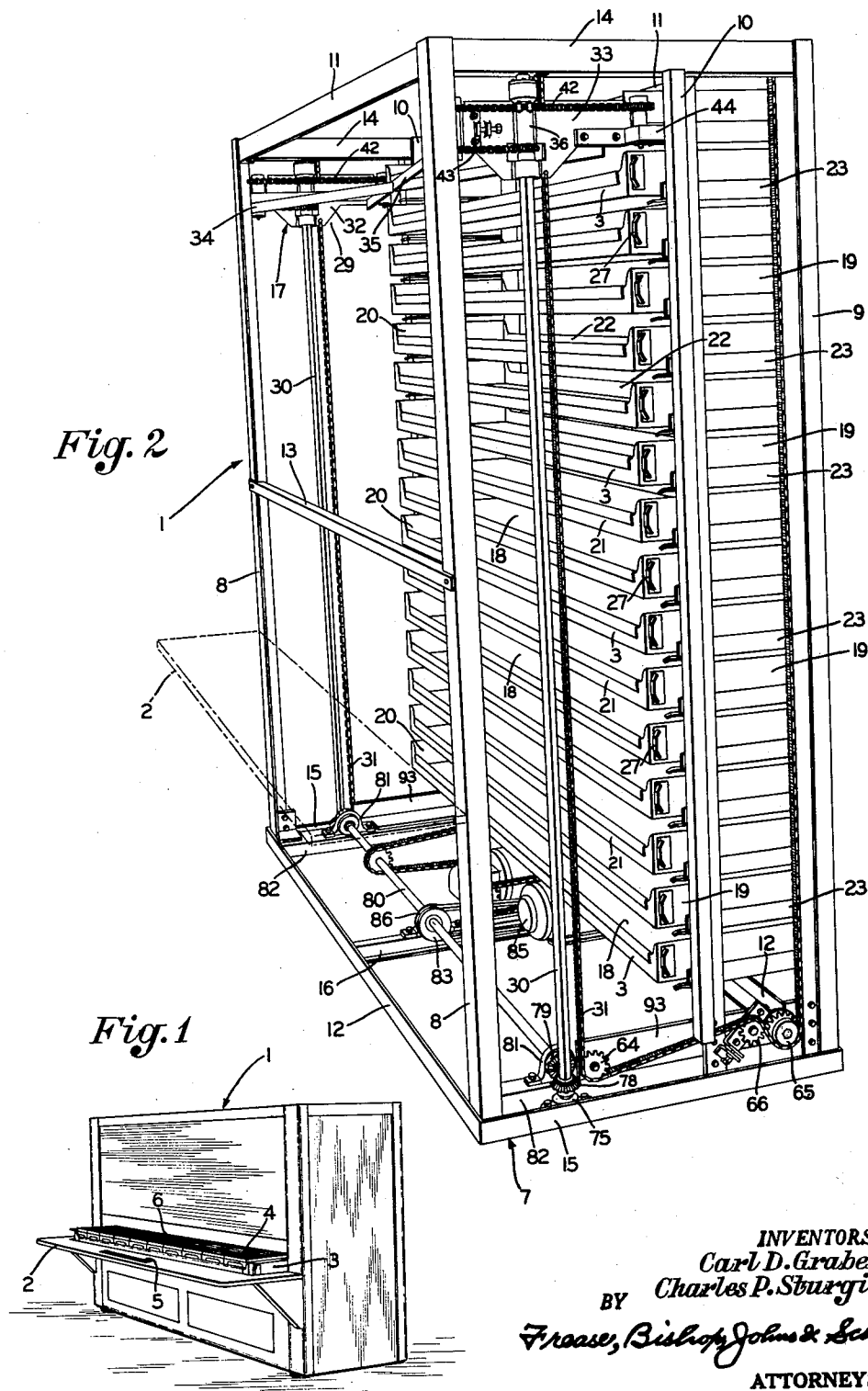
Nov. 13, 1962

C. D. GRABER ET AL
ELEVATOR FILING APPLIANCE

3,063,769

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7 Sheets-Sheet 1



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C. D. GRABER ETAL

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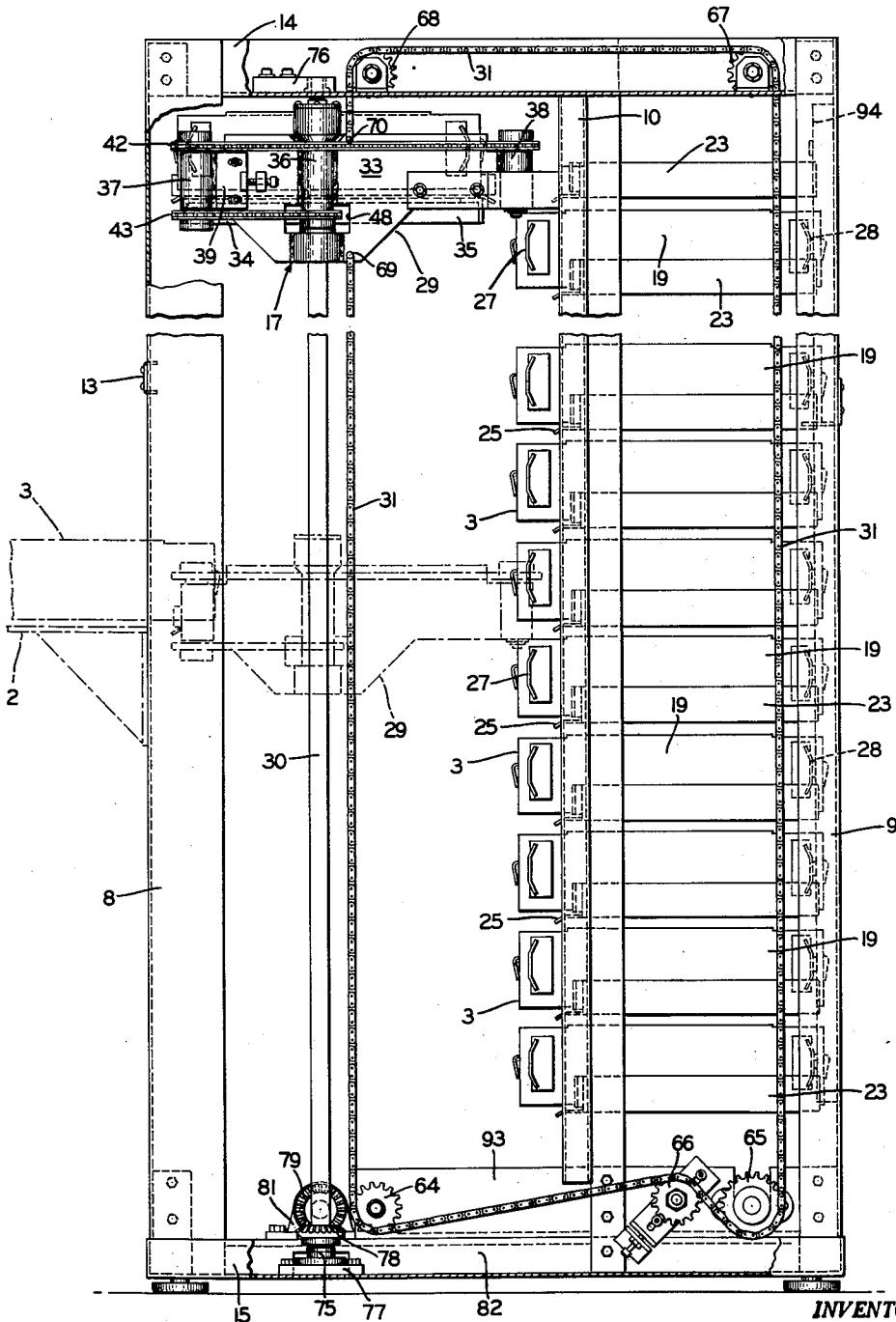


