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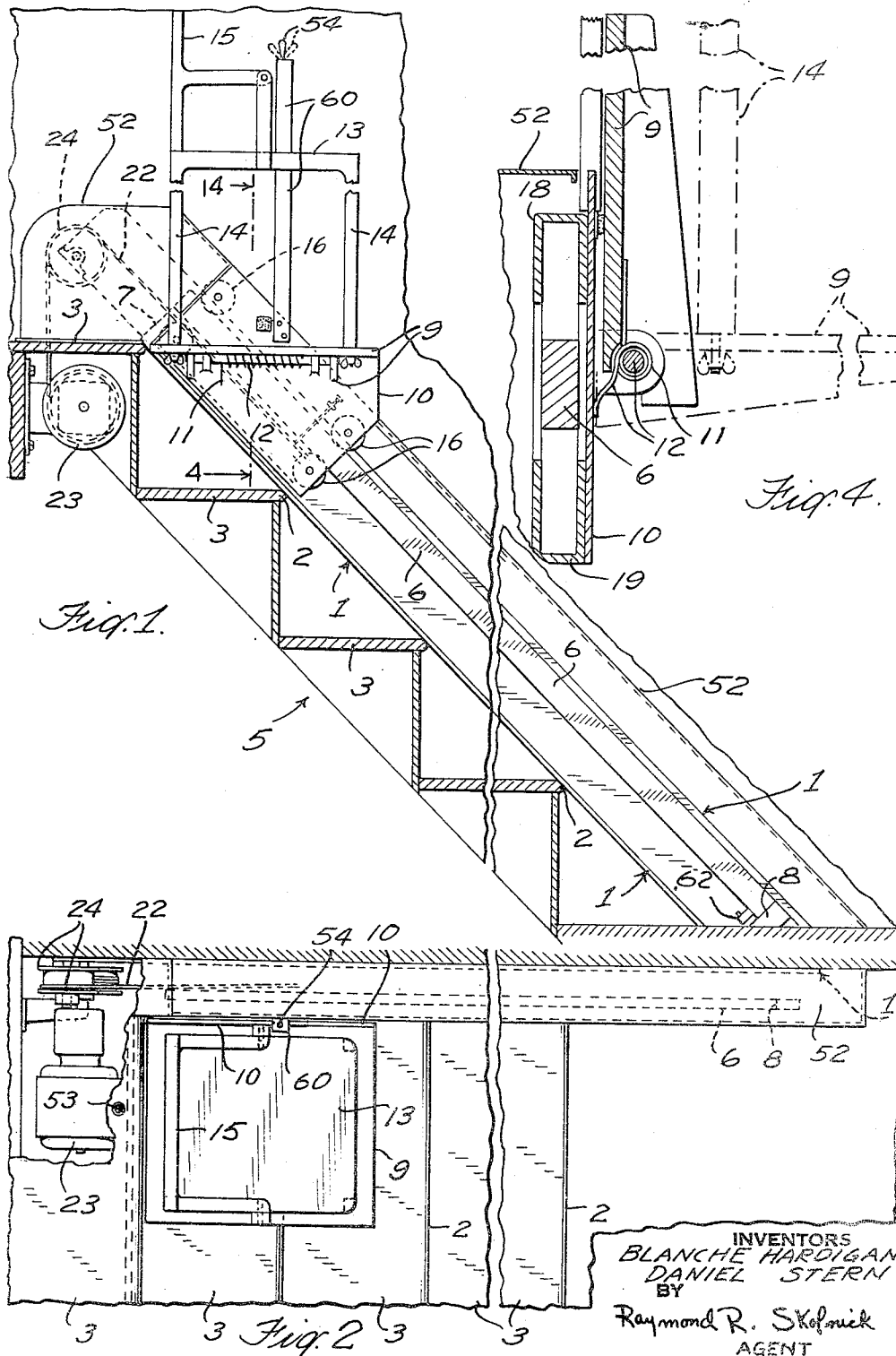
B. HARDIGAN ET AL

