March 1, 1966 L. J. GROSSWILLER, JR., ETAL 3,237,933

BANKING SERVICE EQUIPMENT DOOR SAFETY CONSTRUCTION

Filed Sept. 16, 1963

5 Sheets-Sheet 1

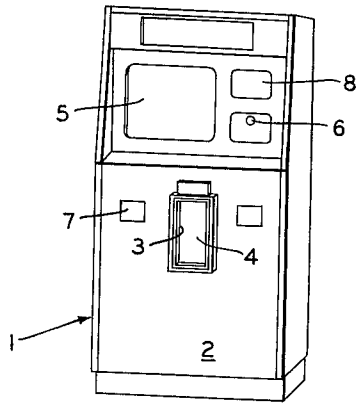


Fig. 1

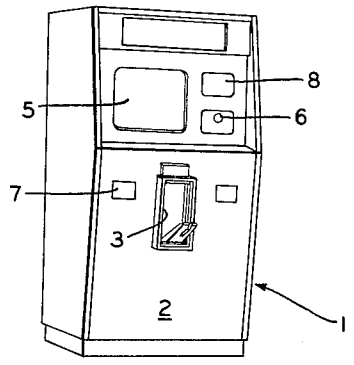


Fig. 2

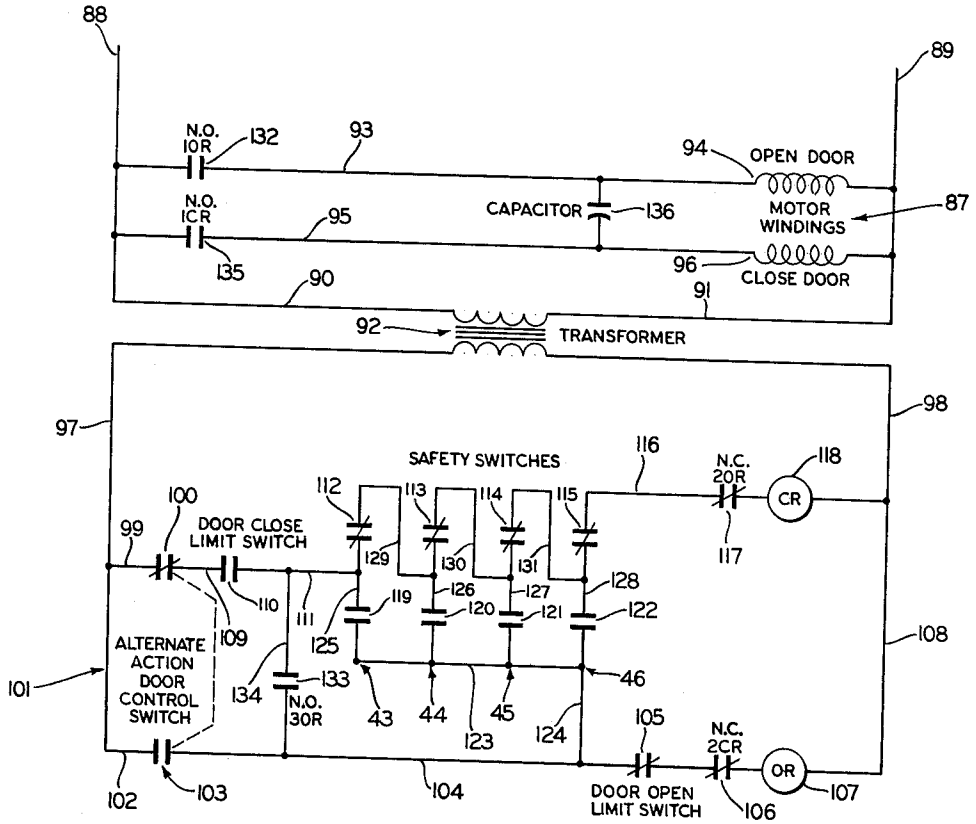


Fig. 11

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5 Sheets-Sheet 2

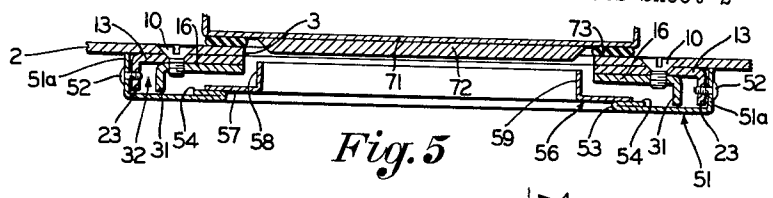


Fig. 5

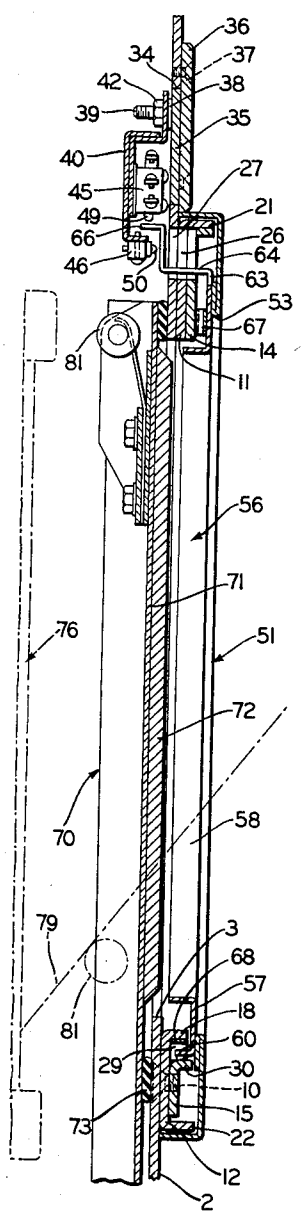


Fig. 4

