July 6, 1937. O. F. SHEPARD 2,086,002

ELEVATOR

Filed Aug. 27, 1934 3 Sheets-Sheet 1

Fig. 1.

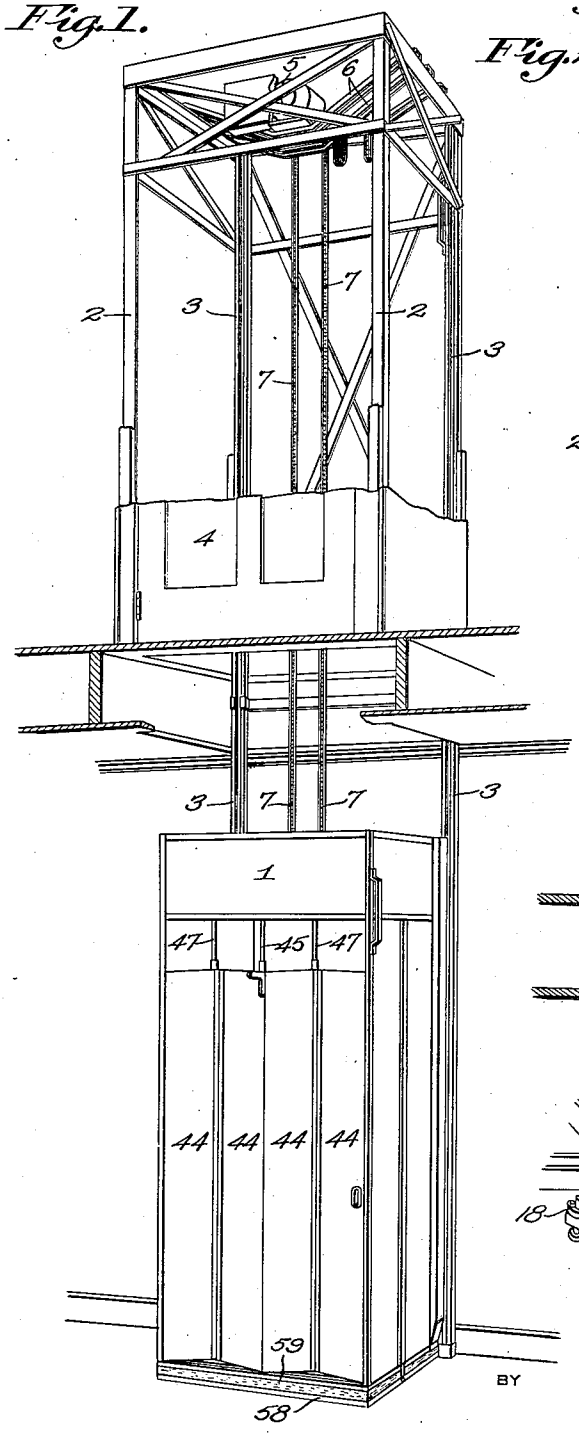


Fig. 2.

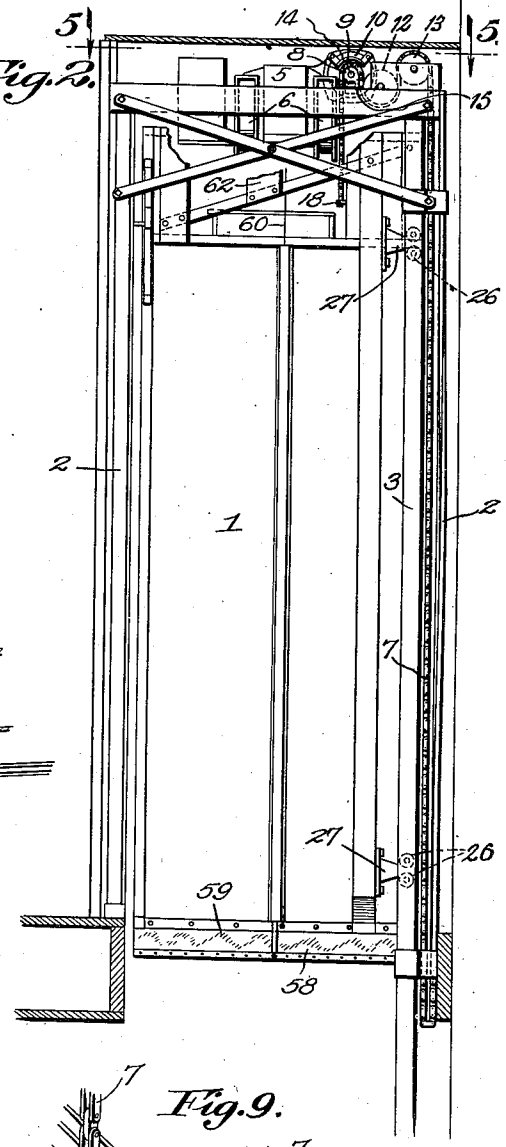
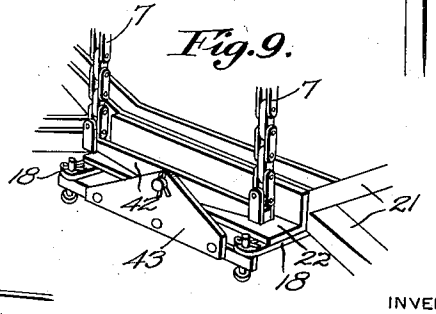