Fig. 3

INVENTORS
Carl D. Graber ^a
BY Charles P. Sturgis ^{att}

Fraase, Bishop, Johns & Schick

ATTORNEYS

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C. D. GRABER ETAL

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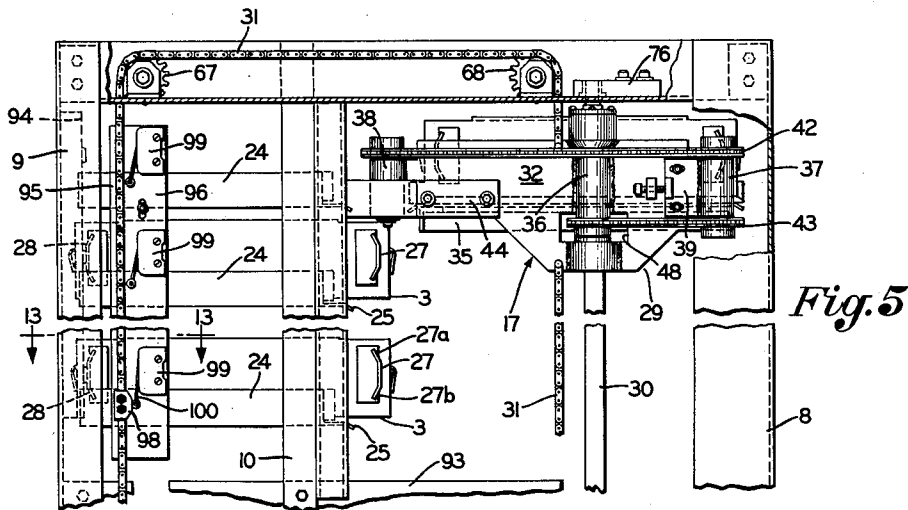


Fig. 5

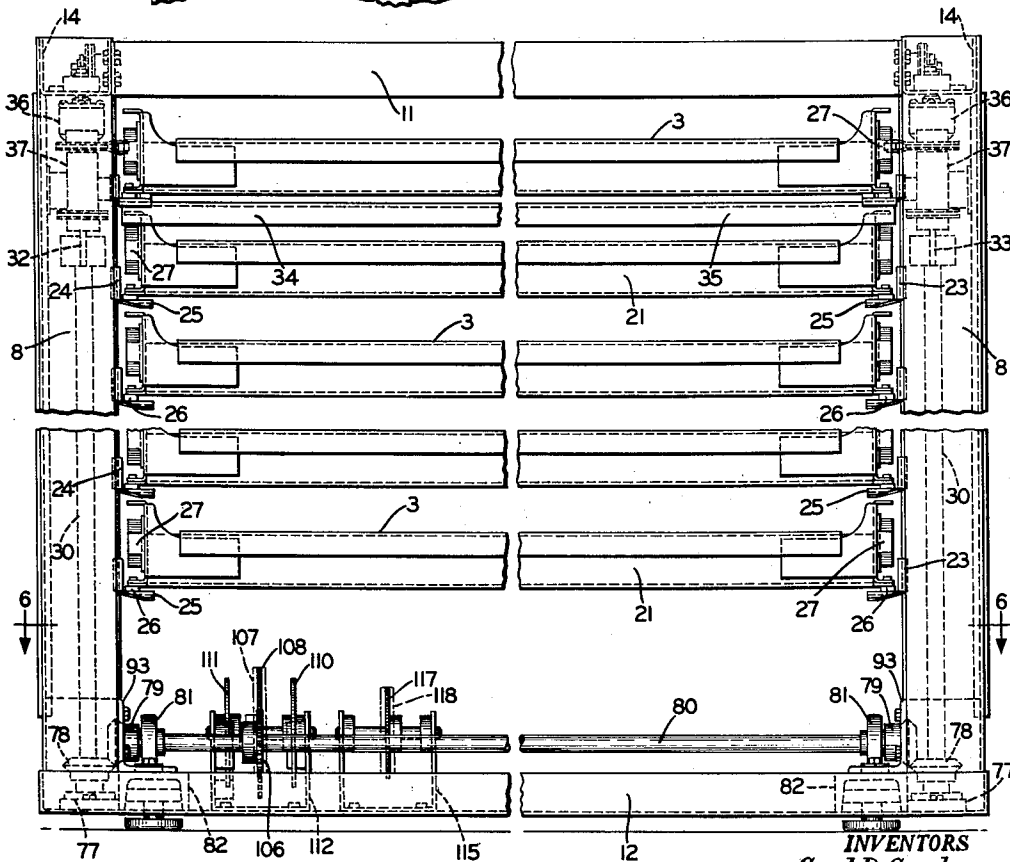


Fig. 4

INVENTORS
Carl D. Graber ^{et al}
BY Charles P. Sturgis
Frasse, Bishop, Johns & Schick
ATTORNEYS

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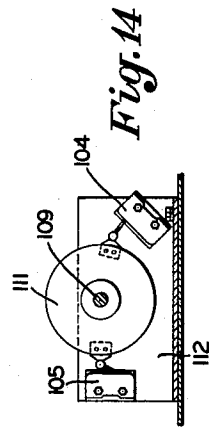


Fig. 6

INVENTORS
Carl D. Graber ^a
 BY *Charles P. Sturgis* ^{2d}
Freese, Bishop, Johnson & Schick
 ATTORNEYS

Nov. 13, 1962

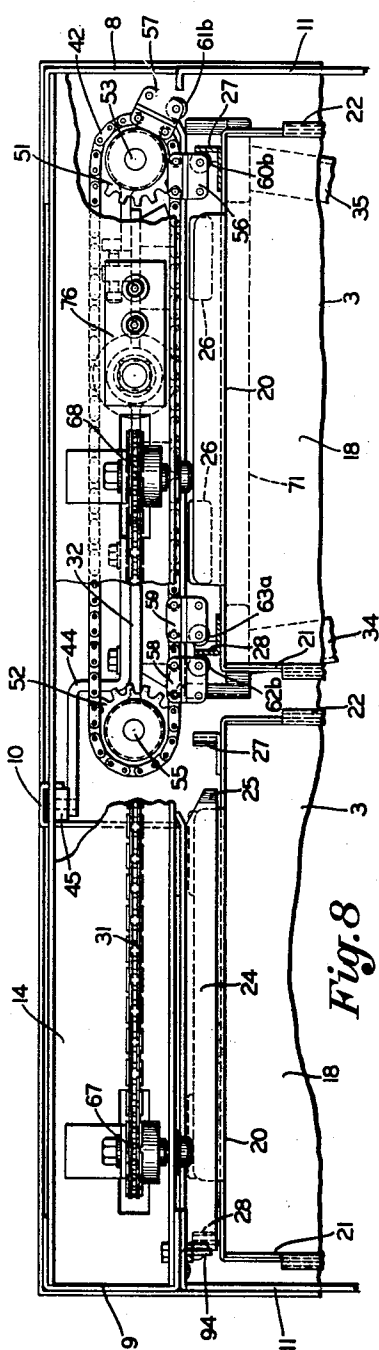
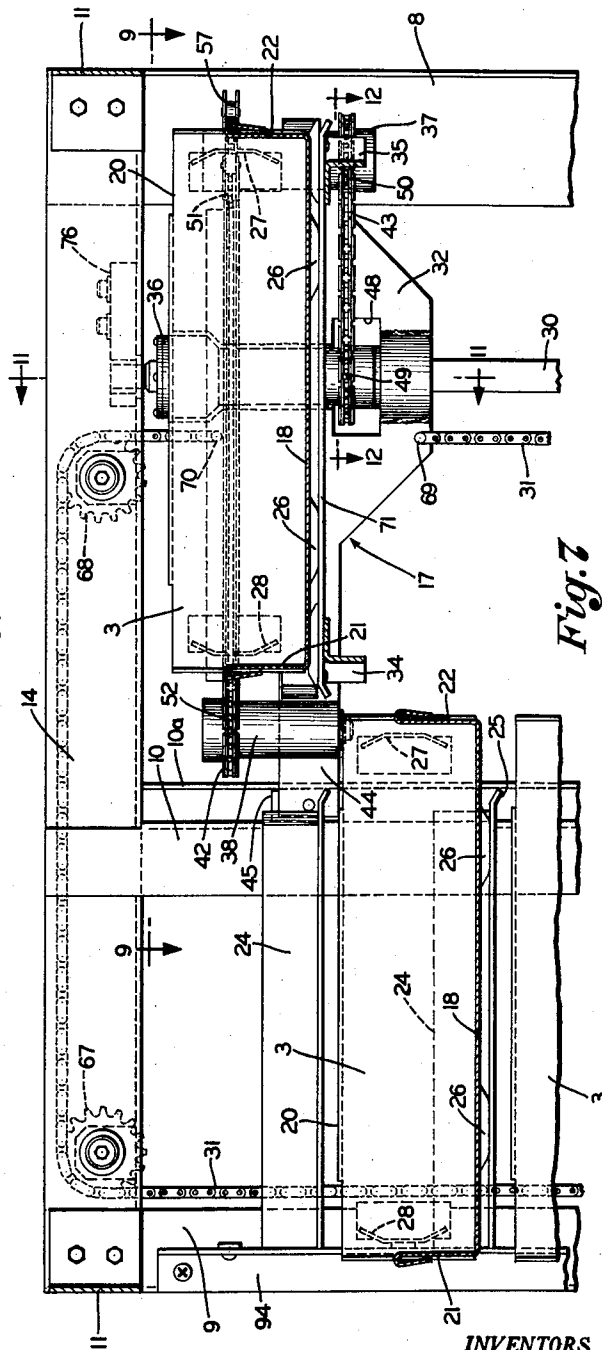
C. D. GRABER ETAL