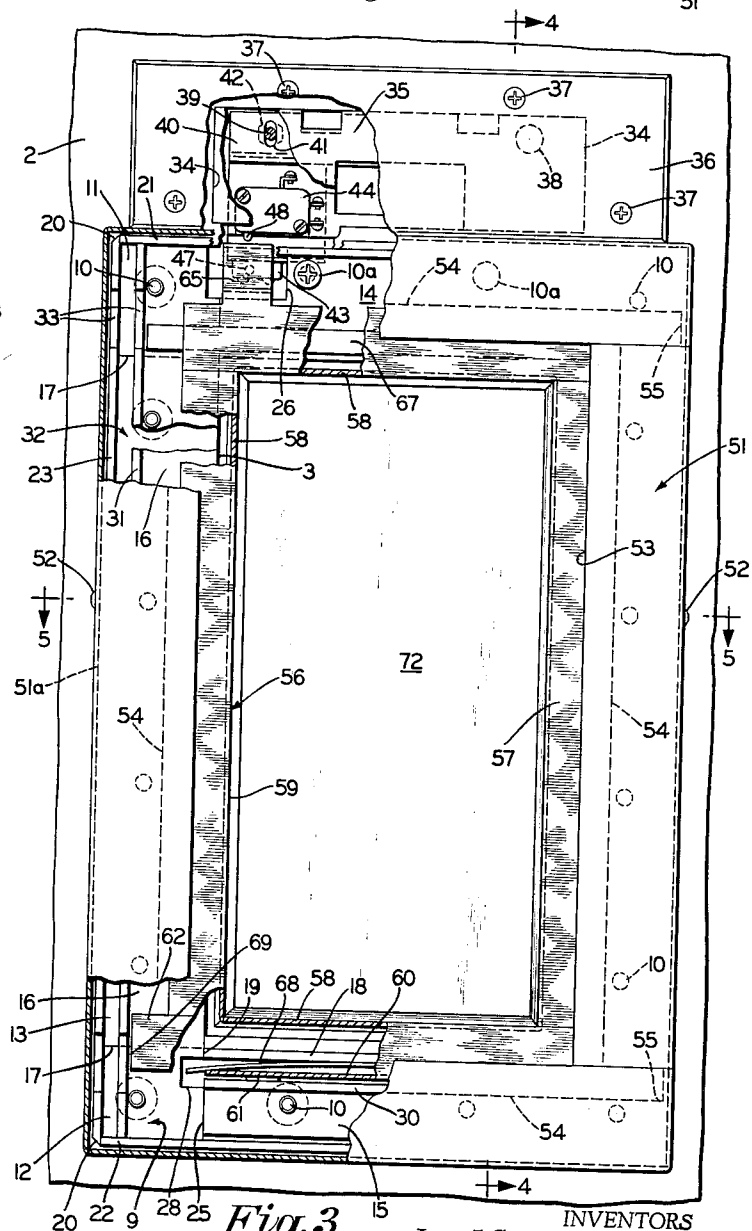


Fig. 3

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5 Sheets-Sheet 3

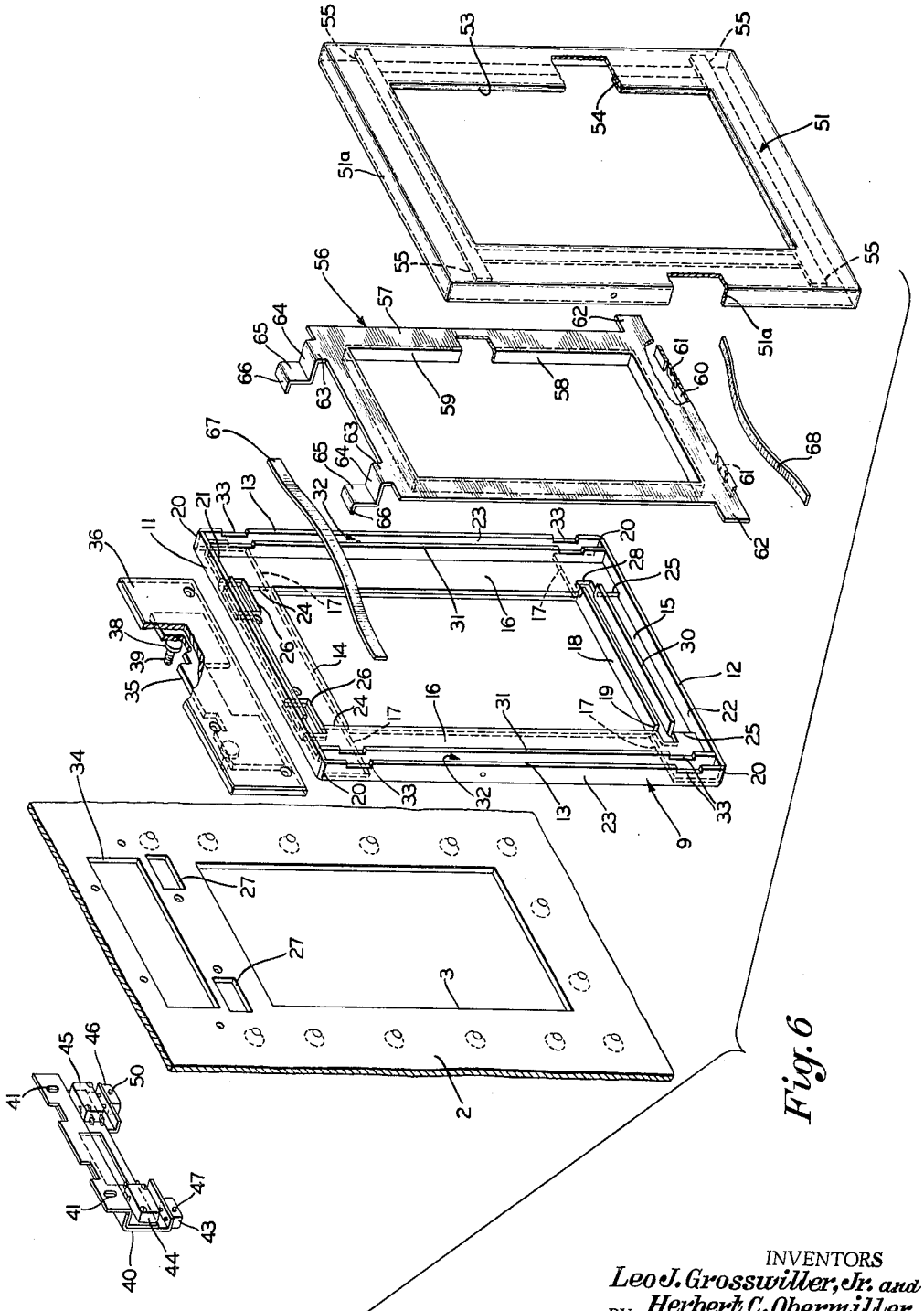


Fig. 6

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5 Sheets-Sheet 4

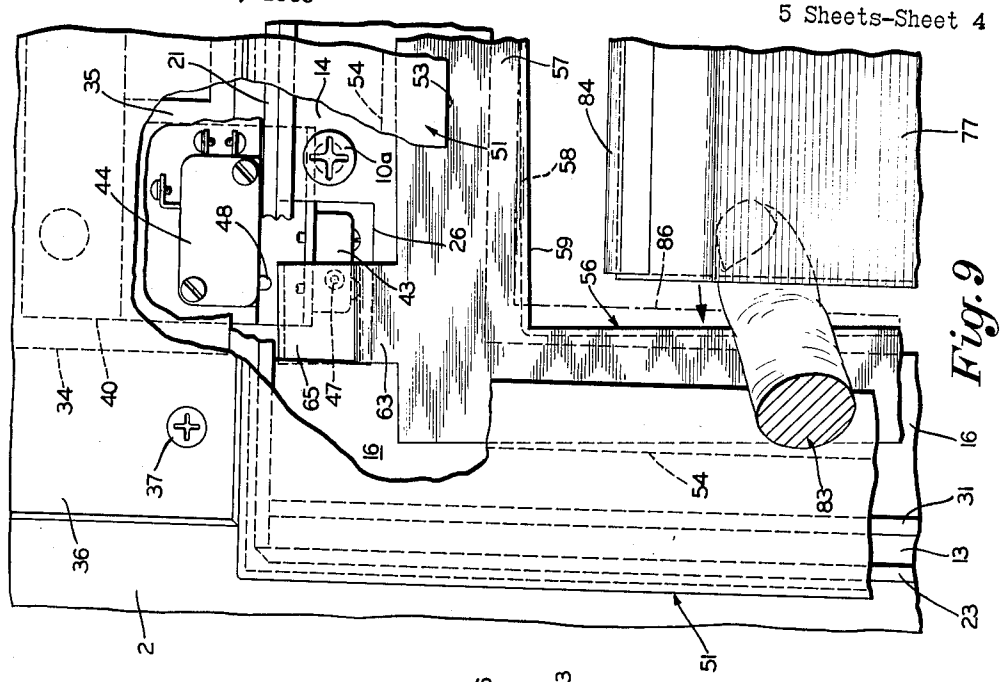


Fig. 9

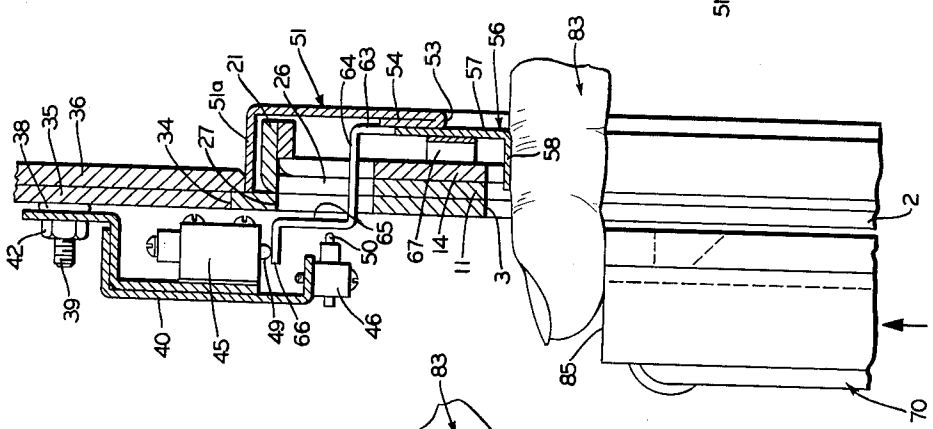


Fig. 8

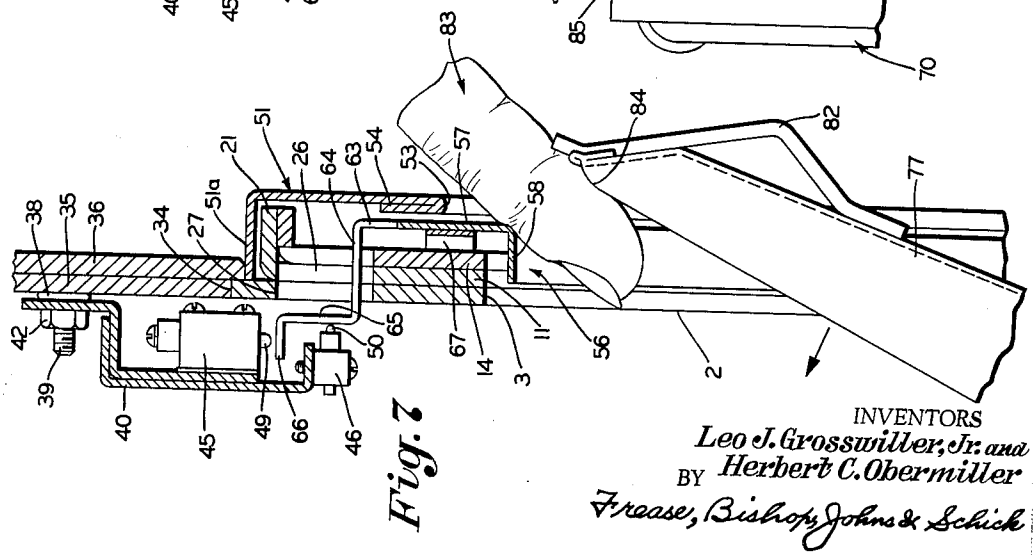


Fig. 7

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5 Sheets-Sheet 5

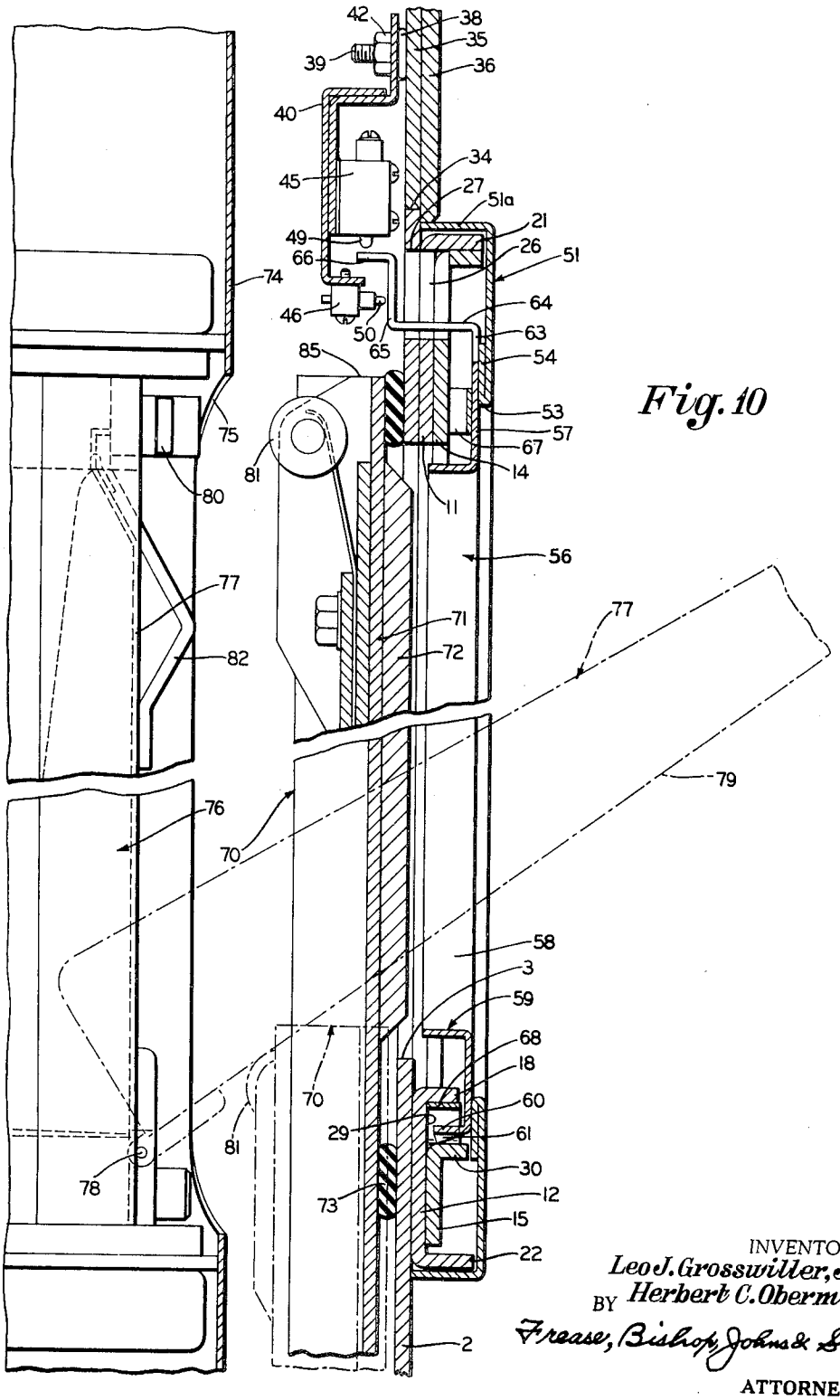


Fig. 10

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BANKING SERVICE EQUIPMENT DOOR SAFETY CONSTRUCTION

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Filed Sept. 16, 1963, Ser. No. 309,244
17 Claims. (Cl. 268—74)

The invention relates to banking service equipment and more particularly to safety door construction for banking service equipment which is opened and closed to render a carrier for banking transaction media accessible or inaccessible to a user.

