April 12, 1966 A. R. BARTLETT 3,245,741

DESK HAVING ELEVATABLE STORAGE CABINET

Filed Aug. 20, 1964 5 Sheets-Sheet 1

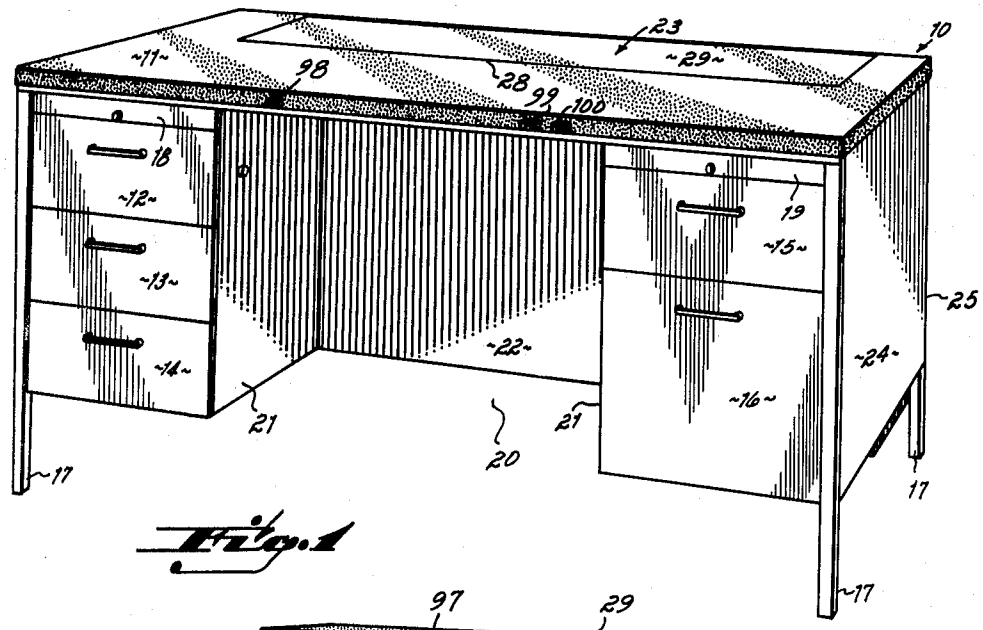


Fig. 1

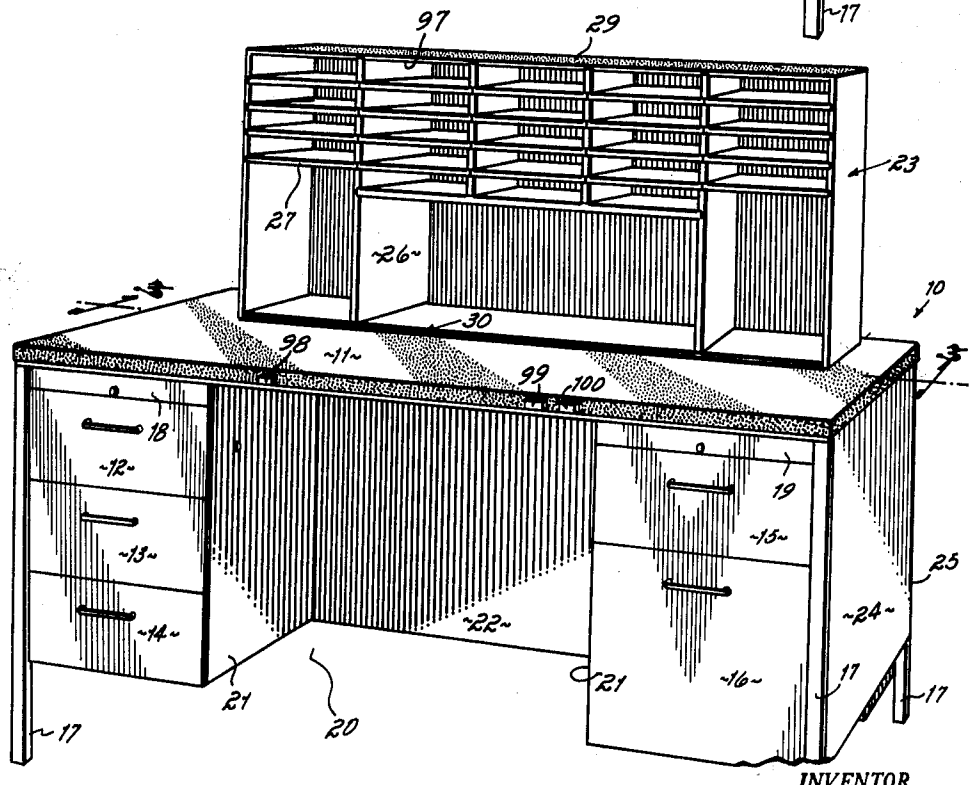


Fig. 2

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DESK HAVING ELEVATABLE STORAGE CABINET