Fig. 9.



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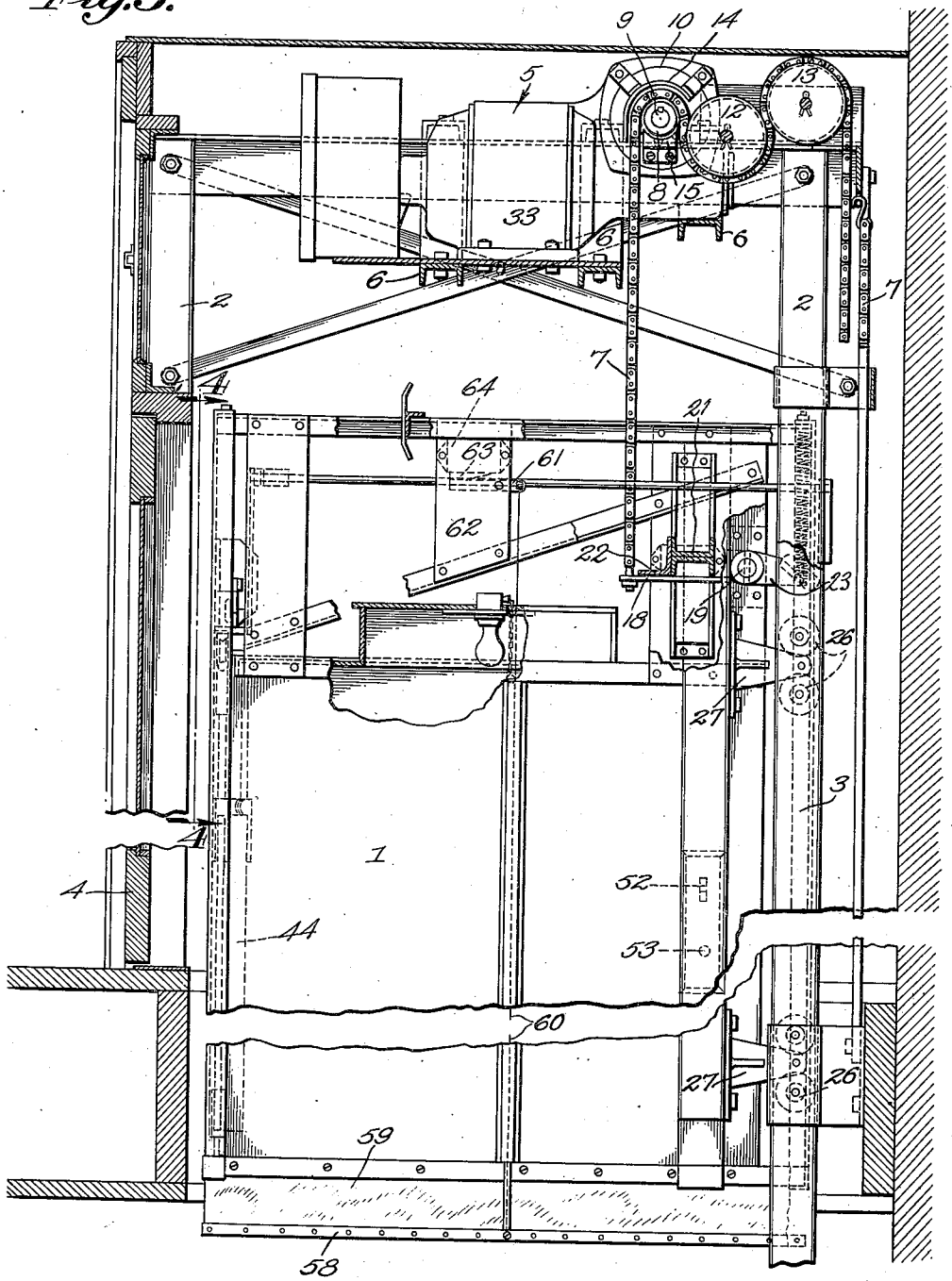
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Fig. 3.



