Oct. 4, 1955 G. P. SCOTT 2,719,607

STAIR ELEVATOR FOR INVALIDS

Filed Nov. 17, 1952 2 Sheets-Sheet 1

Fig. 1.

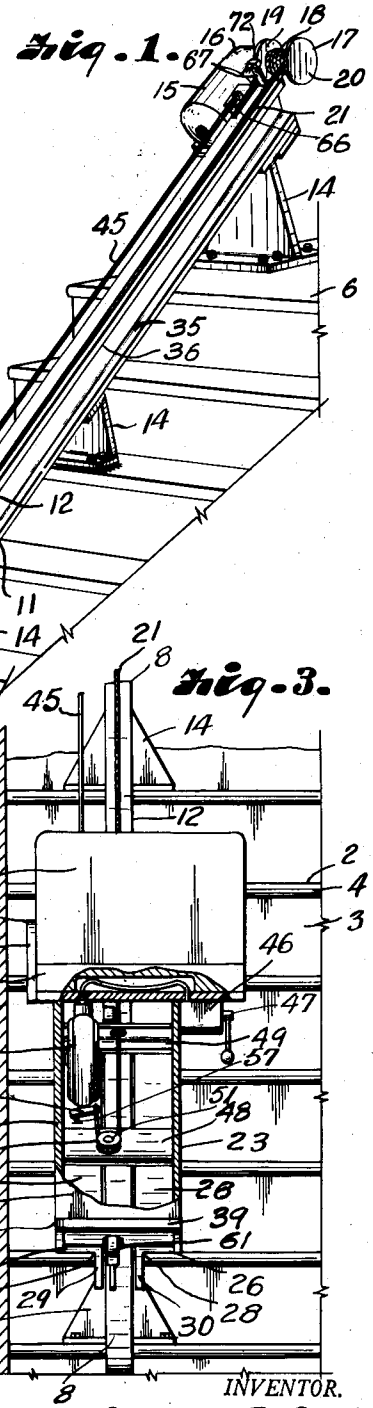


Fig. 2.

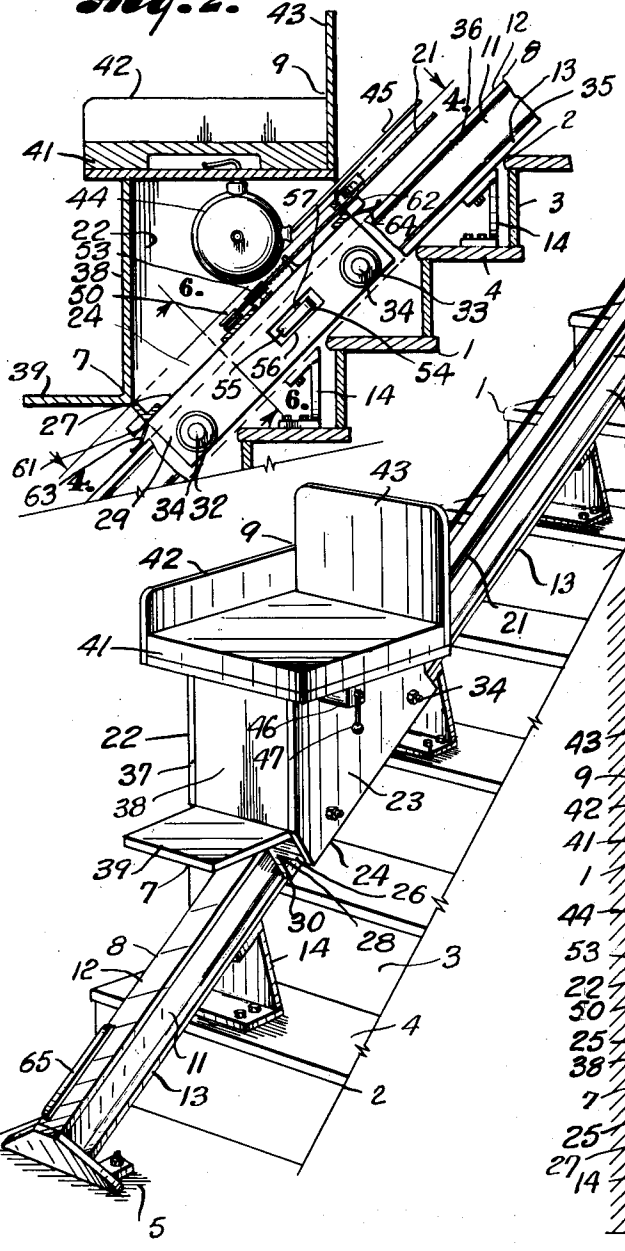


Fig. 3.

