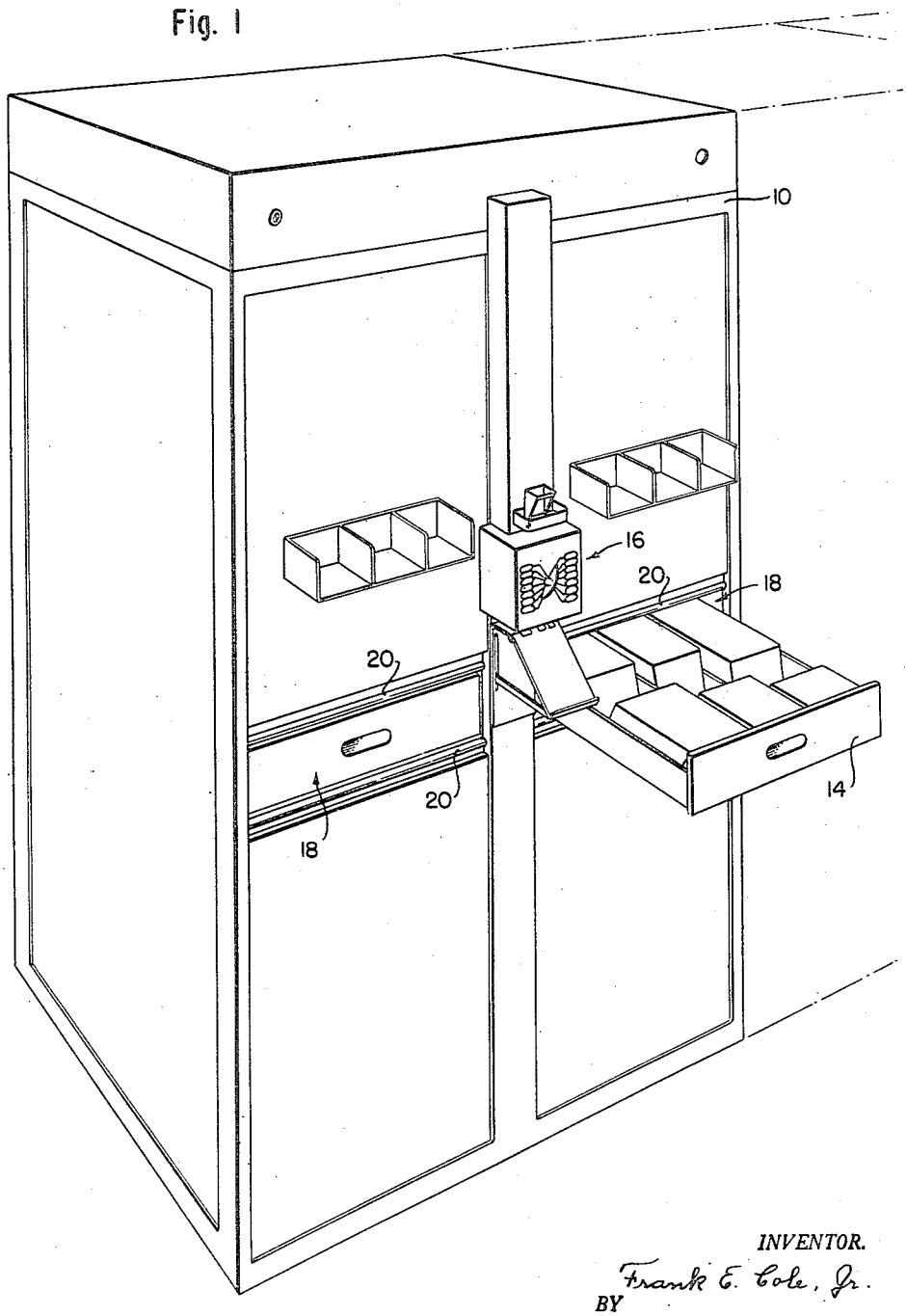
March 4, 1958 F. E. COLE, JR 2,825,616

AUTOMATIC FILING CABINET

Original Filed April 17, 1953 7 Sheets-Sheet 1

Fig. 1



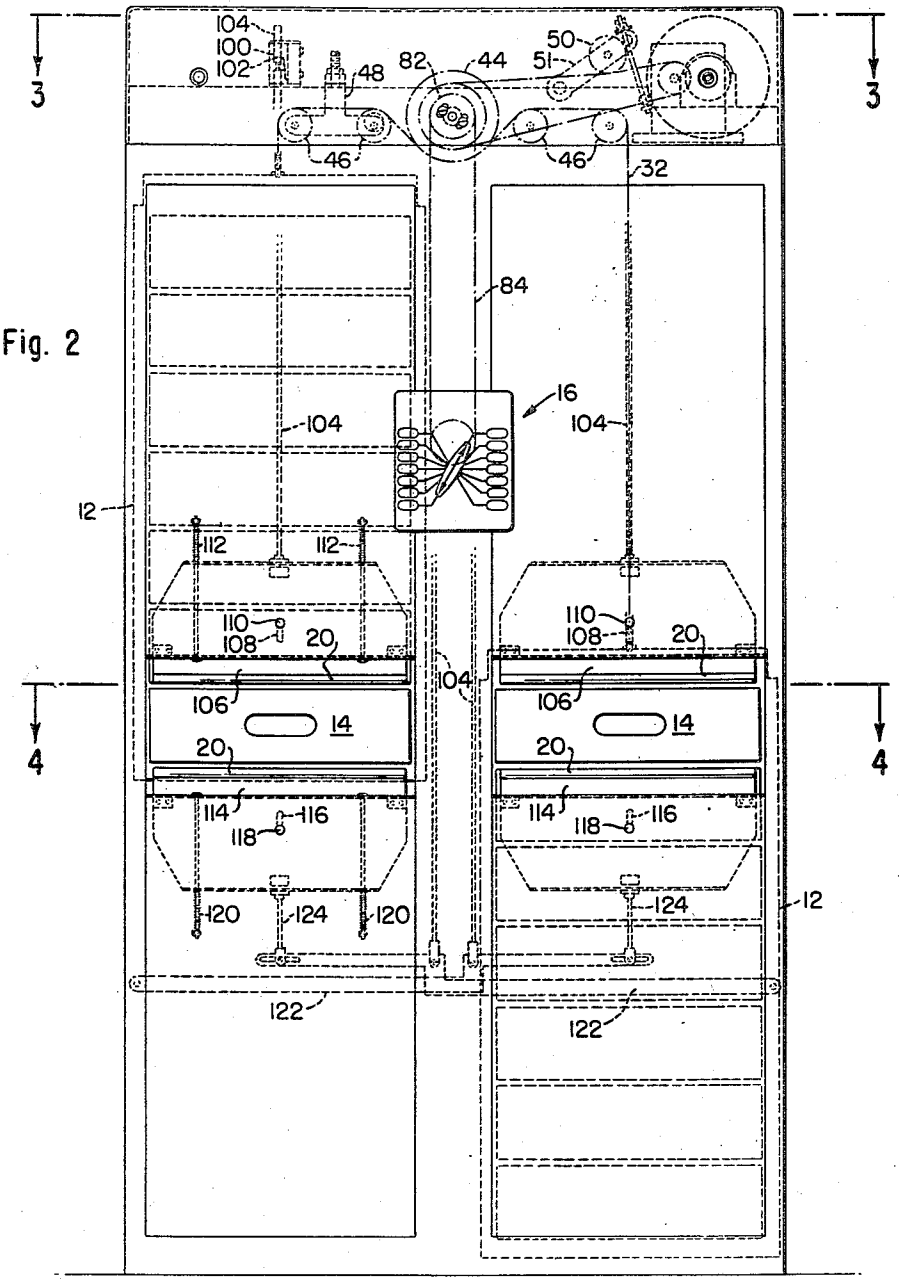
