

Nov. 10, 1959

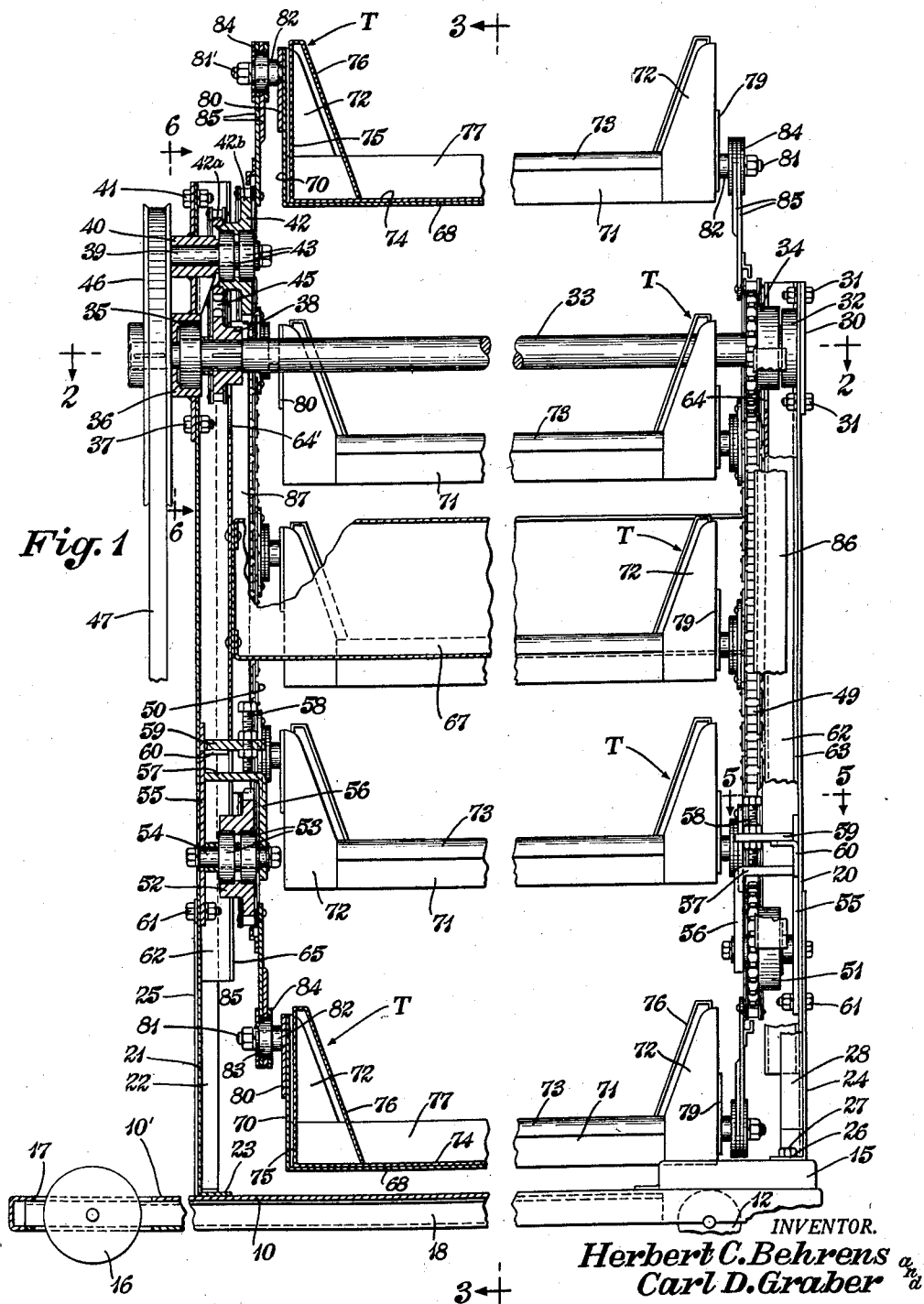
H. C. BEHRENS ET AL

2,912,118

ELEVATOR FILING APPLIANCE

Filed Nov. 23, 1955

7 Sheets-Sheet 1



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7 Sheets-Sheet 2

