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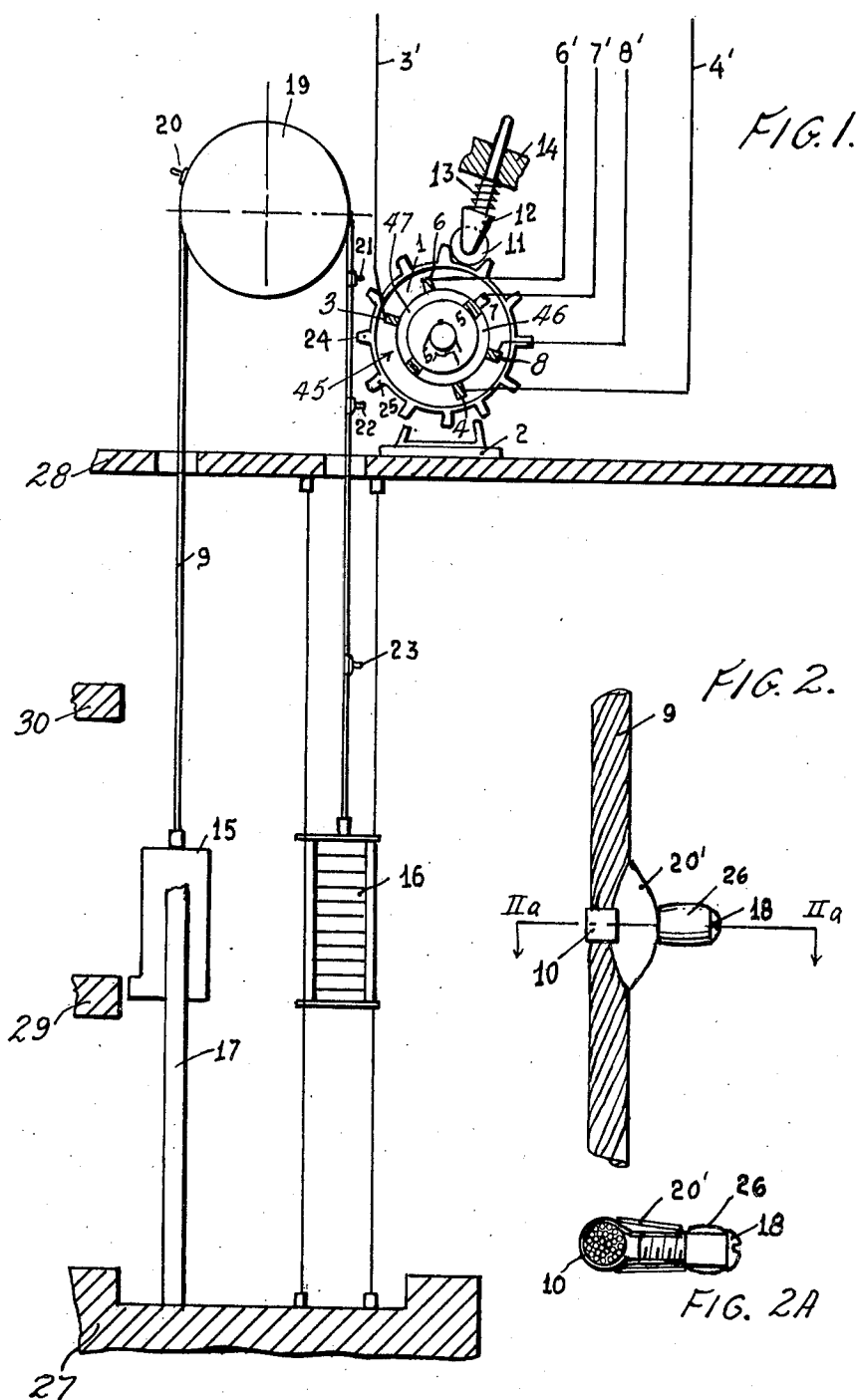
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INTERMITTENTLY ACTUATED SWITCH SELECTOR FOR AN ELEVATOR CONTROL