Filed Aug. 20, 1964 5 Sheets-Sheet 2

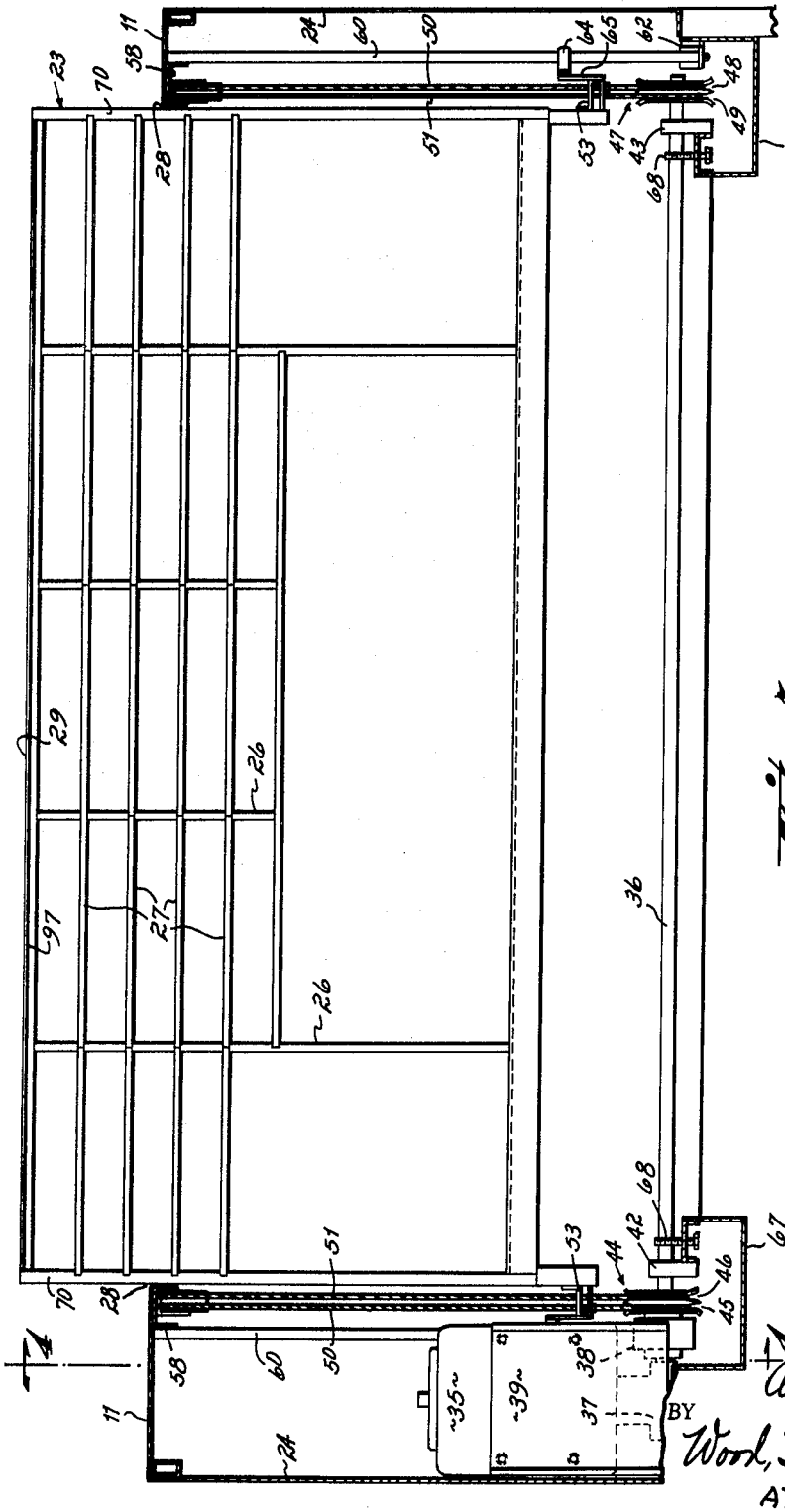


Fig. 3

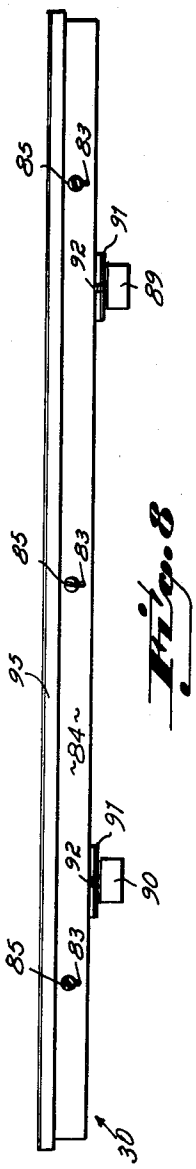


Fig. 8

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DESK HAVING ELEVATABLE STORAGE CABINET