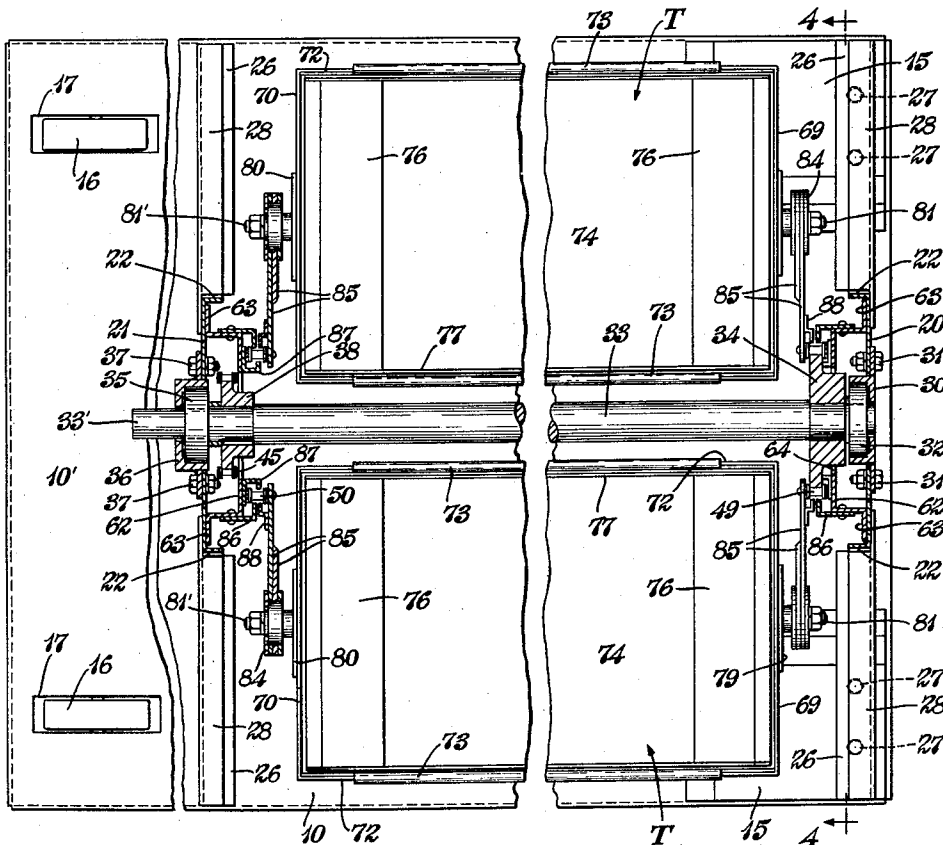


Fig. 2

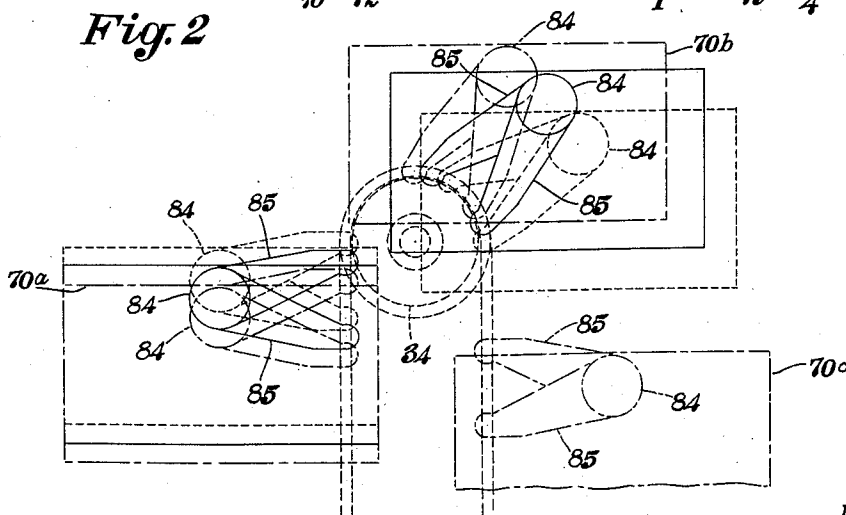


Fig. 7

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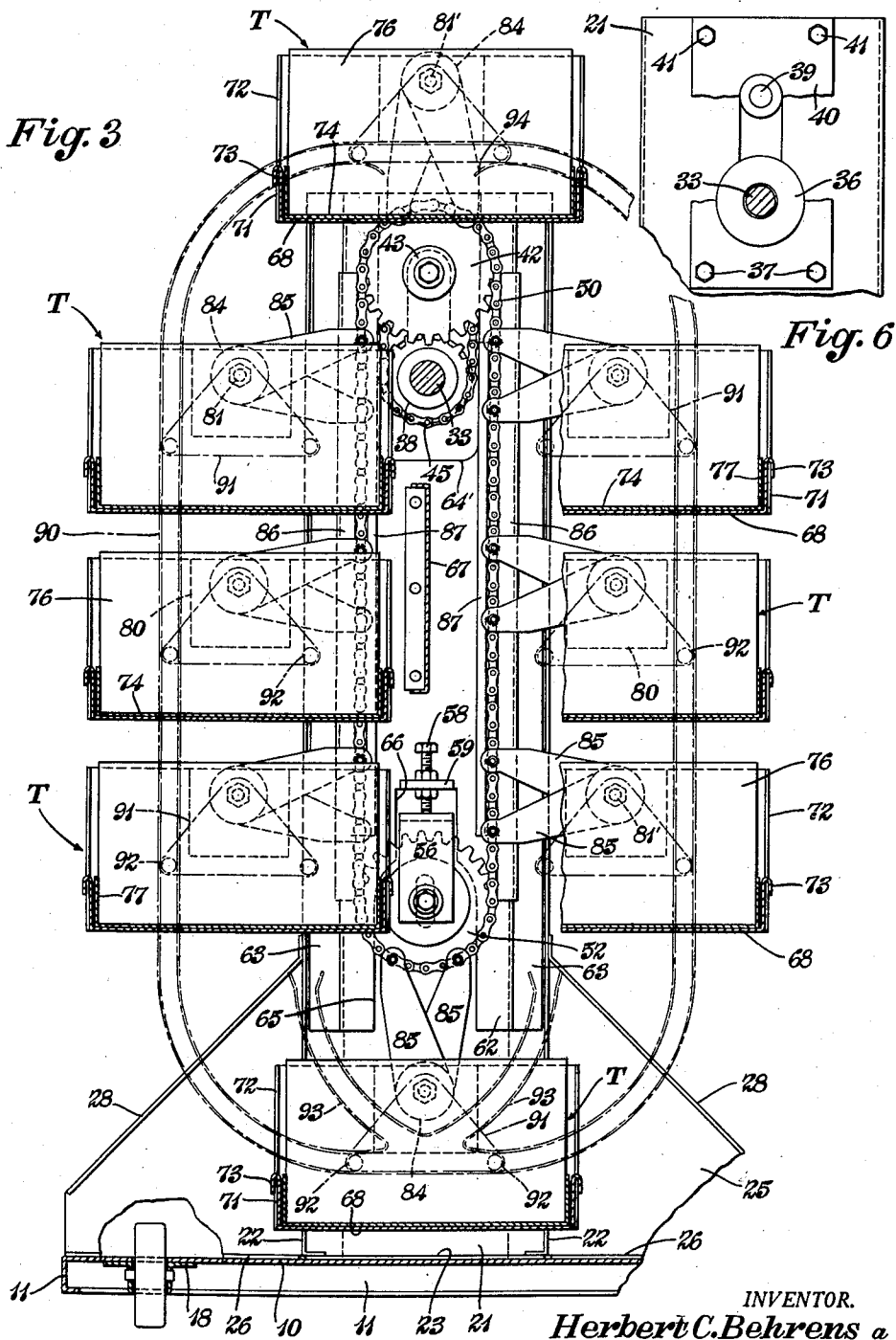
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7 Sheets-Sheet 3