Filed Sept. 28, 1961

2 Sheets-Sheet 1



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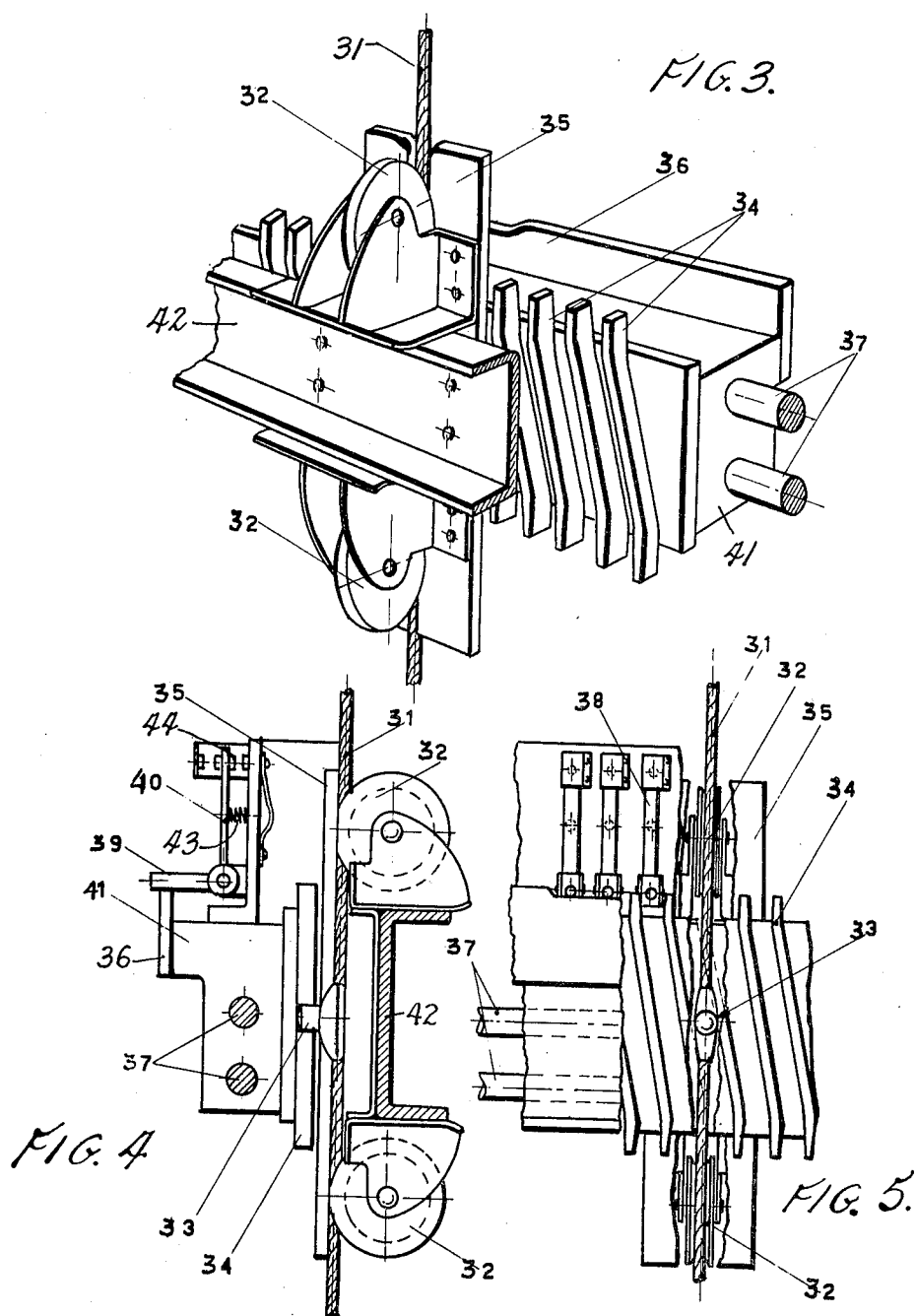
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INTERMITTENTLY ACTUATED SWITCH SELECTOR FOR AN ELEVATOR CONTROL

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9 Claims. (Cl. 187-29)

It is known that the operating circuit for lifts requires the use of a switch/commutator. According to the known art, shifting of the commutator lever, when the cage is moving towards the floor, is caused by a pattern having inclined planes, so as to produce in succession a contact which performs the following two operations:

- (a) Breaking the ascending or descending circuit;
- (b) Switching the opposite descending or ascending circuit for the subsequent operation.

Selector systems are known in which all of the operating and controlling members may be assembled within a small space. These so-called stopping selectors may be controlled either mechanically or by electric impulses.

The mechanically operated selector has the drawback of being unable to ensure a perfect adjustment with respect to the stop positions on the floors due to the circumstance that the amplitude of movement of the operating pattern is on a reduced scale with the respect to the travel of the cage. The electric pulse selector, while removing the drawbacks of the mechanically operated selector, requires special expensive electrical equipment sometimes undergoing phase displacements.