Filed Aug. 20, 1964 5 Sheets-Sheet 3

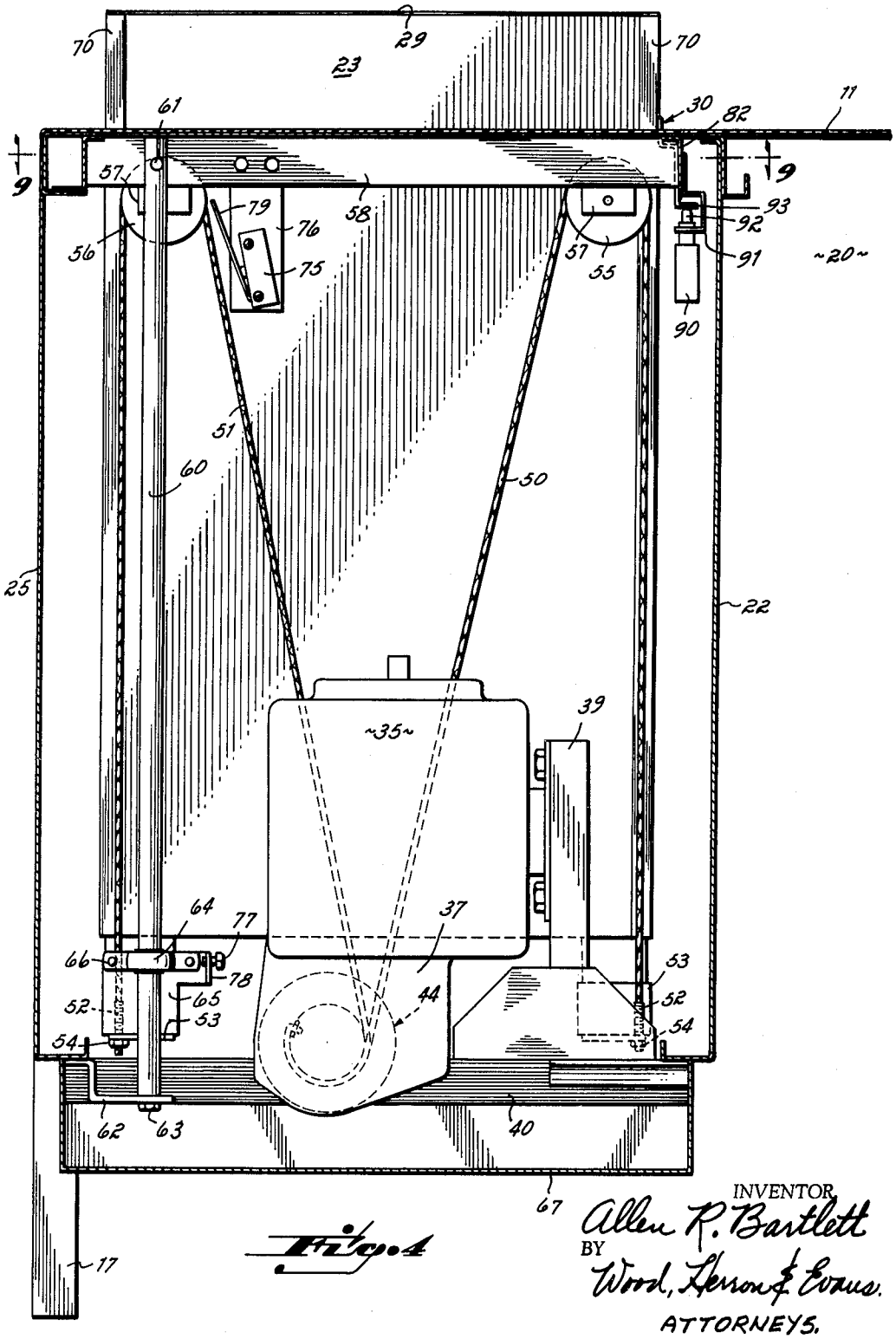


Fig. 4

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DESK HAVING ELEVATABLE STORAGE CABINET

Filed Aug. 20, 1964 5 Sheets-Sheet 4

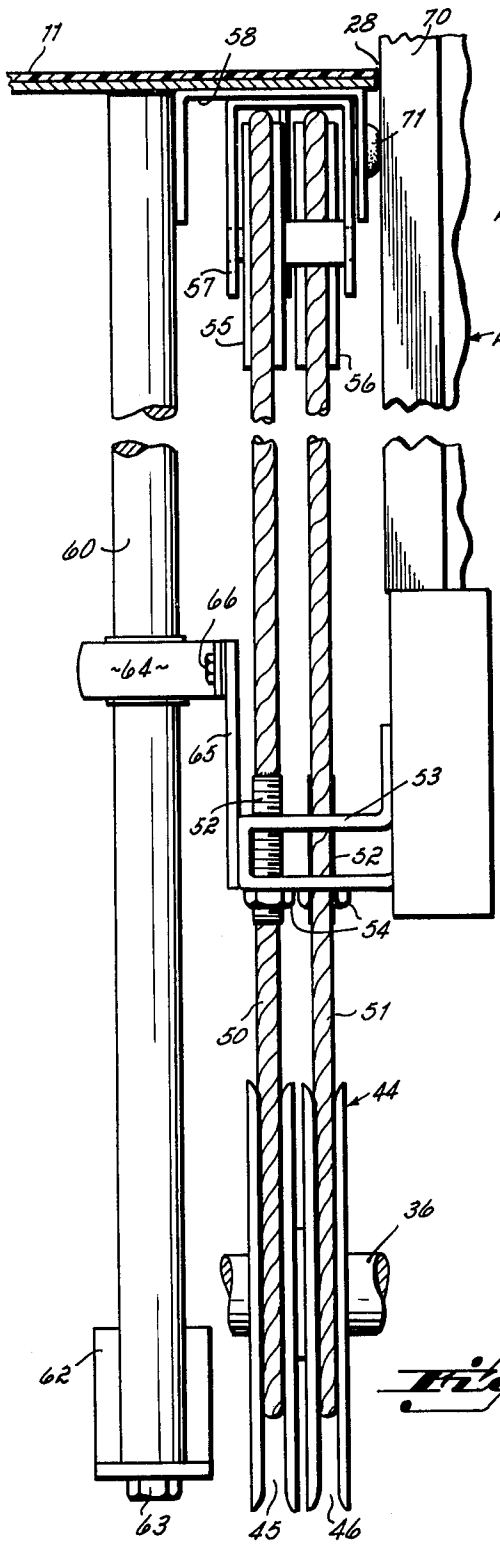


Fig. 5

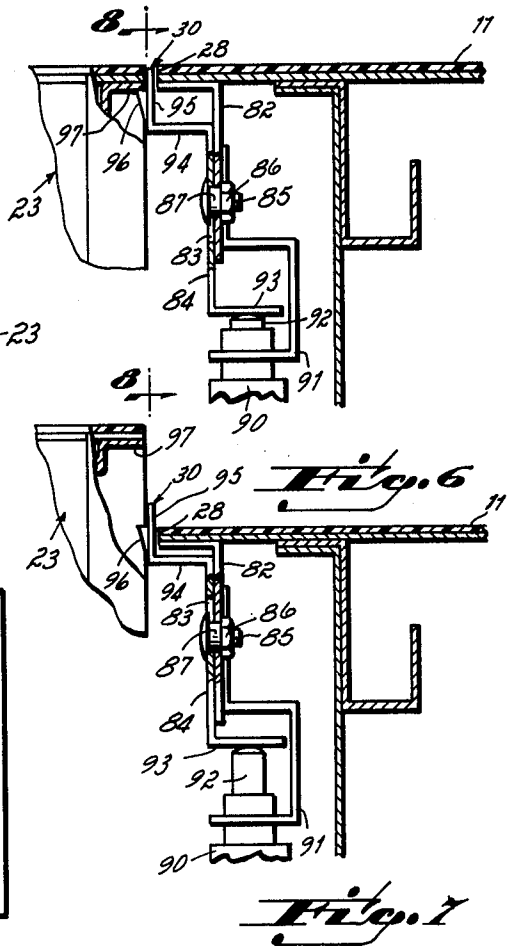


Fig. 6

Fig. 7

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DESK HAVING ELEVATABLE STORAGE CABINET

