

Feb. 10, 1959

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2,873,159

SELECTIVELY POWER-OPERATED DRAWER STRUCTURE

Filed June 5, 1956

6 Sheets-Sheet 1

Fig. 1

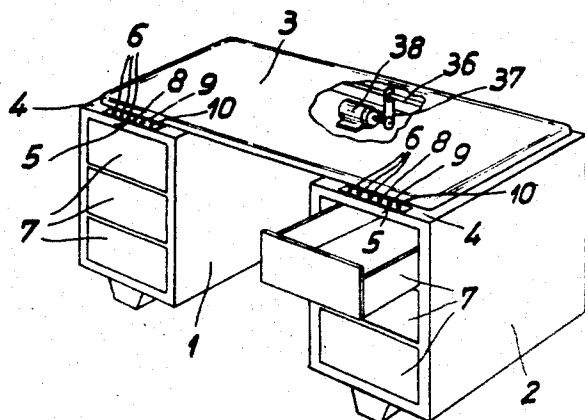
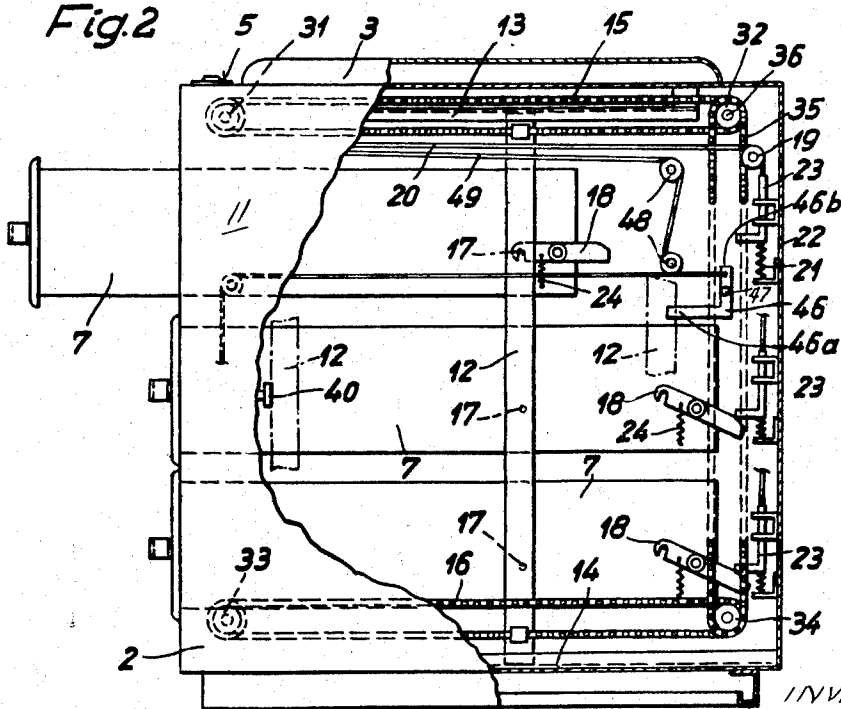