2,950,948

INCLINED STAIRCASE ELEVATOR

Filed Nov. 23, 1959

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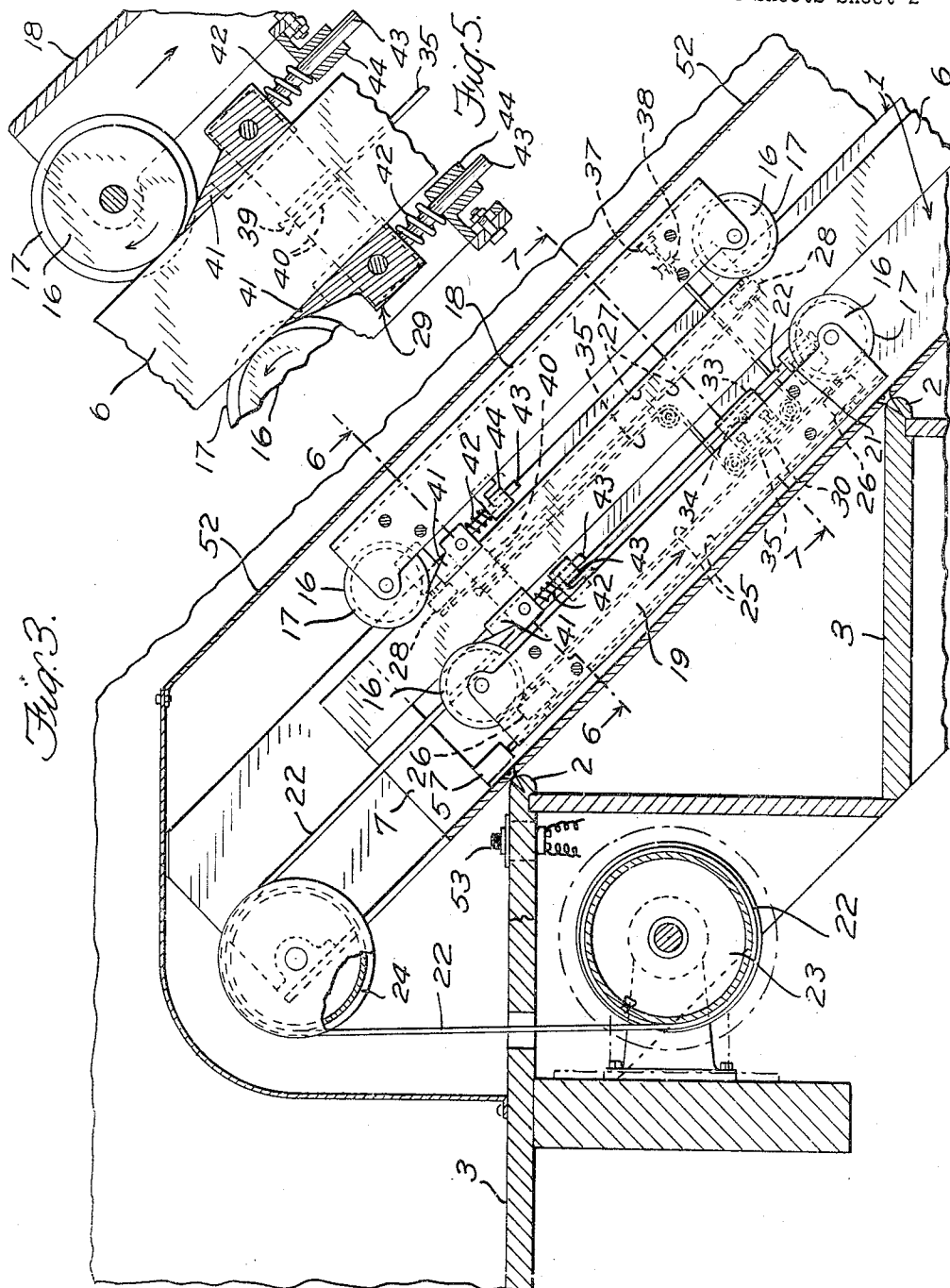
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4 Sheets-Sheet 2