Filed Aug. 20, 1964 5 Sheets-Sheet 5

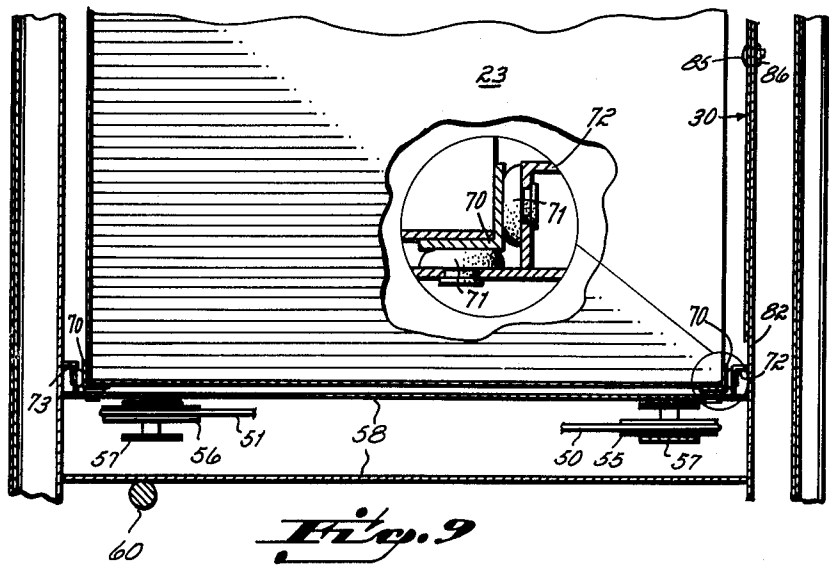


Fig. 9

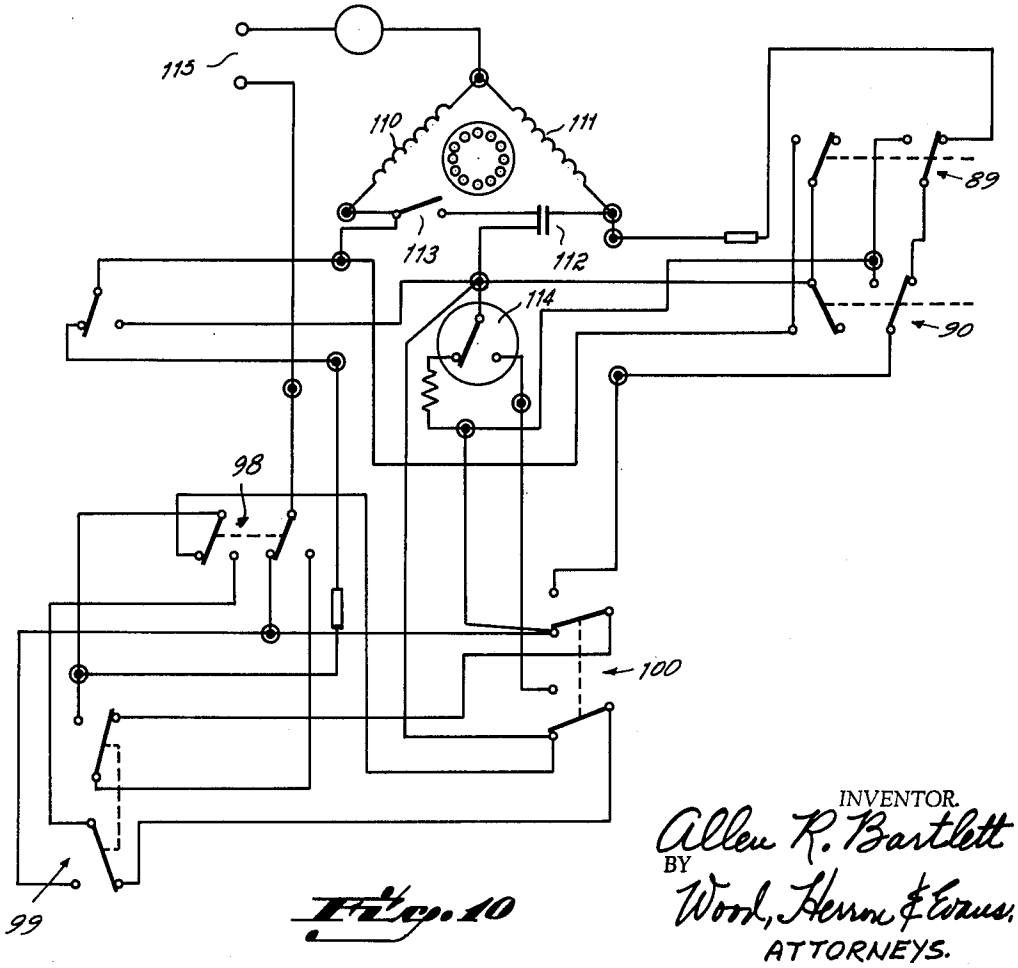


Fig. 10

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United States Patent Office 3,245,741 Patented Apr. 12, 1966

3,245,741

DESK HAVING ELEVATABLE STORAGE CABINET

Allen R. Bartlett, San Carlos, Calif., assignor to The Mosler Safe Company, Hamilton, Ohio, a corporation of New York

Filed Aug. 20, 1964, Ser. No. 390,925
4 Claims. (Cl. 312—223)

This is a continuation in part of my co-pending application, Serial No. 213,291, filed July 20, 1962, now abandoned.