Fig. 2



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6 Sheets-Sheet 2

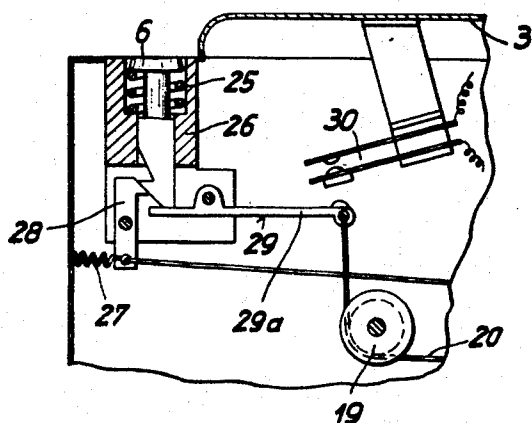


Fig. 3

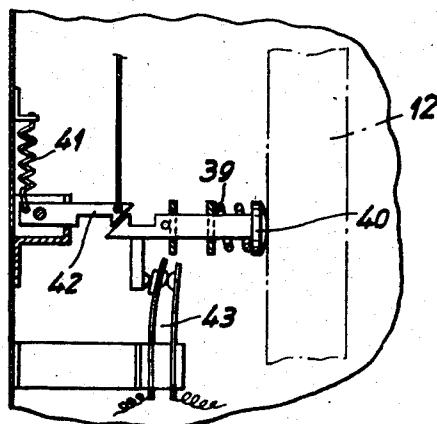


Fig. 4

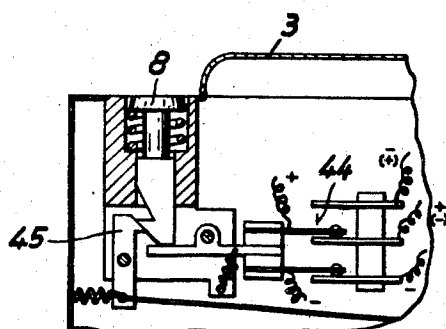


Fig. 5

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6 Sheets-Sheet 3

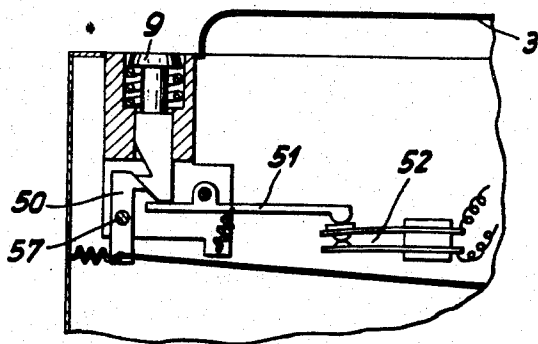


Fig. 6

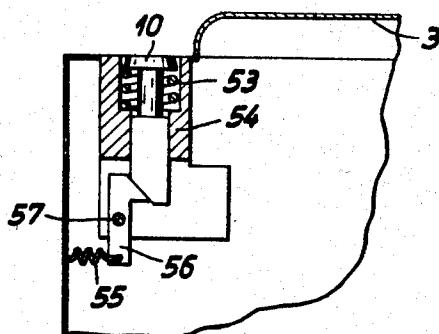


Fig. 7

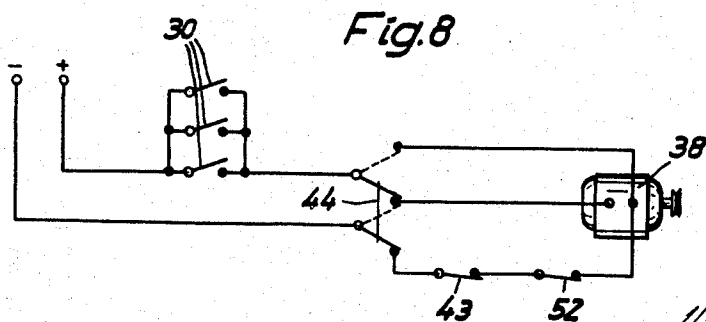


Fig. 8

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SELECTIVELY POWER-OPERATED DRAWER STRUCTURE

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6 Sheets-Sheet 4

Fig. 9

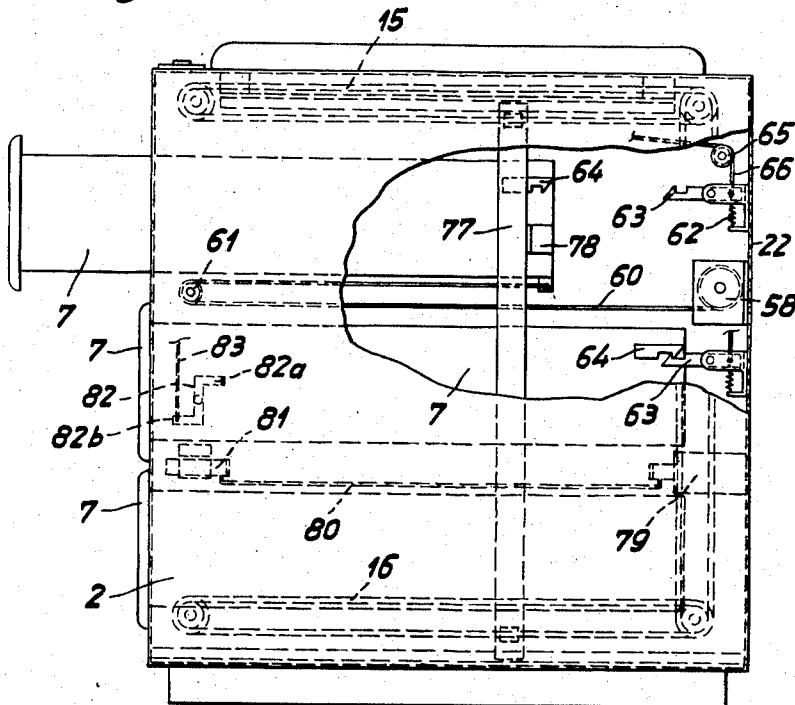


Fig. 10

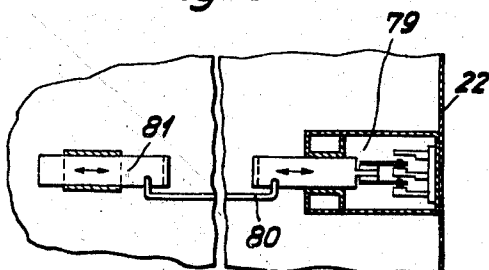
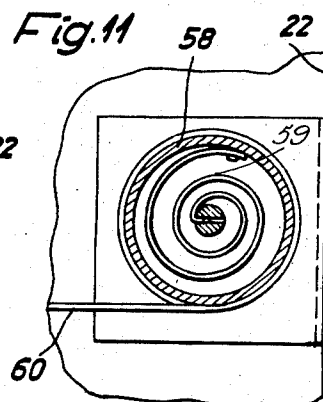