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Fig. 2



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Fig. 3

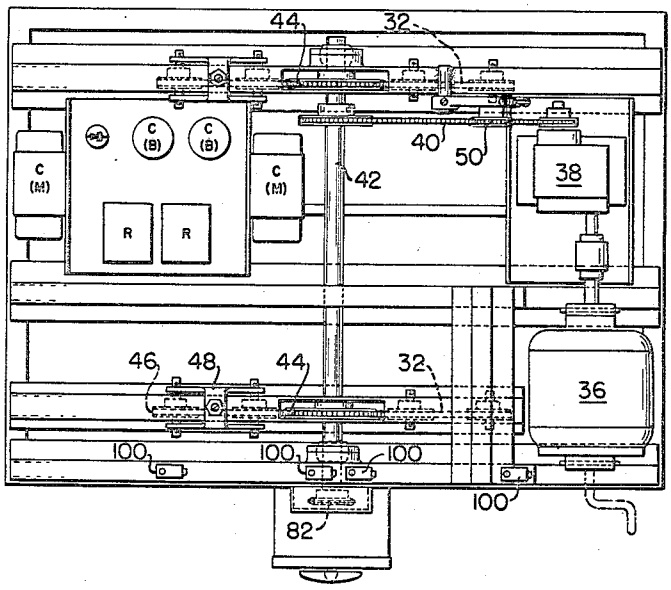
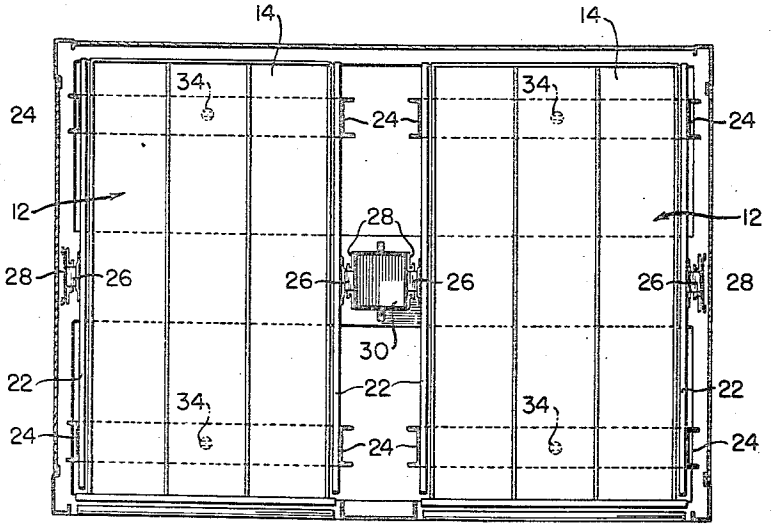