This invention relates to a desk having an elevatable cabinet. More particularly, the invention is directed to a desk having a well across the back and a cabinet mounted in that well, the cabinet being adapted to be elevated to an operative position exposing shelves and storage compartments and lowered to a position in which its top is substantially flush with the top of the desk.

A desk having a cabinet which can be raised to an elevated position in which it projects from the rear edge portion of a desk is not an entirely new concept in the desk art, at least insofar as the patent literature indicates. Such desks were proposed as early as the 1920's but none achieved any degree of commercial success. There are perhaps a number of reasons for the failure of the early prior art desks to gain acceptance. It might be surmised that the principal reason is that the desks were not useful. The basic idea has unquestionable merit but giving that idea a practical effect which would result in the creation of a useful and salable desk has been a problem which has eluded the designers of such desks. Thus, the desks have been described showing the elevatable cabinet and means for elevating the cabinet but these designs generated no interest. While it is not the intention here to explore the psychology of desk manufacturing and selling, and while it is impossible to determine with any great accuracy the reasons for past failures of such desks, it is suggested, that prior designs failed to enjoy any commercial success, were unattractive, cumbersome and dangerous. The prior designs lacked the creative touch by which that which was not useful and dangerous could be transformed to that which would be attractive, efficient, and safe. To effect such a transformation, is the objective of the present invention.

The first step in the creation of the improved desks is to apply motor power to effect the raising and lowering of the cabinet and to embody the motor and power transmission structure in the desk in such a way as to conceal the mechanism substantially completely to avoid the cumbersome and unattractive appearance of the desk. The utilization of a motor to raise and lower the cabinet introduces a powerful element which, in the absence of satisfactory controls, makes a dangerous instrument of such a commonplace device as a desk. The second step then, in the creation of the improved desk, resides in the application of such controls as will eliminate any possibility of danger to the operator and to items on the desk which might inadvertently be in the path of movement of the desk.

To the end of achieving the objectives of the invention, I have employed a number of special features in combination. Among these is a special reversible motor for raising and lowering the cabinet to provide assurance that the cabinet is always under motor power and therefore under control. The particular motor selected is also adapted to be used as a brake which permits instantaneous stopping of the motor and the cabinet unit in emergency situations. Utilization of the motor as a brake also eliminates much complex mechanical structure which would otherwise be required to effect braking of the desk.

I have also provided a circuit in which the simultaneous operation of two well-spaced push button switches is required to raise or lower the desk cabinet. Thus, the desk operation requires the deliberate act of the operator using both hands and eliminates any possibility of inadvertently lowering the desk by bumping a single operating switch.

I also provide a rather close fit between the cabinet and the desk opening. Since there are vertical walls on three sides of the desk, there is no possibility of injury on those sides due to inadvertently lowering of the desk. On the fourth and open side of the cabinet, there is a possibility of injury due to the guillotine effect of the desk shelves crushing an object against that edge of the desk top adjacent the cabinet opening. At that edge of the desk top, I provide a safety bar which operates switches in the motor circuit to brake and reverse the motor for at least a portion of a revolution. Thus, before any crushing can take place, one of the surfaces necessary for the crushing action effects the braking of the motor and stopping of the lowering of the cabinet.

I have also provided that the safety bar projects into operative position only when the cabinet projects above the surface of the desk so that when the cabinet is lowered, there are no unsightly projections on top of the desk. Still further, I use those switches which function with the safety bars as switches to effect stopping of the motor when the cabinet has reached its lowermost position.

The several objectives of the invention will become more readily apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a desk constructed in accordance with my invention,

FIG. 2 is a perspective view similar to that of FIG. 1 but with the elevatable cabinet in the uppermost position,

FIG. 3 is a fragmentary cross sectional view taken generally along line 3—3 of FIG. 2 but with the cabinet partially lowered,

FIG. 4 is a cross sectional view taken along line 4—4 of FIG. 3,

FIG. 5 is an enlarged fragmentary elevational view, partially in section, illustrating the manner in which the ends of the cables for raising and lowering the cabinet are secured,

FIG. 6 is an enlarged cross sectional view illustrating the safety bar, that cooperates with the elevatable cabinet in its lowermost or hidden position,

FIG. 7 is a view similar to that of FIG. 6, but with the cabinet elevated and the safety bar raised or exposed,

FIG. 8 is an elevational view of the safety bar taken in the direction of line 8—8 of FIG. 6,

FIG. 9 is a cross sectional view taken along line 9—9 of FIG. 4, illustrating the manner in which the guide shoes cooperate with the cabinet, and

FIG. 10 is a circuit diagram of the motor circuit

The invention is directed to a desk 10 which is constructed as a conventional desk having a top 11 providing a work surface, and drawers 12–16 mounted between legs 17. Slidable work shelves 18 and 19 are located above the drawers and below the work surface 11. A knee well 20 is defined by inner side walls 21, which partially support the drawers, and a rear wall 22, that forms the front wall of a compartment or well that receives an elevatable cabinet 23. A drawer, the width of knee well 20 could be installed immediately below the work surface 11 if it is desired without interfering with the principles of the invention. Side walls 24 and a rear wall 25 complete the inclosure of the desk.

The storage cabinet 23 has a plurality of conventional divider walls 26 and shelves 27 that can be installed in

a number of various locations as dictated by the type of paper work or material to be stored. As shown in FIG. 2, the cabinet is divided so as to provide space for reference books and a number of shelves for correspondence or the like. With the cabinet 23 located to the rear and in an elevated position, a sufficient desk top area remains available at the front of the desk for performance of regular duties.

The work surface 11 has an opening 28 along its rearward edge to receive the elevatable cabinet 23. It is to be noted that when the cabinet is in its lowermost position, the work surface 15 of the desk is that of a conventional desk except for a minimum gap that outlines the top 29 of the elevatable cabinet. A safety bar 30 (shown in FIG. 2, but best illustrated in FIGS. 4, 6 7 and 8) is located at the forward edge of the elevatable cabinet 23 and is concealed from view by the work surface 11, when the storage cabinet 23 is in its lowermost position but projects above that surface when the cabinet is raised.