INVENTORS
BLANCHE HARDIGAN
DANIEL STERN
BY
Raymond R. Skolnick
AGENT

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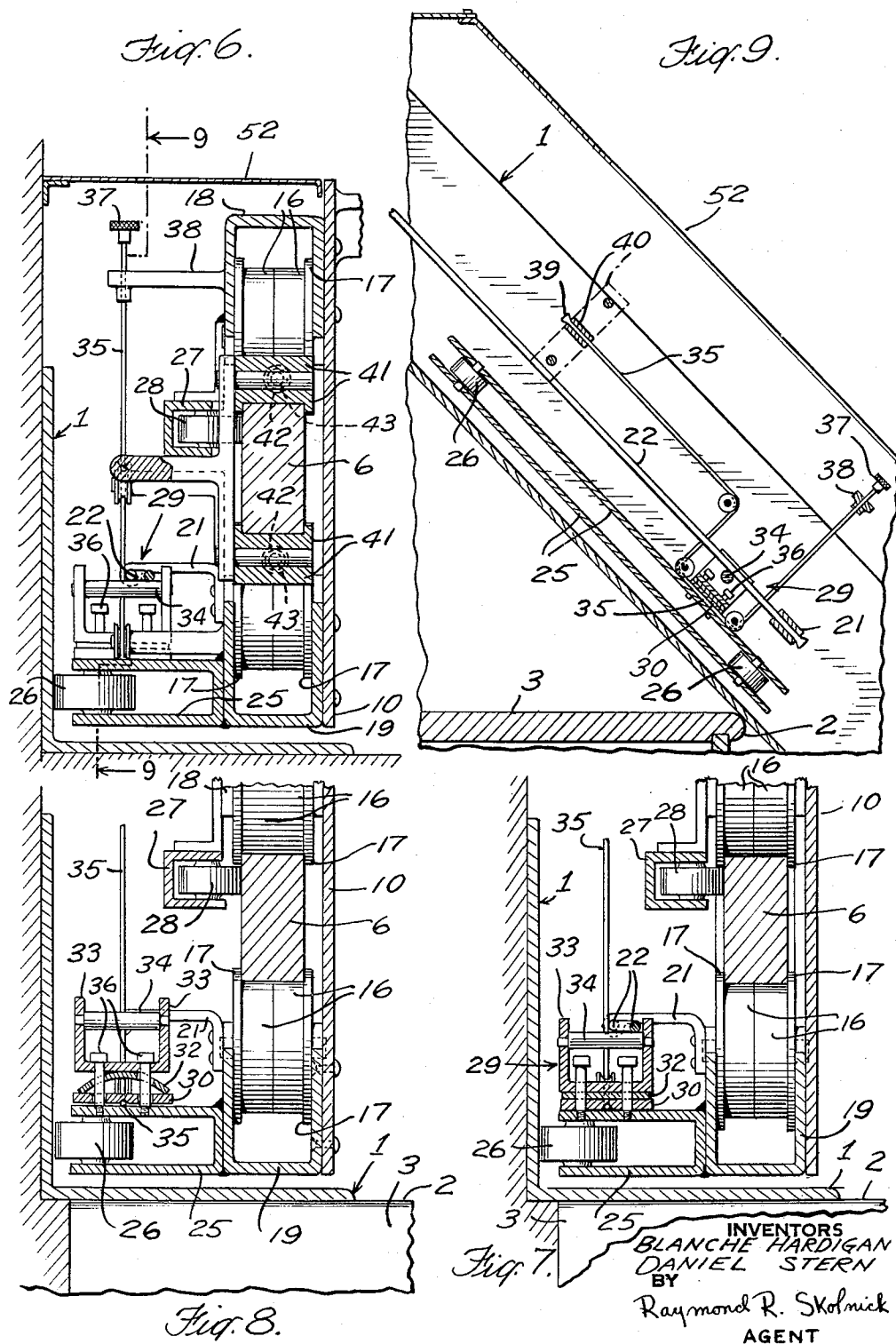
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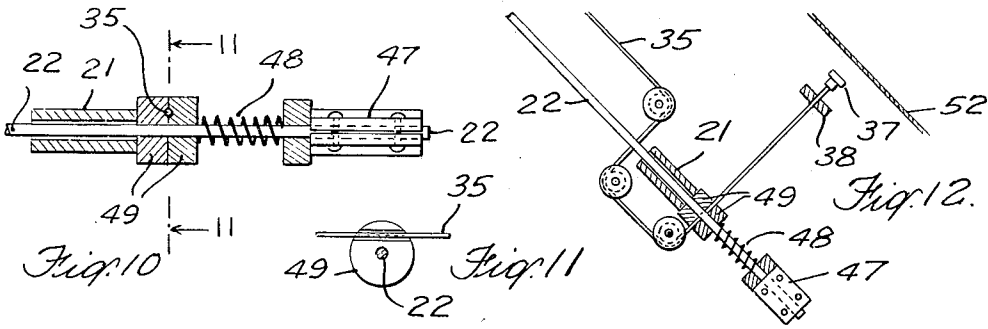
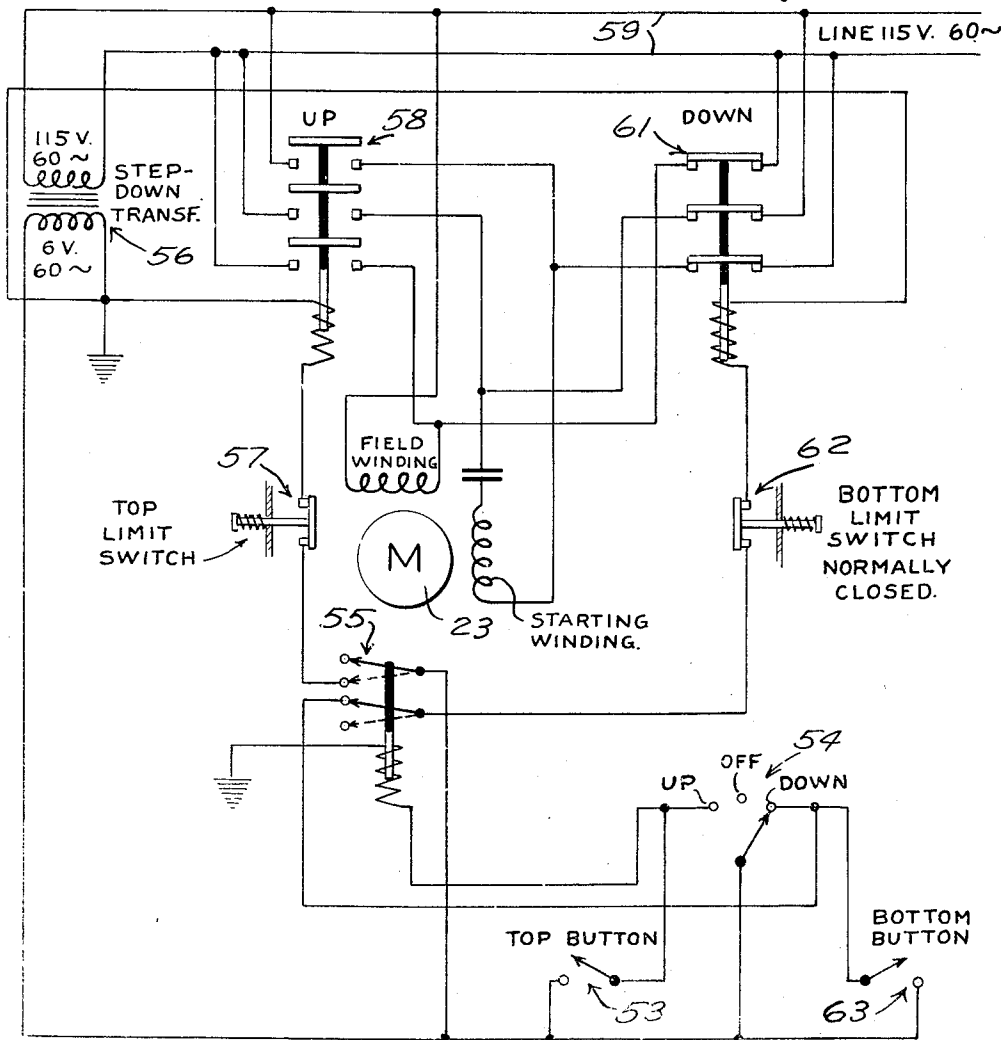