Fig. 11



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Filed June 5, 1956

6 Sheets-Sheet 5

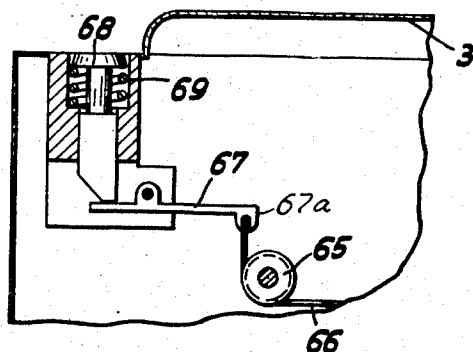


Fig. 12

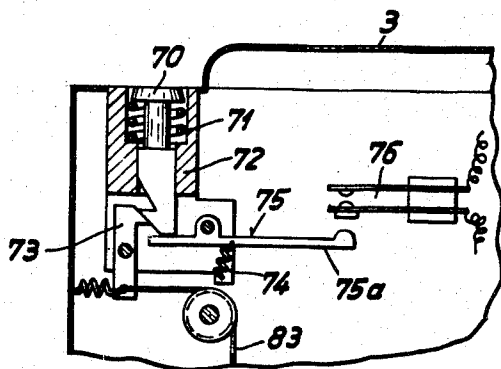


Fig. 13

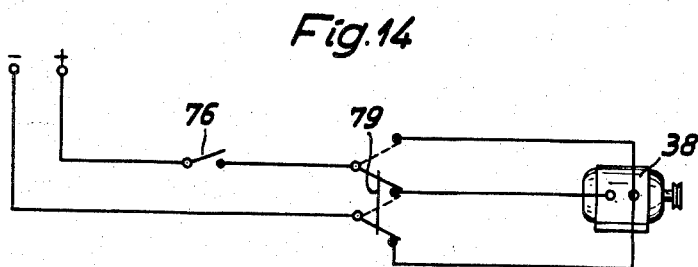


Fig. 14

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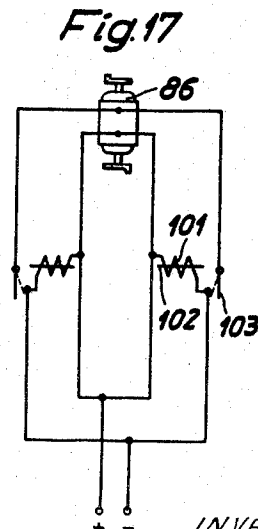
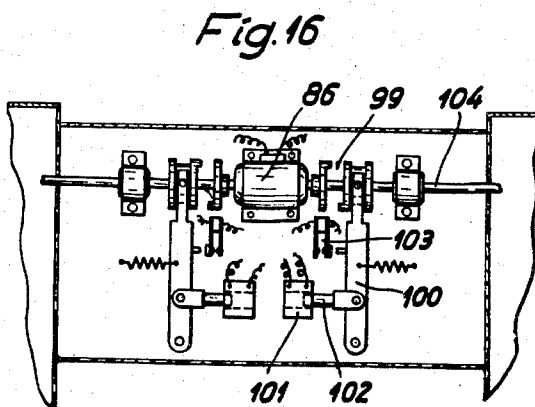
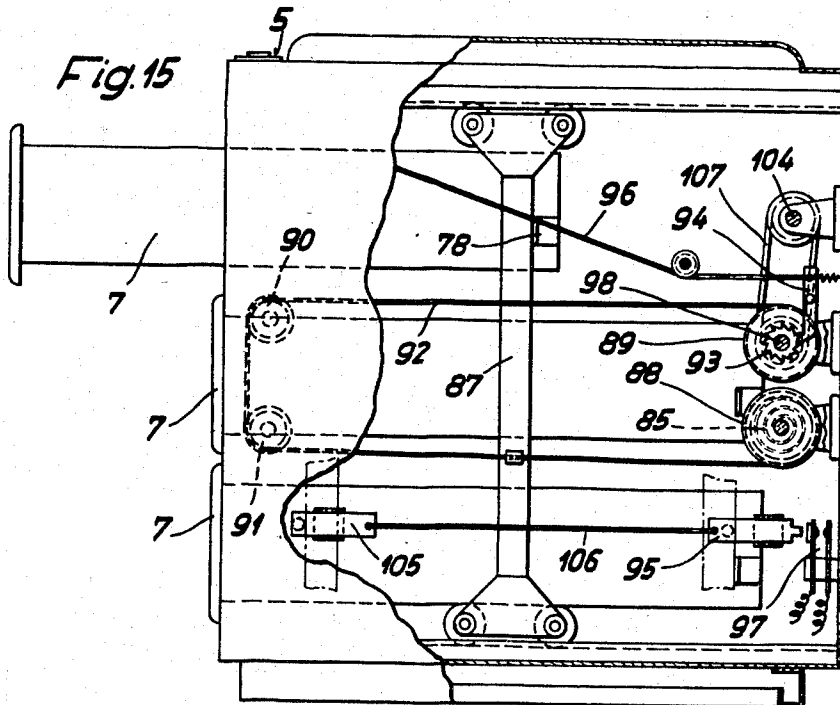
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SELECTIVELY POWER-OPERATED DRAWER STRUCTURE

Filed June 5, 1956

6 Sheets-Sheet 6



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1

2,873,159

SELECTIVELY POWER-OPERATED DRAWER STRUCTURE

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Application June 5, 1956, Serial No. 589,475

Claims priority, application Germany June 13, 1955

14 Claims. (Cl. 312-223)

This invention relates generally to equipment such as office furniture comprising one or several extendable and retractable elements and has as its main object to provide such equipment with a power-operable extending and retracting device for extending and retracting said element or any selected one of said elements with a minimum of physical effort.

The drawers or the like in desks, file cabinets etc. have previously been actuated only by hand. In many cases, however, it is desired to relieve the personnel working at the desks or file cabinets from the physical effort involved in the pulling out and pushing back of the drawers, which are sometimes of considerable weight.

It is an object of the invention to solve that problem in a simple and economical manner.

The invention provides a device for mechanically extending and retracting the drawers or the like arranged in desks, file cabinets or the like. The drawers or the like are extended only to such an extent as to remain in the guides with their rear end. The extending of the desired drawer is caused by the actuation of a certain selector key, whereby the drawer may be coupled to an extending means. The actuation of a return key causes the extended drawer to be retracted to its initial position. The extending and retracting device is disposed inside the desk, preferably in the longitudinal direction of the drawers.

The movement of the drawers or the like is either effected directly by an electric motor or by a combination of springs and an electric motor, the springs causing the drawers to be extended and the electric motor causing the drawers to be retracted and the springs to be strained.

According to another embodiment of the invention the retracting movement may also be effected by springs. In that case the springs effecting the retracting movement are of such a strength as to re-strain the extending springs to retract the drawer at the same time. The retracting springs are strained by an electric motor.

The resilient operation of the drawers by springs is particularly favorable if the drawers meet during their movement an obstacle or contact the body of a person working at the drawer. Appropriate stopping means may be employed to stop the drawers or the like in any desired extended position.