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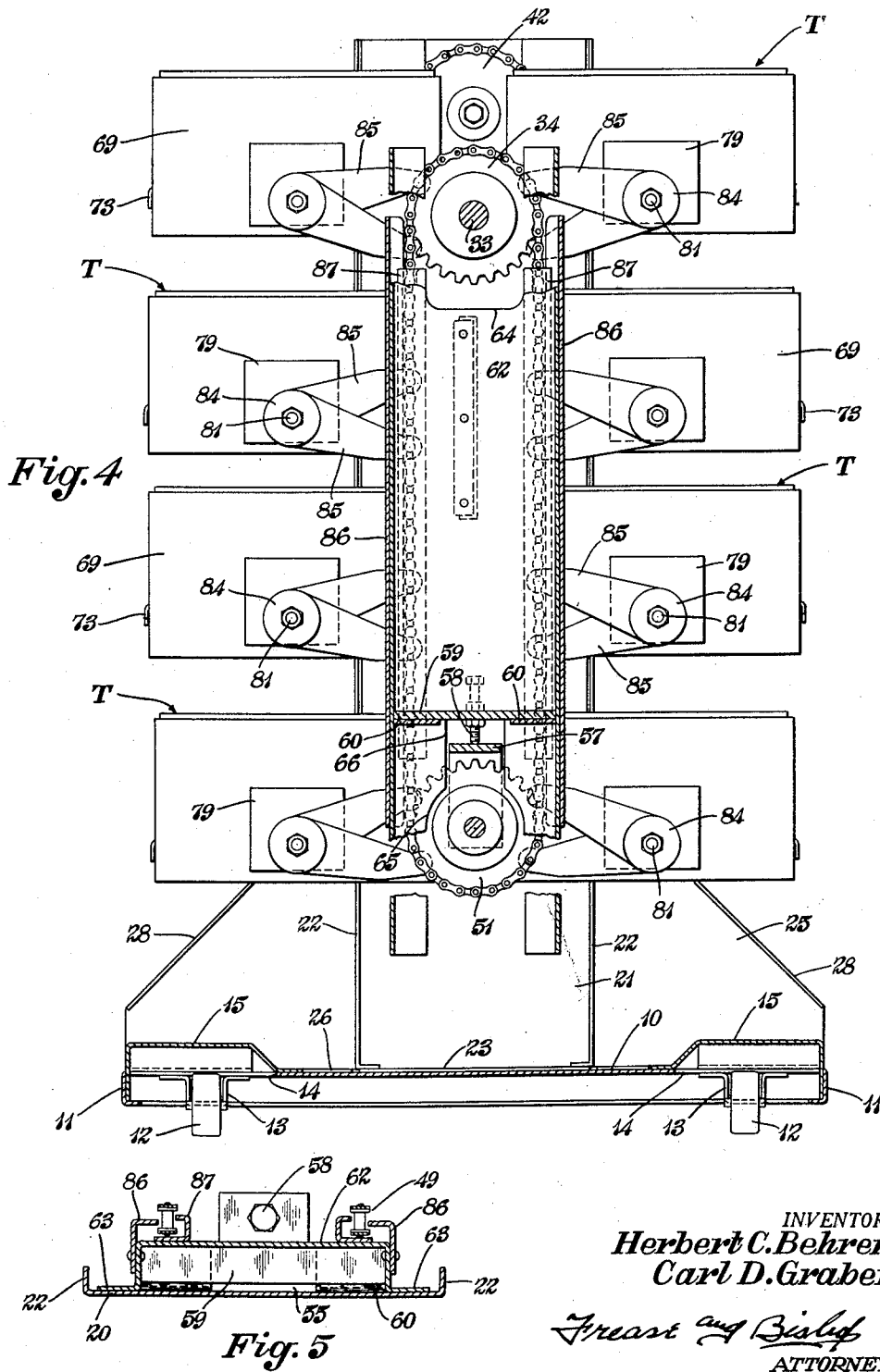
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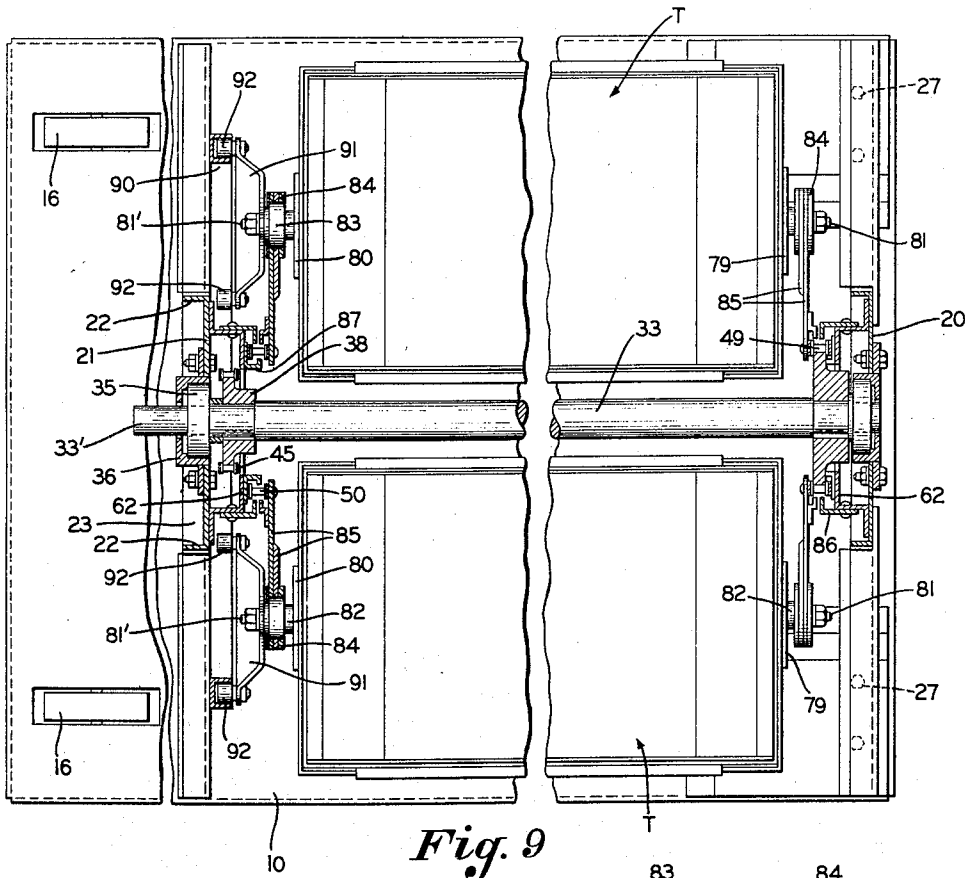