Fig. 4



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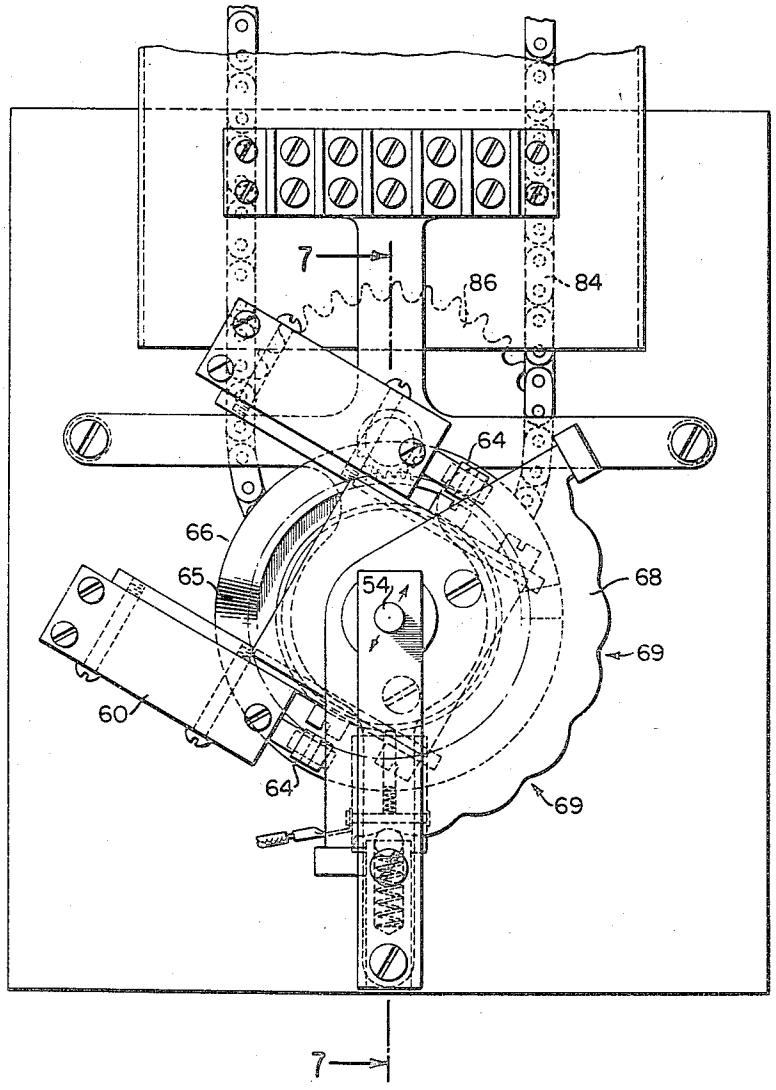


Fig. 5

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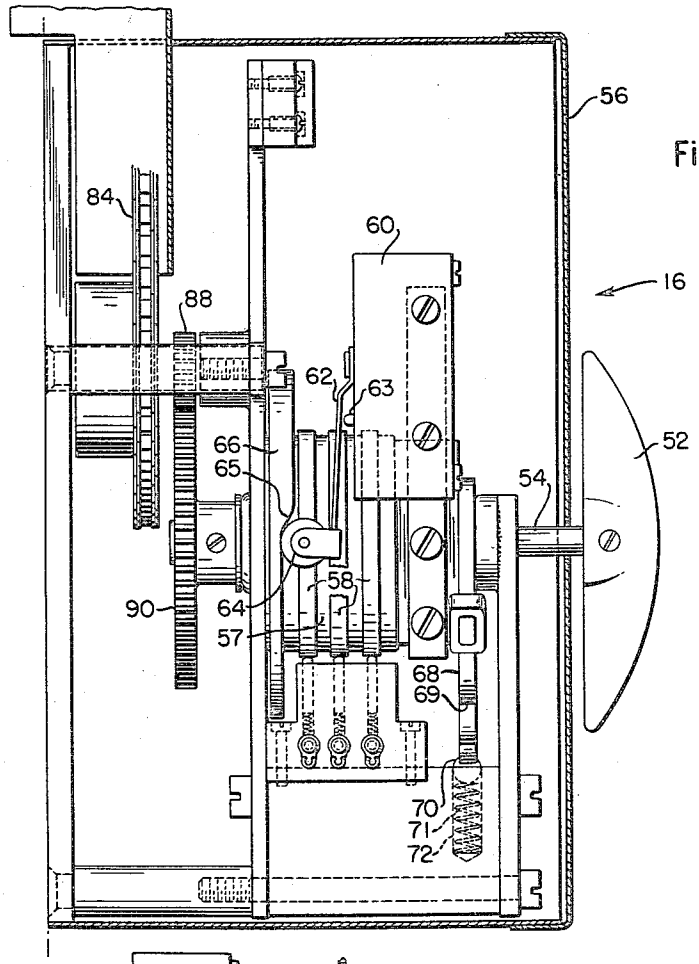