Fig. 13.

INVENTORS
 BLANCHE HARDIGAN
 DANIEL STERN
 BY
 Raymond R. Skofnick
 AGENT

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INCLINED STAIRCASE ELEVATOR

Blanche Hardigan and Daniel Stern, both of
2350 Tiemann Ave., Bronx, N.Y.

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9 Claims. (Cl. 187—12)

The present invention relates in general to elevators and more particularly to inclined elevators which are parallel to, and at the side of, a flight of stairs.

Desirable features for an inclined staircase elevator are economy, simplicity, strength, compactness, ease of maintenance and safety. It should be adaptable to new as well as existing structures and it should be capable of being installed along the side of an existing staircase without interfering or obstructing the use of the stairs.

Heretofore, staircase elevators which have been provided for installation along a flight of stairs have left much to be desired insofar as safety of the passenger is concerned, free access to the staircase and ease of maintenance.

It is, therefore, an object of our invention to provide an improved means for transporting people up or down a flight of stairs.

Another object of the invention is to provide an inclined staircase elevator having positive safety features.

Another object of the invention is to provide an inclined staircase elevator which is capable of being installed on an existing staircase as well as within the wall of a new house construction.

A still further object of the invention is to make possible the use of small, compact, cheap and easily maintained equipment.

To these ends the invention contemplates the use of a rail within a support which is mounted on the toes of treads of a staircase or within a wall which is adjacent to a staircase. A platform which is capable of supporting a standing or sitting passenger is guided along the rail and is motivated by the passenger upon his signalling an electric motor. The electric motor moves the platform up or down the staircase by means of a cable which is connected between the motor and the platform. A pair of wedges are provided to act as a safety brake should the cable have excessive slack, snap or break. These wedges upon the slacking or breaking of the cable lock the platform to the rail and prevents the platform from moving in an uncontrolled manner, thereby providing for the safety of the passenger and operation of the platform.