Fig. 9

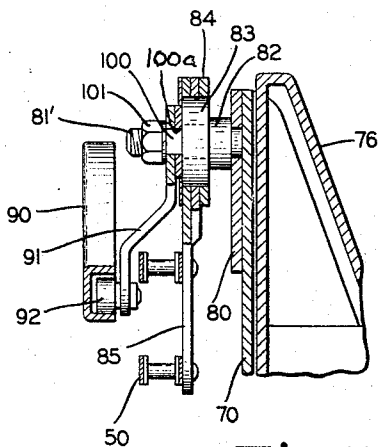


Fig. 11

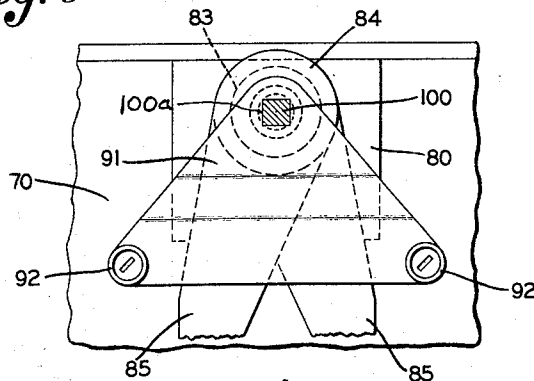


Fig. 12

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7 Sheets-Sheet 7

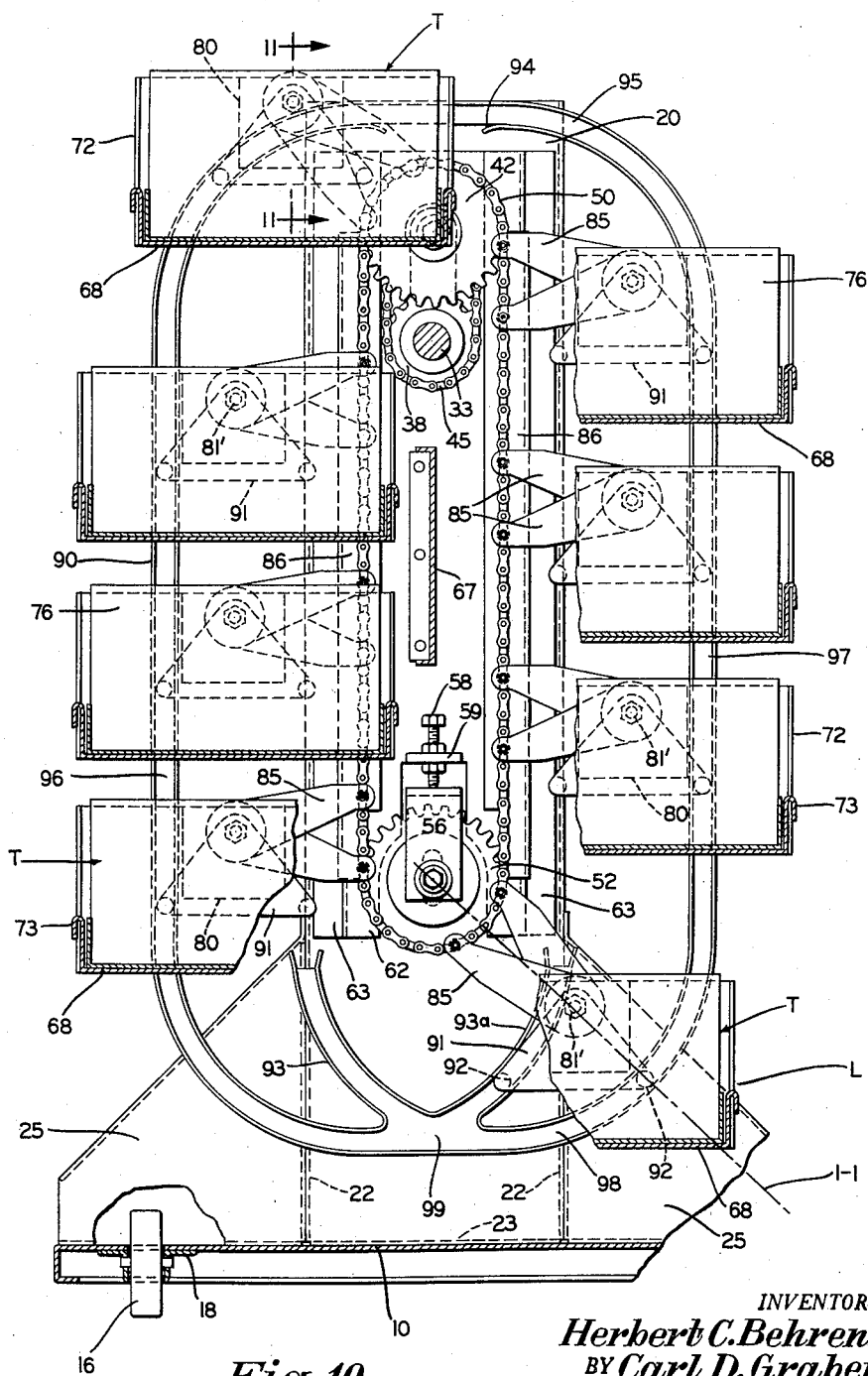


Fig. 10

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2,912,118

ELEVATOR FILING APPLIANCE

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Application November 23, 1955, Serial No. 548,670

7 Claims. (Cl. 211—121)

The invention relates generally to filing appliances, and more particularly to a filing appliance for holding record cards, as in a card index system, in such manner as to make large blocks of the cards selectively accessible to the operator, and this application is a continuation-in-part of our application Serial No. 168,782, filed June 17, 1950, now abandoned.

Certain prior filing appliances of the card index type include record cards arranged substantially radially of a mounting drum which is rotatable on a horizontal axis. While this type of rotary file makes groups or blocks of cards selectively accessible as the drum is rotated, it has a number of disadvantages. For example, when a block of cards is removed the rotary drum becomes unbalanced and difficult to manipulate; the cards must be hung or fastened in special trays on the drum so that they do not fall out when they are upside down; and the card capacity of the rotary file is greatly reduced by the waste space inside of the drum and between the drum and the corners of the rectangular cabinet in which it is housed.

Other prior filing appliances include a plurality of card-holding trays arranged about a horizontal axis for movement through an orbit of travel, whereby the trays are successively presented at an accessible position in the housing of the appliance. In certain filing appliances of this type the trays were swingably mounted on carriers so as to maintain their upright position by gravity. Other similar devices attempted to provide anti-tilting means for maintaining the trays in their upright positions in an attempt to prevent spilling the tray contents; but such means have not been satisfactory to prevent tilting at all positions in the orbit of travel of the trays moving in either direction and at certain locations of travel the trays may upset, for example, where a tray is unevenly loaded with cards only in one side of the tray, a twisting moment about the pivotal axis of the tray causes upsetting.

Another disadvantage of other prior card-filing appliances is they they may work satisfactorily during movement of the trays in one direction only. If the trays are moved in the reverse direction the trays may be moved to an accessible position with greater speed. Thus, if an electrically operated filing appliance is provided with reverse movement for the trays, a particular tray may be moved to the work station in a minimum of time by traveling through the shorter path from a remote location in the orbit of travel. Also, in some prior reversible appliances having partial anti-tilting devices the trays may be moved upright in one direction of travel, but may be upset at a particular location when moving in the reverse direction. Thus, the reversal of forces on the trays may combine with other existing forces to upset the trays.

In addition, it is desirable to provide a filing appliance of minimum overall height and maximum card-carrying capacity and convenient for working with the cards in the trays from one end of the device, in which card-

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carrying trays are held against tilting at all times regardless of location or direction of movement, and are mounted for such movement on a pair of endless chains moving over offset sprockets which provide the minimum height and working convenience arrangements.

It is a general object of the present invention to provide a novel and improved filing appliance construction which eliminates substantially all of the disadvantages of prior rotary card files, while retaining their inherent advantages.

Another and more specific object is to provide a novel card index file which makes movable blocks of record cards of increased numbers selectively accessible and removable at a predetermined location, without becoming unbalanced to such extent as to materially affect the operation of the file.

Another object is to provide a novel filing appliance which movably carries straight interchangeable conventional trays of record cards in an endless path without requiring anchoring or hanging the trays or cards to hold them in upside down position.

Another object is to provide a novel filing appliance having card-carrying trays with anti-tilting means that maintains the trays upright throughout an orbit of travel, particularly where the trays are unevenly loaded.

A further object is to provide a novel and improved filing appliance movably supporting blocks of record cards for selective accessibility, and having maximum card capacity per unit of floor space.

Another object is to provide a novel record card filing appliance of maximum capacity and accessibility which will movably accommodate various heights of cards interchangeably.

Still another object is to provide a novel record card filing appliance which selectively makes two trays accessible simultaneously in side-by-side position.

A further object is to provide a novel record card filing appliance having a plurality of card trays selectively movable to accessible position, in which if desired only part of the trays may be used to contain cards, in order to speed up the operation while maintaining a substantial capacity.

Another object is to provide a novel record card filing appliance which accomplishes the foregoing objects in an economical construction substantially entirely made of sheet metal parts in simply formed shapes.