Several illustrative embodiments of the invention are shown in the accompanying drawings, in which—

Fig. 1 is a perspective view of a desk provided with the device according to the invention;

Fig. 2 is a side view of the desk shown in Fig. 1, with a partly broken-away side wall;

Fig. 3 is a sectional view showing on an enlarged scale the selector keys causing the drawers to be extended;

Fig. 4 shows the combination of an end stop for the driver strip with a normally closed contact;

Fig. 5 is a sectional view showing on an enlarged scale the return key causing the retracting of the drawers;

Fig. 6 is a sectional view showing on an enlarged scale

2

the stop key whereby the drawers can be stopped in any desired extended position;

Fig. 7 is a sectional view showing on an enlarged scale the release key causing the stopped drawers to continue their extending movement;

Fig. 8 is a wiring diagram;

Fig. 9 is a side view of a desk, with partly broken away side wall, provided with another embodiment of the device according to the invention;

Fig. 10 is an enlarged view showing an end stop switch with broken away casing;

Fig. 11 is an enlarged sectional view showing on an enlarged scale a spring-loaded cable drum effecting the extending of the drawers;

Fig. 12 is a sectional view showing on an enlarged scale the selector keys causing the extending of the drawers;

Fig. 13 is a sectional view showing on an enlarged scale the return key causing the retracting of the drawers;

Fig. 14 is a wiring diagram;

Fig. 15 is a side view of a desk, with partly broken away side wall, provided with a further embodiment of the device according to the invention;

Fig. 16 shows the drive means for the spring-loaded cable drum, and

Fig. 17 is a wiring diagram.

Fig. 1 is a perspective view showing a desk having a left-hand pedestal 1, a right-hand pedestal 2 and a desk top 3 in connecting the two pedestals. The top face 4 of each of the pedestals 1 and 2 protrudes forwardly beyond the desk top and is provided with a row 5 of selector keys. Each of the selector keys 6 is associated with a drawer 7 arranged in the pedestal 1 or 2. Operation of one of the selector keys 6 will cause the extending of a certain drawer 7 from the pedestal 1 or 2. Operation of the return key 8 will cause the extended drawer to be retracted to its initial position. The stop key 9 is operable to stop the drawers 7 in any desired extended position. Operation of the release key 10 will cause the stop key 9 to return to its initial position to permit the drawer 7 to continue its interrupted extending movement.

Fig. 2 is a side view of the right-hand pedestal 2 with partly broken away side wall 11. The operating means for the drawers 7 is disposed between the drawers and the side wall 11. The operating means comprises a driver strip 12, which is disposed at right angles to the direction of movement of the drawers 7 and which is guided at its upper and lower ends in guides 13 and 14 and connected at each of such ends to the lower strand of an endless drive chain 15 or 16, which extends parallel to the direction of movement of the drawers. The driver strip 12 carries a driving pin 17 for each drawer. This driver pin serves to couple the respective drawer 7 with the driver strip 12. Also for the purpose of coupling the drawers 7 to the driver strip 12 a coupling lever 18 is provided at the rear end of the drawers 7. Actuation of one of the selector keys 6 operates a cable 20 extending around guide pulleys 19 to lift a coupling bolt 23 associated with the selector key and arranged at the rear wall 22 of the pedestal. This lifting of the coupling bolt 23 is effected against the force of a tension spring 21. Thus the coupling lever of the drawer 7 associated with the actuated selector key 6 is released. The tension spring 24 causes the released coupling lever 18 to perform a pivotal movement to engage the driving pin 17 of the driver strip 12. Thus the drawer is coupled to the driver strip.

Fig. 3 is an enlarged view of the selector key 6. The selector key 6 depressed into the bearing body 26 against a compression spring 25 is held in its depressed position by a latch 28 which falls in automatically under the action of a tension spring 27. The depression of the selector key 6 causes a pivotal movement of a two-armed lever

29 carried in the bearing body 26. Thus the coupling bolt 23 connected by the cable 20 to the arm 29a of the lever 29 is lifted to establish the coupling between the drawer 7 associated with the selector key 6 and the driver strip 12, as has been described hereinbefore. At the same time the arm 29a of the lever 29 closes a normally open contact 30 after the coupling bolt 23 has been lifted to establish the coupling between the drawer and the driver strip 12.

The endless chains 15 and 16 extending around sprockets 31, 32 and 33, 34, respectively, are coupled to each other by an endless chain 35, which extends around the sprockets 32 and 34 of the chains 15 and 16. To this end the sprockets 32 and 34 are formed as double sprockets. The double sprocket 32 for the chains 15 and 35 is carried on a shaft 36, which is coupled by means of an endless belt 37 to the shaft of an electric motor 38. The closing of the normally open contact 30 upon actuation of the selector key 6 closes the circuit of the electric motor 38 (Fig. 8), which drives the endless chains 15 and 16 and thus moves the driver strip 12 coupled thereto to the front side of the drawer. The movement of the driver strip causes the drawer coupled thereto to be extended out of the desk pedestal.