Fig. 6

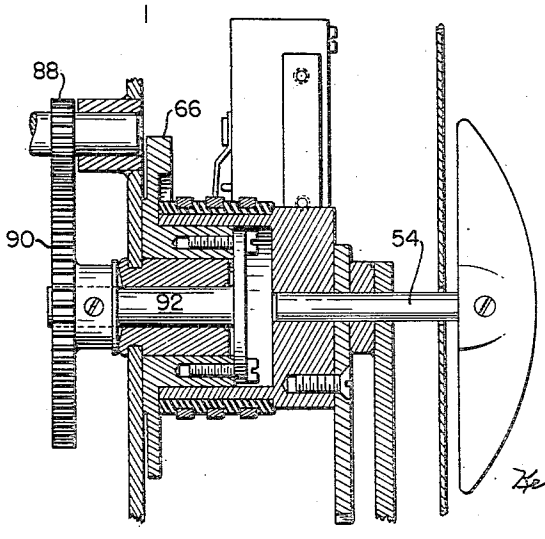


Fig. 7

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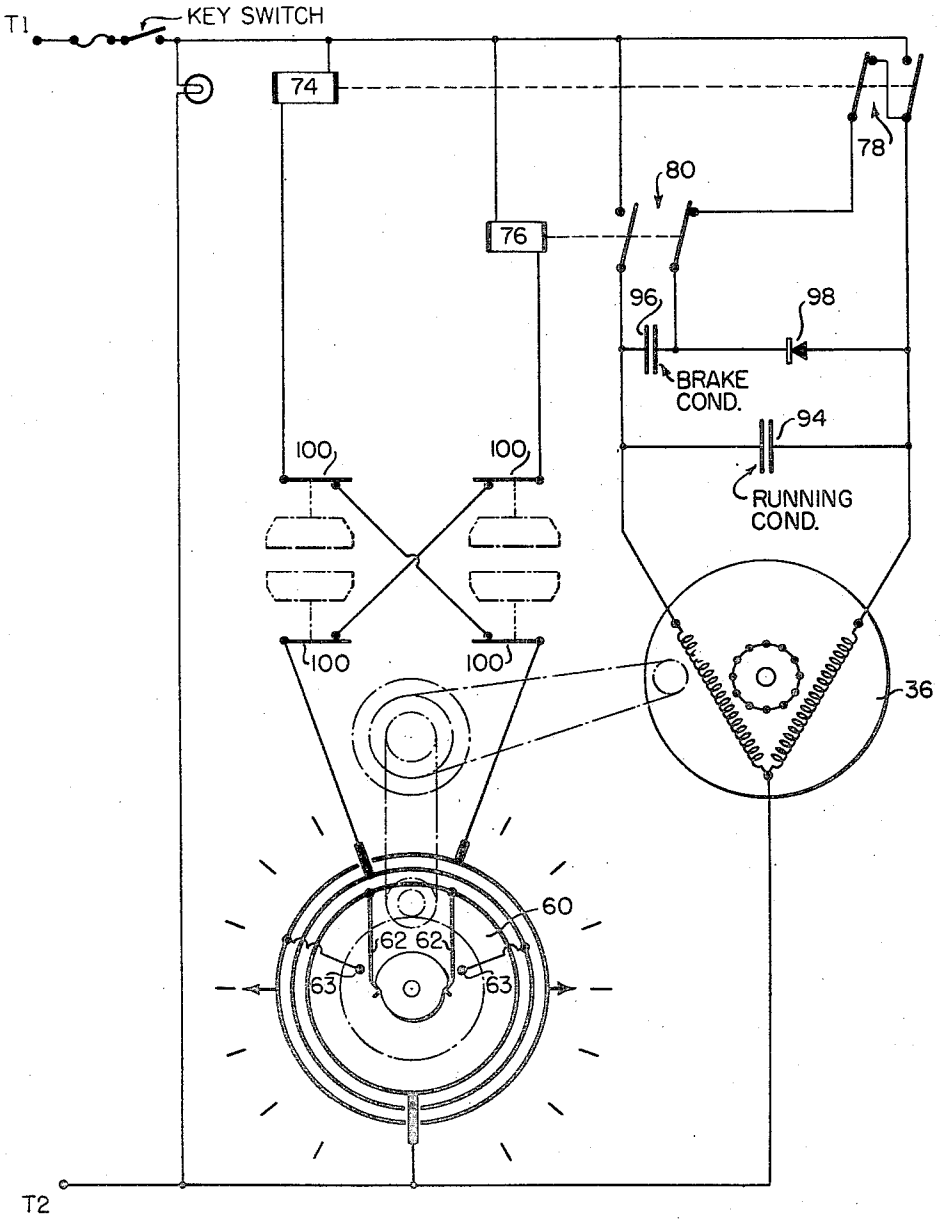


