

Aug. 15, 1933.

B. HENRICKSEN

1,923,034

ELECTRICALLY DRIVEN DUMB WAITER, ETC

Filed Dec. 22, 1932

3 Sheets-Sheet 1

Fig-1-

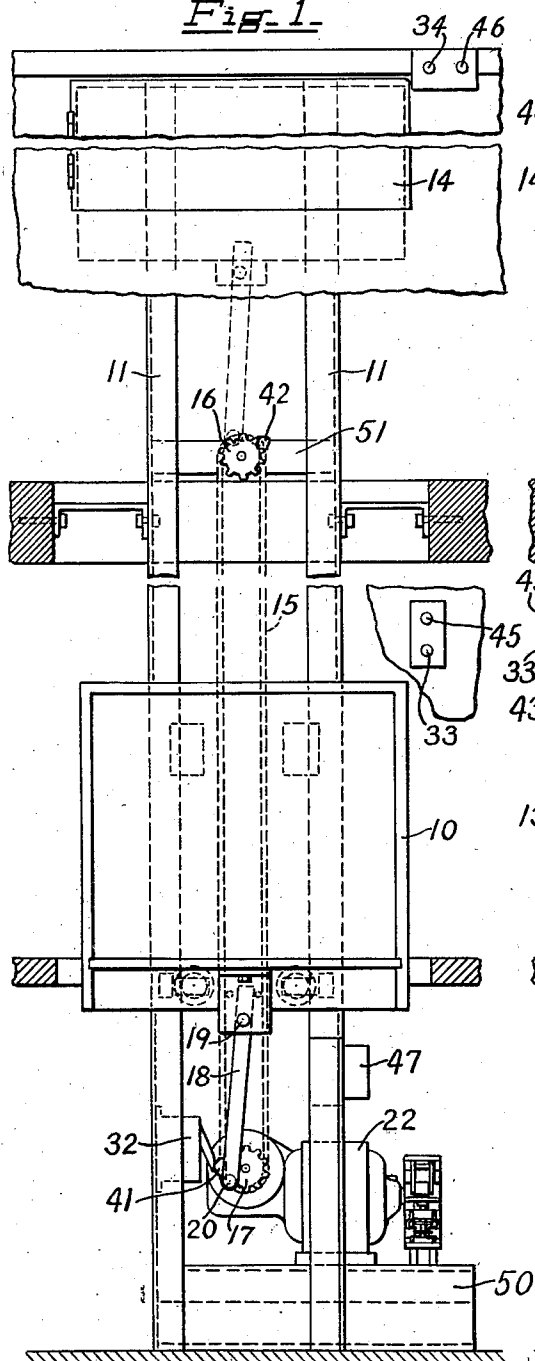
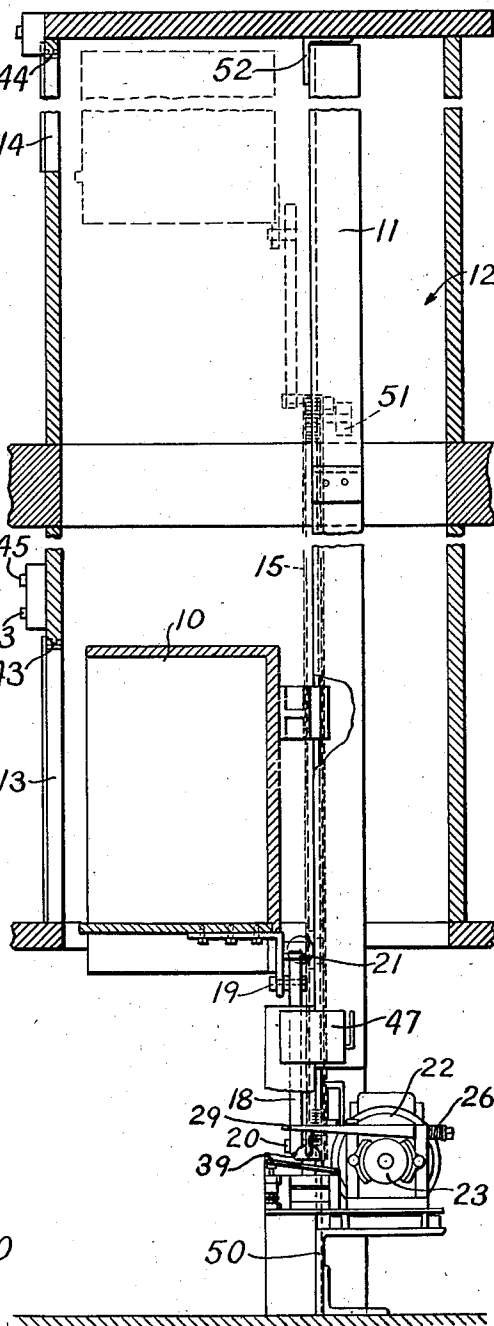