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Fig. 4.

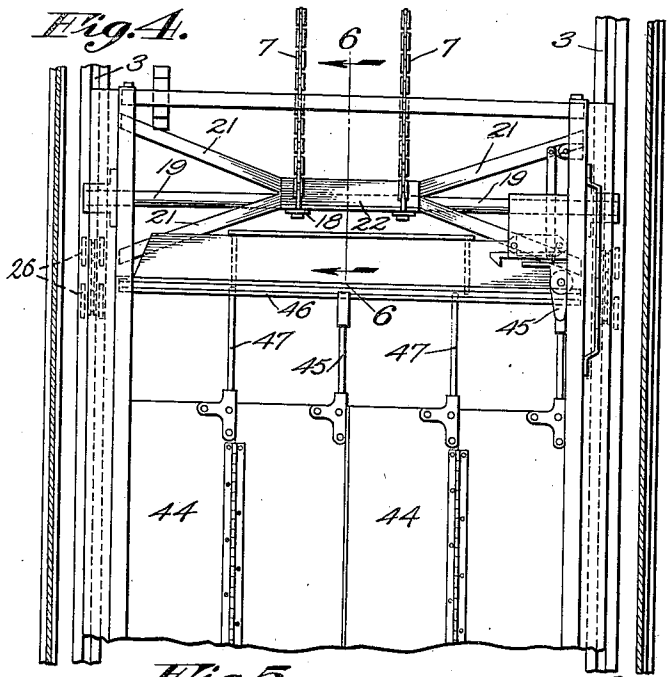


Fig. 6.

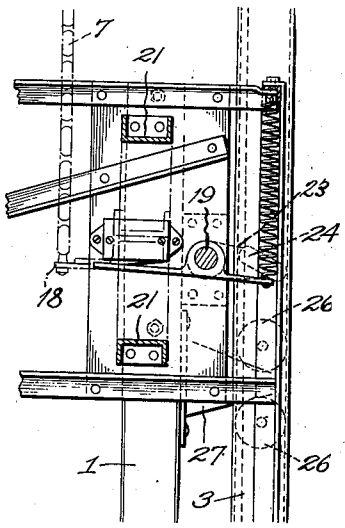


Fig. 5.

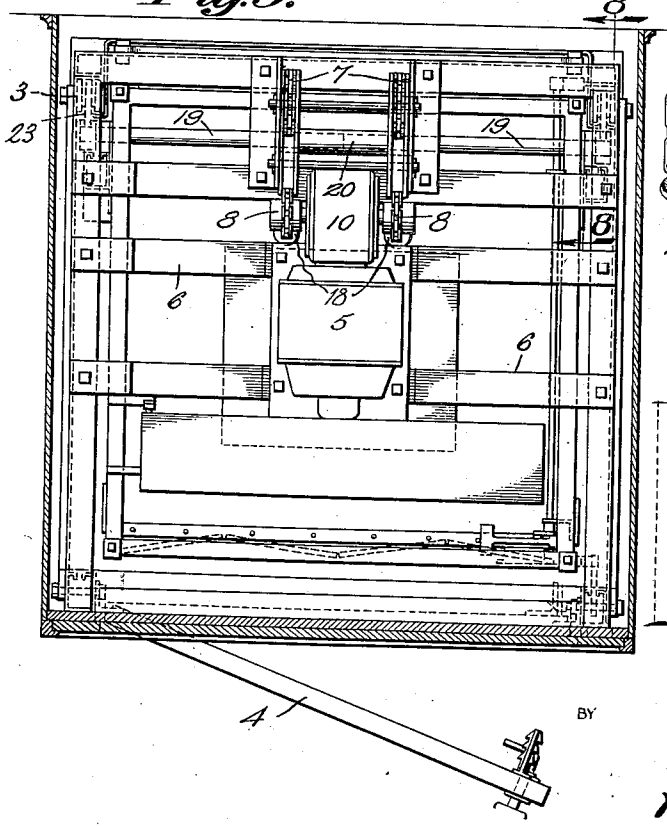


Fig. 7.