Fig. 8

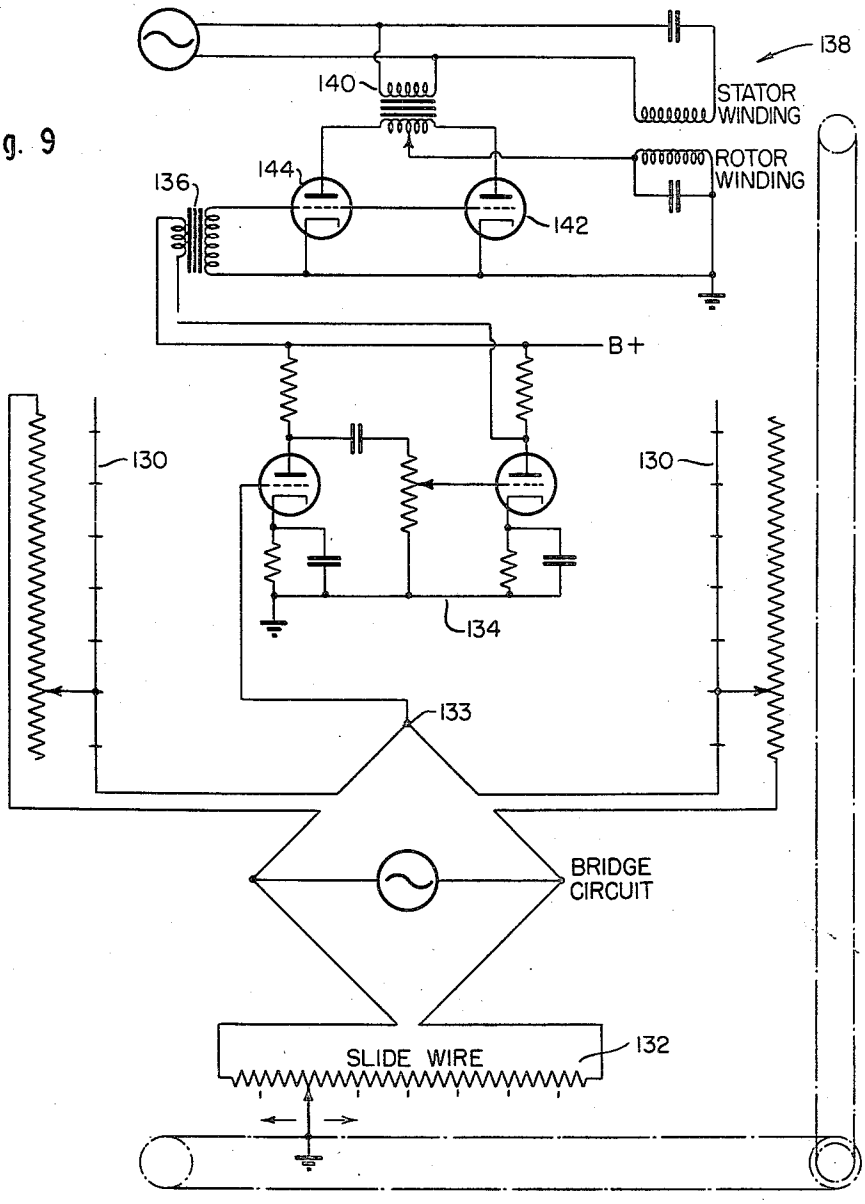
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Fig. 9



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United States Patent Office 2,825,616 Patented Mar. 4, 1958

2,825,616

AUTOMATIC FILING CABINET

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Original application April 17, 1953, Serial No. 349,369, now Patent No. 2,758,901, dated August 14, 1956. Divided and this application May 5, 1955, Serial No. 508,180

5 Claims. (Cl. 312—223)

This invention relates to filing cabinets and more particularly to filing cabinets having a multiplicity of drawers together with apparatus for bringing a given drawer to a predetermined convenient position for use. This application is a division of my co-pending application Serial No. 349,369, filed April 17, 1953, for an Automatic Filing Cabinet, now Patent No. 2,758,901, granted August 14, 1956.

In a number of uses for filing cabinets, data is contained in a plurality of drawers and an operator is required to go from one drawer to another recording and correlating facts. With conventional filing cabinets, such an operation requires frequent shifts to inconvenient positions from which it is difficult to locate the appropriate file and in which recording data is impractical. In some types of card catalogs, individual drawers may be pulled entirely out of the cabinet and placed on sliding shelves in position for convenient use, but such systems are little better, and the drawers can become misplaced. Other systems have included cumbersome turntables and other moving elements which have never been generally accepted because they took up too much room and were generally inconvenient in operation.

Among the objects of my invention is the provision of an automatic filing cabinet in which a multiplicity of drawers may be brought to a convenient operating level by simple operation of a control mechanism.

A further object of my invention is to provide such a filing cabinet with mechanism for insuring prompt and accurate positioning of the drawers together with safety mechanism to protect the hands of the operator as well as to prevent the drawers from inadvertently shifting position.

In the accomplishment of these and other objects of my invention, I employ in a preferred embodiment thereof a vertical cabinet. Inside the cabinet I provide two sets of vertically arranged drawers each mounted in a carrier which is in turn mounted for vertical sliding motion within the cabinet. The carriers are suspended by chains which pass over suitably mounted sprockets in the top of the cabinet. Thus the carriers counterbalance each other, and when the carrier on the left-hand side is at the top of the cabinet, the carrier at the right-hand side is at the bottom. Two drawer openings are provided in the front wall of the cabinet, one for each set of drawers and both being located at a convenient working height. By moving the carriers up and down within the cabinet, a selected drawer in each carrier may be positioned adjacent to the drawer openings, from which position they may be drawn out through the opening.

It is a feature of my invention that the drawer carriers are moved to the correct position to expose a given drawer by an electric motor which operates in response to a control system.

It is a further feature of my invention that the motor employed to position the carriers is immediately braked when the control system indicates that a selected pair of drawers is in operative position, there being practically

no over-travel in the system once the pair of drawers is properly positioned.