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7 Sheets-Sheet 5



INVENTORS
Carl D. Graber
Charles P. Sturgis
 BY
Freese, Bishop, Johnson & Schick
 ATTORNEYS

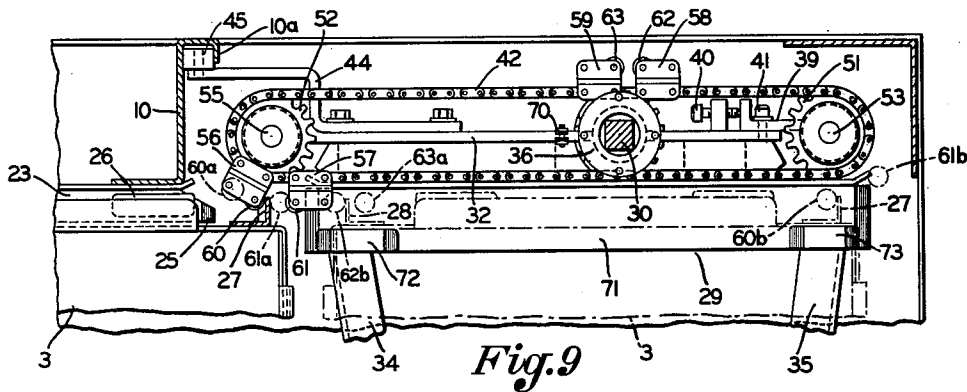
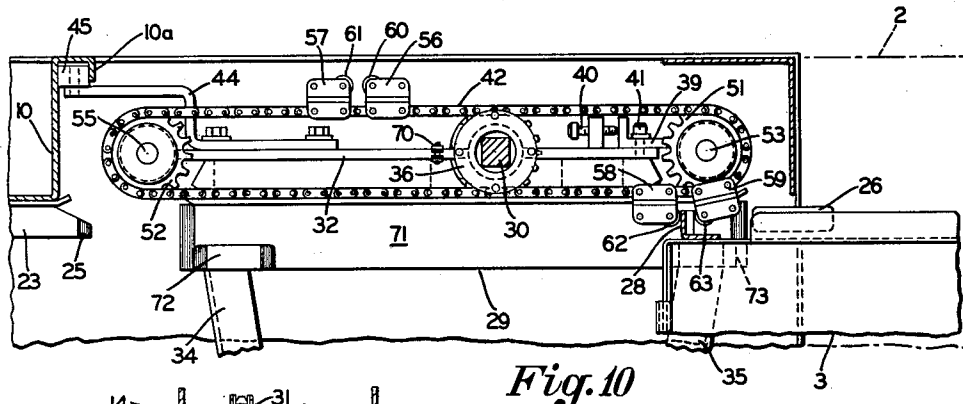
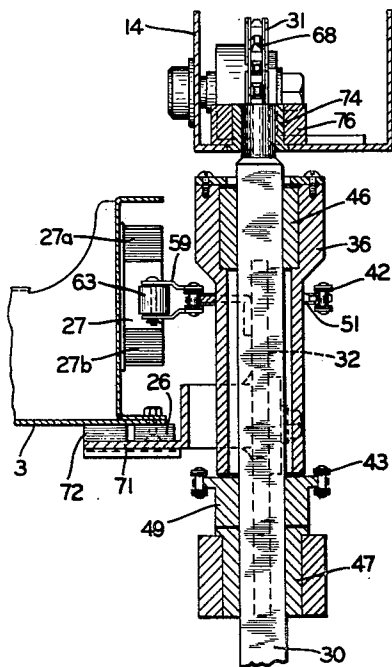
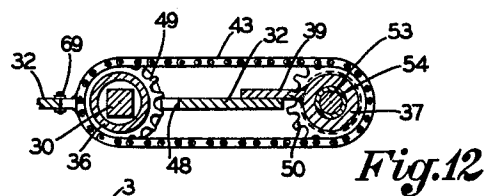
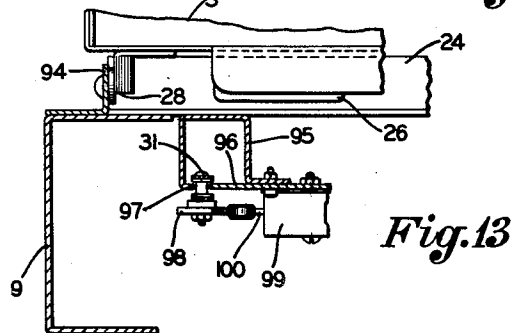
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C. D. GRABER ETAL
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Filed Jan. 6, 1961

7 Sheets-Sheet 6



INVENTORS
Carl D. Graber ^a
Charles P. Sturgis ^a
BY
Freese, Bishop, Johnson & Schick
ATTORNEYS