Shortly before the drawer being extended has reached its front end position the driver strip 12 engages an end stop buffer 40 loaded by a compression spring 39 (Fig. 4). By this engagement the end stop buffer is longitudinally displaced and held in that position by a latch 42, which falls in automatically under the action of a tension spring 41. The longitudinal displacement of the end stop buffer 40 opens a contact 43 to interrupt the circuit for the drive motor 38.

The retracting of the extended drawer to its initial position is caused by an actuation of the return key 8 (Fig. 5). This will cause the shifting of a change-over switch 44, whereby a new circuit for the drive motor 38 is closed. As contrasted with the circuit last interrupted the circuit now closed carries current in the opposite direction so that the sense of rotation of the drive motor is reversed. The return key 8 is formed like the selector key 6 and like the latter is held in its depressed position by an automatically falling-in latch 45. Shortly before the drawer has reached its rear end position the driver strip 12 which effects the retracting of the drawer engages the arm 46a of the bell crank 46 pivotally movable on the pivot 47. The other arm 46b of the bell crank is connected by a branched cable 49 extending around guide pulleys 48 to the latches 28 for the selector keys 6, the latch 45 for the return key 8 and the latch 42 for the end stop buffer 40. The resulting pivotal movement of the bell-crank 46 causes all latches 28, 42 and 45 to move into the release position so as to release the depressed selector keys 6 and 8 held in the depressed position by the latches, as well as the end stop buffer 40 which has been moved out of its initial position and held in said displaced position by the latch 42. As the end stop buffer 40 returns to its initial position the normally closed contact 43 closes to eliminate the break in the circuit at that point.

Actuation of the stop key 9 (Fig. 6) will cause the extending movement of the drawers to be arrested in any desired position. The stop key 9 is formed like the keys 6 and 8 and like the same is held in its depressed position by an automatically falling-in latch 50. Actuation of the stop key operates a double-armed lever 51 to open a contact 52, whereby the circuit is interrupted and the drive motor is stopped. The release key 10 (Fig. 7) is actuated if it is desired to continue the extending movement of the drawer from the position in which it was stopped. This release key is depressed into the bearing body 54 against the pressure of a compression spring 53 to swing a lever 56, which is loaded by a tension spring 55 and is carried on the same shaft 57 as the latch 50 for the stop key 9. Thus the latch

50 is swung into its release position to release the stop key. At the same time the drawer extending circuit, which was opened upon actuation of the stop key, is closed. Upon actuation of the release key 10 the drawers will continue on to the extended position from any intermediate position in which they were stopped by the stop key 9. The cable 49 is branched to connect the latch 50 of the stop key 9 also to the bell-crank 46. As soon as the drawer 7 has reached its initial position the latch 50 is swung into its release position as well as the latches 28, 42 and 45 by the pivotal movement of the bell-crank 49 upon actuation of the release key 10. Thus the stop key 9 is released to permit the contact 52 to close and eliminate the break in the circuit at that point.

In the illustrative embodiment of the invention shown in Figs. 9 to 14 the drawers 7 are extended by spring force. To this end each drawer 7 has associated therewith a spring-loaded cable drum which is disposed at the rear wall 22 of the pedestal and accommodates a spiral spring 59. The end of the cable 60 wound from the spring-loaded cable drum 58 extends parallel to the direction of movement of the drawer and around a guide pulley 61 disposed next to the front wall of the pedestal and is connected to the rear end of the appertaining drawer 7. The rear wall of the pedestal 22 carries for each drawer a latch 63, which is loaded by a tension spring 62 and when the drawers are in their initial position engages a rigid counterlatch 64 disposed at the rear end of the drawers. Thus the drawer 7 subjected to the tension of the cable 60 is held in its initial position. Each of the latches 63 is connected by a cable 66, which extends around guide pulleys 65, to the arm 67a of a double-armed lever 67 (Fig. 12), which is connected to a selector key 68. Depression of the selector key 68 against the pressure of a spring 69 will pivotally move the lever 67 whereby the latch 63 is disengaged from the counterlatch 64 carried by the drawer 7 and the drawer 7 addressed by the selector key 68 is released. Then the drawer 7 is extended by the cable 60, which winds up on the spring-loaded cable drum 58. This extending movement is continued until the drawer 7 engages a stop in its front end position. A return key 70 is actuated to retract the extended drawer 7 to its retracted position. The return key 70 may be depressed against a compression spring 71 into the bearing body 72 and is held in the depressed position by an automatically falling-in latch 73. As the return key 70 is depressed a two-armed lever 75, which is rotatably mounted in the bearing body 72 and loaded by a tension spring 74, is pivotally moved so that its arm 75a closes a normally open contact 76 and with it the circuit for the drive motor 38.