Fig-2-



Bjarne Henricksen, INVENTOR

BY *W. J. Henricksen*
ATTORNEY

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Fig. 3

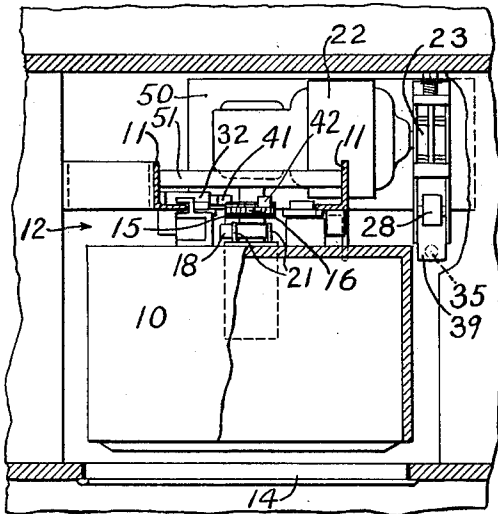


Fig. 4

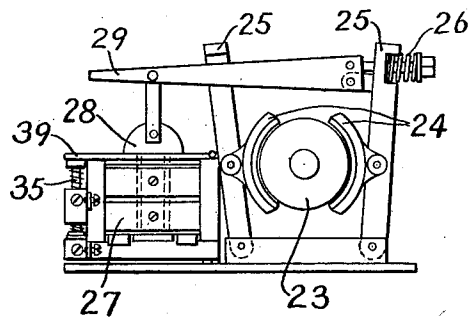


Fig. 5

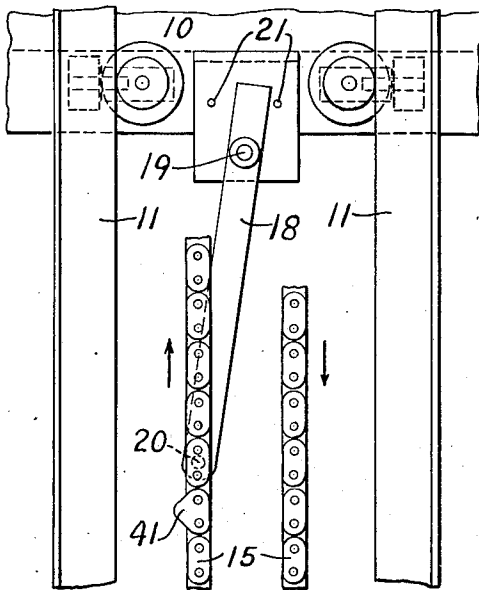
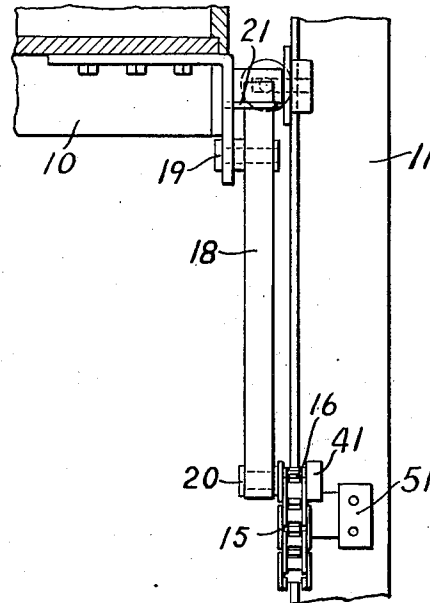