The invention has other objects and advantages which will appear from the following description of a particular embodiment of the invention in conjunction with the accompanying drawings, in which:

Fig. 1 shows a side sectional view of the invention mounted on a staircase with parts broken away;

Fig. 2 shows a plan view of the invention mounted on a staircase with parts broken away;

Fig. 3 is an enlarged cross-sectional view of the invention at the upper end of the staircase;

Fig. 4 is a cross-sectional view taken along line 4—4 of Fig. 1 showing the platform in a raised position;

Fig. 5 is a fragmentary enlarged view of Fig. 3 showing details of the safety brake mechanism;

Fig. 6 is an enlarged cross-sectional view taken along line 6—6 of Fig. 3;

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Fig. 7 is an enlarged cross-sectional view taken along line 7—7 of Fig. 3;

Fig. 8 is a cross-sectional view similar to Fig. 7 showing the safety brake mechanism in an open position;

Fig. 9 is a fragmentary cross-sectional view, on a reduced scale, taken along line 9—9 of Fig. 6;

Fig. 10 shows another form of a safety brake mechanism;

Fig. 11 is a cross-sectional view taken along line 11—11 of Fig. 10;

Fig. 12 shows the application of the safety brake of Fig. 10 to the invention; and

Fig. 13 shows an electrical schematic of the control system of the invention.

With reference to the drawings of Figs. 1 and 2 the particular embodiment shown there of the invention comprises, in general, a support 1 which is made of an L-shaped angle iron. The support 1 is fastened to the toes 2 of treads 3 of a staircase 5 of an existing staircase structure in a dwelling or the support 1 can be fastened inside of an adjacent wall to a staircase in a dwelling which is first being erected. A rail 6 is mounted within the support 1 and is fastened at each of its ends to the support by brackets 7 and 8 respectively. A platform 9 is pivotally mounted on a mounting plate 10. A torsion spring 11 is shown wound about a pivot pin 12 in such a manner as to exert a sufficient force to enable the platform 9 to return to an upright position, as shown in Fig. 4, whenever there is no weight on the platform. By the platform 9 being held in an upright or vertical position whenever the elevator is not in use the staircase 5 is kept open to normal staircase traffic and the platform will not be an objectionable obstruction. The platform is shown in its down position in broken lines in Fig. 4.

The platform 9 has four mounting holes therein. These provide a means for fastening a chair 13 by its legs 14 to the platform 9. The chair 13 is provided for use by a person or persons who cannot stand on the platform or who would rather ride up the staircase in a sitting rather than in a standing position. The back 15 of chair 13 is swivel mounted so that the rider of the elevator can always face in the direction of travel of the chair.

Referring to Fig. 3 it is seen that there are four pairs of rollers 16 which roll on the rail 6. Each pair of rollers are two flange type rollers mounted back to back with the flanges 17 on the outside, as shown in Figs. 6, 7 and 8. The flanges 17 straddle the edges of the rail 6 and prevent the rollers 16 from falling off of the rail when the rollers are traveling along the rail.

A pair of U-shaped brackets 18 and 19 are used for holding the rollers 16. Bracket 18 is used to hold the upper rollers and bracket 19 is used to hold the lower rollers. Brackets 18 and 19 are held in fixed space relationship to each other by means of the mounting plate 10, to which they are securely affixed.

A bracket 21 is rigidly secured to the bracket 19. It is located at the rear end of the bracket and is used to hold the end of a cable 22. A capacitor start motor 23 is connected to the other end of the cable 22 and when the motor is energized it either winds up the cable or unwinds the cable depending upon the direction in which the motor is rotating. The motor 23 is mounted under the top stair of the staircase 5 or it can be mounted directly on top of the uppermost step. A pulley 24 is mounted at the forward end of the support 1 to change direction of the cable 22.

Mounted to the lower roller bracket 19 is a U-shaped bracket 25 and rotatably mounted within the bracket are two rollers 26, shown in Fig. 6. Rollers 26 are in contact with the inner vertical surface of the support 1 and are

provided to add stability for the rail riding unit. Additional stability is provided by another U-shaped bracket 27, shown in Fig. 8, within which is rotatably mounted two rollers 28. Bracket 27 is mounted to the upper bracket 18 and the rollers 28 are in contact with the inside surface of the rail 6.

For the safety of the passengers of the elevator there is provided a mechanical safety brake, generally indicated by the reference character 29. The safety brake is comprised of a plate 30 which has a V notch 31 therein, a leaf spring 32, a bracket 33, a roller 34 mounted within the bracket 33 and a small cable 35. The bracket 33, the leaf spring 32 and the plate 30 are mounted on the bracket 25 by means of shoulder screws 36. As shown in Fig. 7 the cable 22 passes over the roller 34 forcing down the bracket 33, compressing the leaf spring 32, and locking the small cable 35 between the bracket 25 and the plate 30, within the V notch 31 of the plate. As shown in Fig. 8 the breaking of the cable 22 releases the force on the roller 34 and the leaf spring 32 pushes the bracket 33 away from the plate 30. The small cable 35 is now free since it is no longer clamped between the plate 30 and the bracket 25.