It is a further feature of my invention that the upper and lower edges of the drawer openings in the front of the cabinet are provided with guard bars, and that these guard bars, when touched, are adapted to operate switches to break circuits to the carrier driving motor. Thus, if the controls are inadvertently re-positioned to call for a new drawer at a time when the operator's hand is in the opening adjacent to the drawer or when a drawer is partially withdrawn, the pressure against the guard bar will cause the switch to break the circuit to the driving motor and thereby prevent further operation of the motor until the obstruction has been removed.

Further objects and features of my invention will best be understood and appreciated from a detailed description of a preferred embodiment of my invention, selected for purposes of illustration, and shown in the accompanying drawings, in which:

Fig. 1 is a view in perspective of a preferred embodiment of the automatic filing cabinet of my invention;

Fig. 2 is a view in front elevation showing a number of the working elements in dotted lines;

Fig. 3 is a plan view along the lines 3—3 of Fig. 2;

Fig. 4 is a plan view along the lines 4—4 of Fig. 2;

Fig. 5 is an exposed view in front elevation of the control mechanism;

Fig. 6 is an exposed view in side elevation along the lines 6—6 of Fig. 5;

Fig. 7 is a sectional view in side elevation showing the internal arrangement of the control mechanism; and

Fig. 8 is a wiring diagram of the motor and control mechanism.

Figure 9 is a wiring diagram of a modified control system.

A preferred embodiment of my invention herein shown includes in its general organization a rigid, rectangular, upright cabinet **10**; carriers **12** mounted inside the cabinet for vertical movement and supporting drawers **14**; a motor, reduction gear, and chain drive system located in the top of the cabinet; a control unit indicated at **16** on the front of the cabinet; and openings in the front of the cabinet indicated at **18** together with guard bars **20** along the upper and lower edges of the said openings **18**.

The carriers **12** are shown in plan view in Fig. 4 and consist essentially in rectangular metal frames having side panels **22** supported by vertically extending channel bars **24**. The drawers **14** are supported within the carriers **12** by conventional sliding elements (not shown), it being understood, of course, that numerous forms of drawer supporting mechanisms are suitable. The carriers **12** are held in vertical alignment by means of a plurality of vertically disposed blocks **26** mounted centrally on each of the side panels **22** and fitting into vertically disposed channel tracks **28** mounted on each side of each carrier **12** within the cabinet **10**. The two tracks **28** in the center of the cabinet **10** between the carriers **12** are supported by a center post **30** which runs vertically upward through the vertical axis of the cabinet. The carriers **12** are suspended within the cabinet **10** by means of a pair of chains **32** attached to carriers **12** at points **34** (see Fig. 4).

Turning now to Fig. 2 it will be seen that the carriers **12** are arranged in counterbalanced relationship being suspended by the chains **32** and that when the left-hand carrier **12** is in the fully raised position, the right-hand carrier **12** will be in the fully depressed position with the bottom drawer of the left-hand carrier **12** being in position to be withdrawn through the opening **18** and with the top drawer of the right-hand carrier **12** being likewise so positioned.

The mechanism employed for raising and lowering the

carriers 12 is shown more in detail in Fig. 3 and is located in an enclosed area in the top of the cabinet 10. It consists in a single phase-split phase motor 36 operating through a worm gear reduction system 38, to drive a chain 40. The chain 40 in turn drives a shaft 42 mounted for rotation in suitable bearings mounted on the frame of the cabinet 10. Near each end, the shaft 42 carries a pair of sprockets 44 for driving the carrier supporting chains 32.

With reference to Fig. 2 it will be seen that the chains 32 pass underneath the sprockets 44. To each side of the sprockets 44, I provide a pair of idler sprockets 46 mounted upon vertically adjustable supports 48. In Fig. 2, however, I have only shown one such adjustable support 48 and likewise in Fig. 3 I have only shown two, but it will be understood that these supports are duplicated on both sides of the drive sprockets 44. The purpose of idler sprockets 46 and their adjustable supports 48 is to hold the chains 32 in operative position on the sprockets 44 and to provide means for adjustment so that the drawers may be accurately positioned in the initial set up and so that other random misalignments may be corrected.

The reduction gear 38 is preferably of the worm gear, self-locking type so that when the carriers are in proper position with two drawers in registration with the openings 18, any random disparity between the weights of the drawers in the two carriers will not cause a shift in their position.

The drive chain 40 is held in firm bearing engagement with its associated sprockets by means of an adjustable idler sprocket 50 mounted on an arm 51.

Turning now to a detailed description of the control unit indicated generally at 16 and shown in detail in Figs. 5, 6 and 7. It includes in its general organization an operating knob or handle 52 mounted on a shaft 54 which is supported for rotation within a control box 56. A slip ring contact member 57 having three contact rings 58 is mounted on the shaft 54 and turns with the knob 52. Brushes 59 bear against the rings 58 and are employed in forming control circuits to be described below. Also mounted for rotation on the shaft 54 is a double contact switch 60 shown vertically in Figs. 6 and 7, and shown at an angle in Fig. 5. The switch 60 carries two switch operating arms 62 each provided with a roller 64 at the arm extremity for frictionless bearing engagement against a cam plate 66. The cam plate 66 is provided with a raised portion or shoulder 65 and when one of the rollers 64 moves onto the shoulder 65, it depresses the arm 62 and causes a contact 63 adjacent to the arm 62 to be closed. A plate 68 is likewise mounted on the shaft 54 and is provided with seven indentations 69 along its outer peripheral edge. A ball 70 mounted in a cylindrical recess 71 in the lower portion of the control box 56 is urged upwardly against the edge of the plate 68 by a compression spring 72, and by lodging in the peripheral indentations 69 of the plate 68, serves the purpose of centering the knob 52 in one of seven different positions.