Pneumatic tube carrier systems have been used to perform banking services because banking transaction media may be moved rapidly in such tubes between a teller's console at one tube terminal and a customer's kiosk at the other tube terminal located accessibly for customer walk-up or drive-up accommodation.

The console and kiosk each may have a service opening provided with door means to render inaccessible or accessible an article carrier movable in the tube and located adjacent the door means. The door means may include a primary service opening door and a secondary door usually hinged to the carried mounted for swinging movement through the service opening when the primary door is open.

Banking service equipment doors usually are power operated under bank teller control. Such power operated doors must include safety means to avoid injury or damage to an obstacle or the hand of an equipemnt user trapped between the service opening and door while the door is being closed by power operation.

Prior constructions have utilized clutch slippage in the door power drive to stop further closing of the door when an obstacle or hand of a user is trapped betwen the door and opening. Other prior constructions have included a device that stopped the motor drive upon the door encountering an obstacle, the door remaining stopped until the motor circuit subsequently is reset. These prior expedients do not satisfactorily answer the safety problem presented.

Accordingly, objects of the present invention include the provision of door safety construction which positively reverses the motor drive for the door from closing to opening movement when the door encounters an obstacle; which automatically eliminates pressure of closing movement upon the obstacle encountered; which automatically resumes door closing movement after complete door opening whenever the obstacle is removed; which includes a swinging door member movable through a service-opening-defining movable safety frame member controlling the movement of the door; which eliminates difficulties heretofore encountered in the art and solves problems and satisfies existing needs; and which achieves the indicated objects simply, effectively, and inexpensively.

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

The nature of the improved safety door construction may be stated in general terms as including in door construction for the service opening of banking service equipment of a type in which door means are moved to open and closed positions to render a carrier for banking transaction media accessible or inaccessible to a bank customer or user; the combination of a banking service equipment barrier wall provided with a service opening; door means for the service opening preferably including a primary door and a secondary door, means mounting the primary door for movement between open and closed positions with respect to the service opening; motor means including a source of power for moving the primary door between open and closed positions; the secondary door preferably comprising a member hinged to an article carrier; the secondary door when the carrier is located opposite the service opening with the primary door open being adapted to swing through the service opening to open position to permit access to the interior of the carrier through the service opening; means normally urging the secondary door toward open position; the primary door engaging the secondary door and constructed to close the secondary door when the primary door is moved from open to closed position; frame means for the perimeter of the service opening relative to which the door means moves when moving from open to closed position; the frame means including frame elements yieldingly held in normal position and movable out of normal position by pressure thereon as by an obstacle to door closing movement pinched or trapped between the door means and frame means upon movement of the door means from open to closed position; and control means for the motor means including door opening and door closing switch means and safety switch means engageable by said frame elements; the safety switch means being actuated in response to movement of frame elements out of normal position; said control means also including door movement limit switch means, door movement relays, and circuitry connecting said switch means, relays, motor means and power source connected and arranged positively and immediately to reverse the door motor movement from closing to opening movement in response to engagement and movement of frame elements out of normal position by an obstacle to door closing movement encountered by the door, to hold the door means in open position so long as the obstacle holds frame elements out of normal position, and to automatically resume power closing of the door means as soon as the frame elements return to normal position upon withdrawal of the obstacle from pressure contact therewith.

By way of example, an embodiment of the improved safety door construction is illustrated in the accompanying drawings forming part thereof in which:

FIGURE 1 is a perspective view of one type of banking service equipment provided with the improved door construction with the door closed;

FIG. 2 is a view similar to FIG. 1 showing the door for the service opening in open position;

FIG. 3 is a front elevation with parts broken away illustrating the improved door construction;

FIG. 4 is a vertical section taken on the line 4—4, FIG. 3, showing the door means in full lines in closed position and in dot-dash lines in open position;

FIG. 5 is a horizontal section taken on the line 5—5, FIG. 3;

FIG. 6 is an exploded perspective view of components of the safety door construction;

FIG. 7 is an enlarged view similar to a part of FIG. 4 showing a frame element moved out of normal position inward of the service opening by inward pressure of an obstacle to door closing;

FIG. 8 is a view similar to FIG. 7 but showing a frame element moved upward out of normal position by upward pressure of an obstacle to door closing;

FIG. 9 is an enlarged view similar to a part of FIG. 3 showing a frame element moved or turned laterally out of normal position in response to pressure from an obstacle to door closing;

FIG. 10 is an enlarged view similar to FIG. 4; and

FIG. 11 is a wiring diagram of the control means, switches and circuitry.

Similar numerals refer to similar parts throughout the various figures of the drawings.

The improved safety door construction is illustrated and described in connection with a service opening for a teller's console or customer's kiosk of banking service equipment in which a captive pneumatic tube carrier may convey banking transaction media back and forth between the console and kiosk. However, it is to be understood that the invention is not limited to use of the improved safety door construction in this particular type of equipment since conveying means other than pneumatic tube devices may communicate between the teller's and customer's stations for conducting banking services. Also, other types of banking service equipment having customer service openings in barrier walls may be equipped with the improved safety door construction. Furthermore, the invention is not limited to protecting a rectangular service opening since the service opening may have any desired shape.

A customer kiosk generally indicated at 1 of television banking service equipment which may be located outside of or remote from a bank, adjacent a sidewalk, street or parking lot is illustrated in FIGS. 1 and 2. The kiosk is provided with a front barrier wall 2 formed with a service opening 3 normally closed by door means 4, the door means 4 being shown in closed position in FIG. 1 and in open position in FIG. 2. Although no part of the present invention, the kiosk may be equipped with a television screen 5, a television camera 6 and two-way sound communication speaker 7 and microphone 8.

The kiosk 1 may communicate by a pneumatic tube carrier system (not shown) with a teller's console inside a bank. The teller's console likewise is provided with a barrier wall, service opening, door means, television screen and camera, and sound communication speaker and microphone (not shown), but similar to those present at kiosk 1.

The operation of the system may be under the complete control of the teller at his station within the bank building. The teller selects and actuates various control buttons to send the carrier from the teller's console to the kiosk or to bring the carrier back from the kiosk to the console. Another switch preferably having multiple switch contacts may be operated by the teller to open or close the door means 4 by alternate switch operation, or two different teller buttons may be used, one for opening the door and the second for closing the door.

In accordance with the invention, an outer rigid frame generally indicated at 9 is mounted by bolts 10 on the barrier wall 2 surrounding the service opening 3 formed in the barrier wall 2.