One end 37 of the small cable 35 is held by a bracket 38 while the other end 39 of the small cable is held by a bracket 40, see Fig. 3. The bracket 40 is secured to a pair of wedges 41 which slide on the opposite edges of the rail 6. The bracket 40 is spring mounted to the upper and lower roller brackets 18 and 19 respectively by means of springs 42, guide rods 43 and guides 44. To set the safety brake the cable 22 is held away from roller 34 and the small cable end 37 is pulled. This pulls the bracket 40 against the guides 44 and pulls the wedges 41 away from the upper rollers 16. The cable 22 is now released and the tension in the cable is exerted against the roller 34 to compress the leaf spring 32 which in turn exerts pressure on the plate 30. The notch 31, in plate 30, within which the small cable 35 passes is slightly smaller than the diameter of the small cable and therefore when the plate 30 is compressed against the bracket 25 the small cable is locked thereby.

Upon the cable 22 breaking or having excessive slack the pressure is removed from the roller 34 and the small cable 35 is released from between the plate 30 and the bracket 25. Upon the release of the small cable the springs 42 will push against the bracket 40 which holds the wedges 41. The wedges slide on the rail 6 until they come in contact with the forward rollers 16 whereupon the rollers ride up on the wedges locking themselves to the rail, through the wedges.

An alternate form of the safety brake is shown in Figs. 10, 11 and 12. It is shown there that the end of the cable 22 which passes through the bracket 21 is held from passing through the bracket by a clamp 47 and is spring biased by a spring 48. Interposed between the bracket 21 and the spring 48 are a pair of discs 49, each having a V notch therein. When the discs are placed together with the notched sides on the inside facing each other the small cable 35 passing through the discs within the notches is greater in diameter than the space within the notches. It is, therefore, readily seen that when the cable 22 is under tension the discs 49 are held together tightly and clamp the small cable therebetween.

Upon the cable 22 breaking or having excessive slack the spring 48 will exert a force against the clamp 47 pulling the cable free. With the tension removed from the cable the discs will become loose and the small cable 35 will be released from between the discs. Upon the release of the small cable the springs 42 will push against the bracket 40 which has been previously described above, reference being had to Fig. 5. The wedges 41 slide on the rail until they come in contact with the forward rollers 16 whereupon the rollers ride up on the wedges locking themselves to the rail through the wedges.

Both forms of the safety brake are set in the same

manner and the end 37 of the small cable 35 is accessible for setting by the removal of a cover 52, which is secured to the support 1. The cover acts as a dirt shield as well as to keep the apparatus from being exposed.

The operation of the elevator will now be described in conjunction with the wiring schematic shown in Fig. 13. Assuming a passenger is at the top of the staircase 5 and wishes to ride down the staircase and the elevator is at the bottom of the staircase he would first step on the top button 53 which is located at the top of the staircase. With the switch 54 being in the off position relay 55 would be activated by the 6 volts A.C. of the step down transformer 56. The primary winding of the transformer is across 115 volts A.C. and the secondary winding of the transformer is adapted with the correct number of turns so as to provide 6 volts A.C. as its output. With the relay 55 in the activated position current will flow through a top limit switch 57 to activate the main up relay 58. With the main up relay in the activated position the line voltage 59 is placed across the field winding of the motor 23 and the starting winding of the motor 23. The direction of flow of the current across the starting winding is such as to drive the motor in the direction whereby the cable 22 is wound up and the platform 9 will be pulled up the staircase until it hits the top limit switch 57 and opens the contacts of the limit switch. This breaks the flow of current through the main up relay which in turn disrupts the flow of current to the motor and the platform stops at the top of the staircase.

The passenger now steps on the platform 9 and holds the switch 54 in its down position. The switch 54 is located at the top of a vertical support 60, which is secured to the side of mounting plate 10, and is of a momentary type which has to be held in its up or down position in order for it to function. It only holds itself in the off position and is spring biased in its other position so that upon release by the passenger it automatically returns to its off position. By employing a switch of this character the passenger must hold on to the vertical support in order to activate the switch thereby providing an additional safety device for the passenger by compelling him to support himself when using the elevator. With the switch 54 in its down position the relay 55 remains in an unactivated position and current from the step down transformer flows through the down main relay 61 and closes its contacts. With the main down relay in the activated position the line voltage is placed across the starting winding of the motor 23 and the field winding of the motor 23. The direction of flow of the current across the starting winding is opposite to that of the current across the starting winding when the main up relay 58 is activated. Therefore, the motor 23 now operates in the opposite direction and unwinds the cable 22 allowing the platform 9 to travel down the staircase 5. When the platform reaches the bottom of the staircase it hits the bottom limit switch 62 and opens its contacts, breaking the flow of current through the main down relay 61 and stops the motor 23.