Nov. 13, 1962

C. D. GRABER ETAL
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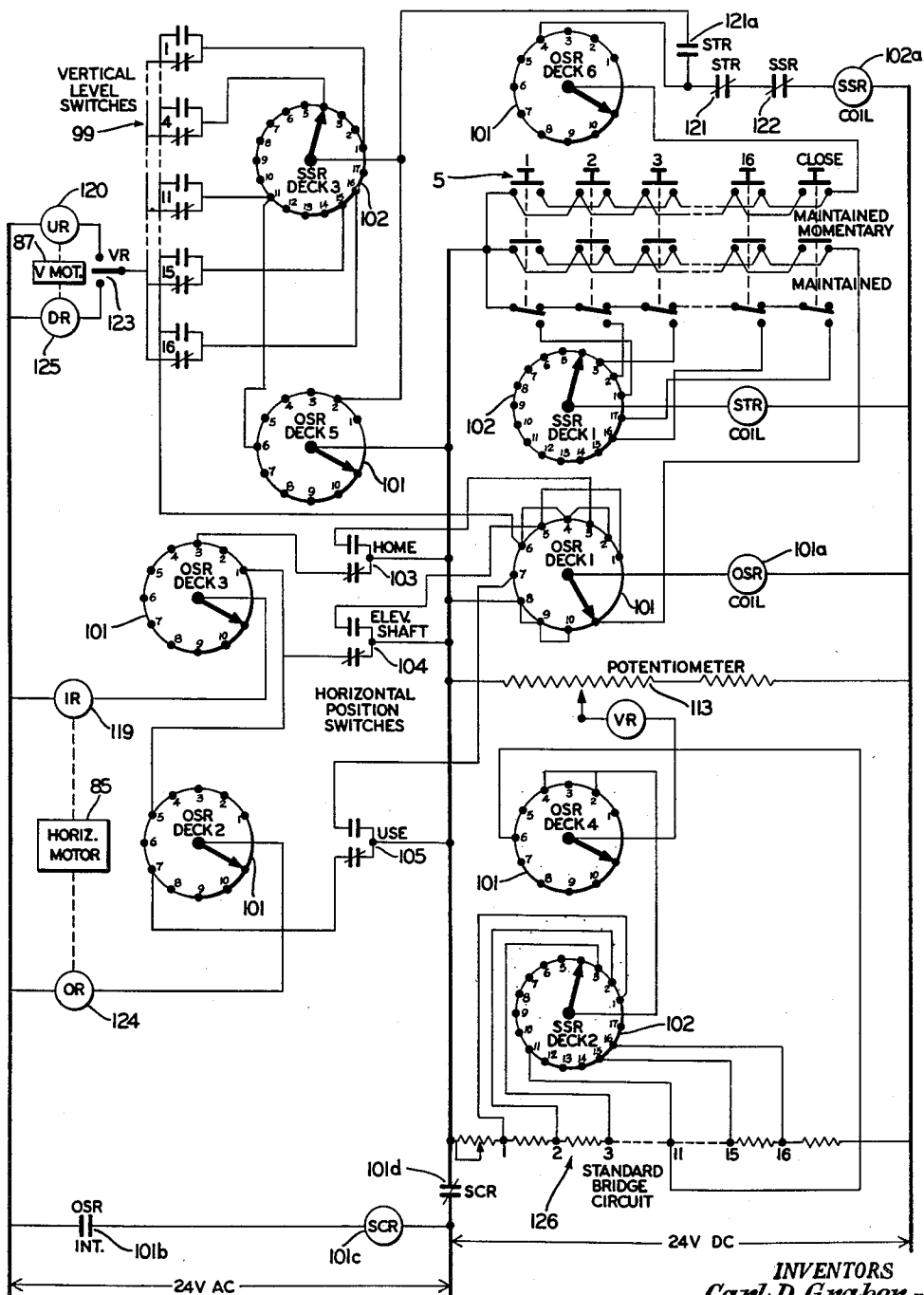


Fig. 15

INVENTORS
Carl D. Graber ^{jr}
BY Charles P. Sturgis ^{jr}
Froese, Bishop, Johns & Schick
ATTORNEYS

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3,063,769

ELEVATOR FILING APPLIANCE

Carl D. Graber, Orrville, and Charles P. Sturgis, Canton, Ohio, assignors to Diebold, Incorporated, Canton, Ohio, a corporation of Ohio

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7 Claims. (Cl. 312-223)

This invention relates to electrically operated filing appliances. More particularly it pertains to a filing appliance having a high capacity for storing record cards of the type used in card index systems, in such manner as to present selective blocks of the cards to the operator; and to a filing appliance which at the same time has a compact arrangement of parts occupying a minimum of floor space for storing a maximum capacity of cards.

In view of the present tendency of business to use labor-saving devices such as business machines and card indexing systems, there has been a corresponding increase in the number of record cards used in connection with such machines and systems. Indeed, the volume of record cards used for general office purposes has grown many-fold. The direct result of that tendency has been a constant need for improved filing appliance constructions for storing and handling the increasing volume of cards.

Prior types of automatic filing appliances have been of the rotary type such as the so-called "elevator file," and the "ferris wheel file," each of which provides a plurality of card-holding trays or pans arranged about a horizontal axis for movement through an orbit of travel so that the pans may be successively presented at an access opening in the housing of the appliance.

Such rotary type files move all of the card-holding pans in their orbit of movement each time a specific pan is desired at the work station. As a result, it is necessary to provide an overall file structure of relatively large size because of the necessity of providing a space for the orbital movement of all of the pans. Additional space is also required because each movable pan requires more clearance with respect to adjacent pans and supporting structure as it moves in an orbit than would be otherwise necessary if the orbital movement of all pans was not involved.

Associated with the problem of additional clearance required for the pans of rotary type filing appliances is the problem of card height. Where all of the card-carrying pans are stored in stationary positions and where each pan is moved separately, the pans can be placed very closely together with only slight clearance between cards and pans for horizontal sliding of the pans when the pan is selected.

It has been found that where card-holding pans are stored one above the other on tiered shelves and pan-moving means such as an elevator is provided in a vertical shaft adjacent the tiered pans for moving only one pan at a time, the tiered shelves may have great vertical height and provide a large volume compact file with maximum capacity per unit of floor space. More cards can be stored with the vertically arranged, closely packed, tiered pans than is otherwise possible.

The tiered arrangement for storing pans in a stationary position when they are not in use is convenient for the operator of the file. A greatly increased number of cards can be filed per unit of floor space and still be readily available.

A further advantage of the vertical stationary storage of card-holding pans is the low unit cost of the file. By providing a pan moving means or elevator for handling only one pan at a time, while the balance of the pans remain in their stationary stored positions, the cost of the moving parts is diminished because of their few-

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er number; and the power cost for moving only the desired pan is less in an electrically operated unit. Moreover, such a file can be adapted to the height of a room and by adding additional units of tiered shelves the file can extend from the floor to the ceiling of a room.

Accordingly, it is a general object of this invention to provide an elevator filing appliance which is of compact construction so as to provide a maximum amount of card storage space per unit of floor area.

It is another object of this invention to provide an elevator filing appliance which is convenient to operate.

It is another object of this invention to provide a low-cost filing appliance.

It is another object of this invention to provide an elevator filing appliance in which card-holding pans are stored in stationary positions on tiered shelves.

It is another object of this invention to provide an elevator filing appliance in which only the card-holding pan in actual use is moved when desired.

It is another object of this invention to provide an elevator filing appliance in which by unitized design a file may be constructed which occupies all the space between the floor and ceiling of an office area.

Finally, it is an object of this invention to provide an elevator filing appliance which accomplishes the foregoing objects and desiderata in a simple, effective and inexpensive manner.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved, and the described difficulties overcome by the discoveries, principles, apparatus, parts, combinations, sub-combinations and elements which comprise the present invention, the nature of which is set forth in the following statement, a preferred embodiment of which—illustrative of the best mode in which applicants have contemplated applying the principles—is set forth in the following description, and which is particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The improved elevator file construction of the present invention may be stated in general terms as including a base, longitudinally spaced front and rear frame members supported on the base, walls on the frame members forming front, rear and longitudinally spaced end walls and forming a file chamber, the front wall having an access opening communicating with the file chamber, the file chamber being divided substantially into front elevator shaft and rear storage longitudinal half-portions, a plurality of horizontal vertically spaced record-carrying pans disposed in the rear storage half-portion of the chamber adjacent the rear wall, storage means for mounting the pans in vertical spaced relation including pan supporting brackets on the frame members, elevator means in the front elevator shaft half-portion of the chamber for raising and lowering any selected pan between the level of the supporting brackets and the access opening level, the elevator means including a pair of elongated shafts one at each end of the elevator means, the elevator means including a carriage having a pan carrier slidably mounted on each of the elongated shafts, each shaft having a non-circular cross section, means preferably including an elongated chain mounted generally on the frame members and connected to each carrier for raising and lowering the carriage on the shafts, each carrier having a continuous link chain mounted on and between transverse spaced chain supporting sprockets mounted on the carrier, each carrier chain being operatively connected to a corresponding elongated shaft, each pan having at least one flange or projection extending from each end wall, each carrier chain having flange-engaging link means, the flanges on corresponding ends of the pans being vertically aligned

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with each other, the flange-engaging link means on each chain being movable vertically in a path adjacent the aligned flanges, reversible means for rotating the elongated shafts simultaneously, control means including pan selection buttons for initiating and stopping operation of the carriage and carrier chains, and the control means also including sequentially operated electric circuit means responsive to a pan selection button for operating the pan elevator through a cycle of operation, to selectively move any selected pan from its storage position to the carriage, then on the carriage up or down the elevator shaft to the access opening, and then from the carriage at the access opening to a work station, and to similarly return the selected pan from the work station to its storage position.