A still further object is to provide a novel and improved record card file in which a plurality of card trays are mounted for movement in a substantially rectangular path and adapted to be housed in a rectangular cabinet occupying a minimum amount of space and adapted to be insulated to provide a fireproof construction.

Another object is to provide a novel filing appliance having card-carrying trays driven by offset sprockets and adapted to permit access to the trays from the end having the lower sprocket, with a minimum over-all height to the appliance.

Another object is to provide a novel filing appliance having card-carrying trays movable in reverse directions and having anti-tilting means for the trays to maintain the trays upright throughout their orbit of travel in either direction.

Finally, it is an object to provide a novel and improved card index filing appliance which accomplishes the foregoing objects and which is adapted for manual or automatic operation.

These and other objects are accomplished by the parts, constructions, arrangements and combinations comprising the present invention, a preferred embodiment of which is shown in the accompanying drawings and described in the specification as exemplifying the best known mode of carrying out the invention, the nature of the inven-

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tion being set forth in the following general statement, and the scope of the invention being defined in the appended claims.

In general terms, the filing appliance comprising the present invention consists of vertically spaced sprockets journaled in longitudinally spaced frame members and endless chains trained around said sprockets, there being a plurality of trays located between said frame members in two vertical rows, and carried on the laterally spaced chains for movement in elevator fashion in an orbit of travel in one direction or the other upwardly in one row and downwardly in the other, the trays being mounted on the chains by lever arms arranged to increase the angular velocity of the trays in traveling around the sprockets, the mountings at the opposite ends of the trays being offset; and anti-tilting means connected to the trays including endless track means adjacent at least one end of the trays, the track means having roller-entry openings at upper and lower ends thereof, the anti-tilting means also including at least one cam bracket secured to each tray, a pair of spaced rollers on each cam bracket, the rollers being separately engageable with the track means, and there being roller transfer track portions at the lower end portion of the track means communicating with the lower roller-entry opening whereby the rollers engage the lower track portion and the corresponding roller transfer portion simultaneously during movement of the trays through the lowermost portion of their orbit of travel.

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

Figure 1 is a side elevation partly in section, with parts broken away, of the novel elevator filing appliance, with the exterior cabinet omitted for the sake of clarity;

Fig. 2 is a top plan view as on line 2—2, Fig. 1, with parts broken away;

Fig. 3 is a vertical sectional view as on line 3—3, Fig. 1;

Fig. 4 is a vertical sectional view as on line 4—4, Fig. 2;

Fig. 5 is an enlarged fragmentary transverse sectional view, with distant parts removed, as on line 5—5, Fig. 1;

Fig. 6 is a fragmentary sectional view as on line 6—6, Fig. 1, with distant parts removed;

Fig. 7 is a diagrammatic view showing various relative positions of adjacent trays when one of the trays is passing around the upper sprocket, as viewed in Fig. 3;

Fig. 8 is a view similar to Fig. 1 illustrating in full lines the parts shown in dot-dash lines in Fig. 3;

Fig. 9 is a top plan sectional view as on the line 9—9, Fig. 8;

Fig. 10 is a vertical sectional view looking in the direction of the arrows 10—10, Fig. 8, but showing the tray holders at other locations in their path of travel;

Fig. 11 is a fragmentary sectional view taken on the line 11—11, Fig. 10; and

Fig. 12 is a fragmentary sectional view taken on the line 12—12, Fig. 8.

Similar numerals refer to similar parts throughout the drawings.

Throughout the drawings, the inner framework and mounting mechanism carrying the filing trays has been illustrated for the sake of clarity without any exterior cabinet, because the cabinet forms no part of the present invention, and various types of suitable cabinets may be used to house the trays and supporting mechanism therefor. It will be obvious that the cabinet may include a top lid which can be lifted or swung out of the way to expose or make accessible the tops of the two uppermost trays in the position of Fig. 4 for working on the cards contained in those trays.

The novel filing appliance preferably includes a base plate 10 having a downturned channel-shaped marginal flange 11 and movably supported at the front end by means of rollers 12 journaled under the frame on angu-

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lar brackets 13. Preferably, the top plate of the base 10 is cut out above the rollers, as indicated at 14, and hood plates 15 are welded to the base over the cut-out portions. The rear end of the base is preferably extended beyond the supporting frame of the filing appliance so as to provide a narrow platform 10' for a purpose to be described, and the rear end of the base is preferably movably mounted on relatively large rollers 16 which extend through slots 17 in the base extension 10', and are journaled on channels 18 secured as by welding to the underside of the base plate and extending longitudinally to reinforce the same, as shown in Fig. 3.

The longitudinally spaced front and rear supporting frames preferably include vertically extending channel-shaped plates 20 and 21, respectively, having angular flanges 22 extending vertically along their side edges and folded under at right angles at the bottom and spot welded to an inwardly folded flange 23 at the bottom of the web, which is in turn welded to the base plate 10, as indicated in Figs. 1, 3 and 4.

Gusset plates 24 and 25 are secured to the lower portions of the channel plates 20 and 21, respectively, as by welding, and the bottom edges of the gusset plates have inturned flanges 26 which may be spot welded to the base. As shown in Figs. 1 and 2, the flanges 26 of gusset plate 24 may be bolted to the cover plates 15 by bolts 27. Preferably, the gusset plates have inturned reinforcing flanges 28 along their inclined side edges.

At the upper end of the vertical channel plate 20, a bearing plate and housing 30 is secured as by bolts 31, for mounting a suitable anti-friction bearing 32 in which one end of a sprocket shaft 33 is journaled, there being a sprocket 34 keyed on the shaft adjacent to the bearing 32. The other end of the shaft 33 extends through and is journaled in a bearing 35 similar to bearing 32, mounted in a housing 36 and secured by bolts 37 on the upper end portion of the channel plate 21. A driven sprocket 38 of smaller diameter than sprocket 34 is keyed on shaft 33 adjacent to the bearing 35.

As shown in Figs. 1 and 3, the channel plate 21 is extended above the sprocket 38, and a stub shaft 39 is secured in a hub plate 40 which is attached to the channel 21 by bolts 41. A double sprocket 42 is journaled by bearings 43 on the inner end of the shaft 39, and the outer sprocket portion 42a is the same diameter as sprocket 38 and aligned therewith. The inner sprocket portion 42b is the same diameter as the sprocket 34 on the front end of the shaft. A chain 45 operatively connects the sprocket 38 to the sprocket portion 42a so that the sprocket portion 42b is driven at the same speed as the sprocket 34.

The means for driving the sprocket shaft 33 may include a driven pulley 46 keyed on the projecting end 33' of the sprocket shaft, as shown in Fig. 1, and a driving belt 47 operatively connects driven pulley 46 with a suitable motor drive supported on the extension 10' of the base. Obviously, the pulley 46 may be replaced by a hand wheel to make the operation manual.