The object of the present invention is to provide an operating and controlling motion transmitting selector means whose commutation movement takes place intermittently within the limits defined by the movement of the cage towards the floor, through the use of abutments mounted on the back of the suspension cables which intermittently engage projections on the motion transmitting selector which is integral with the commutation disc.

The invention also relates to an improvement of a system for transmitting intermittent movement by means of mechanical impulses produced by other abutments entering the device and which are suitably applied on a cable directly connected to the cage mechanism.

This invention, has the advantage of producing, by mechanical means the commutation movement at the same rate as that of the cage and the consequent adjustment with respect to the stop positions on the floors with the same precision as that achieved by the expensive system consisting of commutators arranged along the whole space traversed by the cage. Additionally, possible impingements of the abutments with the operating member of the selector may be avoided, which impingements might possibly occur with the first form of the present invention.

Two embodiments of the invention are illustrated in the annexed drawings and it will be understood that the invention is not limited to the illustrative examples thereof chosen for the purpose of the disclosure. In the drawings:

FIG. 1 is an elevational, somewhat diagrammatic view of an elevator arrangement equipped with the control apparatus of the invention;

FIG. 2 shows a detail of the apparatus of FIG. 1 on an enlarged scale;

FIG. 2A is a sectional plan view of the device of FIG. 2, the section being taken on the line IIa-IIa;

FIG. 3 shows another embodiment of the elevator control apparatus of the invention in a perspective view;

FIG. 4 is a side-elevational, partly sectional, view of the apparatus of FIG. 3; and

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FIG. 5 illustrates the apparatus of FIG. 3 in a fragmentary front elevational view, certain elements being broken away to reveal internal structure.

Referring now to the drawing in detail, and initially to FIG. 1, there is seen a building represented only by portions of its foundation 27, of the ceiling 28 of its top floor 30, and of an intermediate floor 29. An elevator cage 15 is suspended from the pulley 19 of a drive motor, not itself shown, by means of a cable 9 trained over the pulley, and a counterweight 16 as is conventional. The elevator cage carries a trailing cable 17.

The control station for the elevator includes a bracket 2 mounted above the top floor ceiling 28 and carrying a motion transmitting member spaced from the cable 9 in the form of a toothed wheel which is rotatable on the bracket 2 about a horizontal axis. A support 12 is slidably mounted on a portion 14 of the fixed building structure. The support 12 carries a roller 11. A spring 13 acting on the support 12 urges the roller 11 to move radially toward the wheel 1 and to engage an interstice between the teeth or projections of the wheel. The twelve teeth 24, 25 etc. of the latter are shaped to displace the roller 11 radially outward when the wheel 1 is rotated with a force sufficient to overcome the spring 13.

A cylindrical commutator 45 is fixedly and coaxially mounted on the wheel 1. The commutator has two conductive segments 46, 47 separated by two relatively narrow circumferential segments 5, 5 of insulating material. Five carbon brushes 3, 4, 6, 7, 8, are angularly spaced 60° apart about the common axis of the wheel 1 and of the commutator 45, leaving a 120° gap between the brushes 3 and 4. The brushes abut against the cylindrical commutator face and are each spaced from an adjacent brush by an angle relative to the axis which is equal to twice the angular spacing of 30° of the teeth on the wheel 1.

Four identical abutment members 20, 21, 22, 23 are spacedly mounted on the cable 9 and define a path of travel intermediate the cable and motion transmitting member. FIGS. 2 and 2A show one of the abutment members together with the portion of the cable 9 on which it is mounted, in elevation and sectional plan view respectively. Each abutment member consists essentially of a clamp 10 which is tightened about the cable 9 by a screw 18 and is partly protected by a wedge-shaped cover 20'. A portion of the shank of the screw 18 projects outwardly of the cover perpendicularly to the cable 9. A roller 26 is rotatable on the projecting shank portion and held in position by the head of the screw 18 and the cover 20'. The cable 9 cannot rotate about its longitudinal axis and the screws 18 with their rollers 26 are arranged in such a manner as to project from the cable in a direction which is radially outwardly from the pulley 19 when the cable portions carrying the abutment members travel over the pulley.

The wheel 1 is arranged in such a manner that the abutment members 20, 21, 22, 23 engage one of the teeth 24, 25 when such one tooth moves into the path of travel of the abutment members moving past the wheel. The engagement between an abutment member on the cable and a projection on the wheel serves to index the wheel 1 by an angle of 30° corresponding to the spacing of two adjacent teeth. The wheel 1 is arrested in the indexed position by the spring loaded roller 11 after passage of an abutment member.