The elevatable cabinet is offset to the right with respect to the symmetry of the desk so as to accommodate an electrical power unit 35 mounted on the left side. The power unit 35 is a reversible motor of the type described in Patent No. 2,847,629 and is connected to a drive shaft 36 through a conventional speed reduction unit 37 and a coupler 38. The motor 35 and speed reducer 37 are bolted or otherwise secured integrally to a motor mounting bracket 39, which projects upwardly from a horizontal member of frame 40. The speed reduction unit 37 prevents torque on drive shaft 36 from rotating the armature of the motor and thus serves to hold the cabinet in any elevated position which it attains.

The drive shaft 36 is mounted for rotation in a pair of bearing blocks 42 and 43, FIG. 3, secured to the desk frame 40 on each side of the elevatable cabinet 23. A reel 44 is mounted adjacent the coupled end of the shaft 36 and locked thereto as by keying or a set screw. The reel has a divider wall that divides it into an outer section 45 and an inner section 46 so as to wind a pair of cables without entangling them. An identical reel 47 is similarly mounted at the opposite end of the shaft 36 and has an outer section 48 and an inner section 49.

Each outer section 45 and 48 of the reels 44 and 47 has one end of a wire cable 50 securely fastened therein. Another cable 51 is similarly secured to each of the inner sections 46 and 49 of the reels 44 and 47. A threaded stud 52 is fixed to the opposite end of each of the cables 50 and 51 and is secured to their respective brackets 53 by an adjustable locknut 54. The brackets 53 are welded one at each corner to the underside of cabinet 23. The cables 50 are looped over pulleys 55 at each end of the cabinet and adjacent the front edge of the cabinet. The cables 51 are looped over pulleys 56 similarly located at each end and adjacent the rear edge of the cabinet. Pulleys 55 and 56 are mounted for rotation in an inverted U shaped bracket 57 depending from a top support channel 58 that extends transversely at each end of the opening 28.

A cylindrical vertical way 60 is located at each end of the cabinet 23 and near the rear thereof. The vertical way 60 is anchored at its uppermost end to the outer leg of channel 58 by a pin 61. At the lower end, the way 60 is seated upon a bracket 62 projecting from the frame 40. A bolt 63 is inserted through an aperture in bracket 62 and threaded into a hole in the lower end of the way 60. A bearing, mounted in journal block 64, surrounds the vertical way 60 and is securely fastened to an upstanding flange 65 of the rear brackets 53 by bolts 66. It is to be noted that the brackets 53 bearing journal 64 and their relative components all depend below the under surface of the cabinet 11 so as to permit the complete exposure of the cabinet above the top surface 11 of the desk without the display of unsightly hardware. A horizontal enclosing channel 67 is mounted to the bottom of the frame 41 on each side. These channels cover the rotating parts of the desk and thus preclude the danger of clothing or the like being inadvertently wrapped into them.

As mentioned above, the top surface 29 of the cabinet 23 serves to enlarge the work area when it is in its lowered position. However, if the cables 50 and 51 were the only support at this time a slight rocking motion would occur that would be undesirable. To provide a solid base for the cabinet, four adjustable screws 68 are located below the corners of the cabinet 23 and adjusted so that the cabinet 23 will rest on them when in its lowermost position.

Referring to FIGS. 5 and 9, each vertical corner of the cabinet 23 is formed by a stainless steel angle 70. Nylon grommets or guide shoes 71 are pressed into apertures in the top support channel 50. Guide shoes 71 are also pressed into apertures in vertical channel 72 at the front and a similar vertical channel 73 at the rear. These shoes frictionally engage the flanges of the stainless steel angles 70 to guide and provide lateral support for the cabinet as it is raised and lowered. This engagement is in both transverse and longitudinal directions and, in addition to the support given by the vertical ways 60, is sufficient to retain the storage area in vertical alignment at all times.

A normally closed upper limit switch 75 is mounted on a bracket 76 depending from the channel 58. An adjustable trip screw 77 is threaded into a flange 78 of the bracket 65. The trip screw 77 depresses an arm 79 of the switch 75 to shut off the power to the drive unit 35 when the cabinet has reached its uppermost position.

Referring to FIGS. 4 and 6–8, the safety bar 30 is mounted for vertical movement on a bracket 82 depending from the under surface of the desk at the front of the cabinet 23. Three vertical slots 83 are stamped or otherwise formed at the ends and center of a flat vertical portion 84 of the safety bar 30. Shoulder screws 85 are inserted into the slots 83 and through apertures in the bracket 82 and are secured in place by locknuts 86. A shank 87 of the screw 85 is of a length that is slightly more than the thickness of bracket 82 and safety bar 30, thus when the locknuts 86 are tightened against the shoulder a clearance is maintained between the safety bar 30 and bracket 82 permits the safety bar to slide vertically with respect to the bracket 82. A pair of lower limit switches 89 and 90, one at each end of the opening 28, are secured to mounting plates 91 that are suspended from the bracket 82. The two switches are employed to provide assurance of braking of the motor even though only one side of the bar 30 is depressed. An actuator 92 of each switch 89 and 90 is spring urged upwardly and into contact with a ledge 93 that projects at a right angle to the safety bar 30.

A horizontal portion 94 joins an upstanding safety strip 95 to the slidable vertical mounting portion 84. A plurality of fingers 96 protrude from the strip 95 and into the path of an overhanging ledge 97 of the cabinet 23.

As the cabinet is raised, ledge 97 rises permitting finger 96 to rise until slot 83 abuts the lower side of the shoulder screw 85 and thus the actuator 92 is permitted to be raised by its spring (FIG. 7). Additionally, as the cabinet is lowered, ledge 97 comes into contact with finger 96, as the cabinet reaches its lowermost position, thus forcing ledge 92 to compress the spring of actuator 92 to brake the motor 35.