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Fig. 4.

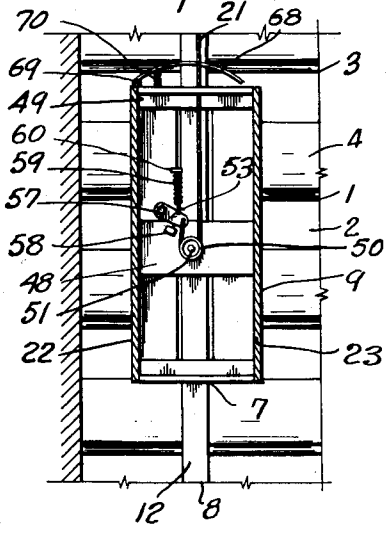


Fig. 5.

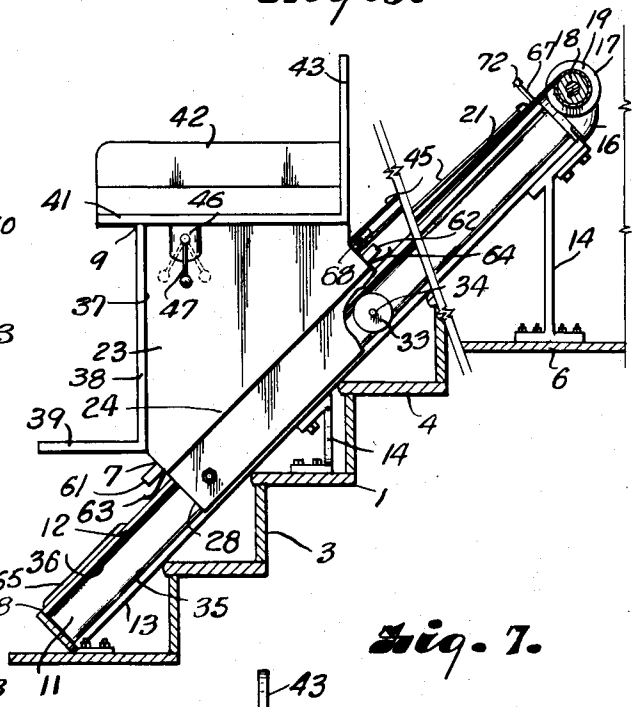


Fig. 6.

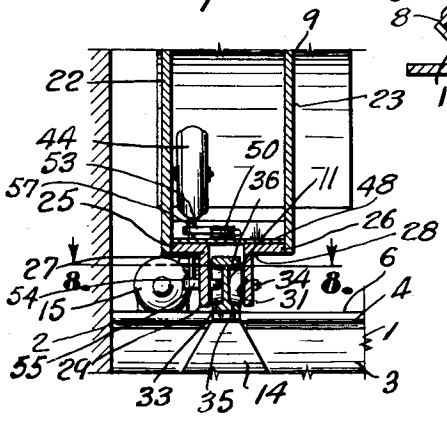


Fig. 7.

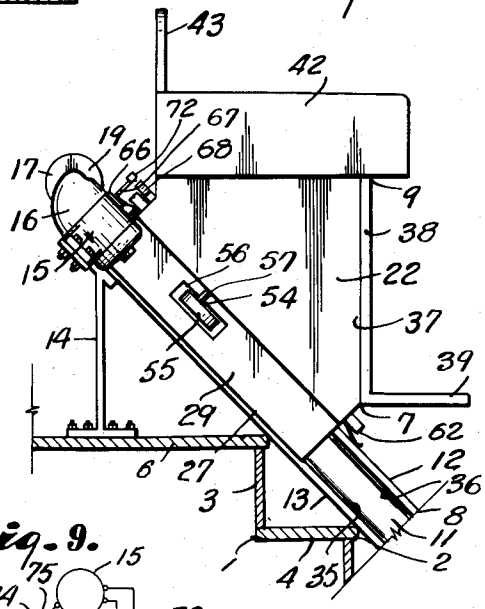


Fig. 8.