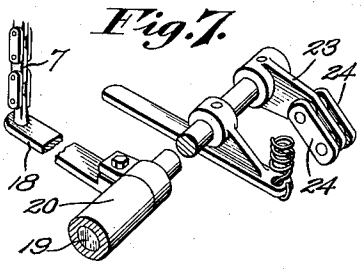
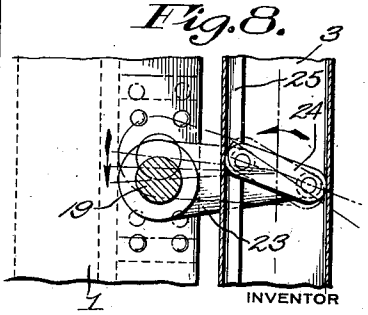


Fig. 8.



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UNITED STATES PATENT OFFICE

2,086,002

ELEVATOR

Oscar F. Shepard, Cincinnati, Ohio

Application August 27, 1934, Serial No. 741,576

3 Claims. (Cl. 187—17)

This invention relates to improvements in elevators, particularly adapted for use in homes, in which the installation can be conveniently made in the existing home without major alterations to the building, generally nothing more than cutting a hole through the second story flooring.

An object of the invention is to provide an elevator preferably for home installation requiring no enclosure for the lower or ground floor of the building, the cam traversing in the open room on guide rails along the wall thereof and when not in service is stationed at the second floor out of the way, leaving only the rails exposed to the room below which may be finished to harmonize with the trimmings of the room.

Another object of the invention is to use a pair of sprocket chains as a hoist for the cab, the chains having an overrun end free or slack, eliminating the use of counterweights and are suitably guided at the driving sprockets to prevent the chain climbing the sprockets or the slack end from adhering to the sprockets.

Another object of the invention is to operate the elevator upon the house lighting circuit to avoid making special power feed line installations to the building and in adapting the use of a single phase alternating current induction motor for elevator service together with a system of control for a simple, safe and efficient operation.

Various other features and advantages of the invention will be more fully set forth in a description of the accompanying drawings, in which:

Figure 1 is a perspective view of a two floor elevator installation, preferably for homes, the cab shown at lower floor, free from enclosure or hatchway with parts broken away for the second floor portion to better illustrate the supporting structure thereof.

Figure 2 is a vertical sectional view through the upper floor closet-like enclosure of the hatchway, and the cab shown in side elevation located at its upper or second floor limit.

Figure 3 is an enlarged vertical sectional view taken on the centerline of upper floor enclosure, the car shown in elevation and located somewhat below its upper limit and with certain portions broken away.

Figure 4 is a vertical sectional view taken on line 4—4, Figure 3, showing the upper portion of car in front elevation and with upper or top panel thereof removed to illustrate the supporting in top structure of the car.

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 2, with hatch door shown ajar and showing elevating mechanism and elevator cab in top plan.

Figure 6 is a fragmentary vertical sectional view taken on line 6—6, Figure 4, and showing a main power control cut-out switch operable on breakage of the lift chain.

Figure 7 is a perspective view of the car connection of one of the lift chains, emergency brake and cut-out switch leverage assembly.

Figure 8 is a vertical sectional view as on the line 8—8, of Figure 5, showing emergency brake in use, dot and dash lines showing normal position.

Figure 9 is a detail perspective view of an equalizer device used in conjunction with the two elevating chains.

The elevator is primarily adapted to be installed in homes for two floor service, motor driven and the electric power taken from the regular house lighting circuit. Installation can be readily made in an existing home as well as one being constructed by merely cutting an opening through the second floor flooring slightly larger than the size of the cab.

In the arrangement disclosed, the first floor preferably has no enclosure, nor is it necessary to cut into the second floor ceiling. The cab normally is stationed at the second floor as a closure for the second floor opening, and with the cab stationed at the second floor, all that is visible on the first floor are two small rails along the wall of the lower or first floor, which may be painted to match the wall covering. This permits the elevator to be installed in the average width of hall or entrance way without being an obstruction and the cab for a minimum size occupies a floor space of about 30″ x 30″. No major alterations of the building are required.