Fig. 6



Bjarne Henricksen,

INVENTOR

BY

Attorney

ATTORNEY

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Fig. 7.

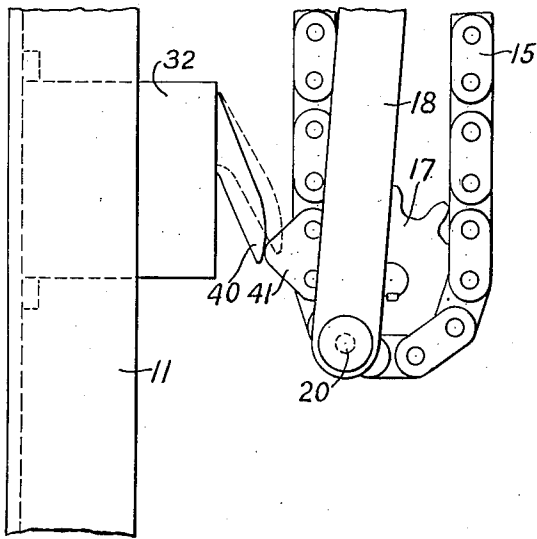


Fig. 8.

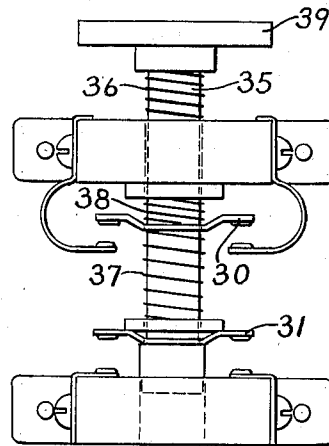
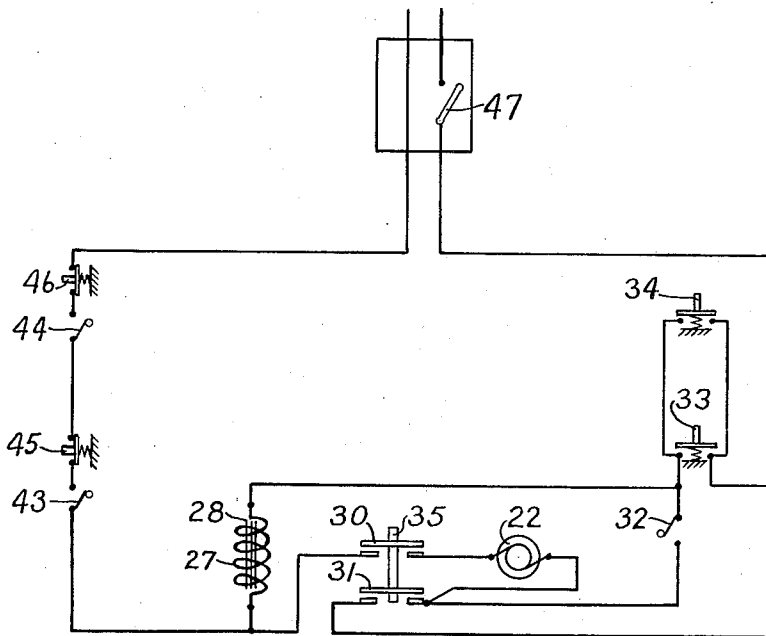


Fig. 9.