The front and rear endless chains for movably supporting the filing card trays are indicated at 49 and 50, respectively, being trained around the upper sprockets 34 and 42, respectively. The sprocket 42 is mounted above the level of sprocket 34 for a purpose to be described. The lower ends of the chains 49 and 50 are trained around sprockets 51 and 52 journaled on the front and rear plates 20 and 21, respectively, the sprocket 52 being spaced above the level of the sprocket 51 the same distance as the sprocket 42 is spaced above sprocket 34 so that the chains 49 and 50 are of identical length. The mountings of the sprockets 51 and 52 are identical so that only the mounting of the sprocket 52 will be described.

The sprocket 52 is journaled in suitable anti-friction bearings 53 which are supported on a stub shaft 54 secured at its outer end in a plate 55 and at its inner end

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on a bracket 56, which has a horizontal flange portion 57 extending over the sprocket 52 and secured to the plate 55. The plate 55 and bracket 56 provided an adjustable mounting for the sprocket 52 so that the slack in the chain 50 can be taken up. The means for adjusting the sprocket mounting preferably includes an adjusting bolt 58 threaded through a stationary plate 59 and abutting the flange 57 of the bracket, the stationary plate 59 being secured to angular brackets 60 welded to the channel plate 21. The plate 55 is guided at its upper end by the plate 59, and at its lower end by a bolt 61, which passes through a slot in the bottom portion of plate 55.

The means for guiding the chains preferably includes vertically extending channel members 62 having outturned flanges 63 welded to the inner surfaces of the plates 20 and 21, respectively. These channels 62 are notched out at their top ends as indicated at 64 and 64', respectively, to fit around the hubs of the front sprocket 34 and the rear sprockets 38 and 42. The members 62 are also notched out at their bottom ends as indicated at 65 to fit around the hubs of the lower sprockets 51 and 52. The notches 65 communicate with upwardly extending narrow notches 66 which fit around the horizontal flanges 57 of the mounting brackets 56, as shown in Figs. 3 and 4.

The vertical channels 62 are tied together by a transverse channel plate 67 which extends transversely between the strands of the chains 49 and 50 and is fastened at its ends to the webs of channels 62, as shown in Figs. 1 and 3.

The tray holders for the card trays are rectangular pans and supported at intervals on and between the chains 49 and 50. Each tray holder includes a sheet metal bottom wall 68, front and rear end walls 69 and 70, and narrow side walls 71. Preferably the end walls 69 and 70 have tapered side wing flanges 72 bent inwardly at right angles overlapping and secured to the ends of the side walls. Between the wing flanges, the side walls are preferably provided with downturned stiffening lip flanges 73.

The card trays indicated generally at T are rectangular and of such dimension as to fit somewhat loosely in the tray holders so as to be easily lifted out of the tray holders. The card trays T are preferably formed of sheet metal, each having flat bottom walls 74, exterior vertical end walls 75 with inclined interior card-abutting walls 76, and narrow side walls 77.

Each tray holder has a mounting plate 79 fastened to the lower portion of the front wall 69, and a mounting plate 80 fastened to the upper portion of the rear wall 70, and the shafts or trunnions 81 and 81' for pivotally mounting the tray holders on the chains 49 and 50 are secured in these plates. Preferably the pivot shafts 81 and 81' have shouldered portions 82 secured in the plates 79 and 80, and are journaled in anti-friction bearings 83 mounted in circular housing plates 84.

Each front pivot shaft 81 is connected to the chain 49 by a forked lever having arm portions 85 having a V-like arrangement as shown, connected at their inner ends to extended link pins at intervals along the chain 49, and pivotally connected at their outer ends to the circular bearing housings 84. The rear pivot shafts 81' are similarly connected by forked lever arms 85 to the rear chain 50. Thus as the lever arms travel with the chains around the sprockets, the tray holders pivot in the bearings 83 and remain in horizontal positions at all times.

Consequently, the trays T do not need to be fastened to the tray holders, although they may be integral therewith if desired, and the record cards contained in the trays need not be fastened therein, so that plain unpunched conventional cards can be used. Thus any type of record card can be used in the trays, and cards from an old system can be transferred into the trays T. Cards of

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various heights can be used by varying the spacing between tray holders.

Outer guide means for the chains 49 and 50 between sprockets preferably includes vertical angle plates 86 secured to the side legs of channel plates 62 and having flanges extending inwardly between the links of the chain and terminating adjacent the roller pins thereof. Inner guides may consist of L-shaped vertical plates 87 secured to the webs of channels 62 and having flanges extending outwardly between the chain links in similar fashion. As shown in Fig. 2, the ends of forked arms 85 may have guide angles 88 extending inwardly between the chain links alongside of the angle plates 86.

The tray holders are pivoted to the arms 85 at the lower portions of their front ends and at the upper portions of their rear ends, so that the tray holders are mounted on misaligned pivots and can not tip over as they travel around the sprockets. This mounting arrangement also limits the amount of side sway or swinging of the tray holders. However, such arrangement necessitates spacing the rear sprockets 42 and 52 above the front sprockets 34 and 51, respectively, by an amount equal to the vertical distance between the front pivot 81 and the rear pivot 81' on each tray holder.

The length of the lever arms 85 between the pivots 81 and 81' and the opposite ends where they are attached to the chains 49 and 50 is made considerably greater than the radii of the chain sprockets, so that as the arms travel around the sprockets, the angular velocity at their outer pivots is increased sufficiently to swing each tray holder out of the way of the one following. Thus the tray holders never move any closer together than the spacing shown between the intermediate tray holders in Figs. 3 and 4.

Referring to Fig. 7, several relative positions of tray holders traveling around the upper sprocket 34, for example, are shown diagrammatically. The relative positions of three tray holders are shown in dot-dash lines at 70a, 70b and 70c and the space between tray holders 70a and 70b is somewhat greater than the spacing of the intermediate tray holders. As the tray holders 70a and 70b move clockwise around sprocket 34 to the full line positions, the tray holder 70b moves laterally out of the way of tray holder 70a due to the proportionately increased length of the forked lever arms 85 which impart increased angular velocity to the tray holder 70b. The dotted positions show that the tray holder 70b moves increasingly farther away from 70a as 70b travels around the sprocket.

Thus, by mounting the tray holders on the arms 85, the tray holders may be mounted on the chains 49 and 50 at close intervals, as indicated in Figs. 3 and 4, with close clearance between the top edges of the cards in one tray and the bottom of the tray holder next above. This makes for maximum conservation of space and provides a file having maximum capacity per unit of floor area. As a matter of fact, a file constructed according to the present invention has the capacity of approximately three times as many record cards as a file of the rotary drum type occupying the same cubical space.

In order further to stabilize the tray holders carrying loaded trays and thus reduce strain on the arms 85 and their pivot mountings, it may be desirable in certain installations, as, for example, where trays are unevenly loaded with cards of various sizes, to provide a guide track at the rear end of the file for the tray holders. Such a track may be U-shaped in cross-section as illustrated at 90 in dot-dash lines in Fig. 3, and may be suitably supported on the rear vertical channel frame 21.