When the knob 52 is turned from one position to a new position, the shaft 54 carries the switch 60 around to the new position and in doing so, causes one of the rollers 64 to ride up on one of two shoulders 65 of the cam plate 66. When this happens the contact 63 on one side of the switch 60 is closed. With reference to the wiring diagram of Fig. 8 it will be seen that, when one of the sides of the switch 60 is closed, a circuit will be established from the source of power T1, through either a relay 74 or a relay 76, through one side of the switch 60, and out to the power return T2. Depending upon which side of the switch 60 is closed, relay 74 or relay 76 will be energized and will in turn operate double throw switches 78 or 80 respectively. Thus, the switches 78 and 80 are never closed simultaneously because the switch 60 never operates to energize relays 74 and 76 simultaneously. Therefore the operation of only one of the switches 78 or 80 need be described. When the switch 78 is closed by operation of the relay 74, a circuit is established directly through one phase of the motor 36 and the said motor will then commence to operate in the direction called for by that phase. While the motor 36 is in operation, it operates through chains 40 and 32 to drive the carriers 12 toward the new operative position. Also at this time, the motor 36 serves to move the cam plate 66 of the control system to a new position by means of a sprocket 82 mounted on the end of the shaft 42 and a chain 84 which is driven by the sprocket 82. The chain 84 drives another sprocket 86 located in the control unit which, through gears 88 and 90, turns a shaft 92 upon which the cam plate 66 is mounted. The gear ratio of gears 88 and 90 is designed to rotate the cam plate 66 approximately 120° when the carriers 12 move from one extreme position to the other. This is designed in relation to the spacing of the indentations 69 on the plate 68, there being seven indentations 69 spaced apart approximately 20°.

When the carriers 12 have arrived at a new position, the cam plate 66 will also have been turned to its new position and the roller 64 which previously was on the shoulder 65 of the cam 66 will have receded therefrom breaking the circuit through the switch 60. This in turn de-energizes the relay 74 (or 76 as the case may be) and breaks the power circuit to the motor 36.

A conventional running condenser 94 and a braking condenser 96 are employed across the fields of the motor 36. During operation a charge is permitted to build up on the condenser 96 by means of a rectifier 98 in series with the said condenser, and thus whenever the power circuit is broken by returning the switch 78 (or the switch 80) to its normally open position, the condenser 96 discharges through the field of the motor 36 freezing its armature. In this way, the condenser 96 causes the motor 36 to stop extremely rapidly and prevents the mechanism from oscillating or "hunting."

In order to prevent damage to the drawers or injury to personnel resulting from inadvertent operation of the control system at a time when one of the drawers is drawn out or when an operator's hand is positioned in opening 18, I provide guard bars 20 along the upper and lower edges of the openings 18. The guard bars 20 are mounted to recede under pressure and to operate limit switches 100 in the control circuit. The limit switches 100 may be of conventional construction. In this embodiment, I employ the type in which a ball 102 is caused to recede by operation of a sliding rod 104 which has a narrowed cross section adjacent to the ball 102 in the normally closed position. The limit switches 100 are mounted in the upper part of the cabinet 10 (see Fig. 2 and Fig. 3). Only one switch 100 has been shown in Fig. 2 in order to avoid obscuring other mechanical features. Rods 104 extend downward from the limit switches 100 inside the cabinet 10, and in the case of the two upper guard bars 20, rods 104 connect to vertical plates 106 on which the upper guard bars 20 are mounted. The plates 106 are provided with vertical slots 108 into which pins 110 (secured to the cabinet 10) fit to serve the purpose of holding the plates 106 for vertical sliding movement. Springs 112 urge the plates 106 downwardly so that in the normal position, the pins 110 are at the upper limit of the slots 108. Also in the normal position, the rods 104 are positioned so that the limit switches 100 are closed. Upward pressure on the upper guard bars 20 results in elevating the plates 106 against the pressure of springs 112. This causes the rods 104 to elevate and opens the limit switches 100. By reference to Fig. 8, it will be seen that opening the switches 100 breaks one of the circuits through the switch 60, and by de-energizing either relay 74 or 76 causes the motor 36 to cease operation.

The lower guard bars 20 are similarly mounted but they respond to downward pressure. Vertical plates 114 support the lower guard bars 20 and are mounted for vertical sliding motion by means of slots 116 in the plates

114 and pins 118 secured to the cabinet 10. Springs 120 urge plates 114 upwardly. The limit switch operating rods 104 associated with the lower guard bars 20 do not connect directly to plates 114, but instead they connect pivotally to lever arms 122, and the lever arms 122 in turn connect to operating rods 124 which are secured to the plates 114. Thus a downward pressure on the lower guard bars 20 depresses plates 114 thereby depressing both the operating rods 124 and the lever arms 122 which in turn carry the rods 104 downward and cause the associated limit switches 100 to open.