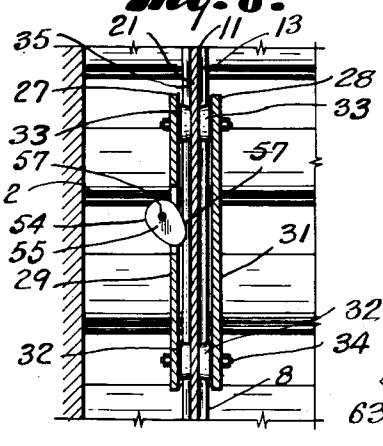
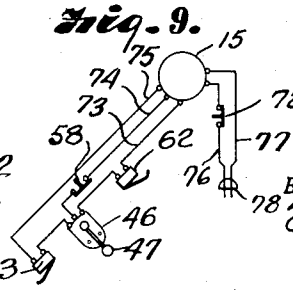


Fig. 9.



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United States Patent Office 2,719,607 Patented Oct. 4, 1955

2,719,607

STAIR ELEVATOR FOR INVALIDS

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Application November 17, 1952, Serial No. 320,899

4 Claims. (Cl. 187—14)

This invention relates to elevators for carrying persons up and down a stairway and has for its principal object to provide a small self-contained, lightweight unit that is readily mounted along one side of a stairway and which leaves ample room for persons to use the stairway in a regular way.

Other objects of the invention are to provide a stair elevator employing a monorail to which all of the parts including a traveling chair are attached, to provide the elevator with simple and effective automatic safety controls, and to provide an elevator in which movement of the chair is under control of the rider.

In accomplishing these and other objects of the invention hereinafter pointed out, I have provided an improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a stairway equipped with an elevator embodying the features of the present invention.

Fig. 2 is a partial longitudinal section to illustrate mounting of the chair on the monorail.

Fig. 3 is a partial front view of the elevator showing the chair in partial section.

Fig. 4 is a horizontal section through the chair illustrating attachment of the cable through an automatic brake control lever.

Fig. 5 is a partial longitudinal section through the stair showing the rail and chair in elevation.

Fig. 6 is a fragmentary section on the line 6—6 of Fig. 2.

Fig. 7 is a side elevational view of the rail and chair as viewed from the wall side at the upper end of the stair.

Fig. 8 is a section through the track and chair truck on the line 8—8 of Fig. 6.

Fig. 9 is a diagram of the electric circuit supplying the motor and control circuit.

Referring more in detail to the drawings:

1 designates an ordinary stairway comprising a series of steps 2 composed of risers 3 and treads 4 whereon a person may climb from a lower floor 5 to an upper floor or landing 6.

Mounted on the stairway at one side thereof is an invalid's elevator 7 constructed in accordance with the present invention. The elevator comprises a self-contained unit including a track or rail 8, a carriage or chair 9, and the operating mechanisms therefor.

The track 8 is of monorail type in that it is a single I-beam having a vertical web 11 and upper and lower flanges 12 and 13. The rail is of a length to extend from the floor 5 along the length of the stairway and to project over the upper floor or landing 6 for accommodating the chair 9 at the respective ends of the rail. The chair may thus be moved from a position about the height of a chair, forwardly of the lower step, to a similar position over the upper floor or landing 6. The rail is supported from the treads 4 by means of stands or brackets 14 that

are attached to the underside of the flange 13 and to the treads 4. The brackets 14 are arranged at suitable intervals along the rail so as to firmly support the rail and retain the chair in stable position during its movement up and down the rail as later described.

Mounted at the upper end of the rail and preferably carried by the upper ends of the brackets 14 is a motor 15 having a self-contained speed reduction unit, indicated by the housing 16, for driving a reel or winding drum 17 that extends across the end of the rail with the upper periphery of the spool portion 18 slightly above the upper flange 12 of the rail. The reel or winding drum 17 also has end flanges 19 and 20 to retain a cable 21 that connects the winding drum with the chair 9.

The chair 9 includes spaced side plates or frames 22 and 23 of generally triangular shape with their long edges 24 extending parallel with the sides of the track and attached to lateral flanges 25 and 26 of angle members 27 and 28. The other flanges 29 and 30 of the angle members project downwardly at the sides of the rail and carry front and rear pairs of wheels or rollers 32 and 33, the rollers being mounted on studs 34 that are carried by the depending flanges of the angles near the ends thereof. The rollers are of a diameter corresponding with the spacing between the interior surfaces of the rail flanges so that the peripheries may roll upon the faces 35 and 36 of the respective flanges as best shown in Fig. 6.

The peripheries of the rollers are conical to conform with the angularity of the respective flanges to support the chair in stable position on the rail. The forward edges 37 of the side plates 22 and 23 are connected by a front plate 38 carrying a forwardly projecting foot rest 39. Mounted on the upper edges 40 of the side and front plates is a seat 41 having an arm and back rest 42 and 43.