For the second floor, a self-supporting steel frame structure is provided, set against a wall of the second floor about the opening through the flooring which can be enclosed, and having a door for the front side.

The elevator is button operated and the cab does not move until all safety precautions have been taken care of. The cab at its lower side, where no enclosure is provided for the lower floor, is equipped with means effective under the slightest touch for automatically stopping the cab, the slightest obstruction placed therebeneath in the path of the descending cab will stop its descent, therefore there is no hazard to anyone standing on the lower floor beneath the descending cab.

Referring to the drawings, Figures 1, 2 and 3,

1 indicates the elevator cab constituting a steel framework, three of the sides enclosed and a front opening with a folding sliding door. A steel or metal framework 2 is provided for the second floor, suitably secured in place over the second floor opening. The framework includes a pair of channel rails 3, 3 respectively, at the rear corners thereof and extended downwardly along the wall of the first floor room to the base thereof. With the cab stationed at the second floor, the rails only are visible from the first floor.

The steel frame 2 is preferably enclosed with any of the various types of building materials, suitable for such purposes, which include a door 4 for the front side and the enclosure finished and decorated to correspond with that of the room in which it is located. The steel frame structure 2 is preferably made of the same structural iron bars or rails for the vertical corner posts and top cross bars connecting the posts together with tie strips in horizontal and angular arrangement, particularly at the top or head end of the frame.

An electric motor 5 and transmission is mounted within the upper end of the framework, and, as illustrated, the motor is mounted upon and bolted to spaced channel iron bridge bars 6, 6 having their opposite ends fixed respectively to the top cross bars of the steel frame structure.

The cab hoist comprises a pair of sprocket chains 7, 7 in parallel spaced arrangement with one end fixed to the top framework of the cab. Each chain respectively is engaged over a sprocket wheel 8 of the motor transmission, the sprocket wheels 8 for the two chains being respectively fixed upon and at opposite protruding ends of a cross shaft 9 journalled in a transmission casing 10 shown as a part of the motor casing. The shaft 9 is driven by suitable gearing connected with the motor shaft housed within the transmission casing 10 and in general constitutes a worm wheel fixed to the cross shaft 9 meshing with a worm fixed to or a part of the motor shaft 11.

From the sprocket wheel 8, the chain continues over a pair of circumferentially grooved idler wheels 12, 13, relatively progressively arranged and disposed at different elevations to direct the slack or non-loading carrying end of the chain to the rear of the framing and into the space between the cab and building wall. The chain loops about the underside of the idler 12, next adjacent the sprocket wheel 8, centered below the axis of the sprocket wheel to insure maximum tooth engagement with the sprocket wheel, and thence over the top of the idler wheel 13 adjacent the idler wheel 12, set at a higher elevation for a maximum chain contact with the peripheries of the idler wheels and the idlers tracking the chain to clear the car and assume a minimum head room. This permits the use of sprocket wheels and sprocket chains for hoisting elevator car or cab, the chains having a taut portion connecting with the cab and with an over-running end free or slack.

A guard 14 of curved form is suitably fixed upon the transmission casing 10 above the sprocket wheel 8 and portion of chain engaged thereon for preventing the chain from climbing the sprocket or becoming disengaged therefrom.

A second guard 15 is secured to the transmission casing at the lower side of the sprocket wheel straddling the teeth thereof and serves to prevent the slack end of the chain from remaining on the sprocket and wrapping under the taut end which would wedge the chain from the sprocket teeth.

Guards of duplicate construction are provided for each of the sprocket wheels and chains and a pair of chains are employed for safety purposes and also enables the use of a lighter weight or size of chain of standard commercial make.

The taut ends of the chains each are respectively fixed to a projecting end of a lever arm 18 fixed to and projecting from a rock shaft 19 journalled at one end within a bearing mounted upon the cab framing. The rock shaft 19 for both chains are coaxially arranged with their inner ends abutting and loosely engaged within a sleeve 20 for supporting continuity. The lever arms 18 in sustaining the load of the cab, bear or are engaged against a cross beam 21 of the cab framing. The cross beam constitutes a pair of channel iron beams in X formation with an angle plate 22 joined to the forward side of the central meeting portions of the channel beams against the underside of which the lever arms 18 bear or contact when under load sustaining stress.