Referring to the drawings in which a preferred embodiment of the invention is shown by way of example:

FIGURE 1 is a perspective view of an elevator file showing a pan of record cards presented at the work counter or station;

FIG. 2 is an enlarged perspective view of the elevator file with the outer housing removed to show the general disposition of the stored card-holding pans in storage positions with respect to the elevator shaft adjacent thereto;

FIG. 3 is an enlarged end view, partly broken away, showing in solid and broken line different positions of the elevator carriage within the elevator shaft;

FIG. 4 is a front elevational view, partly broken away, showing the manner in which the stored pans are arranged on tiered shelves;

FIG. 5 is a vertical sectional view of the upper end of the file opposite the end shown in FIG. 3;

FIG. 6 is a horizontal sectional view taken on the line 6—6 of FIG. 4, showing the operating mechanism for the elevator carriage including the motors;

FIG. 7 is an enlarged fragmentary end view showing a card-holding pan on the carriage at the upper end of the elevator shaft;

FIG. 8 is a fragmentary horizontal sectional view of the elevator operating means with a card-holding pan in the position shown in FIG. 7;

FIG. 9 is a fragmentary horizontal sectional view showing the position of a carrier pan moving chain as it engages a flange on the end of the pan preliminary to moving the pan from its storage position onto the carriage, and showing in broken line a subsequent position of the pan when the pan is completely supported on the carriage, taken on line 9—9 of FIG. 7;

FIG. 10 is a fragmentary horizontal sectional view showing the positions of the carrier pan moving chain and the pan when the latter is partially disposed on the work counter;

FIG. 11 is a vertical sectional view taken on the line 11—11 of FIG. 7, showing one of the pair of square shafts at one end of the carriage for moving the carrier pan moving chains;

FIG. 12 is a horizontal sectional view taken on the line 12—12 of FIG. 7, showing the chain and sprocket connection for transmitting the rotation of the shaft to the carrier pan moving chains;

FIG. 13 is an enlarged fragmentary sectional view taken on the line 13—13 of FIG. 5, showing the manner in which the elevator carriage moving chain is mounted in a track to prevent its yielding when a switch actuator on the chain moves into contact with microswitch levers (FIG. 5);

FIG. 14 is a vertical sectional view taken on the line 14—14 of FIG. 6, showing a cam wheel for actuating microswitches that limit vertical and horizontal movements of the pans by the elevator carriage; and

FIG. 15 is a wiring diagram for the file.

Similar numerals refer to similar parts throughout the several views of the drawing.

An elevator filing appliance or elevator file is generally indicated at 1 in FIG. 1. It is provided with a work counter 2 onto and from which trays or pans 3 containing

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record cards 4 are located when an operator of the file depresses one of a number of control buttons 5 located on the work counter 2 at a "work station." The number of control buttons 5 is equal to the number of pans 3 contained within the file 1 and additional buttons may be provided for other purposes such as turning the file elevator mechanism on and off. Each pan 3 is moved horizontally onto and off of the surface of the counter 2 through an access opening 6 in the front side of the file above the inner edge of the counter 2.

The file 1 is shown in FIG. 2 with the outer housing removed from a supporting frame generally indicated at 7. The frame includes a pair of vertical front members 8, a pair of vertical rear members 9 (FIG. 5), and a pair of vertical intermediate members 10 (FIG. 5). The frame 7 also includes a pair of longitudinal top members 11, a pair of longitudinal bottom members 12 as well as an intermediate longitudinal member 13 which extends between the front vertical members 8 for reinforcement. Finally, the frame 7 also includes a pair of transverse top members 14, a pair of transverse bottom members 15 as well as an intermediate transverse member 16 extending between bottom longitudinal members 12. All of the frame members are preferably angle or channel-shaped members and are secured together either by bolts, spot welding or the like. As shown in broken lines (FIG. 2), the counter 2 is mounted on and between the front vertical members 8.

The interior chamber of the file 1 is divided into substantially equal vertical half-portions, one of which is for pan storage occupied by the plurality of tiered pans 3 and the other of which functions as an elevator shaft through which pan elevator means moves for carrying a preselected pan 3 between its place of storage and the work counter 2. Accordingly, the file 1 serves two primary functions, namely storage of record cards 4 in the several pans 3 at individual positions and delivery and return of a selected pan 3 of cards from its storage position to and from the operator's work station at the work counter by elevator means generally indicated at 17.

As shown, the several pans 3 are elongated shallow members having an open top and five walls including a bottom wall 18, end walls 19 and 20, and side walls 21 and 22 which extend between the end walls. Each pan 3 is slidably mounted and stored on and between a pair of pan support angles or brackets 23 and 24 (FIG. 4). As shown in FIGS. 2 and 8, each bracket 23 and 24 is mounted on and between the vertical rear frame member 9 and the vertical intermediate frame member 10 with corresponding pairs of brackets 23 and 24 being on the same horizontal levels for a particular pan 3. As shown in FIGS. 3 and 7, each bracket 23 and 24 includes a forward end portion 25 which is turned down to facilitate sliding of pans 3 onto the bracket from the elevator means.

The sliding of the pans between their home or storage positions on the brackets 23 and 24 and the elevator means is facilitated by providing each pan with a pair of runners 26 on the undersurface at each end of the pan. The runners 26 are preferably composed of nylon or other similar friction-reducing and sound-deadening material and are the only part of each pan 3 which contacts the brackets 23 and 24.

The end wall 19 of each pan is provided with a pair of clips, flanges or projections 27 and 28 which extend perpendicularly from the end wall as shown in FIG. 8. Likewise, a similar pair of clips, flanges or projections 27 and 28 are provided on the opposite end wall 20 of each pan as shown in FIGS. 4 and 5. The flanges 27 and 28 are engaged by the elevator means so that the pans can be moved horizontally between the elevator and home position as well as between the elevator and work counter 2. In addition, each projection 27 and 28 is formed with upper and lower inclined portions 27a and 27b which facilitate alignment of the pans in their storage positions

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on the brackets 23 and 24, as will be described hereinbelow. As shown, all of the flanges 27 on corresponding ends of the pans are vertically aligned with each other, as are all of the flanges 28, when all of the pans 3 are properly disposed in their storage positions.

The elevator means 17 includes a carriage 29, a pair of vertical shafts 30 of square cross section, as well as means including a pair of link chains 31 for raising and lowering the carriage. The carriage 29 includes a pair of carriers 32 and 33 separately mounted on the shafts 30 and movable together vertically thereon. The carriers 32 and 33 are interconnected by crossed members 34 and 35 which maintain the carriers 32 and 33 at equally spaced positions at all times as well as maintaining the carriers parallel with each other. Accordingly, the carriers 32 and 33 move together up and down the vertical shafts 30 within the elevator shaft between selected pan positions.

Each carrier 32 and 33 is a vertical plate having a central hub portion 36 as well as sprocket mounting portions 37 and 38 at opposite extremities as viewed in FIG. 3. The sprocket mounting portion 37 is mounted on a bracket 39 which cooperates with a spacer bolt 40 and tightening bolts 41 for holding link chains 42 and 43 tautly in place. As shown in FIG. 9, a carrier stabilizing lever 44 is mounted on one side of the carrier and is provided at its outer extremity with a block 45 which moves within a channel portion 10a of the vertical member 10.

The hub portion 36 (FIG. 11) of the carrier 32 is mounted on the square shaft 30 and is provided with upper and lower bearings 46 and 47 having square holes slidable along the square shaft 30, so that the bearings 46 and 47 turn with the shaft and move longitudinally thereon as the carriage is moved vertically by the link chain 31. As shown in FIGS. 3, 5 and 7, the carriers 32 and 33, being similar in construction, are provided with similar rectangular openings 48 so that a sprocket 49 (FIG. 11) with a square opening therethrough may be mounted on the shaft 30, with the sprocket resting upon the upper end of the bearing 47. When the shaft 30 rotates, the sprocket 49 turns with it and thereby drives the link chain 43 (FIG. 12).

Other sprockets 50, 51 and 52 are provided on the carriers 32 and 33, all of which cooperate with the link chains 42 and 43 to move the pans 3 horizontally between the storage positions, the elevator carriage 29 and the work counter 2. The sprocket 50 is fixedly mounted on the lower end of a shaft 53 (FIG. 12), and shaft 53 extends within a sleeve bearing 54 upwardly through the sprocket mounting portion 37. The sprocket 51 is fixedly mounted on the upper end of the shaft 53 (FIG. 10). The sprocket 52 is similarly mounted at the other end of the carriage on a shaft 55 which is mounted in the sprocket mounting portion 38 of the carrier within cylindrical bearings in a conventional manner. Accordingly, when shaft 30 is rotated, sprocket 49 drives the chain 43 around and between the sprockets 49 and 50, transferring motion through shaft 53 to sprocket 51, thereby driving the link chain 42 which extends around and between the sprockets 51 and 52.

As shown in FIGS. 8-11, the chain 42 is provided with means for engaging the pans for moving the pans horizontally onto and off of the elevator carriage 29. The engaging means includes a pair of roller mounting links 56 and 57 as well as a pair of roller mounting links 58 and 59. All of the links 56, 57, 58 and 59 are similar in construction and also form links of chain 42 and are provided in pairs, as indicated, to form mounting means on chain 42 for rollers which engage the clips 27 and 28. The links 56 carry a roller 60 and links 57 carry a roller 61 (FIG. 11). Likewise, links 58 and 59 mount rollers 62 and 63.