The relays and other circuit elements which control the motor driving the pulley 19 have not been shown but it will be understood that they include the conventional relays for actuating ascending and descending motion of the elevator, and floor relays corresponding to the three floors of the building between which the elevator travels. The carbon brushes 6, 7, 8 are connected by respective conductors 6', 7', 8' to the floor relays. When the eleva-

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tor cage 15 is on one of the floor levels, the corresponding brush registers with an insulating segment 5. The abutment member 20 is coordinated with the top floor position of the elevator cage 15, the abutment member 23 with the ground floor position and the two spaced abutment members 21, 22 with the intermediate floor position for respective action during the ascending and descending movements of the elevator cage 15.

The afore-described elevator arrangement operates as follows:

As shown in FIG. 1, the elevator cage 15 is stopped on the intermediate floor and the carbon brush 7 coordinated with this floor faces an insulating segment 5 of the commutator. When the ground floor relay is actuated by a command button in the usual manner, a circuit is closed for initiating descent of the elevator cage 15. This circuit includes the carbon brush 8, the conductive commutator segment 46, the carbon brush 4 and the conductor 4' which leads from the brush 4 to a remote control switch. The cage 15 descends, the abutment member 22 engages the tooth 24 and transmits movement of the cable 9 to the wheel 1 which is indexed one tooth spacing. The tooth 25 now occupies the space in which the tooth 24 is shown in FIG. 1. The rotation of the wheel 1 shifts the commutator 45 so that the carbon brush 7 is in contact with the conductive segment 47 and thereby with the conductor 3' leading to a remote control switch for actuating upward elevator movement. The control device is ready to respond to a command for upward movement from the ground floor.

When the elevator cage 15 reaches the ground floor, the abutment member 23 engages the tooth 25 and indexes the wheel 1 by one more tooth spacing. The commutator 45 is thereby positioned in such a manner that the carbon brush 8 registers with the insulating segment 5, the descent circuit is interrupted and the elevator is stopped. It will be apparent to those skilled in the art that the control apparatus illustrated in FIG. 1 and described above is also effective in controlling other upward and downward movement of the elevator between the three floors shown. During such movement, the switches constituted by the brushes 3, 4, 6, 7, 8 and the segments 46, 47 are sequentially actuated.

FIGS. 3, 4 and 5 illustrate another embodiment of the invention. The building, the elevator and its drive have been omitted from the showing of FIGS. 3 to 5 but will be understood to be substantially as shown in FIG. 1.

There is seen a portion of an elongated cable 31 attached to an elevator cage for movement therewith. An abutment member 33 substantially identical with that shown in FIGS. 2 and 2A is attached to the cable portion and it will be appreciated that the cable 31 carries as many additional spaced abutment members as are required for control of the elevator. The fixed portion of the control apparatus includes two grooved pulleys 32 which guide the cable 31 and prevent its lateral displacement while at the control station formed by the fixed control apparatus portion. The pulleys 32 are rotatably mounted on a beam 42 fastened to the non-illustrated building, or an integral part thereof.

Movement of the abutment member 33 through the control station is guided by two plates 35 fastened on the beam 42 and defining therebetween a slot in which a portion of the abutment member 33 travels. The member 33 projects from the slot into one of several parallel grooves formed between cam ribs or projections 34. The ribs 34 are mounted on a slide 41 which is freely movable transversely of the cable 31 in spaced relation thereto on two guide rods 37. The grooves between the cam ribs or projections 34 have respective entrance and exit portions parallel to the direction of elongation of the cable 31 and a central portion intermediate the entrance and exit portions which is inclined at such an angle that the entrance portion of each groove is longitudinally aligned with the exit portion of an adjacent groove.

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The slide 41 has a switch cam 36 mounted thereon. The cam sequentially actuates the movable contact carriers 38 of as many switches as are required to operate an elevator in the manner apparent from the description of the first embodiment of the invention. Each movable contact carrier is a bell crank lever pivoted on one of the plates 35. One arm 39 of the lever engages the face of the switch cam 36 under the pressure of a spring 43 acting on the other arm 40 which also carries the movable contact 44 of the switch.