The frame 9 may have a primary component assembled from a top primary angle member 11, a lower primary channel member 12 and side primary angle members 13. A secondary frame component may be assembled from a top secondary angle member 14, a lower secondary angle member 15 and side secondary angle members 16. The legs at the upper and lower ends of side members 13 may be notched out at 17, and each end of flange 18 of lower member 12 may be notched out at 19. Members 11, 12 and 13 assembled together with their leg or web portions in coplaner relation are welded at notched ends 17 and corners 20 between outer flanges 21, 22 and 23, respectively, of members 11, 12 and 13 to form a rigid primary frame component.

Similarly, the leg of top angle member 14 may be welded at its ends 24 (FIG. 6) to the upper leg ends of side angle members 16; and lower angle member 15 is welded at its leg ends 25 to the lower leg ends of side angle members 16 (FIG. 6) to form a rigid secondary frame component.

The secondary frame component is assembled within the primary frame component as best shown in FIG. 6, and the two frames are held in proper assembled relation to one another when mounted on the barrier wall 2 by bolts 10 and 10*a*.

Openings 26 are formed adjacent each top corner of the outer rigid frame 9 extending through both primary and secondary top members 11 and 14, and registering with similar openings 27 formed in barrier wall 2. Secondary frame side members 16 may be notched out at 28 adjacent their lower ends opposite a channel 29 (FIG. 4) formed between flange 18 of member 12 and the flange 30 of member 15. Flanges 31 of side angle members 16 are spaced inwardly of flanges 23 of side angle members 13 and define therewith vertical channels 32. Flanges 23 and 31 are each notched at 33 adjacent their upper and lower ends for a purpose to be later described.

A rectangular opening 34 is formed in the barrier wall 2 above service opening 3 to receive a safety switch mounting plate 35 carried on the backside of escutcheon plate 36, and the latter is removably mounted on barrier wall 2 by screws 37. Bolt heads 38 of bolts 39 are welded to the rear face of switch mounting plate 35 and the bolts project rearwardly therefrom. A mounting bracket 40 is adjustably mounted on bolts 39 by elongated apertures 41 received by bolts 39, the bracket 40 being clamped to mounting plate 35 by nuts 42 (FIGS. 4 and 6). Thus, bracket 40 may be adjusted vertically. Bracket 40 may be removed from the barrier wall by removing screws 37 which permits bracket 40 assembled to mounting plate 35 and escutcheon 36 to be passed through opening 34 for adjustment or repair of parts carried by bracket 40.

Four safety switches 43, 44, 45 and 46 are mounted on bracket 40, respectively, having actuator contacts 47, 48, 49 and 50. A cover frame 51 having angle-shaped top, bottom and side members encloses outer frame 9 and is assembled thereto by screws 52, passing through cover frame flanges 51*a* and outer frame flanges 23 (FIGS. 3 and 5). Cover frame 51 presents an opening 53 which is aligned with but slightly larger than service opening 3 in barrier wall 2 (FIGS. 3 and 4). Cover frame 51 preferably has inwardly and reversely folded edges 54 defining the opening 53 to stiffen the cover frame around opening 53. The infolded edges 54 of the top and bottom portions of frame 51 preferably extend the entire width of frame 51 as indicated at 55. The notches 33 in the flanges 23 and 31 provide clearance for the infolded edge portions 55.

A movable frame member generally indicated at 56 is trapped between the outer rigid frame 9 and cover frame 51 when the frames 9 and 51 are assembled together. Movable frame member 56 comprises a generally rectangular frame face 57 provided with an inturned flange 58 defining a rectangular opening 59. The flange 58 and face 57 surround the perimeter of opening 59, and opening 59 normally is aligned with opening 53 in cover frame 51 and service opening 3 in barrier wall 2. The opening 59 in movable equipment 56 defines the effective service opening for the banking equipment illustrated in FIGS. 1 and 2.

An inturned flange 60 is formed at the lower edge of frame face 57 and flange 60 may be split to provide bendable tongues 61. The lower end of frame face 57 also is preferably provided with laterally projecting ears 62. Frame face 57 also is formed adjacent the top corners of the movable frame 56 with an angular step-shaped tongue projecting upwardly at 63, inwardly at 64, upwardly at 65 and inwardly at 66.

A flat leaf spring 67 is mounted above movable frame

upper flange 58 reacting between top rail portion of frame face 57 and the upper ends of rigid secondary side frame members 16 normally pressing movable frame 56 outwardly to engage the inturned edge 54 of cover frame 51 as shown in FIGS. 4 and 5. Another leaf spring 68 is trapped in channel 29 and reacts between the ends of inturned flange 60 on cover frame 56 and flange 18 of lower primary channel member 12 (FIGS. 3 and 4). Spring 68 normally presses movable frame 56 downward with tongues 61 engaging flange 30 of frame member 15.

Lateral movement of movable frame 56 is limited by ears 62 which can engage flanges 31 of frame member 16. Ears 62 are normally slightly spaced from flanges 31 by the clearance space 69 illustrated in FIG. 3.

The movable frame 56 thus has a floating yielding mounting between rigid frame 9 and cover frame 51. Frame 56 can move upward from the normal position shown in FIGS. 3 and 4, can move inward with respect to service opening 3 from the normal position shown in FIGS. 4 and 5, and can move, rock or twist laterally from the normal position shown in FIG. 3.

Referring to FIGS. 3, 4, 5 and 10, the service opening 3 in barrier wall 2 is normally closed by door means generally indicated at 70 including closure plate members 71 and 72 and gasket means 73. Door 70 is mounted by any suitable means for general vertical movement between a closed position shown in full lines and an open position shown in dot-dash lines in FIG. 10. Door 70 in moving from open to closed position preferably moves vertically upward spaced slightly rearwardly of barrier wall 2 and when closure members 71 and 72 are generally opposite service opening 3, door 70 moves generally in an outward direction with respect to wall 2 to seat and seal gasket 73 around service opening 3 in an airtight manner, particularly when the improved construction is used in connection with a pneumatic tube carrier system.

The pneumatic tube of a pneumatic tube system is indicated at 74 in FIG. 10 provided with an opening 75 for access to a carrier generally indicated at 76 which may be closed by a door 77 hinged at 78 and normally spring-pressed to move to open position such as indicated by dot-dash lines at 79. Door 77 may be held in closed position by latch means generally indicated at 80 which form no part of the present invention.

Roller means 81 may be mounted at the upper end of door 70 engageable with door 77 and skid 82 on door 77 to move door 77 to closed position as door 70 moves from open position shown in dot-dash lines in FIG. 10 to closed position shown in full lines.

With carrier 76 located in the position shown in FIG. 10 and door 70 closed, as door 70 is moved to open position, latch 80 may be unlatched permitting door 77 to fall outward through the service opening to the position shown at 79. Door 70 may be power operated by a suitable drive mechanism, not shown, driven by reversible motor indicated at 87 in the wiring diagram of FIG. 11.

Referring to FIGS. 3, 4, 6 and 10, the step-shaped tongues 63–66 projecting upwardly and rearwardly from movable frame 56 pass through the openings 26 and 27 in rigid frame 9 and barrier wall 2 with portion 65 of one tongue adjacent actuator contact 50 of safety switch 46 and portion 66 of the same tongue adjacent actuator contact 49 of safety switch 45 as shown in FIG. 10. Portion 65 of the other tongue is located adjacent actuator contact 47 of safety switch 43 and tongue portion 66 is located adjacent actuator contact 48 of safety switch 44 (FIG. 3). In the normal position of movable frame 56 (FIG. 10), the step-shaped tongues 63–66, as shown, do not contact any of the actuator contacts 47–50 of safety switches 43–46.