The elevator carriage 29 is moved vertically on the square shafts 30 to the proper level opposite a preselected pan 3. As shown in FIGS. 2 and 3, chain 31 extends over and around sprockets 64 and 65 as well as a chain

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tightening sprocket 66 at the lower end of the file and thence upwardly and around sprockets 67 and 68 at the upper ends of the file. Each chain 31 has opposite ends connected at 69 and 70 (FIGS. 9, 10 and 12) at the lower and upper portions of each carrier 32 and 33.

As the elevator moves vertically and rollers 60 and 61 are disposed in the dotted line positions 60a and 61a (FIG. 9) with a gap space between the rollers. During vertical carriage movement this roller gap is aligned with the aligned tray projections 27, and the rollers 60 and 61 straddle any tray projection 27 as the elevator carriage moves vertically past such projection. If for any reason one of the pans 3 is slightly out of alignment with the other pans, the projection 27 of that pan will be contacted by the vertically moving roll 61a which engages either upper or lower inclined portion 27a or 27b, depending upon the direction in which the carriage is moving, and thereby pushes the pan into proper alignment.

When the elevator carriage 29 is properly aligned horizontally with a selected pan 3, the chain 42 may be revolved counterclockwise as viewed in FIG. 9 until the roller 60 at each end of the pan 3 engages the projection 27 and moves the pan from its storage position (FIG. 9) on the brackets 23 onto similar support brackets 71 on each carrier 32 and 33 (FIG. 11) until the roller 60 comes to a stop at position 60b (FIGS. 8 and 9). The pan 3 then is located on the elevator carriage between the carriers 32 and 33 (FIG. 8). At the same time the rollers 62 and 63 move to positions 63a and 62b (FIG. 8) with the roller 62 engaging the rear flange 28 of the pan 3 (FIGS. 7, 8, and 9).

The elevator carriage then may be moved vertically to the level of the work counter 2 whereupon the chain 42 again is revolved counterclockwise from the position of FIG. 8 to that of FIG. 10, during which movement the rollers 62 move the pan 3 onto the work counter 2 where it is accessible to the operator of the file.

Subsequently when it is necessary to return the pan 3 from the work counter 2 to its individual storage position and/or obtain another selected pan 3, the chain 42 is moved clockwise (FIG. 10), causing the rollers 63 to engage the flanges 28 and push the pan 3 back onto the flanges 71 of the carriers 32 and 33. As shown in FIGS. 9 and 11, the flange 71 on each carrier is provided with a pair of spaced glides 72 and 73 similar to the runners 26 on the undersurface of the pans 3. The glides facilitate movement of the pans onto and off of the carriers when the runners 26 are disposed in the spaces between the brackets 23 and 71 as well as between the brackets 71 and the work counter 2 so that overlapping portions of the pans 3 rest upon the glides 72 and 73 to maintain the pans 3 completely horizontal and in alignment with the brackets 23 and 71 during horizontal movement.

When the elevator completes its vertical travel for returning a particular pan 3 to its storage position, the chain 42 again is moved clockwise to push the pan onto its storage brackets 23. During such movement, as the rollers 63 move out of straight line travel and around the sprocket 52, the rollers 61 approach the flanges 27 (at position 61b in FIGS. 8 and 9) and continue pushing the pan 3 off of the elevator carriers 32 and 33 and onto the storage flanges 23. Upon completion of that operation, the chain 42 stops rotating and comes to rest at the position of the chain, as shown in FIG. 9. The elevator is then free to move vertically to another pan 3 at a different level.

In FIG. 2, the upper and lower ends of the square shafts 30 are journaled in bearings 74 and 75 as shown more particularly for the bearing 74 in FIG. 11. The bearing 74 is contained within a pillow block 76 which is secured to the transverse top frame member 14. Similarly, the lower bearing 75 is mounted in a pillow block 77 secured to the transverse bottom frame member 15 as shown in FIG. 3. In addition, a miter gear 78 is fixedly mounted on each shaft 30 at the lower end above the bearing 75.

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Each miter gear 78 is driven by a miter gear 79 (FIGS. 2, 3 and 4) mounted at the ends of horizontal drive shaft 80 conventionally journaled in similar bearing assemblies 81 which are adjacent the miter gears 79 and which are secured to transverse channel frame members 82 as shown in FIGS. 2, 3 and 6.

As shown more particularly in FIG. 6, a V-pulley 83 is mounted on the shaft 80 in alignment with a V-pulley 84 which is driven by a motor 85. A V-belt 86 extends over and between the pulleys 83 and 84. Thus the reversible motor 85 (horizontal motor) operates the means for moving the pans 3 horizontally between their various positions in the file.

Likewise, a reversible motor 87 is provided to drive the chains 31 on opposite sides of the file for raising and lowering the elevator carriage 29. Motor 87 (vertical motor) drives sprocket 88, continuous link chain 89, and sprocket 90 mounted on horizontal shaft 91. In FIG. 6, opposite end portions of shaft 91 are conventionally mounted in similar bearing assemblies 92 which are mounted on an upright portion of angle members 93 which are secured to the upper sides of the channel members 82. The sprockets 65 are mounted on opposite extremities of the shaft 91 to drive chains 31.

As shown in FIG. 13, the projection 28 near the rear of each pan 3 abuts a stop member 94 which is mounted on the rear frame members 9. In addition, a vertical channel member 95 is provided on the left side of the file as viewed in FIG. 4. Member 95 together with a vertical plate 96, provide a vertical space or guide track 97 along which chain 31 runs. In addition, a switch actuator member 98 is mounted on the chain 31 (FIGS. 5 and 13) for actuating one of the normally open limit switches 99 having switch lever means 100 engaged by the actuator 98. A switch 99 is provided for each storage position. Accordingly, when the appropriate switch 99 for the selected pan or storage position is operated by the actuator 98, a circuit to the vertical movement motor 87 is opened and the elevator carriage 29 stops opposite the selected pan 3.

The manner in which the pans 3 are moved between the storage positions and the work counter 2 is controlled by the electrical circuit means shown in FIG. 15. The circuit includes or controls the horizontal motor 85, the vertical motor 87, the several vertical level limit switches 99, the control buttons 5, an operation step relay 101 (OSR) as well as selection step relay 102 (SSR) to be later described.

In addition, the circuit includes horizontal position limit switches including a storage switch 103, a pan limit switch 104, and a use or counter position switch 105. These switches are actuated in connection with rotation of the shaft 80.

As shown more particularly in FIG. 6, a sprocket 106 is mounted on the shaft 80 and is connected by link chain 107 to sprocket 108 mounted on shaft 109 on which a pair of switch actuator disks 110 and 111 are likewise mounted. The disks 110 and 111 are similar except that disk 110 actuates or controls one horizontal position switch, namely position switch 103. As shown in FIG. 14, disk 111 actuates or controls pan limit switch 104 and counter limit switch 105. Accordingly, the horizontal movements of the pans 3 between the storage racks, the elevator and the work counter are controlled by the switches 103, 104, and 105 which in turn are actuated by the shaft 80 which operates the horizontally moving members of the elevator. In FIG. 6, the shaft 109 is mounted between upright portions of a U-shaped bracket 112.

In addition, the electrical circuit includes a potentiometer 113 which is mounted on a shaft 114, the ends of which are mounted in a U-bracket 115. Shaft 114 is turned in one direction or another by sprockets 116 and 117 mounted on the shafts 91 and 114, respectively, and link chain 118.

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The OSR and SSR relays 101 and 102 are of conventional construction and may include any desired number of decks of contacts. As indicated in FIG. 15, the OSR operation step relay 101 may include six decks of contacts as well as a coil 101a. The SSR selection step relay 102 may include three decks of contacts as well as a selection step relay coil 102a. The several decks of OSR relay 101 are identified in FIG. 15 by the letters OSR and the particular deck number, and the selection step relay decks are identified by the letters SSR and the particular deck numbers.

A typical cycle of operation of the file involves seven steps including:

- (1) Horizontal travel of a pan 3 from the work counter 2 to the elevator,
- (2) Vertical travel of the elevator with the pan to the proper level for storage of the particular pan,
- (3) Horizontal travel of the pan from the elevator to its storage rack position,
- (4) Vertical travel of the empty elevator to the storage location of a newly selected pan,
- (5) Horizontal travel of the newly selected pan from its storage position to the elevator,
- (6) Vertical travel of the elevator with the newly selected pan to the work counter, and
- (7) Horizontal movement of the newly selected pan from the elevator to the work counter 2.