The seat, front, and side plates thus form a housing for enclosing a spring tensioned reel 44 for winding up and paying out an electrical cable 45 which contains electrical conductors that connect the motor circuit with a controller switch 46. The controller 46 is mounted under a projecting edge of the seat 41 and is operated by a lever 47.

Extending across the flanges 26 and 27 above the upper flange of the rail are spaced transverse members 48 and 49. The member 48 carries a pulley 50 that is journalled thereon by a stud 51. The cable 21 passes within a circumferential groove of the pulley 50 and the end thereof is connected with a lever 53 of a brake mechanism 54. The brake mechanism includes an eccentric 55 that operates in a slot 56 of the side plate 23 so that the periphery 57 of the eccentric is in position to engage against the web 11 of the rail. The eccentric 55 is carried on a shaft 57 that is journalled within the flange 25 of the angle 27, the arm 53 being rigidly connected with the upper end of the shaft. The arm 53 is normally retained in contact with a microswitch 58 that is also mounted on the flange 25 as best shown in Fig. 4. With this arrangement, the tension or pull on the cable keeps the eccentric out of contact with the web of the rail. However, should the cable break or become slack, the eccentric automatically sets to grip the web of the rail by means of a coil spring 59 having one end attached to the lever and the other end attached to an ear 60 on the flange 25.

Carried at the front and rear of the chair above the upper flange of the rail are limit switches 61 and 62 having operating levers 63 and 64 for respectively engaging lugs 65 and 66 at the respective lower and upper ends of the rail as shown in Fig. 1. Mounted on the carriage and in position to engage a lug or arm 67 at the upper end of the rail is a lever 68. The lever 68 is best shown in Fig. 4. It is pivoted at one end to the chair as indicated

at 69. The other end of the lever is yieldingly retained in spaced relation with the chair by a coil spring 70 that has one end engaging against the chair and the other end against the lever as shown in Fig. 4. Mounted on the upwardly extending lug or arm 67 is a switch 72 adapted to be engaged by the lever 68 in case of failure of the upper limit switch.

The cable 45 contains conductors 73, 74 and 75 that connect the limit switches 62 and 63, controller 46, and switch 58 in circuit with the motor 15 and with a supply circuit including conductors 76 and 77 that are adapted to be connected by a plug 78 with any convenient electrical socket. The safety switch 72 is connected into the main circuit as shown in Fig. 9.

Assuming that the elevator is assembled as a self-contained unit and installed on a stairway as above described, with the chair at the lower end of the track, the operator seats himself on the seat 41 of the chair 9 and moves his feet to the platform 39. He then manipulates the controller 46 to energize the motor 15 through the conductors 74 and 73 and limit switch 62. The motor then begins to operate and rotates the winding drum 17 to reel the cable 21 thereon and draw the chair up the track to the top of the stairs. The chair rolls along the rail with the wheels bearing against the tapered faces of the flanges 12 and 13, which together with the web 11, holds the chair in stable position on the rail. When the chair reaches the top of the stairs, the lever 64 of the limit switch 62 engages the lug 66 to automatically open the motor circuit and stop movement of the carriage. The chair will then remain at the top of the stairs until the person desires to descend to the first floor. With the limit switch 62 open and the switch 63 closed, the motor will rotate in reverse direction and cause the winding of the drum to pay out the cable and permit descent of the chair on the rail until the arm 63 of the limit switch 61 engages a lug 65 thereby interrupting the circuit to the motor and stopping movement of the chair.

Should the cable break or become slack for any reason, the spring 59 becomes effective to swing the arm 53 away from the microswitch 58 and open circuit between the controller and the motor and at the same time set the brake mechanism in gripping engagement of the web 11 so that the chair is prevented from a runaway descent to the lower end of the track. When the cable is repaired, the tension of the chair, acting in opposition to the spring 59, again brings the arm 53 into position for releasing the eccentric from its gripping contact with the rail and for closing the switch 58. The circuits are then in condition so that the chair may be operated upon manipulation of the controller 46. Should the upper limit switch fail to operate, the lever 68 will engage the safety switch 72 and stop operation of the motor. Should this happen, operation is reestablished by pressing the switch lever 68 in the direction of the chair to release the microswitch. The switch 62 is also important to prevent possible injury to the rider and damage to the equipment in case the rider should suddenly move the control lever through neutral to reverse position. When this happens, operation stops, but as soon as the spring pressed lever strikes the switch 58, the switch opens the circuit as above described.