Referring to FIG. 7, and assuming that carrier door 77 is being moved toward closed position, if the door encounters an obstacle to closing such as the finger of a user indicated at 83 which would be injured upon continued power closing of door 77, the finger 83 is trapped between the upper edge 84 of door 77 and movable frame 56. Continued movement of the door 77 presses finger 83 laterally to the left against movable frame 56 which moves out of normal position against the resistance of spring 67, and the portion 65 of one of the step-shaped ears will engage and actuate the actuator contact 47 or 50 of one of safety switches 43 or 46 as illustrated in FIG. 7.

This will immediately result in stopping further closing movement of door 77 and in initiating opening movement thereof in a manner to be described.

Another condition of obstacle trapping is illustrated in FIG. 8. Assume that the door 77 has been closed and door 70 is moving upward and nearing closed position when the finger 83 of a user is accidentally inserted or trapped between the top edge 85 of door 70 and movable frame 56. Continued closing movement of door 70 will push finger 83 upward against movable frame 56, moving frame 56 upward out of normal position against the pressure of spring 68 (FIG. 3). One of the step-shaped tongue portions 66 on movable frame 56 will contact and actuate one of the actuator contacts 48 or 49 of one of safety switches 44 or 45 as illustrated in FIG. 8 stopping further closing movement of door 70 and initiating opening movement thereof in a manner to be described so as to avoid injury to the user's finger.

Still another condition is illustrated in FIG. 9 wherein door 77 is moving toward closed position and the finger 83 of a user is trapped between the side edge of door 77 and a side portion of movable frame 56 such that the finger might be sliced or cut off if door closing movement is continued. Under such circumstances, pressure from closing movement of the door on the finger laterally rocks movable frame 56 from normal position shown in dot-dash lines at 86 toward the full line position illustrated in FIG. 9. Rocking movement of movable frame 56 raises the right hand corner of frame 56 (not shown) so that the step-shaped ear portion 66 engages and actuates actuator contact 49 of safely switch 45 stopping further door closing and initiating opening movement of the door to avoid injury.

Although inward, upward and twisting movements of movable frame 56 are illustrated in FIGS. 7, 8 and 9 as a result of door closing pressure on an obstacle such as the finger of a user, movement of movable frame 56 in any particular situation when an obstacle is encountered may not involve simply one movement but may involve combinations of inward, upward or twisting movements. In any event, at least one of the actuator contacts 47–50 of safety switches 43–46 will be engaged or tripped under any condition that can arise.

The control means and circuitry for the safety mechanism is diagrammatically illustrated in FIG. 11.

Power for operating the banking service equipment may be supplied through line wires 88 and 89 connected by wires 90 and 91 with a transformer 92, and connected by line 93 with the winding 94 of motor 87 which energizes the motor to run in a direction to open door 70. Line 95 connects line wires 88–89 with the winding 96 of motor 87 which, when energized, runs the motor 87 in a direction to close door 70.

Output lines 97 and 98 of transformer 92 supply power for the control circuitry. Line 99 connects line 97 with one side of a set of contacts 100 of an alternate action door control switch 101, and line 102 connects line 97 with one side of the other set of contacts 103 of alternate action door control switch 101. Contacts 100 are closed when contacts 103 are open upon one actuation of switch 101, as shown. The next or alternate actuation of switch 101 closes contacts 103 and opens contacts 100. The other contact of contacts 103 is connected by line 104 with a door open limit switch 105, relay contacts 106 marked "2CR," the coil of door open

relay 107 and wire 108 connected to transformer output line 98.

The other contact of door switch contacts 100 is connected by line 109 with door close limit switch 110 and through line 111 in series through the normally closed contacts 112, 113, 114 and 115, respectively, of safety switches 43, 44, 45 and 46. The series connection of normally closed contacts 112–115 continues through line 116 through relay contacts 117 marked "20R" and then through the coil of door close relay 118 to line 98.

Each safety switch 43–46 has another set of contacts 119, 120, 121 and 122, respectively, which are open when contacts 112–115 are closed. One contact of each set of contacts 119–122 is connected by lines 123 and 124 to line 104. The other contact of contact 119 is connected by line 125 with line 111. The other contact of the sets of contacts 120, 121 and 122 are connected by lines 126, 127 and 128, respectively, with lines 129, 130 and 131 in the series connections between normally closed safety switch contacts 112–115.

The relay contacts 117 are controlled by door open relay 107 and the relay contacts 106 are controlled by door close relay 118, and constitute electrical interlock contacts preventing one of the relays 107 and 118 from being energized when the other is energized.

Door open relay 107 in addition to controlling contacts 117 also controls contacts 132 marked "10R," and contacts 133 marked "30R." Contacts 132 are in line 93 which connects with the open door winding 94 of motor 87. Contacts 133 are in a line 134 connecting between line 111 and line 104.

Door close relay 118 in addition to controlling contacts 106 also controls contacts 135 in line 95 which connects with the close door winding 96 of motor 87. A capacitor 136 is connected across the motor windings 94 and 96.

The operation of the safety door construction and control mechanism is as follows:

Assume that the various parts of the equipment are in the position shown in FIGS. 4 and 10 with the door 70 closed. Under these conditions the switches and circuitry are in the condition illustrated in FIG. 11 with the door open limit switch 105 closed and the door close limit switch 110 open. Contacts 106 and 117 are normally closed; and contacts 132, 133 and 135 are normally open. Switch contacts 103 of door control switch 101 are open and switch contacts 100 of switch 101 are closed, previously having been closed when the door was power operated to closed position. Relays 107 and 118 are deenergized; and the normally closed series connected contacts 112–115 of the safety switches 43–46 are closed, while the normally open contacts 119–122 of the safety switches are open.

Now assume that the door control switch 101 is actuated to open door 70 by closing contacts 103. A circuit is established from lines 97 and 102 through contacts 103, line 104, limit switch 105, contacts 106, relay 107 and line 108 to line 98 which energizes the door open relay 107. When relay 107 is energized, contacts 132 close, contacts 117 open and contacts 133 close. The closed contacts 133 perform no function at this time but are ready to function later under certain conditions. Opening of contacts 117 prevents relay 118 from being energized so long as relay 107 is energized.

Closing of contacts 132 establishes a circuit from line 88 through line 93 to the open door winding 94 of motor 87 and thence to line 89. The motor 87 then runs in a direction to open door 70 which, when it reaches open position shown in dot-dash lines in FIG. 10, permits the carrier door 77 to move to open position through the effective service opening 59 in movable frame 56. When door 70 is power operated to and reaches full open position, it trips and opens door open limit switch 105, thus opening the circuit through relay 107 which becomes deenergized. At this time, contacts 132 open shutting off motor 87, contacts 117 close for future use, and contacts 133 open. At the same time the door close limit switch 110 closes.

Now assume that a banking transaction has been carried out and it is desired to close doors 77 and 70. Alternate action door control switch 101 is again actuated closing its contacts 100 and opening its contacts 103. This completes a circuit from lines 97 and 99 through switch 100, switch 110, line 111, closed series connected contacts 112–115 of safety switches 43–46, line 116, contacts 117, and relay 118 to line 98, energizing relay 118.