Bjarne Henriksen,
INVENTOR

BY *[Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE

1,923,034

ELECTRICALLY DRIVEN DUMB WAITER,
ETC.

Bjarne Henriksen, North Bergen, N. J., assignor
to Sedgwick Machine Works, Incorporated,
Poughkeepsie, N. Y., a Corporation of New
York

Application December 22, 1932
Serial No. 648,372

REISSUED

13 Claims. (Cl. 187—3)

My invention relates particularly to a type of elevator construction for household, restaurant, store, office and factory use, commonly termed dumb waiters.

5 The main object is to provide a simple, inexpensive but reliable mechanism which can be driven electrically and controlled by manual and automatic switches.

10 A special object is to provide a construction of this character which can be driven by a simple type of non-reversing motor without the use of reversing mechanism.

Another object is to provide mechanism especially adapted to serve two landings.

15 Another object is to provide an installation which can be operated with a minimum sized power unit.

20 Another object is to provide a simple installation which avoids the necessity for reversing switches.

Another object is to avoid the necessity for over-travel spaces and switches.

25 Another object is to provide a construction in which the weight of the lift, cage or car (which for convenience will be called a car) assists the motor when starting.

Another object is to provide a simple and self contained construction which can be easily installed by ordinary mechanics.

30 In the drawings I have illustrated a simple form of apparatus embodying my invention, employing a conventional type of car provided with assembled guides and adapted to be enclosed in a shaft having doors. The car is raised by means
35 of an electric motor and a chain drive which is connected to the car and the motor also controls the lowering of the car. The term "chain" is used to broadly cover a flexible band-like device whether formed of links or a perforated band or
40 a cable, or solid tape or belt with means to prevent slippage.

45 An automatic brake is provided for stopping the motor and the car and holding them stationary. The starting of the motor and the operation of the brake are controlled by manually operable and automatic switches.

50 Switch mechanism is preferably arranged on each floor for starting and stopping the motor when desired. Automatic door-controlled switches may also be provided so that the car can not be operated when the doors are open. One of the automatic switch devices is positioned to be actuated by one or more projections carried by the chain. These projections are arranged so
55 as to open the motor circuit and apply the brake

when the car arrives near the upper and lower landings or stations.

The switch and the operating projections or cams are so located as to automatically stop the car just before it reaches its lowest position on the down trip and to stop the car just after it has reached its upper limit of travel and started to move down so that the weight of the car when it is stationary is always applying some tension on the driving chain. Consequently when the motor
65 starts to rotate it has practically no gravity load to overcome. The entire structure may be assembled in a framework which can be transported and readily erected at the desired location.

Other advantages will be understood from the following specification.

Fig. 1 is a fragmentary front view of an installation involving my invention as applied to a dumb waiter or similar mechanism operating from one floor or landing to another.

Fig. 2 is a side view and partial section of the same.

Fig. 3 is a plan view showing the same mechanism, parts being broken away and parts being shown in cross section.

Fig. 4 is a side view showing the brake in the released position and its operating magnet and control switch.

Fig. 5 is a fragmentary rear view showing the connecting rod and stops.

Fig. 6 is a fragmentary edge view showing the upper sprocket and driving chain.

Fig. 7 is a fragmentary detail showing the lower sprocket with the limit switch.

Fig. 8 is a detail view of the motor control switch.

Fig. 9 is a wiring diagram of the installation.

The car or lift 10 may be of any suitable construction and guided in any suitable manner by upright rails 11. Usually at least a part of the construction will be enclosed in a shaftway 12 and doors such as 13 and 14 may be provided at the various loading platforms, landings, floors or levels.