As shown, triangular guide brackets 91 may be mounted one on each pivot shaft 81' with laterally-spaced guide rollers 92 at the lower corners of the brackets. One roller 92 of each bracket rolls in the track at one side as the tray holders move upwardly, and the opposite roller 92 rolls in the track at the other side as the

tray holders move downwardly, and the rollers transfer at the ends of the track. As indicated, the bottom end of the track may have transfer portions 93, while the top end may have the inner guide flange cut away, as shown at 94.

In the operation of the novel elevator file of the present invention, assuming that the lid at the top of the cabinet enclosing the file has been opened, the operator rotates the drive shaft 33 in either direction, to bring two of the filing trays to the top position as shown in Fig. 4, where they are fully exposed for being worked on. The operator will obviously work on the cards from the front of the file because the sprocket 34 and the supporting frame therefor is spaced substantially below the tops of the tray holders. If desired, the tray holders are easily removed from the two top trays and transferred to a table or the like.

If the drive shaft 33 is driven by a motor, the motor may be operated by a well known double-throw switch, so that the tray holders are driven in either direction at the will of the operator. If, for example, only four of the trays are needed, four adjacent trays, such as the top four trays in Fig. 4, may be used. In this way the operation of making the loaded trays selectively accessible is faster, because the file can be operated to jog the trays back and forth only the distance occupied by one tray. Under these conditions the unbalancing effect due to the loaded and empty trays is small because of the manner of supporting the tray holders, and the capacity of the four loaded trays is still about one and one-half times that of a rotary drum type file occupying the same space as the entire file.

It is obvious that the novel file is readily adapted for automatic electrical operation, by indexing the several trays and providing an automatic push button selector whereby any desired tray can be brought to the operating position. This automatic operation can easily be arranged so that the desired tray will always travel the shortest distance in one direction or the other to the operating position at the top of the file.

Theoretically, the arrangement of misaligned pivots at the front and back of the trays prevents tipping and limits side-sway or swinging of the tray holders, provided that complete rigidity of tray holders and mountings is possible and uniform tray loading is maintained. Practically however, this arrangement cannot be depended on to prevent some tipping, sidesway or swinging of the tray holders as they move in one direction or the other around the orbit of travel, because of lack of rigidity of tray holders made of sheet metal and particularly if any tray is unevenly loaded which may result in tilting at certain locations in the orbit of travel.

Thus, practically, the guide track and bracket arrangement illustrated in dot-dash lines in Fig. 3 must be used to prevent any tilting, sidesway or swinging of the tray holders in all instances where the trays may be unevenly loaded.

The construction of the guide track and guide brackets is shown in full lines in Figs. 8 to 12, wherein the remainder of the construction may be the same as illustrated in Figs. 1 through 7.

When the guide track 90 is supported on the rear vertical channel frame 21, the channel frame 21 is turned around as shown in Figs. 8, 9 and 10 so that the flanges 22 thereof project outwardly. The upper end of the frame 21 is extended somewhat to support the upper end portion 95 of the track. The track 90 has vertical side portions 96 and 97, and the top and bottom end portions of the track and vertical side portions are connected by curved portions, as shown. The transfer portions 93 and 93a at the bottom end of the track communicate with the track centrally of the lower end portion 98 by omitting a section of the top flange of the U-shaped track channel section 90 at this location, as indicated at 99.

The U- or channel-shaped cross-section of the track 90 provides channel guide flanges which are engaged by the guide bracket rollers 92 to limit movement of the rollers excepting along the extent of the channel. The cut-away portions 94 of the inner guide flange at the top end portion 95 of the track may be flared as indicated to direct entry of one of the rollers 92 into the track 90 prior to the other roller leaving the track.

The triangular guide brackets 91 are mounted on the pivot shafts 81' of each tray holder in fixed position with respect to the tray holder by any usual keying means, such as by providing a squared shaft portion 100 over which a squared opening 100a in bracket 91 is engaged beneath nuts 101 (Figs. 9, 11 and 12). The rollers 92 are mounted at the lower corners of each triangular bracket on either side of and below the connection between the bracket and the tray holder shaft 81'. The rollers are selectively engaged in and roll within the U-flanges of the track member 90.

The positions of the tray holders are illustrated in Figs. 8 and 9 in the same positions as in Figs. 1 and 2. The tray holders are also shown at other locations in their paths of travel in Fig. 10.

A tray holder 68 is shown in Fig. 10 at location L with its pivot shaft 81', the outer guide roller 92 and the center of sprocket 52 in alignment as indicated by dot-dash line 1-1. Assume the absence of the track with the tray holder L at a different location but moving clockwise around the orbit of travel, and assume that the portion of the tray holder L to the left of a vertical line through the pivot shaft 81' is loaded heavily without any load in the tray holder to the right of a vertical line passing through its pivot shaft 81'.

Under such circumstances, the left-hand side of the tray holder, particularly adjacent pivot shaft 81' at its rear end, tends to continue to move downward and to impart a twist to the tray holder as the tray holder continues to travel downward and around to the left. This tendency of the tray holder to twist can result in upsetting and improper operation or jamming of the equipment. Similar conditions can occur as the tray holders pass around each corner of the orbit of travel, depending upon the direction of travel and the manner of tray loading.

The track arrangement 90 illustrated in Figs. 3, 8, 9 and 10 cooperating with the guide rollers 92 and triangular guide brackets 91 prevents any such twisting or tilting of any of the tray holders at any place and at all times in the path of travel of the tray holders. Referring particularly to Fig. 10, any tendency of any tray holder to tilt due to uneven loading as the tray holder is moving either upward or downward along either of the vertical track portions 96 or 97 is prevented by engagement of the rollers 92 with either the outer or inner flange of the U-shaped track section. As any tray holder moves in its path of travel around either of the top corners between the top end track section 95, and either of vertical track sections 96 and 97, swinging of the tray holder is prevented by one or the other of the rollers 92 engaging the inner or outer flange of the track section, if the tray holder is subjected to a force tending to produce tilting in either direction.

With particular reference to the tray holder illustrated in full lines at the top left-hand corner of Fig. 10, any force imparted to the tray holder 68 tending to produce tilting causes the left-hand roller 92 to tend to swing about pivot shaft 81' as a pivot point. Such movement of the roller 92 is substantially at right angles to the inner and outer flanges of track 90 and is immediately resisted thereby.

As the tray holder 68 passes across the top track section 95, at least one roller 92 is engaged in the track while the other roller is moving into or out of the track entry opening 94, and the engaged roller prevents swinging movement of the tray in either direction by imme-

diate contact with one of the track flanges at an angle with respect thereto.

When a tray holder is at location L in Fig. 10, different conditions prevail which require the presence of the transfer section 93a. Assume that a tray holder 68 is moving downward around the lower right-hand corner, unevenly loaded so that the tray holder is at all times subject to a tendency to tilt. As the tray holder moves downwardly its pivot support 81' is above a line passing through the right-hand roller 92 and the center of sprocket 52. At location 1—1, pivot shaft 81' becomes aligned with roller 92 and the center of sprocket 52. With continued movement pivot shaft 81' passes below the line passing through the latter somewhat in the fashion of a toggle.