It is assumed for purposes of description of the foregoing sequence of operations with regard to the electrical diagram of FIG. 15 that the file 1 is provided with sixteen pans 3 (counting from the top) and that the position of pan No. 11 is horizontally aligned with the level of the work counter 2. Accordingly, when pan 11 is selected, vertical movement of the elevator to and from the work counter is eliminated.

A typical cycle of operation begins with a pan on the work counter. Assuming that pan No. 4 is on the counter and the operator desires pan No. 1, the control button 5 for the No. 1 (top) pan 3 is pressed. Each control button 5 (FIG. 15) includes three pairs of contacts, two of which are maintained and one of which is momentary. The momentary contact advances the OSR relay 101 (deck 1) from position 11 to position 1 by operation of coil 101a.

Each time the coil 101a operates, interrupter contacts 101b which are normally open are closed, which actuates a step control relay 101c which in turn opens the circuit through normally closed contacts 101d, thereby de-energizing the circuit through the D.C. side of the circuit and advances the OSR relay 101 to the next position.

The circuit through the elevator shaft limit switch 104 is thereby closed (through OSR-deck 3 position 1), as well as through an "In" relay 119 (IR) to the horizontal motor 85. The operation of the motor 85 pulls pan No. 4 onto the elevator carriage 29 from the work counter 2 until the limit switch 104 is actuated to stop the motor by disconnecting the circuit through the relay 119. At the same time the switch 104 which is a double throw switch, actuates the operating step relay coil 101a, thereby moving the operating step relay 101 to position 2.

A circuit is then closed (position 2 of OSR-deck 5) through the SSR relay 102 (deck 3), through a vertical level limit switch 99 for pan No. 4, through the vertical relay contacts 123 to an "Up" relay 120, causing the vertical motor 87 to operate and lift the elevator to the level of storage of position No. 4 of the pan. At that level the appropriate vertical level limit switch 99 is opened and the motor 87 stops because of the open circuit through the "Up" relay. At the same time, the limit switch 99 closes a circuit (OSR-decks 1 and 5 and SSR-deck 3) through the operation step relay coil 101a and moves OSR relay 101 to position No. 3.

Current then flows through home limit switch 103 through No. 3 contact of the OSR relay 101 (deck 3) to the "In" relay 119, causing the horizontal motor 85 to move the pan 3 into its home or storage position No. 4.

At that point the home limit switch 103 is again operated to break the circuit through the "In" relay 119 and thereby stopping the motor 85. The limit switch 103 simultaneously again actuates the operation step relay coil 101a (OSR-deck 1) to position No. 4.

The selection step relay 102 is then energized through maintained contacts of the push button 5 for pan No. 1 through the operation step relay 101 (deck 6), thereby closing the circuit through the normally closed contacts on a stop relay 121, as well as through interrupter contacts 122 on the selection step relay. The selection step relay 102 then steps itself around until it reaches contact No. 1 (corresponding to pan 1), at which time the normally closed contacts of the stop relay 121 are opened, thereby stopping the selection step relay at position No. 1. Current then flows through the maintained contacts on control button 5 No. 1, through contacts No. 4 of the OSR relay 101 (deck 6), through normally open contacts 121a of the stop relay, through contacts No. 1 of SSR relay 102 (deck 3) through No. 1 vertical limit switch 99, through vertical relay 123 and to the "Up" relay 120 to actuate the vertical motor 87. The motor 87 moves the elevator carriage 29 up to level No. 1 and thereby actuates the appropriate vertical level limit switch 99 to open the circuit through the "Up" relay 120 and thereby stopping the motor 87. At the same time, the limit switch 99 again actuates operation step relay 101 (deck 1) to position No. 5.

The circuit is then closed through the elevator shaft limit switch 104 and through contacts No. 5 on the operation step relay 102 (deck 2) to an "Out" relay 124, thereby operating motor 85 to move pan No. 1 onto the elevator carriage 29. Operation of the motor 85 is terminated when the elevator shaft limit switch 104 is actuated and at the same time said switch again actuates the operation step relay 101 (deck 1) to position No. 6.

Current then flows through the relay 101 (deck 5) to switch No. 11 of vertical limit switches 99 (which is used at the No. 11 level aligned with the work counter 2). Current also flows through vertical relay 123 to a "Down" relay 125 to the vertical motor 87 until No. 11 vertical limit switch 99 is actuated to break the circuit through the "Down" relay 125 and stopping the motor 87. Simultaneously said limit switch again actuates operation step relay 101 (deck 1) to position 7.

The circuit is thereby closed through limit switch 105, through contact 7 of operation step relay 101 (deck 2), through "Out" relay 124 to the horizontal motor 85 which drives No. 1 pan 3 onto the work counter 2. The limit switch 105, being a horizontal position limit switch, is actuated to break the circuit through the "Out" relay 125 and the motor 85 and at the same time again actuates the operation step relay 101 to position 8. As shown in operation step relay 101 (deck 1) positions 8, 9, and 10 are interconnected so that when the relay reaches position 8 it steps itself to position No. 11 where it stops until a new selection is made by pressing another control button 5 and the pan 3 (No. 1) remains on the work counter for use by the operator.

When the operator is through with the file 1 for an extended period such as overnight, it is desirable that the pan 3 on the counter 2 be returned to the home or rest position without bringing out another pan. For that purpose a close button is included with the control buttons 5, which button when actuated performs the first three operations of the above described cycle, including the steps of pulling the pan from the counter onto the elevator carriage 29, moving the elevator carriage vertically to the proper level, and moving the pan 3 from the elevator carriage 29 onto the support brackets 23 at the home or storage position. After the first three operations are completed, the selection step relay 102 steps itself to position No. 17 where it stops because there are no connections to any of the vertical limit switches 99, for which reason

there is no further vertical travel of the elevator carriage 29.

Subsequent operation of the file is made when a control button 5 for a particular tray 3 is pressed and the selection step relay 102 steps itself to the new position. Completion of the cycle of seven steps which was begun by closing the file for an extended down period then occurs as outlined above and the selected pan 3 is brought to the work counter 2 for the operator.

The vertical relay 123 is a two-position polarized relay. Direct current through the coil in one direction causes contacts on one side to close and current in the opposite direction causes contacts on the other side to close. This relay is also of the latching type, i.e., the operated contacts stay closed when the coil current is reduced to zero and do not open until the current has reversed and is of sufficient amplitude to cause operation in the other direction. The relay therefore has no null position in which both contacts are open. As a pan 3 approaches the correct vertical level the vertical relay 123 never opens its operated or closed contacts and the disconnection of the "Up" or "Down" relays 120 or 125 is done by one of the vertical limit switches 99.

The vertical relay 123 does connect the proper "Up" or "Down" relay 120 or 125 for the correct direction of vertical travel. Its coil current is supplied by a Wheatstone bridge positioning circuit, which varies both the amplitude and direction of the current. One leg of the bridge is the potentiometer 113, the wiper arm of which is driven by the vertical motor 87. Another leg is a series of resistors 126 with their terminals connected to the selection step relay 102. The selection step relay 102 when it stops at the selected position connects one of the resistor terminals to one side of the vertical relay coil 120. The other side of the coil is connected to the potentiometer wiper arm. The current through the coil is in such direction as to choose the "Up" or "Down" relay 120 or 125, whichever is needed for correct positioning.

For operation No. 6 the desired vertical level is always that of pan No. 11. Therefore the operation step relay, when in position 6, connects the resistor terminal corresponding to level No. 11. This is independent of the selection step relay 102 for this particular operation.

Accordingly, the present invention provides a new and improved elevator filing appliance having a greatly enlarged capacity for storing and handling record cards per unit of floor space occupied. By providing a filing appliance in which record card holding pans are stored in stationary positions and moved only when a particular pan is selected, the clearance between adjacent tiered pans in storage position and the cards in said pans is greatly reduced so that either the size of the file for a given capacity is reduced or a file of a given size has a greatly increased capacity for storing record cards.