Each rock shaft 19 is provided with a second lever 23 fixed upon the outer end thereof and extending inwardly into a respective channel rail 3 at a corresponding side of the cab. The free end of the lever arm 23 at opposite sides thereof has a pair of wedge bars 24—24 rigidly fixed thereon, each wedge bar engaging between the base of the rail and an inturned flange 25 thereof and constituting a safety clamp which hangs the cab from the rails in the event of hoist chain breakage.

As long as the cab is suspended from the hoisting chain or chains, the chain connecting lever arms contact with the lower side of the cross beam of the cab framing, canting the wedge bars through their connection with the respective cross shafts 19 to a degree to free the same from wedging contact with the channel rails. The instant the chain ceases to sustain the cab, the springs force the rock shafts to swivel, causing the wedge bars to be wedgingly engaged with the rails, holding the cab against descent. Therefore, at the slightest degree of drop of the cab when not sustained by the chains, the load upon the lever arms 18 is transferred to the levers 23, hanging the cab to the rails.

In Figure 8 the parts in full line are shown with the wedge bars 24 gripped or wedged within the rail and in the same view, in dot and dash lines, in a released position in which the rock shaft is shown as at a slightly higher elevation from its position shown in solid. This represents the susceptible drop the cab may take when released from its chain suspension to a position locked against descent to the rails.

The guide rollers 26 preferably are in tandem arrangement, each set carried by a bracket 27 fixed to the elevator cab framing. The upper set of rollers fixed to the head end of the cab normally ride upon the inturned flange of the rails while the lower set of rollers fixed to the base end of the cab ride upon the base of the rail. This stabilizes the cab so that the rollers wheel as well as guide the cab in its travel, eliminating any chatter of the cab.

The elevator being primarily for home service operates upon the ordinary commercial house electric light circuit. The motor, therefore, must be either a direct current or a single phase alternating current. Of the direct current motors there are two types known as shunt or series.

The shunt type is of constant speed while the series type varies in speed with load. Therefore, the shunt type is only used for elevator work.

There are three general types of alternating current motors, series type corresponding to the direct current series motor, the repulsion type which has the same characteristics as the series motor, and the induction type which has the same characteristics as the shunt direct motor having practically constant speed. Therefore, the induction motor is adopted for elevator purposes. However, a simple single phase induction motor will not start from rest and must have some sort of a starting device to give it direction of rotation and bring it up to nearly synchronous speed when the starting device is disconnected.

When operating as a straight induction motor, any changes in the connections or reversal of the circuit will not reverse the motor. After once being started, it must be brought to a stop or nearly to a stop before reversal can be had. The great difficulty in the past with the use of single phase motors for elevators or in places where a positive reversal is required is the hazard of having the motor operate in the wrong direction by sudden reversal of the operating switches, so that the motor does not stop at the limits of travel.

The employment of a single phase induction motor necessitates the system of control, that on any interruption of the circuit after the car is started, the motor must come to rest or to sufficiently slow speed so that the starting device is reinstated before another start can be made. In the present control system by means of an electric interlock connection on the up and down direction switches and a governing interlock switch on the motor itself, it is impossible to have the direction switches reversed and the motor continued to operate in the wrong direction.

A commercial starting device with which some manufacturers of single phase induction motors are equipped is utilized in connection with an interlock switch on the motor to operate coincidentally with the cutting in and out of the starting device. The automatic control of the interlock switch may be separate from the motor or starting device therefor, and constitute a switch in the elevator control system primarily for rendering the motor control ineffective until the motor comes to rest or slows down in speed at which motor reversing is practical.

In Figure 9 a modified form of connection of the chain hoist with the cab is illustrated. The ends of both chains are respectively connected to the opposite ends of a pivoted equalizing bar **42**. The equalizing bar **42** is pivotally connected upon a connecting bar or link **43** having its opposite ends loosely pinned to the forward ends of the lever arms **18**.

The cab for home service being of reduced dimension and preferably when the first floor is not enclosed, the exterior finish of the cab is such as will appropriately correspond to the finish and furnishings and room to not detract when stationed at the first floor.

It is necessary to provide some form of closure for the open side of the cab. The closure employed is of a type compactly foldable or collapsible against an inner side of a side wall of the cab, easily operated and will not incommode passengers in folding or collapsing the door.