In passing through this condition, represented by the line 1—1, any tilting movement imparted to the tray 68 is not resisted by lower right-hand roller 92 in the main track section since roller 92 could swing and move longitudinally of the track. For instance, with the tray holder 68 traveling clockwise and uneven tray loading tending to impart counterclockwise tilting movement to the tray holder, the tendency would be for the downwardly traveling lower right-hand roller 92 to reverse its direction of travel in the track and to move upward therein, in passing through the 1—1 location.

This tilting movement, however, is resisted by the left-hand roller 92 engaged in transfer portion 93a, because such guide roller when subjected to tilting movement is engaged substantially at right angles by one or the other of the flanges of the transfer track section 93a.

Similar situations can occur at the lower left-hand corner of the path of travel depending on the direction of tray holder travel and the nature of tray loading.

Thus, the track 90, triangular brackets 91 and rollers 92 provide anti-tilting means maintaining the tray holders horizontal at all times.

The cooperative relation of the particular arrangement of offset drive and anti-tilting means is also of importance. Referring to Figs. 1, 3, 8 and 10, the front of the device is to the right in Figs. 1 and 8, and the fronts of the tray holders at the top are accessible to the operator without substantial interference by the drive mechanism since the pivot shafts 81 are at the lower portion of the front end of the tray holders. In the lowermost position of any tray, as at the bottom of Figs. 1 and 8, this pivot support 81 is located immediately above the base. Thus, there is no space below the pivot shafts 81 at the front of the tray holders for the downward projection of any brackets 91 at the front ends of the trays, or for locating any track therebelow, without raising the effective height of the equipment. However, because of the offsetting of the front and rear sprockets and the vertical offsetting upward of the rear pivot shafts 81', the track 90 and triangular brackets 91 may be located below the pivot shafts 81' at the rear ends of the tray holders, as shown in Figs. 3, 8 and 10 without any increase in height of the device. Thus ample clearance is present at the lower left corner of Fig. 8 for the downward projection of bracket 91 and location of lower portion 98 of track 90 above the bottom of the lowermost tray holder 68.

The novel elevator filing appliance of the present invention accordingly retains substantially all of the advantages of the rotary drum type of file, and embodies many advantages thereover, especially the advantage of much greater capacity per unit of floor area. Other advantages include rendering accessible two card trays of increased capacity side-by-side simultaneously; using interchangeable conventional trays and interchangeable unpunched conventional cards without anchoring the trays or cards; the ability to accommodate various heights of cards interchangeably; and the ability to remove the trays easily at any time, and to utilize only part of the card trays at one end of the appliance.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein 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 details of construction.

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

We claim:

1. In a filing appliance, a base, longitudinally spaced vertical front and rear frame members supported on the base, a pair of vertically spaced sprockets carried by each frame, a first endless chain forming a driving connection between the pair of sprockets carried by the front frame, a second endless chain forming a driving connection between the pair of sprockets carried by the rear frame, common drive means for said sprockets, a plurality of card tray holders located longitudinally between the frame members, said holders being vertically spaced and horizontally disposed; a trunnion fixed to and extending from each end of each holder, lever arms connected to the first and second chains at intervals and extending laterally outwardly from the chains and pivotally connected to the trunnions; a series of guide brackets, one secured to each trunnion at one end of each holder, a pair of rollers on each bracket vertically and horizontally offset from the bracket trunnion connection; continuous guide track means on one of the frame members adjacent the ends of the holders on which the guide brackets are secured, the track means surrounding the corresponding chain; the continuous track means including spaced parallel vertical portions and connecting upper and lower end portions, one roller on any guide bracket being engageable with one vertical portion and portions of the upper and lower end portions of the continuous track means, the other roller on such bracket being engageable with the other vertical track portion and other portions of the upper and lower end portions of the track means during travel of the bracket in an orbit of movement completely around the track; the track means having roller entry openings in the upper and lower end portions through which the rollers engage and disengage the track portions, there being roller transfer track portions in one of the end portions communicating with the corresponding roller entry opening, and both rollers of any pair being engaged simultaneously respectively with at least one transfer portion and one end portion of the track means during movement of the holder on which said pair of rollers is mounted along the said track end portion in the orbit of travel of the holder, whereby the continuous engagement of the guide bracket rollers with the track means always retains the tray holders in a horizontal position during travel.

2. In a filing appliance, a base, longitudinally spaced vertical front and rear frame members supported on the base, a vertically spaced pair of sprockets journaled in each frame member, endless chains carried by the front and rear sprockets, means for driving one sprocket of each pair, lever arms secured to said chains at intervals and extending laterally outwardly therefrom, a plurality of card tray holders, said holders being located between said frame members, means pivotally mounting an end of each holder on the outer end of one of said lever arms, said holders being vertically spaced and horizontally disposed, a guide bracket rigidly connected to one end of each holder, a pair of rollers rotatably secured to each bracket, the roller mountings and bracket connection being tri- angularly arranged with the rollers of any pair vertically

offset from the pivotal mounting of the respective holder on its lever arm; continuous guide track means on one of the frame members adjacent the ends of the holders on which the brackets are secured, the track means surrounding the corresponding chain; the continuous track means including spaced parallel vertical portions and connecting upper and lower end portions, one roller on any guide bracket being engageable with one vertical portion and portions of the upper and lower end portions of the continuous track means, the other roller on such bracket being engageable with the other vertical track portion and other portions of the upper and lower end portions of the track means during travel of the bracket in an orbit of movement completely around the track; the track means having roller entry openings in the upper and lower end portions through which the rollers engage and disengage the track portions, there being roller transfer track portions in one of the end portions communicating with the corresponding roller entry opening, and both rollers of any pair being engaged simultaneously respectively with at least one transfer portion and one end portion of the track means during movement of the holder on which said pair of rollers is mounted along the said track end portion in the orbit of travel of the holder, whereby the continuous engagement of the guide bracket rollers with the track means always retains the tray holders in a horizontal position during travel.

3. The filing appliance construction defined in claim 2 in which the continuous track means is channel shaped in cross-section with an outer continuous channel flange, and in which the entry openings in the upper and lower end portions are formed in the inner channel flange.

4. The filing appliance construction defined in claim 1 in which the roller transfer portions communicate with the lower end portion roller entry opening and in which

the trunnion on any holder moving along the upper track portion is located above said upper track portion during such upper track portion movement of such holder.

5. The filing appliance construction defined in claim 1 in which the rollers of each pair are vertically offset below said trunnion.

6. The filing appliance construction defined in claim 1 in which at least one of the trunnions on an end of a holder extends from the upper portion of said end of the holder, and in which the upper end of the guide bracket is secured to said upper extending trunnion.

7. The filing appliance construction defined in claim 1 in which the trunnion mounted on the front end of each holder is located at the lower portion of said holder, and the trunnion at the rear end of each holder is located at the upper portion of the holder vertically offset from said lower trunnion, in which the axes of the upper sprockets of each pair are vertically offset a distance equal to the vertical offset between the upper and lower trunnions, and in which the upper end of the guide bracket on each holder is secured to the upper rear end trunnion.

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