100 In the form shown, a chain 15 is provided for controlling the raising and lowering of the car. This chain travels on guide sprockets 16 and 17 which are suitably supported at the upper and lower parts of the installation. The car is connected to the chain by a rod or bar 18 which is pivoted at 19 to any suitable part of the car and pivoted at 20 to the chain. Stops 21—21 are preferably provided to limit the swinging movement of the connecting rod so that no excessive
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lateral thrust can be applied to the chain by the weight of the car.

The lower sprocket 17 and the chain are driven by a motor 22 of any suitable type, preferably an electric motor which is adapted to drive in one direction only. The armature or rotating member of the motor may, of course, be suitably geared to the sprocket 17 preferably through a usual worm gear. The motor serves to raise the car and to control its descent.

In order to stop the motor and the chain and car, I provide a suitable form of brake mechanism which includes a brake drum 23 on the armature shaft of the motor.

Brake shoes 24 are carried by levers 25. A spring 26 is adapted to bring the brake shoes into action and an electric solenoid magnet 27 with a core 28 attached to the bar 29 is adapted to retract the brake shoes when the magnet is energized. Any suitable form of brake mechanism might, however, be employed.

The electrical system for controlling the operation of the apparatus includes two contacts 30, 31 of an electro-magnetic switch in the motor circuit, an automatic limit switch 32 and push button or other manually operable starting switches 33 and 34. The movable parts of the switches 30 and 31 are carried by an upright 35 which is normally lifted by spring 36. Springs such as 37 and 38 may provide yielding backings for the movable contacts 30 and 31. The connection 39 in the form of a lever is interposed between the head of the magnet core 28 and the switch plunger 35 so that when the magnet is energized the lever 39 is depressed and the switches 30 and 31 closed, the brakes released and the motor armature free to rotate.

The limit switch 32 may be of any suitable construction and has a movable spring pressed actuating member 40. When this actuator member is projecting, the switch is closed and when the actuator is pressed inwardly the switch is open. The chain 15 is provided with two cams 41 and 42 which are adapted to press the switch actuator 40 inwardly to open the circuit and stop the motor. The cam and actuator may be designed to start the motor instantly when the cam begins to move or a time delay action may be obtained by suitable design and arrangement of the cams and switch.

Door actuated switches 43 and 44 may also be provided so that the apparatus will not operate unless the doors are closed. Such switches are of course well known in this art.

Manually operable emergency stop switches 45 and 46 may also be provided if desired. A main control or entrance switch 47 will also ordinarily be employed.

Under normal circumstances if we assume the car to be at the bottom of the shaft as shown in Figs. 1, 2 and 7, the condition of the switches would be as follows: The entrance or control switch 47 will be closed; the starting switches 33 and 34 will both be open; the motor switches 30 and 31 will both be open; the limit switch 32 will be open; the emergency switches 45 and 46 will both be closed, and we will assume both door switches 43 and 44 to be closed. To start the car we will assume switch 33 to be closed. Current will then flow from the right hand side of the line through the switch 33 and the magnet coil 27 to the left hand side of the line. The magnet is thus energized and draws down the core 28 which releases the brake to permit the motor to operate and closes the switches 30 and

31 and thus completes a shunt through the motor 22. As soon as the motor starts to turn, the chain 15 carries the actuating cam 41 out of the path of movement of the switch actuator 40 so that the switch 32 is automatically snapped on thus closing the circuit around the switch 33 so that when switch 33 is released the motor continues to operate.

It will be noted that in the vertical installation as the connection 20 is above the lowest point on the sprocket 17, the weight of the car tends to start the movement of the chain when the brake is released.

It will also be noted that the load is applied gradually as the pin 20 rises around the sprocket so that the motor has time to get up speed before the full load is applied. In fact the load assists the motor in starting and thus eliminates starting jerk. By the use of counterweights I can balance the weight of the car so as to reduce the load on the motor to a minimum.

When the chain has driven the car to the upper floor, the cam 42 engages the switch actuator 40 just as the connection 20 passes the highest point on the upper sprocket 16. This opens the circuit through the limit switch 32, de-energizes the magnet coil 27, releases the core 28 and the spring 26, closes the brake shoes 24 against the brake drum 23 and stops the motor, the chain, and the car, with the weight of the car on the down side of the chain 15.