Referring again to FIG. 7, it can be appreciated that if a foreign object were resting on strip 95 of the safety bar 30, the ledge 97 would come into contact with it on the downward travel of the cabinet and thus would brake the power unit in the identical manner described above, but before the foreign object could be collapsed by the ledge 97. Actually, the motor is not only

braked but is slightly reversed as will be described below.

A series of switches are placed on the front of the desk so as to insure that the operator will need both hands to raise or lower the cabinet. Switch **98** located on the left is a common safety switch in that it is necessary to depress it for both raising or lowering of the cabinet. At the right side of the desk is an elevating switch **99** and a lowering switch **100**. Thus to elevate the cabinet **23**, the switch **98** is depressed simultaneously with the depressing of switch **99** and completes a circuit to the motor **35**. Motor **35** rotates shaft **36** and with it the reels **44** and **47** that wind up the cables **50** and **51**. As the cables are wound upon the reels, the unwound length is shortened, or otherwise expressed, the studs **52** are pulled upwardly toward the pulleys **55** and **56** until such time as the trip screw **77** engages arm **79** to open switch **75** and brake the motor.

To lower the cabinet, switches **97** and **100** must be depressed simultaneously. Depression of these switches completes a circuit to the motor **35** that causes it to rotate to unwind the cables **50** and **51** from reels **44** and **47**. As the cables unwind, they are kept taut by the weight of the cabinet. Otherwise expressed, the cabinet is simply permitted to lower as fast as the cables are unwound. The motor is braked by the ledge **93** of the safety bar **30** engaging the actuator **92** of the switch **90** as described above.

As indicated above, the motor **35** is of the type described in Patent No. 2,847,629. The motor and its operation are well enough described in that patent that no detailed description is required here. The motor is a split phase capacitor start type having an *up* winding **110** and a *down* winding **111**, a capacitor **112** and a centrifugal switch **113**. The motor has a rotation sensing switch **114** which swings to the left as viewed in FIG. 10 when the motor is turning to lower the cabinet and swings to the right when the motor is rotating in a direction to raise the cabinet. The motor is operated by a source of alternating current **115** which is selectively connected either to the *up* winding **110** or the *down* winding **111** by the manual switches **98**, **99** and **100**. These switches are double throw switches which are shown in their normal position and are spring urged to that position. It will be observed that the *up* winding can be energized only when the up switch **99** and the common switch **98** are simultaneously operated. Similarly, the *down* winding **111** can be energized only when the down switch **100** and the common safety switch **98** are operated simultaneously. As indicated in FIG. 2, this operation can take place only by two hands of the operating person applied to the common switches and either the up or down switch which, as shown in FIG. 2, are spaced widely apart.

The movement of the cabinet can be stopped by release of either of the hand-held switches. On the other hand, the switches can be held until the cabinet moves to its extreme upper or lower position and when that position is attained, the motor will be automatically stopped.

In the operation of the motor to move the cabinet in an upward direction the *up* winding **110** is energized from the source **115** which is connected to the winding **110** through the up limit switch **75** in addition to the manual switches **98** and **99**. When the up limit switch **75** is contacted by the trip screw **77** projecting from the cabinet, the circuit connecting the power source to the winding **110** is interrupted and the limit switch **75**, swinging to the other contact, connects the winding **111** and the capacitor **112** in shunt across the *up* winding **110** to effect dynamic regenerative braking. This regenerative braking is rapid enough for the purpose of stopping the cabinet when it is moving in an upward direction.

When stopping the cabinet when it is moving in a downward direction, a more rapid braking is required particularly in view of the fact that the braking is required in those emergency situations in which the safety bar has been depressed to operate the limit switches. To this end, the invention employs the instant reversing feature of the motor. Thus, when either limit switch **89** or **90** is depressed, the power to the winding will be changed from a normal energization of the *down* winding **111** to an energization of the *up* and *down* windings **110** and **111** in parallel, with the *down* winding being connected in series with the capacitor **112**. It is this connection of windings which provides maximum torque in the *up* direction not only for immediately braking the motor but also for a reversal of the direction of the motor through one or two revolutions. As soon as the rotation sensing switch **114** detects the reversal of the motor shaft, its contacts shift thereby interrupting the power to the motor. Since the motor is operated through reduction gearing, it reverses to the extent of one or two revolutions and results in no more than a 1° turn of the shaft **36** to which the winding reels are mounted.

It can now be appreciated that the utilization of the space at the rear of the desk in no way impairs one from the performance of his duties. Depression of switches **98** and **99** will cause the elevatable cabinet to rise from the desk. When the cabinet is in this elevated position, a large amount of shelf space is available for use. If the work surface is not of a sufficient size for the task to be performed, depression of switches **98** and **100** will cause the cabinet to lower within the desk and come to rest upon a rigid base. When in this lowered position, the desk top is that of a conventional sized desk with the safety bar being pulled down so that its upper edge is flush with the top surface of the desk.

Switch **98** is located at a convenient position on the left and switches **99** and **100** are similarly located to the right so that the operator needs both hands to raise or lower the cabinet. However, if an object is within the confine of the opening into which the cabinet is to be received, the safety bar will provide immediate braking of the motor before the object can be crushed.