As shown in the drawings, the door opening is for the full width of the cab and the door or closure is composed of four panels **44**, hingedly connected along their longitudinal edges preferably by piano type of hinges and arranged for an accordion fold of the panels. One of the end panels is hingedly fixed to one of the side walls of the cab, and the panel for the opposite end of the door at its upper end is sustained by a hanger **45** sliding or riding upon a rail or rod **46**. Likewise the door may be intermediately sustained by one or more hangers **45** riding upon the rail **46**, the hangers being preferably connected at the hinged connections of the panels.

In this instance wherein the cab is not enclosed for the lower or first floor, the down limit automatic control is applied to the lower side of the floor of the elevator and effective by a slight pressure thereagainst so that the elevator can be stopped at any point in its descent.

A plate or diaphragm **58** is movably suspended from the lower side of the bottom of the elevator cab, and in the present instance the plate or diaphragm **58** constitutes a sub-bottom parallel with the cab bottom and of corresponding area and outline therewith, suspended therefrom by a fabric apron **59** extending completely around the base of the cab as a closure for the space between the cab bottom and sub-bottom.

A wire or the like **60**, one for each of the relatively opposite sides of the cab, each at one end is connected with the plate or diaphragm and at the opposite end with one end of a lever **61** pivoted upon a plate **62** of the elevator cab top framing. The lever **61** engages with a lever **63** of a spring switch **64** mounted upon the plate **62** of the cab upper framing.

The weight of the diaphragm **58** sustains a switch actuating lever **61** in depressing contact with the switch lever **63**, holding the electric circuit contacts of the switch closed. Any slight upward pressure upon the diaphragm releases the electric switch breaking a motor controlling circuit, stopping the elevator descent. This safety control is effective upon the slighest movement of the diaphragm and by a depressing contact against the diaphragm at any point in its entire area, and serves as the stop switch when the car reaches the lower floor.

While the first floor has been shown without enclosure, an enclosure similar to the upper floor may be utilized.

Also, the elevator may be used to serve three or more floors in which case all the upper floors must be enclosed.

Having described my invention, I claim:

1. In an elevator, an elevator cab, an electric motor driven transmission for hoisting said elevator, including a pair of sprocket wheels, a pair of sprocket chains respectively transmittingly engaged with said sprocket wheels, each having an end connecting with the cab and the opposite sprocket over-run end free, idler wheels respectively in alignment with each of said sprocket wheels and disposed relatively for chain contact with the peripheries of the idlers and sprocket wheels for tracking the non-load-sustaining portion of the chain away from the sprocket wheels to prevent the same from jumping the sprocket wheel and wrapping around the same to guidingly transmit the free end of said chains from the sprocket wheels.

2. In an elevator, an elevator cab, an electric motor driven transmission for hoisting said elevator, including a pair of sprocket wheels, a pair of sprocket chains respectively transmittingly engaged with said sprocket wheels, each having

an end connecting with the cab and the opposite sprocket overrun end free, and guide means for each sprocket wheel, idler wheels respectively in alignment with each of said sprocket wheels and disposed relatively for maximum chain contact with the peripheries of the idlers and sprocket wheel for tracking the non-load-sustaining portion of the chain from the sprocket wheel and to avoid interference therewith to divert the free portion of the chain from the sprocket wheel.

3. An elevator for home installation, comprising, a framing adapted to be stationed upon the floor and about an opening therethrough of an uppermost floor to be served by the elevator for sustaining the elevator cab and transmission mechanism therefor, the framing receiving the elevator cab when serving said uppermost floor, a pair of spaced guide rails forming post elements of said framing and extending downwardly therefrom, each rail of channel form in cross section, the opposite flanges thereof having inturned longitudinal margins for guiding and laterally confining the elevator cab for its full length of travel, an elevator cab having roller journalling carriages arranged in upper and lower sets, mounted upon a wall of the cab, each for engagement into a rail for roller traction therein and translatably sustaining the cab in a position projected from the rails, transmission mechanism carried by said framing having a hoisting connection with said cab, a floating safety platform dependingly sustained from the bottom of the cab floor and of a corresponding area therewith and connected thereto by a bellows-like enclosure, and transmission control means operatively connected with said platform, functioning upon depressing said platform toward the cab floor.

OSCAR F. SHEPARD.