From the foregoing it is obvious that I have provided an elevator for invalids which consists of a self-contained, light-weight unit that is easily installed on a conventional stair and which may be readily removed when desired since no alteration is required in either the stair or the building. It is also obvious that I have provided the elevator with simple and efficient safety control mechanisms to stop the chair in any position along the length of the track in case of failure of the cable or any part of the power mechanism. It is also obvious that I have provided a safety stop for automatically stopping movement of the carriage at the upper end of the rail in case the upper limit switch should fail to operate or should the operator become excited and improperly operate the control lever.

I claim:

1. A stair elevator including, a monorail adapted for support on a stair and having a web and upper and lower flanges extending laterally from the web, a power unit, a chair having side supports provided with portions depending on opposite sides of the monorail, wheels carried by said depending portions of the side supports and having peripheral portions adapted for rolling contact with said upper and lower flanges and having face portions closely adjacent side faces of said web portion, a brake carried on the depending portion of one of said side supports of the chair, a spring for exerting pressure on the brake in the direction of the web portion of the monorail to draw the depending portion of the opposite chair support toward the monorail to effect engagement of one of said portions at that side of the monorail with said monorail for cooperating with the brake in gripping the monorail therebetween, means connecting the power means with the chair through said brake for normally holding the brake out of pressure exerting position for free movement of the chair up and down the monorail upon actuation of the power unit and for tensioning said spring whereby the spring acts to urge the brake into said pressure exerting position in case of failure of said connecting means for stopping movement of the chair on said monorail.

2. A stair elevator including, a monorail adapted for support on a stair with an upper end thereof at a top of the stair and a lower end at a bottom of the stair, said monorail having a web and upper and lower flanges extending laterally from the web, a power unit carried by the upper end of the monorail and having a winding drum, a chair having side members provided with portions depending on opposite sides of the monorail, wheels carried by said depending portions of the side members and having peripheral portions adapted for rolling contact with said upper and lower flanges and having face portions closely adjacent side faces of said web, brake means carried on the depending portion of one of said side members of the chair, a spring for exerting pressure on the brake means in the direction of the web of the monorail to draw the opposite side member toward the monorail to effect movement of one of said portions at that side of the monorail into contact with the monorail for cooperating with the brake means in respectively gripping opposite sides of the monorail, a cable having one end wound on the winding drum and the other end connected with the chair through said brake means for normally holding the brake means out of pressure exerting position for free movement of the chair up and down the monorail upon actuation of the power unit and for tensioning said spring whereby the spring is effective to urge the brake into said pressure exerting position in case of failure of the cable and its connections for stopping movement of the chair on said monorail.

3. A stair elevator including, a monorail adapted for support on a stair and having an upper end at a top of the stair and a lower end at a bottom of the stair, said monorail having a web portion and upper and lower flange portions extending laterally from the web portion, a power unit carried by the upper end of the monorail and having a laterally projecting winding drum extending transversely of the upper end of the monorail, a chair having side supports provided with flanges depending on opposite sides of the monorail, wheels carried by said flanges and having rolling contact with said upper and lower flanges, a brake carried on the flange of one of said side supports of the chair, a spring for exerting pressure of the brake in a direction to effect gripping of the monorail, a cable having one end wound on the winding drum and the other end connected with the chair through said brake for normally holding the brake out of pressure exerting position for free movement of the chair up and

down the monorail upon actuation of the power unit and for tensioning said spring whereby the spring acts to urge the brake into said pressure exerting position in case of failure of the cable and its connections to stop movement of the chair on said monorail.

4. A stair elevator including, a monorail adapted for support on a stair and having an upper end at a top of the stair and a lower end at a bottom of the stair, said monorail having a web portion and upper and lower flange portions extending laterally from the web portion, a power unit carried by the upper end of the monorail and having a laterally projecting winding drum extending transversely of the upper end of the monorail, a chair having side plates on opposite sides of the monorail, angles having flanges fixed to the side plates and flanges depending on respective sides of the monorail, wheels carried by said depending flanges and having rolling contact with said upper and lower flanges, a shaft extending through one of the flanges that is fixed to one of the side plates, a brake on the shaft, a lever arm on the shaft, a spring

connected with the lever arm for applying the brake to the monorail to draw the depending flange at the opposite side of the monorail to effect gripping of the monorail, a pulley on said chair, a cable having one end wound on the winding drum and the other end connected with the lever arm to connect the chair with the power unit and for normally holding the brake against action of the spring for free movement of the chair up and down the monorail upon actuation of the power unit whereby the spring acts to urge the brake into said pressure exerting position in case of failure of the cable and its connections to stop movement of the chair on said monorail.

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