When relay 118 is energized, its contacts 106 and 135 are actuated to open contacts 106 and close contacts 135. Opening of contacts 106 prevents relay 107 from being energized so long as relay 118 is energized. Closing of contacts 135 establishes a circuit from line 88 through line 95 energizing close door windings 96 of motor 87 starting the motor which runs in door closing direction until door 70 is closed, at which time door close limit switch 110 is tripped and opens. This opens the circuit to relay 118 which is deenergized, opening contacts 135, thereby shutting off motor 87 and closes contacts 106 for future use. Door open limit switch 105 closes at this time.

Now assume, while motor 87 is operating to close door 70, that the finger or hand of a user or some foreign object of obstacle to closing becomes trapped in a manner such as illustrated in any of FIGS. 7, 8 and 9 between one of the closing door elements 70 or 77 and movable frame 56. The movement of the frame 56 out of normal position will trip or actuate one or more of the actuator contacts 47, 48, 49 and 50 of safety switches 43–46 as illustrated for example, in FIGS. 7, 8 and 9. Actuation of any of the safety switches 43–46 will open at least one of the normally closed contacts 112–115 of these switches, thereby opening the circuit to relay 118 deenergizing the relay. The other set of contacts 119–122 of the safety switch which was actuated, closes (assume 112 contacts open and 119 contacts closed) at the time when the normally closed contacts of such safety switch opens by movement of frame 56.

When relay 118 is deenergized, contacts 135 open stopping motor 87, and contacts 106 close allowing relay 107 to be energized. When contacts 119 of safety switch 43 close, a circuit is established from lines 97 and 99 through switch 100, switch 110, lines 111 and 125, contacts 119, lines 123 and 124, limit switch 105, contacts 106, relay 107 and line 108 to line 98, energizing door open relay 107.

When relay 107 is energized, contacts 132 close, running motor in a direction to open the door 70; contacts 117 open preventing relay 118 from being energized; and contacts 133 close, by-passing safety switches 43–46 so that the door must open fully before again attempting to close whether the obstacle to closing has been removed or not.

When the door reaches open position, door open limit switch 105 is tripped and opens, deenergizing relay 107 which opens contacts 132 stopping the motor, closes contacts 117 and opens contacts 133. At the same time limit switch 110 closes.

If at the time that door 70 reaches open position through the actuation described initiated by an obstacle to closing, moving movable frame 56 out of normal position and tripping one of the safety switches, so long as movable frame 56 is out of normal position and held by the obstacle, the door will remain in open position.

However, if at the time the door reaches open position, the obstacle has been removed, movable frame 56 returns to normal position releasing the safety switch previously tripped (assume safety switch 43 tripped), and the contacts 112 of that switch close while the contacts 119 open.

This reestablishes the circuit from line 97 and 99 through switch 100, switch 110, the normally closed contacts 112–115 of the safety switches, line 116, contacts

117 and relay 118 to line 98 and the door starts to close again and will complete the closing cycle so long as one of the safety switches is not tripped again by movement of the movable frame 56 out of normal position initiated by pressure of an obstacle to closing.

In accordance with one aspect of the invention, the movable frame 56 protects the perimeter of the effective service opening of the banking service equipment against any pinching force or pressure on any obstacle to door closing trapped between the perimeter of the opening and a door which moves relatively to the opening to closed position or to provide a closure for the opening.

From another aspect, the movable frame when moved out of normal position by movement of an obstacle to closing which contacts the frame from movement imparted to the obstacle by power closing door movement, actuates a switch to reverse the power movement of the door from closing movement to opening movement to thereby relieve pressure between the frame and door upon the obstacle.

From still another aspect, so long as the movable frame is held out of normal position by pressure of an obstacle to power closing of the door, the door whose closing movement has been reversed to opening movement will remain in fully open position after having reached such open position by the power operation thereof.

From another aspect, whenever power closing movement of the door is reversed during closing, initiated by encountering an obstacle to closing, the door must move to fully open position before further closing movement can be imparted to the door.

From still another aspect, the door, then being power-closed and encountering an obstacle to closing which initiates opening movement of the door, automatically reverts to closing movement after reaching fully open position if the obstacle has been removed prior to the time when the door reaches open position, or automatically reverts to closing movement at any time that the obstacle is removed after the door has moved to and been held in open position.

Another aspect of the invention is that the improved safety door mechanism is operative and effective whether the door associated with the service opening swings through the opening or moves in some other manner with respect to the opening in moving between open and closed positions to render a bank service receptacle accessible or inaccessible to a user. Thus, in the particular type of banking service equipment illustrated, the door means is composed of two elements, a sliding door which closes the opening and a swinging door which moves through the opening. An obstacle to closing trapped by either of these door elements and the opening initiates operation of the safety mechanism.

From still another aspect, the invention comprehends providing the actuating means for the door safety control mechanism on a fixed wall containing the service opening for banking service equipment which the actuating means surrounds, and initiating actuation of the actuating means by pressure applied in various directions and from various sources to the actuating means.

Accordingly, the improved safety door construction eliminates difficulties heretofore encountered in the art; avoids damage or injury to banking service equipment incorporating the improved construction and to a user thereof; achieves the many objectives hereinabove described in detail; and provides a construction which solves problems that have existed in the art.

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 terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is by way of example and the scope of the invention is not limited to the exact details illustrated or described because these may be varied without departing from the fundamental principles of the invention.

Having now described the features, discoveries and principles of the invention, the construction, operation, adjustment, use and characteristics of a preferred form thereof, and the advantageous, new and useful results obtained thereby; the new and useful discoveries, principles, apparatus, combinations, parts, elements, subcombinations, arrangements, constructions, controls, and coordination of components, and mechanical equivalents obvious to those skilled in the art are set forth in the appended claims.

We claim:

1. Safety door construction for banking service equipment including an equipment barrier wall provided with a service opening; door means for the service opening including a door member and means mounting the door member for swinging movement through the opening between open and closed positions; motor means including a source of power for moving the door means between open and closed positions; frame means extending around the perimeter of the service opening mounted on the barrier wall and including a rectangular, effective-service-opening defining, frame element movable with respect to the barrier wall between normal and out of normal positions; and control means for the motor means including door opening and closing switch means and safety switch means actuated by said rectangular frame element when the latter is moved out of normal position; said control means also including door movement limit switch means and circuitry connecting all said switch means, motor means and power source; said control means being operable in one condition to impart closing movement from the motor means to the door means to move the door member through the service opening from open to closed position, and automatically during such closing movement of the door member to reverse such movement to opening movement in response to movement of said frame element out of normal position.

2. The construction defined in claim 1 in which the control means also is operable, after reversal of door movement from closing to opening movement in response to movement of the frame element out of normal position, to resume power closing of the door means in response to return of said frame element to normal position.

3. The construction defined in claim 1 in which the control means also is operable, upon reversal of door movement from closing to opening movement, automatically to move the door means to fully open position before further change in the condition of the door as to its location and movement can occur.

4. The construction defined in claim 1 in which the control means also is operable after reversal of door movement from closing to opening movement, automatically upon arrival at open position to hold the door means in open position so long as the frame element is out of normal position.