If the platform 9 is at the top of the staircase 5 and a passenger is at the bottom of the staircase he steps on the bottom button 63, which is located at the bottom of the staircase. Switch 54 being in its off position, which is its normal position, current from the step down transformer 56 flows through the relay 55, which is in its unactivated position, to the main down relay 61 and activates it. With the main down relay activated the line voltage 59 is placed across the field winding and starting winding of the motor 23. The direction of flow of the current across the starting winding is such as to drive the motor in the direction whereby the cable 22 is wound up and the platform 9 will be pulled up the staircase until it hits the top limit switch 57 and opens the contacts of the limit switch 57. This breaks the flow of current through the main up relay 58 which in turn

disrupts the flow of current to the motor 23 and the platform now stops at the top of the staircase.

The passenger if he desires to stop the platform at any point other than at the top or the bottom of the staircase merely places or releases the switch 54 so that it returns to its off position. With the top button 53 open, the bottom button 63 open and the switch 54 in the off position, no current from the step down transformer can flow to either the main up relay 58 or the main down relay 61 thereby the motor cannot receive any line voltage and is deenergized. The motor 23 is of the worm-wheel drive type and therefore when it is in a deenergized position it cannot be rotated by pulling on the cable 22. This assures the platform remaining in any position that it is stopped in.

If the elevator should be in use and someone steps on the top button 53 or the bottom button 63 the platform will come to a stop because the line voltage to the motor will be broken and the motor will become deenergized.

Although a particular embodiment of the invention has been described and illustrated it is understood that the present disclosure has been made by way of example and that changes in the details of construction and the combination and arrangement of parts may be made without departing from the spirit and the scope of the invention as hereinafter claimed.

What we claim is:

1. An inclined staircase elevator comprising, a main support adapted to be mounted in an inclined position, a rail adapted to be mounted within said support, a plurality of roller supports, a roller rotatably mounted within said roller support, a mounting plate for securing said roller supports about said rail so that some of the rollers are in rolling contact with the upper surface of said rail and some of the rollers are in rolling contact with the lower surface of said rail, a plurality of side supports in contact with an inside surface of said main support and secured to said lower roller supports, a platform pivotally secured to said mounting plate, a power means, a cable secured between said power means and said lower roller supports and a starting and stopping circuit connected between said platform and said power means.

2. An inclined staircase elevator comprising, an L shaped main support adapted to be mounted in an inclined position on toes of treads of a staircase, a rail adapted to be mounted within said support, a plurality of roller supports, a roller rotatably mounted within said roller support, a mounting plate for securing said roller supports about said rail so that some of the rollers are in rolling contact with the upper surface of said rail and some of the rollers are in rolling contact with the lower surface of said rail, a retaining means for retaining said rollers in contact with said rail, a platform pivotally secured to said mounting plate, a vertical support adapted to be mounted on said mounting plate for supporting a passenger on said platform, a plurality of side rollers secured to the lower roller supports, said side rollers being in rotatable contact with the side surface of said main support, an electric motor adapted to be mounted at the top of a staircase, a cable secured between said motor and said lower roller supports, a limit switch mounted near the top of said staircase within said main support and adapted to engage the forward end of one of said lower roller supports, a second limit switch mounted near the bottom of said staircase within said main support and adapted to engage the rear end of one of said lower roller supports, a biased switch mounted at the top of said vertical support, a starting and stopping circuit connected between said electric motor, said limit switches and said biased switch and a safety brake means adapted to be mounted between said cable and said forward rollers whereby upon the breaking of said cable said brake means will engage said forward rollers and prevent their rotation on said rail.

3. An inclined staircase elevator as claimed in claim 2,

wherein said roller and said retaining means includes a pair of flanged rollers mounted back to back with the flanges on the outside for rolling engagement with said rail and for engaging the sides of said rail to prevent said rollers from slipping off said rail.

4. An inclined staircase elevator as claimed in claim 3, wherein said brake means includes a U-shaped bracket flexibly secured to one of said side rollers, a leaf spring held between said U-shaped bracket and said side roller, a plate having a V notch therein held between said leaf spring and said side roller, a cylindrical roller mounted within said U-shaped bracket, a pair of wedges mounted between the rail and the forward rollers, a pair of brackets mounted on the roller supports, one on each side of the rail, a pair of springs mounted between said wedges and said brackets, a wedge plate secured to said wedges for holding said wedges on said rail, a small cable connected between said wedge plate and said V-notched plate and a means for tightening said small cable whereby said wedges compress the said springs and keep the wedges from engagement with said forward rollers, said cable passing over said cylindrical roller thereby compressing said leaf spring and clamping said small cable between said V-notched plate and said side roller.