Moreover, by providing a tiered arrangement for storing separate record card holding pans, the number of parts necessary for operating the file can be reduced because of the fewer number of moving parts. Unlike prior automatic filing appliances in which card carrying pans all move together, only one pan moves at a time in the improved construction. Such a construction not only has lower maintenance and operation costs but is more convenient to operate.

Other improved aspects of the invention are that the pans are reversible end for end when desired, since the projections 27 and 28 are located at each end of the pan at the same distance from each corner; that the file can be adapted to house any size or height of card, simply by arranging the spacing between storage locations to accommodate a card of particular height; and that the file on removal of the counter 2 can be moved through any standard 32" wide, 6'-8" high door frame.

Also, the square shafts 30 in the improved elevator construction accomplish two mechanical functions, of guiding elevator travel and of supplying the power for

all horizontal pan movement onto and off of the elevator in each direction. The improved elevator construction also eliminates a separate cradle movable on the elevator in prior constructions which was moved from the elevator to beneath the stored article. Such cradle in prior constructions then picked up the stored article to transfer it from place to place. Elimination of such a cradle carried by and moved onto and off of the elevator immeasurably simplifies the mechanism.

The elimination of the prior art movable cradle is accomplished in the improved construction by the provision of two sets of pan-engaging members or lugs on the driven carrier or transfer chains, one or the other or both of which engage one or the other or both of the pan projections to impart horizontal movement to the pans in either direction.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations have been implied therefrom as such words are used for descriptive purposes and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example and the scope of the present invention is not limited to the exact construction shown.

Having described the invention, the construction, operation and use of a preferred embodiment thereof, and the advantageous, new and useful results obtained thereby; the new and useful elevator filing appliance construction and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

What is claimed is:

1. A filing appliance including a base, longitudinally spaced front and rear frame members supported on the base, at least a front wall on the frame members and having an access opening, a plurality of horizontally extending tiered record-carrying pans disposed in the appliance, storage means slidably supporting the pans in vertical spaced relation including pan-supporting brackets on the frame members, an elevator carriage between the front wall and the tiered pans, means for raising and lowering the elevator carriage between the storage level of any selected pan and the access opening level, means on the carriage for engaging and sliding any pan horizontally between the pan-supporting brackets and the carriage and for sliding the pan between the carriage through the access opening and a work station, an elongated shaft at each end of the appliance, the carriage being slidably mounted on the shafts, each shaft having a non-circular cross section, the pan sliding means being operatively connected to the elongated shafts and including a horizontally disposed member extending the distance between the pans in the storage position and in the access opening position and which member has opposite end portions overlapping adjacent end portions of the pans in each position, reversible means for rotating the elongated shafts, and control means including pan selection buttons for initiating and stopping operation of the carriage and shaft rotating means.

2. A filing appliance including a base, longitudinally spaced front and rear frame members supported on the base, at least a front wall on the frame members and having an access opening, a plurality of horizontally extending tiered record-carrying pans disposed in the appliance, storage means slidably mounting the pans in vertical spaced relation including pan-supporting brackets on the frame members, a pan elevator carriage between the front wall and the tiered pans, means for raising and lowering the elevator carriage between the storage level of any selected pan and the access opening level, means on the carriage for engaging and sliding any pan horizontally between the pan-supporting brackets and the carriage and for sliding the pan between the carriage through the access opening and a work station, an elon-

gated shaft at each end of the appliance, the carriage having a carrier slidably mounted on each elongated shaft, each shaft having a non-circular cross section, the pan sliding means including a continuous link chain and transversely spaced chain-supporting sprockets mounted on each carrier, each chain being operatively connected to a corresponding elongated shaft, each pan having at least one flange extending from each end wall, each chain having pan flange engaging means for sliding a pan horizontally to and from the carriage, one of the chain-supporting sprockets on each carrier being positioned in a zone adjacent the flanges on the end wall of each pan, the other chain-supporting sprocket on each carrier being positioned in a zone adjacent the end of one pan disposed in the access opening, reversible means for rotating the elongated shafts simultaneously, and control means including pan selection buttons for initiating and stopping operation of the carriage and shaft rotating means.

3. A filing appliance including a base, longitudinally spaced front and rear frame members supported on the base, a front wall on the frame members and having an access opening, a plurality of horizontally extending tiered record-carrying pans disposed in the appliance, storage means for movably mounting the pans in vertical spaced relation including pan-supporting brackets on the frame members, a pan elevator carriage between the front wall and the tiered pans, means for raising and lowering the elevator carriage between the storage level of any selected pan and the access opening level, means on the carriage for engaging and moving any pan horizontally between the pan-supporting brackets and the carriage and for moving the pan between the carriage and through the access opening and a work station, an elongated shaft at each end of the appliance, the carriage having a carrier slidably mounted on each elongated shaft, each shaft having a non-circular cross section, the pan moving means including a continuous link chain mounted on and between transversely spaced chain-supporting sprockets on each carrier, each chain being operatively connected to a corresponding elongated shaft, each pan having at least one flange extending from each end wall, each chain having flange-engaging lug means, the flanges on corresponding ends of the pans being vertically aligned with each other, the flange-engaging lug means on each chain being movable vertically in a path adjacent the aligned flanges, reversible means for rotating the elongated shafts simultaneously, control means including pan selection buttons for initiating and stopping operation of the carriage, and the control means also including sequentially operated members responsive to a pan selection button for operating the pan elevator through a cycle of operation.

4. The construction as defined in claim 3 in which the means for raising and lowering the elevator carriage includes a link chain connected to each carrier and in which the chain is operatively connected to a reversible motor.

5. The construction as defined in claim 3 in which the link chain on each carrier overlaps the ends of each pan, in which the flange on each pan end wall is adjacent the path of vertical movement of the chain on the carrier, and in which each chain has a horizontal portion extending between its mounting sprockets from the flange to a location near the front wall of the appliance.

6. In a filing appliance, a base, longitudinally spaced front and rear frame members supported on the base, walls on the frame members forming front, rear and longitudinally spaced end walls and forming a file chamber, the front wall having an access opening communicating with the file chamber, the file chamber being divided substantially into front and rear longitudinal half-portions, a plurality of horizontally extending vertically spaced record-carrying pans disposed in the rear half-portion of the chamber adjacent the rear wall, storage means movably supporting the pans in vertical spaced relation

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including pan-supporting brackets on the frame members, elevator means in the front half-portion of the chamber for raising and lowering any selected pan between the level of the supporting brackets and the access opening level, the elevator means including a pair of elongated shafts one at each end of the elevator means, the elevator means including a carriage having a pan carrier slidably mounted on each of the elongated shafts, each shaft having a non-circular cross section, means including an elongated chain connected to each carrier for raising and lowering the carriage on the shafts, each carrier having a continuous link chain mounted on and between transverse spaced chain supporting sprockets, each chain being operatively connected to a corresponding elongated shaft, each pan having at least one flange extending from each end wall, each chain having flange-engaging lug means, the flanges on corresponding ends of the pans being vertically aligned with each other, each chain extending horizontally from a zone adjacent the vertically aligned flanges on the supporting brackets on the ends of the pans to a zone adjacent the end of the pan in the access opening position, the flange-engaging lug means on each chain being movable vertically in a path adjacent the aligned flanges, reversible means for rotating the elongated shafts simultaneously, control means including pan selection buttons for initiating and stopping operation of the carriage and shaft rotating means, and the control means also including sequentially operated electric circuit devices responsive to a pan selection button for operating the pan elevator through a cycle of operation.

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7. A filing appliance including a base, longitudinally spaced front and rear frame members supported on the base, a front wall on the frame members and having an access opening, a work counter on the outside surface of the front wall, a plurality of horizontally extending tiered record-carrying pans in a vertical storage portion of the appliance on spaced pan-supporting brackets adjacent the rear frame members, a pan elevator carriage between the front wall and the tiered pans, means for raising and lowering the carriage between the storage level of any selected pan and the level of the access opening, means on the carriage for engaging and sliding any pan horizontally between the pan-supporting brackets and the carriage and for sliding any pan between the carriage and the work counter, any pan on the work counter having an edge portion disposed within the front wall, the pan engaging and sliding means extending between the tiered pans and the front wall and having one end portion overlapping the ends of the pans and having another end portion overlapping the end portion of a pan on the work counter, and control means including pan selection buttons for initiating and stopping operation of the carriage and pan engaging and sliding means.

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