From the foregoing description it will be seen that if either door is opened while the car is in motion it will break the circuit and stop the motor and car immediately in the same manner as the automatic opening of the switch 32.

If at any time while the car is in motion it is desired to stop it, one of the push buttons 45 or 46 may be operated to open the circuit in the same manner as above described. The invention particularly lends itself to a unit assembly for factory production and installation by simple erection on the job. For this purpose the guide rails 11 may be connected by a number of cross bars such as 50 and 51 and 52 so as to constitute a framework.

The motor, brake and electro-magnetic switches may be secured to the bottom cross bar or plate 50. The various other switches may be carried by the uprights. The upper sprocket may be carried by the cross bar 51. Such an arrangement ensures proper factory inspection and alinement.

One of the advantages of this arrangement is that no overtravel of the car is possible. It is therefore unnecessary to provide extra clearance space above or below the car. I also avoid the need of safety or so-called overtravel cut-out switches.

While I have shown and described the preferred construction and arrangement, I wish it understood that the invention is not limited to the particular construction or to the circuit arrangements except as required by the claims and that many features of the invention may be applied to other uses although it is especially adapted to the control of vertically movable devices.

Although I have shown and described apparatus designed to serve two landings, it should be understood that the car can be stopped at any number of intermediate stations or levels.

I claim:

1. A dumb waiter construction comprising a vertically movable car, a chain for raising and lowering the car, guides for said chain, a motor for driving said chain, a rod connecting the car

and the chain, a cut-out switch for the motor and cams carried by the chain for actuating said switch, said cams and said connecting rod being arranged with respect to the switch so as to stop the motor while the weight of the car is on a descending branch of the chain so that gravity will assist in starting the motor.

2. A dumb waiter construction embodying a car, upper and lower sprockets, a driving chain operating on said sprockets, guides for confining the car to vertical movement, a connecting rod hinged to the car and connected to said chain, an electric motor for driving said chain in one direction only, a brake for stopping the motor, a single electro-magnetic switch mechanism actuated by the movement of the chain for applying the brake when the car reaches a predetermined position and means for releasing the brake and starting the motor while the point of connection between the rod and the chain is on one of the respective sprockets so as to permit the load to be applied gradually to the motor.

3. A dumb waiter construction including a vertically movable car, a rod connected to said car, a chain connected to said rod for raising and lowering the car, guides for confining the car to vertical movement, an electric motor for driving said chain, a switch in the motor circuit, two cams carried by the chain spaced apart from each other for actuating the switch to stop the motor when the car is at its lower loading level and also for stopping the motor when the car is at its upper loading level, said rod being disposed in such a position when the car is in either of said positions as to permit the weight of the car to aid in starting the motor gradually.

4. A dumb waiter construction comprising a vertically movable car, a chain having an ascending and a descending branch for raising and lowering the car, guides for said chain, a motor for driving said chain in one direction only, a single cut-out switch and a brake for stopping the motor and a cam carried by the chain for actuating said switch and applying the brake, said cam being arranged with respect to the switch so as to open the motor circuit and apply the brake and hold the car while the weight of the car is on a descending branch of the chain so that gravity will assist in starting the motor when the brake is released.

5. Dumb waiter apparatus comprising upper and lower sprockets, an electric motor for driving one of said sprockets, a chain connecting said sprockets, a single car, lateral guides for said car, a connecting rod pivoted to said car and to said chain, stops for limiting the lateral movement of said rod, a switch for controlling the motor circuit, and a cam movable with the car for opening the motor circuit, the point of connection between the rod and the car being located between the two runs of the chain.