5. An inclined staircase elevator as claimed in claim 3, wherein said brake means includes a pair of V-notched discs mounted notched sides together about one end of said cable, a clamp mounted at the end of said cable, a spring adapted to be mounted between said clamp and said discs about said cable, a pair of wedges mounted between the rail and the forward rollers, a pair of brackets mounted on the roller supports, one on each side of the rail, a pair of springs mounted between said wedges and said brackets, a wedge plate secured to said wedges for holding said wedges on said rail, a small cable connected between said wedge plate and said V-notched discs and a means for tightening said small cable whereby said wedges compress the said springs and keep the wedges from engagement with said forward rollers, said small cable being clamped between said V-notched discs by the tension of the cable.

6. An inclined staircase elevator comprising, an L-shaped main support adapted to be mounted in an inclined position on toes of treads of a staircase, a rail adapted to be mounted within said support in a vertical position, said rail having its forward and rear ends thereof securely affixed to the inside of the bottom side of said main support, a pair of U-shaped roller supports, a mounting plate for securing said roller supports in a fixed space relationship to each other, one of said roller supports being positioned above the said rail and the other of said roller supports being positioned below the said rail, four pairs of flanged rollers, two pairs of rollers rotatably mounted within each of said U-shaped roller supports, one pair mounted in each of said roller supports so as to be in rolling contact with said rail, said rollers being mounted back to back with said roller flanges positioned at the outside surfaces of said rollers and about said rail, a platform pivotally secured to said mounting plate, a torsion spring adapted to be mounted about the pivot point of said platform for holding said platform vertical when not in use, a vertical support adapted to be mounted on said mounting plate for supporting a passenger on said platform, a U-shaped side roller support secured to the side of the bottom roller support, a pair of side rollers rotatably mounted within said side roller support, said side roller being positioned one at each end of said side roller support and each being in rolling contact with the inside vertical surface of said main support, a plurality of rollers adapted to be mounted for engagement with the inside of said rail for stabilizing said platform, a capacitor start electric motor adapted to be mounted at the top of a staircase, a pulley adapted to be mounted at the forward end of said main support, a cable secured between said motor and said lower

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roller support and passing over said pulley, a bottom switch button adapted to be mounted at the bottom of said staircase, a top switch button adapted to be mounted at the top of said staircase, a top limit switch mounted near the top of said staircase within said main support and adapted to engage the forward end of said lower roller support, a bottom limit switch mounted near the bottom of said staircase within said main support and adapted to engage the rear end of said lower roller support, a biased switch adapted to be mounted at the top of said vertical support, a starting and stopping circuit interconnected between said motor, said bottom switch, said top switch, said bottom limit switch, said top limit switch and said biased switch and a safety brake means adapted to be mounted between said cable and said forward rollers whereby upon the breaking of said cable said brake means will engage said forward rollers and prevent their rotation on the said rail.

7. An inclined staircase elevator as claimed in claim 6, wherein said brake means includes a U-shaped bracket flexibly secured to one of said side rollers, a leaf spring held between said U-shaped bracket and said side roller, a plate having a V notch therein held between said leaf spring and said side roller, a cylindrical roller mounted within said U-shaped bracket, a pair of wedges mounted between the rail and the forward rollers, a pair of brackets mounted on the roller supports, one on each side of the rail, a pair of springs mounted between said wedges and said brackets, a wedge plate secured to said wedges

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for holding said wedges on said rail, a small cable connected between said wedge plate and said V-notched plate and a means for tightening said small cable whereby said wedges compress the said springs and keep the wedges from engagement with said forward rollers, said cable passing over said cylindrical roller thereby compressing said leaf spring and clamping said small cable between said V-notched plate and said side roller.

8. An inclined staircase elevator as claimed in claim 6, wherein said brake means includes a pair of V-notched discs mounted notched sides together about one end of said cable, a clamp mounted at the end of said cable, a spring adapted to be mounted between said clamp and said discs about said cable, a pair of wedges mounted between the rail and the forward rollers, a pair of brackets mounted on the roller supports, one on each side of the rail, a pair of springs mounted between said wedges and said brackets, a wedge plate secured to said wedges for holding said wedges on said rail, a small cable connected between said wedge plate and said V-notched discs and a means for tightening said small cable whereby said wedges compress the said springs and keep the wedges from engagement with said forward rollers, said small cable being clamped between said V-notched discs by the tension of the cable.

9. An inclined staircase elevator as claimed in claim 6, wherein a chair is adapted to be mounted upon said platform.

No references cited.