I claim:

1. A desk comprising,

a base,

a top connected to said base, said top having a rectangular opening,

at least two guide shafts vertically mounted to said top and extending downwardly therefrom, said shafts mounted adjacent to different corners of said top,

a rectangular cabinet having horizontal dimensions generally co-extensive with said opening in said top,

said cabinet slidably secured to said guide shafts by guide brackets secured to said cabinet and encircling said shaft,

an electric motor mounted to said desk, said motor having two driving directions,

an output shaft operably connected to said motor and rotated thereby,

a plurality of pulleys, at least four of which are axially secured to said output shaft, and rotatable therewith, and at least four of which are secured to the base of said desk above said output shaft,

said pulleys being axially rotatable in a vertical plane,

a plurality of cable receiving brackets mounted to said cabinet at a bottom corner thereof,

said cables each passing over a pulley mounted to said base so that rotation of said output shaft in a first direction winds said cables around said pulleys and raises said cabinet and a subsequent rotation in an opposite direction unwinds said cables from said pulleys and lowers said cabinet,

an electrical raising switch mounted to said base and operably connected to said motor for actuation thereof in said first and opposite directions,

an electrical limiting switch mounted to said base for halting the upward movement of said cabinet,

abutment means on said cabinet engageable with and actuating said limiting switch so that when said cabinet carries said abutment means into engagement with said limiting switch, said switch is actuated and the upward movement of said shelf is halted,

at least one down limit switch mounted to and below said top adjacent to the front of said opening, said switch halting the downward movement of said shelf when actuated,

an actuator bar operably connected to said down switch said bar being spring biased and extending beyond the plane of said top when said shelf is moved upwardly above said top,

said bar when depressed actuating said down switch and halting downward movement of said shelf,

and means on said cabinet for engaging and operating said down switch when said cabinet has attained its lowermost position.

2. A desk comprising,

a base,

a top connected to said base, said top having a rectangular opening,

a rectangular cabinet having horizontal dimensions generally co-extensive with said opening in said top,

said cabinet slidably secured to said guide shafts by guide brackets secured to said cabinet and encircling said shaft,

an electric motor mounted to said desk, said motor having two driving directions,

an output shaft operably connected to said motor and rotated thereby,

a plurality of pulleys, at least four of which are axially secured to said output shaft, and rotatable therewith, and at least four of which are secured to the base of said desk above said output shaft,

said pulleys being axially rotatable in a vertical plane,

a plurality of cable receiving brackets mounted to said cabinet at a bottom corner thereof,

a plurality of cables each secured at one end to a pulley mounted on said output shaft and secured at the other end to a cable receiving bracket,

said cables each passing over a pulley mounted to said base so that rotation of said output shaft in a first direction winds said cables around said pulleys and raises said cabinet and rotation in an opposite direction unwinds said cables from said pulleys and lowers said cabinet,

switch means mounted to said base and operably connected to said motor for actuation thereof in said first and opposite directions,

a control switch widely spaced from said switch means and interconnected with said switch means whereby both said switch means and said control switch must be activated to effect either raising or lowering of said cabinet,

an electrical limiting switch mounted to said base for halting the upward movement of said cabinet,

abutment means on said cabinet engageable with and actuating said limiting switch so that when said cabinet carries said abutment means into engagement with said limiting switch, said switch is actuated and the upward movement of said shelf is halted,

at least two electric safety switches mounted to and below said top adjacent to the front of said opening, said switches halting the downward movement of said shelf when depressed,

an actuator bar operably connected to said safety switches, said bar being spring biased and extending beyond the plane of said top when said shelf is moved upwardly above said top,

said bar when depressed actuating said safety switch and halting downward movement of said shelf.

3. A desk comprising,

a base,

a top connected to said base, said top having a rectangular opening,

a rectangular cabinet having horizontal dimensions generally co-extensive with said opening in said top,

an electric motor mounted to said desk, said motor having two driving directions,

means connecting said motor to said cabinet to raise and lower same,

an electrical raising switch mounted to said base and operably connected to said motor for actuation thereof in said first and opposite directions,

an electrical limited switch mounted to said base for halting the upward movement of said cabinet,

abutment means on said cabinet engageable with and actuating said limited switch so that when said cabinet carries said abutment means into engagement with said limited switch, said switch is actuated and the upward movement of said cabinet is halted,

at least one down limit switch mounted to and below said top adjacent to the front of said opening, said switch halting the downward movement of said cabinet when actuated,

an actuator bar operably connected to said down switch, said bar being spring biased and extending beyond the plane of said top when said cabinet is moved upwardly above said top,

said bar when depressed at least to the level of said top actuating said down switch to halt downward movement of said shelf.

4. A desk comprising,

a base,

a top connected to said base, said top having a rectangular opening,

at least two guide shafts vertically mounted to said top and extending downwardly therefrom, said shafts mounted adjacent to different corners of said top,

a rectangular cabinet having horizontal dimensions generally co-extensive with said opening in said top,

said cabinet slidably secured to said guide shafts by guide brackets secured to said cabinet and encircling said shaft,

an electric motor mounted to said desk, said motor having two driving directions,

an output shaft operably connected to said motor and rotated thereby,

a plurality of pulleys, at least four of which are axially secured to said output shaft, and rotatable therewith, and at least four of which are secured to the base of said desk above said output shaft,

said pulleys being axially rotatable in a vertical plane,

a plurality of cables each secured at one end to a pulley mounted on said output shaft and secured at the other end to said cabinet,

a plurality of cables each secured at one end to a pulley mounted on said output shaft and secured at the other end to a cable receiving bracket,

said cables each passing over a pulley mounted to said base so that rotation of said output shaft in a first direction winds said cables around said pulleys and raises said cabinet and a subsequent rotation in an opposite direction unwinds said cables from said pulleys and lowers said cabinet,

an electrical raising switch means mounted to said base and operably connected to said motor for actuation thereof in said first and opposite directions,

an electric limiting switch mounted to said base for halting the upward movement of said cabinet,

abutment means on said cabinet engageable with and actuating said limiting switch so that when said cabinet carries said abutment means into engagement with said limiting switch, said switch is actuated and the upward movement of said shelf is halted,

at least two electric safety switches mounted to and below said top adjacent to the front of said opening, said switches halting the downward movement of said shelf when depressed,

an actuator bar operably connected to said safety switches, said bar being spring biased and extending beyond the plane of said top when said shelf is moved upwardly above said top,

said bar when depressed actuating said safety switch and halting downward movement of said shelf.

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