6. Dumb waiter apparatus comprising a car, a chain having guiding means at upper and lower points, an electric motor for driving said chain in one direction, brake mechanism for stopping the motor, switch mechanism for opening the motor circuit, means of connection between said car and said chain, and means movable with the car for opening the switch while the weight of the car is applied to said chain in the same direction as the power of the motor.

7. Dumb waiter apparatus comprising a car, upper and lower guides, a chain traveling on said guides and connected to said car for raising and

lowering the same, an electric motor for driving said chain in one direction only, an electro-magnet including an armature, a normally open starting switch adapted to close a circuit through said magnet, brake mechanism for stopping the motor, the armature coacting with the remainder of the magnet for releasing the brake, two switch members adapted to be closed when the electro-magnet is energized, a circuit having two branches including said switches and the motor so that the motor is energized when the magnet is energized, one of said switches being located in each branch of the motor circuit, and an automatic switch adapted to close a circuit between the motor and the electro-magnet in shunt with the motor as soon as the brake is released and the car starts to move.

8. A construction comprising a movable carrier, guides therefor, a chain for moving the carrier on the guides, sprockets for said chain, a motor for driving said chain, means connecting the carrier and the chain, a cut-out switch for the motor and cams carried by the chain for actuating said switch, said cams and said connecting means being arranged with respect to the switch so as to stop the motor while the weight of the carrier is on a descending branch of the chain so that gravity will assist in starting the motor and the resistance of the load will be applied gradually as the motor starts to rotate.

9. A power construction embodying a carrier, two spaced sprockets, a driving chain operating on said sprockets and connected to the carrier, guides for confining the movement of the carrier to reciprocation in a straight-line an electric motor for driving one sprocket and said chain in one direction only, and a single electro-magnetic switch mechanism actuated by the movement of the chain for stopping the carrier at two predetermined points.

10. Power apparatus comprising two spaced sprockets, an electric motor for driving one of said sprockets, a chain connecting said sprockets, a carrier, a connecting rod pivoted to said carrier and to said chain, guides for confining the movement of the carrier to straight line reciprocation stops for limiting the movement of said rod to prevent spreading of the chain, a switch for controlling the motor circuit, and a cam movable with the carrier for opening the motor circuit.

11. Power apparatus comprising a carrier, two spaced guide sprockets, a chain traveling on said sprockets, an electric motor for driving said chain in one direction only, an electro-magnet, a normally open starting switch adapted to close a circuit through said magnet, spring actuated brake mechanism for stopping the motor, an armature coacting with the magnet for releasing the brake, two switch members adapted to be closed when the electro-magnet is energized, a circuit directly including said switches and the motor so that the motor is energized when the magnet is energized, said switches being located in separate branches of the motor circuit, and an automatic switch adapted to close a circuit between the motor and the electro-magnet in shunt with the motor when the brake is released and the carrier starts to move.

12. An elevator system comprising a car, guides for confining the movement of the car, a continuous chain, a pair of supporting sprockets for the chain, one of said sprockets being located near each end of the guides, an electric motor rotatable in one direction only and geared to one of the sprockets to drive the chain in one direction

only, means of connection between the chain and the car to permit the car to slide back and forth on the guides as the chain is driven by the motor, a spring-pressed brake for stopping the motor and car, an electromagnetic device adjacent the motor for releasing the brake and starting the motor, a single switch for opening the circuit of the electromagnetic device to de-energize it, two cams carried by the chain spaced apart from each other to actuate said single switch and permit the brake to stop the motor when the car is at the opposite ends of the guides respectively, and a manually actuated switch and

direct circuit connections for energizing the electro-magnetic device to release the brake and start the motor.

13. A dumb waiter construction comprising a car, a chain connected to said car for driving the same, means for confining the car to vertical movement, a motor for driving said chain, a single switch, and spaced cams carried by the chain for actuating the switch to stop the motor when the car is at a lower level and also for stopping the motor when the car is at an upper level.

BJARNE HENRICKSEN.

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