The same operating means as in the embodiment described last is provided for returning the drawer 7 into its retracted position. In this case the driver strip 77 carries no driving pins 17 and is disposed in the initial position next to the front wall of the pedestal. When the circuit for the drive motor 38 is closed by actuation of the returning key 70 the endless chains 15 and 16 are driven and the driver strip 77 coupled thereto is moved rearwardly to move the drawer back to its initial position since the driver strip 77 engages an angle stop 78 at the rear end of the drawer 7 when the same is extended. As the drawer returns to its initial position the driver strip 77 engages a change-over switch 79, whereby the direction of current flow in the drive motor is reversed. Thus the sense of rotation of the drive motor 38 is reversed so that the driver strip 77 is returned to its initial position. Shortly before the driver strip 77 has returned to its initial position the change-over switch 79 is shifted. This is effected by a control slide 81, which is actuated by the driver strip and coupled by a rod 80. This slide 81 is longitudinally moved by the driver strip to shift the change-over switch. As the driver strip 77 approaches its initial position it engages the arm 82a of a bell-crank 82 to move the latter. The arm 82b of the

5

bell-crank 82 is connected by a cable 83 to the latch 73 for the return key 70 so that a pivotal movement of the bell-crank 82 will swing the latch 73 to its release position. When the return key has been released by the latch 73 the lever loaded by the tension spring 74 can return to its initial position. Thus the normally open contact 76 held closed by said lever is permitted to open and interrupt the circuit for the drive motor 38. Fig. 14 shows the wiring diagram for the illustrative embodiment just described.

Another embodiment of the invention is shown in Figs. 15 to 17. In that embodiment the drawer addressed by a selector key is extended from the pedestal under the action of the spring-loaded cable drum 58, just as in the foregoing embodiment. In the present embodiment the retracting of the extended drawer 7 is effected by the spring force of a spiral spring 85. The spiral spring 85 is strong enough to strain the spiral spring 59 in the spring-loaded cable drum during the retracting of the extended drawer. The spiral spring 85 is strained by an electric motor 86.

As in the foregoing embodiment the driver strip 87 is disposed next to the front wall of the pedestal in its initial position. The driving of the extended drawer during the retracting movement is also effected by an angle stop 78 carried at the rear end of the drawer. During the retracting of the drawer to its initial position the driver strip 87 is moved rearwardly by the action of the spiral spring 85. After the drawer has reached its initial position the driver strip 87 is returned to its initial position by the electric motor 86, which strains the spiral spring 85 at the same time.

To this end a cable 92 is provided, which has its ends wound on cable drums 88 and 89 rotatably carried at the rear wall of the pedestal and extends around guide pulleys 90 and 91 rotatably carried by the front wall of the pedestal. The spring-loaded cable drum 88 accommodates the spiral spring 85 for retracting the drawers. The cable drum 89 rotatably carried on a shaft 98 is connected to a ratchet wheel 93, which is engaged by a pawl 94 whereby the rotation of the cable drum 89 in one direction is prevented so that the spring-loaded cable drum 88 is unable to unwind the end of the cable 92 wound on the cable drum 89.

Upon disengagement of the pawl 94 from the ratchet wheel 93 the cable 92 is wound by the spring-loaded cable drum 88, whose spring is strained, from the cable drum 89 onto the cable drum 88. At the same time the driver strip 87 connected to the cable 92 retracts the drawer from its extended to its initial position.

The disengagement of the pawl 94 is caused by the actuation of a return key connected to the pawl 94 by the cable 96. That return key may be formed like the selector key shown in Fig. 12. As soon as the driver strip 87 has pushed the extended drawer back to its initial position it actuates a contact actuating slide 95, whereby a contact 97 is closed.

The cable drum 98 is carried on a shaft 98 which is connected by an endless chain 107 to a shaft 104, which can be coupled by a clutch 99 with the electric motor 86 provided to strain the spiral spring 85. The clutch 99 is engaged and disengaged by a clutch lever 100.