5. The construction defined in claim 1 in which the control means also is operable after reversal of door movement from closing to opening movement and after arrival of the door means at open position, automatically to resume power closing of the door means whenever the frame element returns to normal position.

6. The construction defined in claim 1 in which the frame means includes yielding means yieldingly holding the frame element in normal position.

7. Safety door construction for banking service equipment including a fixed equipment barrier wall provided with a service opening, door means for the service opening including a door member and means mounting the door member for swinging movement through the opening between open and closed positions, motor means for moving the door means between open and closed posi-

tions, means for actuating the motor means to impart closing movement to the door means from open to closed positions, and door safety mechanism including a rectangular, effective-service-opening-defining, frame element movably mounted on the barrier wall extending around the perimeter of the service opening operative upon the occurrence of any pinching force between the frame element around the perimeter of the opening and the door member at any time during closing movement of the door means to reverse such movement to opening movement.

8. The construction defined in claim 7 in which the door means includes a plurality of movable door members and in which the trapping of an obstacle to closing between any door member and the movable rectangular safety mechanism frame element initiates automatic reversal of door movement from closing to opening movement.

9. The construction defined in claim 7 in which the door safety mechanism frame element is movable with respect to the fixed barrier wall between normal and out of normal positions; and in which the door safety mechanism also includes safety switch means actuated by movement of said frame element out of normal position in directions upward, inward and laterally of the opening to initiate door movement reversal.

10. Safety door construction for banking service equipment including a fixed equipment barrier wall provided with a service opening, door means for the opening including a plurality of doors, means mounting each door for movement between open and closed positions with respect to the service opening, motor means for moving one of the doors between open and closed positions, said other door being engaged and moved from open to closed position by said one door, means normally urging said other door to move from closed to open position, the mounting means for one of the doors comprising hinge means upon which such door swings through said service opening when moving between open and closed positions, frame means for the perimeter of the service opening relative to which each door moves when moving from open to closed position, the frame means including a frame element movable with respect to the barrier wall between normal and out of normal positions, said frame element being movable out of normal position by pressure engagement with said element of an obstacle to the closing of either door, means for actuating the motor means to impart closing movement to the door means from open to closed position, and means actuated by said frame element in response to movement of the frame element out of normal position by obstacle pressure operative during closing movement of the door means to reverse said motor means and door movement from closing to opening movement.

11. The construction defined in claim 10 in which the frame means includes yielding means yieldingly holding the frame element in normal position.

12. Safety door construction for banking service equipment including a fixed equipment barrier wall provided with a rectangular service opening, door means for the opening including a primary door and a secondary door, means mounting the primary door for movement between open and closed positions with respect to the service opening, motor means for moving the primary door between open and closed positions, hinge means mounting the secondary door for swinging movement through said service opening between open and closed positions, means normally urging the secondary door toward open position, the primary door engaging the secondary door and moving the secondary door from open to closed position when the primary door moves from open to closed position, rectangular frame means for the perimeter of the service opening relative to which each door moves when moving from open to closed position; the frame means including a rigid rectangular frame structure mounted on the barrier wall surrounding the service opening and having horizontal and vertical members, a rectangular cover frame structure enclosing the rigid frame structure having horizontal and vertical members spaced from the rigid frame structure horizontal and vertical members, a rectangular movable frame element located in the space between the rigid and cover frame structures forming an effective service opening aligned with said barrier wall service opening through which said secondary door swings, yielding means holding said movable frame element in said space in normal position pressed outwardly against the cover frame members and downwardly against members of said rigid frame structure, and said movable frame element being movable inwardly, laterally and upwardly with respect to said barrier opening out of normal position by pressure applied thereto; means for actuating the motor means to impart closing movement to the door means from open to closed position, and means actuated by said movable frame element in response to movement thereof out of normal position during closing movement of the door means to reverse said motor means and door movement from closing to opening movement.

13. Safety door construction for banking service equipment including a fixed equipment barrier wall provided with a rectangular service opening, door means for the opening including a primary door and a secondary door, means mounting the primary door for movement between open and closed positions with respect to the service opening, motor means for moving the primary door between open and closed positions, hinge means mounting the secondary door for swinging movement through said service opening between open and closed positions, means normally urging the secondary door toward open position, the primary door engaging the secondary door and moving the secondary door from open to closed position when the primary door moves from open to closed position, rectangular frame means for the perimeter of the service opening relative to which each door moves when moving from open to closed position, the frame means including a frame element yieldingly held in normal position and movable out of normal position by pressure engagement with said element of an obstacle to the closing of either door, tongue means projecting from the frame element, safety switch means mounted on the barrier wall engageable by said tongue means when the frame element is moved out of normal position; and control means for the motor means including a source of power, door opening and closing switch means, and circuitry connecting said safety switch means, door opening and closing switch means, motor means and power source; said control means being operable in one condition to impart closing movement from the motor means to the door means to move the door means from open to closed position, and automatically during such closing movement of the door means to reverse such movement to opening movement in response to movement of said frame element out of normal position by obstacle pressure.

14. The construction defined in claim 13 in which the tongue means projecting from said frame element comprises a tongue member extending from each upper corner of the frame element having upwardly and inwardly projecting portions, in which the safety switch means includes two safety switches adjacent each frame element upper corner, and in which one of said two safety switches is actuated by an upwardly projecting tongue portion and the other of said two safety switches by an inwardly projecting tongue portion at each corner when the frame element is moved out of normal position, whereby movement of said frame element upwardly, inwardly or laterally of the service opening actuates at least one of said safety switches.

15. The construction defined in claim 13 in which flange and ear members also project from said frame element, in

which said frame means includes a rigid frame structure and a cover frame structure between which the movable frame element is yieldingly held in normal position, and in which said movable frame element flange and ear members are engageable with portions of said rigid frame structure to limit movement of the movable frame element out of normal position.

16. The construction defined in claim 13 in which the frame means includes a rigid frame structure mounted on the barrier wall and a cover frame structure enclosing the rigid frame structure between which structures the movable frame element is yieldingly held, in which the rigid frame structure is provided with spaced flanges forming a channel, in which the movable frame element has an inturned flange received in said channel, and in which spring means is located in said channel engaged with one of said channel flanges and pressing the frame element flange against the other channel flange to yieldingly hold the frame element in normal position.

17. In banking service equipment, a fixed equipment barrier wall provided with a rectangular service opening; a rigid rectangular frame mounted on the wall surrounding the opening having spaced flanges forming a channel opening outwardly of the wall at the lower end of the frame, and having outwardly projecting flanges along the sides of the frame; a cover frame mounted on the rigid frame; a rectangular frame element provided with an inturned flange defining a rectangular opening normally

aligned with the barrier wall opening and having a face wall extending between the rigid and cover frames; said frame element having an inturned lower flange normally resting upon one of the rigid frame channel flanges; spring means in said channel reacting between said frame element lower flange and the other channel flange; a spring element reacting between the face wall of said frame element at the upper end of the latter and the rigid frame normally pressing the frame element outwardly against the cover frame; said spring means and spring element yieldingly holding said frame element in normal position and said frame element being movable upwardly, inwardly and laterally with respect to the rigid frame by pressure applied to the frame element; safety switch means mounted on the barrier wall above the frame element; and tongue means projecting from the frame element engageable with the safety switch means when the frame element is moved out of normal position.

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