A variation in the control system is shown in Fig. 9 and may be broadly described as a servo system controlled by a bridge circuit. One side of the bridge includes a pair of variable resistors 130 controlled by the operating knob 52 to assume one of seven different positions. The other side of the bridge circuit comprises a slide wire resistor 132 which is brought into balance with the variable resistors 130 by means of a mechanical coupling to the carrier driving mechanism in a manner similar to the follow-up operation of the cam plate 66. When the knob 52 is turned to a new position, thereby changing the values of the resistors 130, the bridge circuit becomes unbalanced and a voltage appears at terminal 133. The phase of the said voltage at 133 will, of course, depend upon the direction of unbalance of the bridge circuit. The said voltage at 133, regardless of its phase, is amplified at 134 and is employed to operate the carrier drive mechanism to reposition the carriers 12 and concurrently to bring the slide wire resistor 132 to a new position of balance as will be further described below.

A conventional single phase induction motor 138 may be employed in which the stator winding is supplied directly from the alternating current source of power and the rotor winding is connected to the center tap of a transformer 140 having its primary winding also connected to the said source of power. The direction of rotation of the motor 138 depends upon the phase of the applied voltage during which current flows in the rotor winding and reversal of the direction of rotation may be accomplished by shifting the said phase approximately 180°. This is done by connecting the output of the amplifier 134 through a transformer 136, to the grids of two triodes 142 and 144 connected to the rotor winding, one at each end of the secondary winding of the transformer 140. The phase of the voltage in the rotor winding depends upon which of the triodes 142 and 144 is conducting, and this depends upon the phase of the voltage in the secondary winding of the transformer 136 which in turn depends upon the phase of the voltage at terminal 133. Thus the motor 138 rotates in the direction called for by the condition of unbalance of the bridge circuit.

Further minor variations of my invention will now be apparent to those skilled in the art, and therefore, it is not my intention to confine the invention to the precise form herein shown, but rather to limit it in terms of the appended claims.

Having thus described and disclosed a preferred embodiment of my invention, what I claim as new and desire to secure by Letters Patent is:

1. A filing cabinet comprising, a housing, a series of filing drawers disposed one over the other within said housing, a carrier for said drawers, said carrier being mounted for vertical motion within said housing, a servo system for raising and lowering said carrier and moving said carrier to a predetermined position within said housing including an induction motor the direction of rotation of which depends upon the phase of current supplied thereto, a bridge circuit control for said motor, a pair of variable resistances on one side of said bridge circuit, means for controlling said variable resistances, a slide wire resistor, and a mechanical coupling between said motor and said slide wire resistor.

2. A filing cabinet comprising, a housing, a series of filing drawers disposed one over the other within said housing, a carrier for said drawers, said carrier being mounted for vertical motion within said housing, a servo system for raising and lowering aid carrier and moving said carrier to a predetermined position within said housing including an induction motor the direction of rotation of which depends upon the phase of current supplied thereto, a bridge circuit control for said motor, a pair of variable resistances on one side of said bridge circuit, means for controlling said variable resistances, a slide wire resistor, a mechanical coupling between said motor and said slide wire resistor, walls forming an opening in said housing, and safety mechanism associated with said opening including movably mounted guard bars, and means operatively associated with said guard bars for interrupting the operation of said servo system when pressure is applied to one of said guard bars.

3. A filing cabinet comprising, a housing, a series of filing drawers disposed one over the other within said housing, a carrier for said drawers, said carrier being mounted for vertical motion within said housing, a servo system for raising and lowering said carrier and moving said carrier to a predetermined position within said housing including a motor, a bridge circuit control for said motor, a pair of variable resistances on one side of said bridge circuit, means for controlling said variable resistances, a slide wire resistor, phase sensing mechanism for controlling the direction of rotation of said motor, and a mechanical coupling between said motor and said slide wire resistor.

4. A filing cabinet comprising, a housing, a series of filing drawers disposed one over the other within said housing, a carrier for said drawers, said carrier being mounted for vertical motion within the said housing, means including a motor mounted within said housing for raising and lowering said carrier, walls forming an opening in said housing, a servo system for controlling the direction of rotation of said motor including a bridge circuit, a series of fixed resistances on one side of said bridge circuit, a slide wire resistor on the other side of said bridge circuit, means for supplying alternate current to said bridge circuit, phase sensing mechanism operatively associated with said bridge circuit, and a mechanical coupling between said motor and said slide wire resistor.

5. A filing cabinet comprising a housing, a series of filing drawers disposed one over the other within said housing, a carrier for said drawers, said carrier being mounted for vertical motion within said housing, means including a motor mounted within said housing for raising and lowering said carrier, walls forming an opening in said housing, a servo system for controlling the direction of rotation of said motor including a bridge circuit, a series of fixed resistances on one side of said bridge circuit, a slide wire resistor on the other side of said bridge circuit, means for supplying alternate current to said bridge circuit, a phase-sensing circuit coupled to said bridge circuit, mechanical means connecting said motor to said slide wire resistor, guard bars disposed about said opening, a source of field voltage connected to said motor, and means for disconnecting said motor from said source of field voltage in response to movement of said guard bars.

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