Closing of the contact 97 causes an electromagnet 101 to be energized. When energized the electromagnet attracts an armature 102 connected to the clutch lever 100. The resulting pivotal movement of the clutch lever 100 causes the clutch 99 to engage and establish the connection between the shaft 104 and the electric motor 86. At the same time the clutch lever 100 actuates a contact 103 to close the circuit for the electric motor 86.

When the electric motor has thus been started the cable drum 89 is driven to wind the cable 92 from the spring-loaded drum 88 onto the cable drum 89. Thus the spiral spring 85 is strained and the driver strip 87 returned to its initial position.

6

As soon as the driver strip 87 has returned to its initial position it will actuate a slide 105, which is connected by a rod 106 to the contact actuating slide 95. Actuation of the slide 105 will return the contact actuating slide 95 to its initial position whereby the contact 97, which was held closed by the contact actuating slide, is allowed to return to its normal open position and thus to interrupt the circuit for the electric motor 86 and the electromagnet 101.

Thus the electric motor 86 is stopped and the armature 102 is released by the electromagnet 101. As the armature 102 is released by the electromagnet the electric motor is uncoupled from the cable drum.

The invention is not only applicable to drawers, but may also be used for the actuation of lowering devices for typewriters and other machines which are to be moved to a position for use by a pivotal movement, particularly by an upwardly directed pivotal movement. In this base the operating means are disposed at a suitable position of the swinging device in such a manner that the pivotal extending and retracting movements are produced by the forward and backward movements of the described operating means.

The invention is not restricted in its application to drawers in desks, but may also be applied to operate drawers, containers or articles disposed in a frame, shelf, cabinet, counter or trough, for office or other use. The invention is not restricted to the embodiments described but includes in its scope also considerable modifications thereof within the spirit of the invention.

I claim:

1. Equipment for extending and retracting a plurality of vertically stacked slidable elements in a piece of furniture; said equipment comprising a prime mover and transmitting means; said transmitting means including flexible drive means, a driving member, and a plurality of driven members; a portion of said flexible drive means being disposed longitudinally with respect to the length of said slidable elements alongside the said elements; the said driving member being drivable by said drive means and being disposed transversely with respect to the length of the said slidable elements alongside the said elements; said driven members being mounted respectively on each of the said elements and being operatively positioned to engage said driving member; said driving member extending across the driven members of all the elements of the said vertical stack.

2. Equipment as set forth in claim 1, in which said prime mover comprises an electric motor and said transmitting means are arranged to receive power from said motor in an extending direction and to transmit said power directly to said elements, and which comprises stopping means arranged to stop said motor responsive to the arrival of any of said elements at a predetermined end position of its extending movement.

3. Equipment as set forth in claim 1, which comprises means for arresting said transmitting means responsive to the arrival of a previously extended element at a predetermined end position of its retracting movement.

4. Equipment as set forth in claim 1, which comprises a stop key operable to interrupt the extending movement of said element in any desired position and a release key operable after the operation of the stop key to cause said interrupted extending movement to be continued.

5. Equipment as set forth in claim 1, in which said transmitting means comprise a spring motor.

6. Equipment as set forth in claim 1, in which said transmitting means comprise a plurality of springs each of which is adapted to extend one of said elements, and joint means for retracting said elements.

7. Equipment as set forth in claim 1, in which said transmitting means comprise a first spring motor for extending said elements, and a second spring motor stronger than said first spring motor and strainable by said prime

7

mover and adapted to retract said elements and to strain said first spring motor.

8. Equipment as set forth in claim 1, in which said driving member is movable relative to said elements at least in said extending direction and operatively connectible to any of said elements for moving the same at least in said retracting direction.

9. Equipment as set forth in claim 2, in which said stopping means is common to all said elements.

10. Equipment as set forth in claim 3, in which said driving member is movable from an initial position to retract said elements and which comprises means operable by said prime mover to return said driver to its initial position responsive to said arrival of a previously extended element at said predetermined end position of its retracting movement, and stopping means arranged to arrest said prime mover responsive to the arrival of said driver in said initial position.

8

11. Equipment as set forth in claim 5, in which said transmitting means comprise at least one spring motor for transmitting power to said elements at least in one of said directions and said prime mover comprises an electric motor for straining said spring motor.

12. Equipment as set forth in claim 11 in which said spring motor is operable to transmit power to said elements in both said directions.

13. Equipment as set forth in claim 6, in which said joint means comprise a spring motor.

14. Equipment as set forth in claim 6, in which said joint means are arranged to receive power directly from said prime mover.

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