When one of the abutment members, of which the member 33 is an example, moves through the control station, it is guided by the plates 35 to enter a groove between two adjacent cam ribs 34 on the slide 41. Since the abutment member 33 is restrained to travel in a rectilinear path, it engages an obliquely inclined contact face of one of the cam ribs 34 and indexes the slide 41 by the transverse center-to-center spacing of two adjacent ribs. Inertial movement of the slide 41 is arrested while the abutment member 33 passes through the exit portion of the groove. When the abutment member 33 leaves the groove, an adjacent groove is positioned within the path of travel of the abutment members 33 to receive the next abutment member on the cable 31. The switch cam 36 is moved transversely in intermittent indexing steps during sequential longitudinal passage of the abutment members through the control station. The manner of wiring the several switches illustrated in circuit with the elevator relays will be apparent to those skilled in the art from the description of the apparatus of FIG. 1 in the preceding portions of this disclosure.

The advantages achieved with the invention have already been made clear at the beginning of the specification and it is added that the simplicity of realizing the whole device facilitates the work of the installer and of the services of maintenance, as compared with the devices as now in use, chiefly because of the movement of the cams of maintenance being always performed in a very convenient position for any operation to be carried out.

Moreover, the system of the collector according to the invention—whose movement of commutation takes place intermittently and by means of cams meshing from time to time, with reference to the improvement according to which the cams are applied to a cord directly connected with the mechanism of the cage—permits to achieve with great precision that at every passage of a cam the operating member is displaced by a distance which is equal in both directions, thus preventing also the cam from violently striking against the operating member of the selector.

The invention has been disclosed and illustrated by way of example only, without any limitation. Of course, it is likely to undergo all such modifications as may be suggested by the art or by putting it into effect, without thereby departing from the scope of the invention itself.

What I claim is:

1. In an elevator arrangement, in combination:

- (a) elevator cage means adapted to travel along a predetermined route;
- (b) elongated cable means having a portion secured to said cage means for longitudinal movement of said cable means past a fixed control station when said elevator cage means travels along said route;
- (c) a plurality of abutment members fastened on said cable means in longitudinally spaced relationship and defining a path of travel spaced from said cable;
- (d) a plurality of switch means;
- (e) intermittent motion producing means including a motion transmitting member supported at said control station in spaced relation to said cable having spaced projections thereon, at least one of which is normally positioned in said path of travel engageable by said abutment members during said movement of said cable means and operatively connected to said switch means for respectively actuating the

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same in predetermined sequence when sequentially engaged by said plurality of abutment members; and

(f) there being substantial spacing between adjacent abutment members whereby an intermittent indexing movement is imparted to said motion transmitting member by said longitudinal movement of said cable.

2. In an arrangement as set forth in claim 1, said motion transmitting member including a rotatable wheel, a plurality of teeth on said wheel, said teeth being angularly spaced about the axis of rotation of said wheel and sequentially engageable with said abutment members for indexing rotation of said wheel by said members, said wheel being operatively connected to said switch means.

3. In an arrangement as set forth in claim 2, said switch means including commutator means coaxially secured to said wheel for joint rotation, said commutator means including a plurality of contact faces and insulator means circumferentially interposed between said contact faces for insulating the same from each other, a plurality of fixed contact members angularly spaced about said commutator means for sequential contact with said contact faces and said insulator means during said indexing rotation, and conductor means for connecting said fixed members in circuit with control apparatus for said elevator cage.

4. In an arrangement as set forth in claim 3, the angular spacing of said fixed contact members being twice the angular spacing of said teeth.

5. In an arrangement as set forth in claim 2, arresting means for arresting said indexing rotation of said wheel after an angular displacement thereof corresponding to the angular spacing of two adjacent ones of said teeth.

6. In an arrangement as set forth in claim 1, releasable fastening means for fastening each of said abutment members to said cable.

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7. In an arrangement as set forth in claim 1, said motion transmitting member including slide means movable transversely of the direction of elongation of said cable means, and a plurality of cam means having respective face portions extending obliquely relative to said direction and respectively engageable with said abutment members for actuating indexing movement of said slide means; and switch actuating means on said slide means for actuating said switch means in predetermined sequence during the indexing movement of said slide means.

8. In an arrangement as set forth in claim 7, said cam means defining therebetween a plurality of substantially parallel grooves, each groove having an entrance portion and an exit portion parallel to said direction of elongation, and an intermediate portion connecting said entrance and exit portions and obliquely inclined relative to said direction, the entrance portion of each groove being longitudinally aligned with the exit portion of an adjacent groove.

9. In an arrangement as set forth in claim 1, said abutment members having each a portion projecting transversely from said cable means, and means for guiding said abutment member in a plane parallel to the direction of elongation of said cable means while said abutment member is located adjacent said station for engagement with said motion transmitting member.

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