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Elevator governor

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(73) Proprietors
Otis Elevator Company
(USA-New Jersey)
Ten Farm Springs
Farmington
Connecticut 06032
United States of America

(72) Inventor
Werner Koppensteiner

(74) Agent and/or
Address for Service
Frank B. Dehn & Co.,
Imperial House,
15-19 Kingsway,
London WC2B 6UZ

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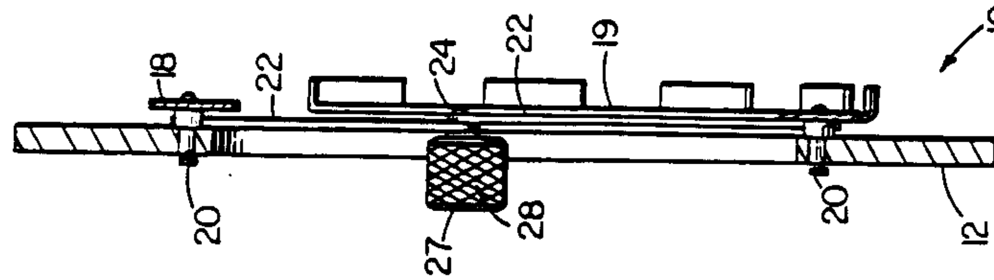

FIG. 2

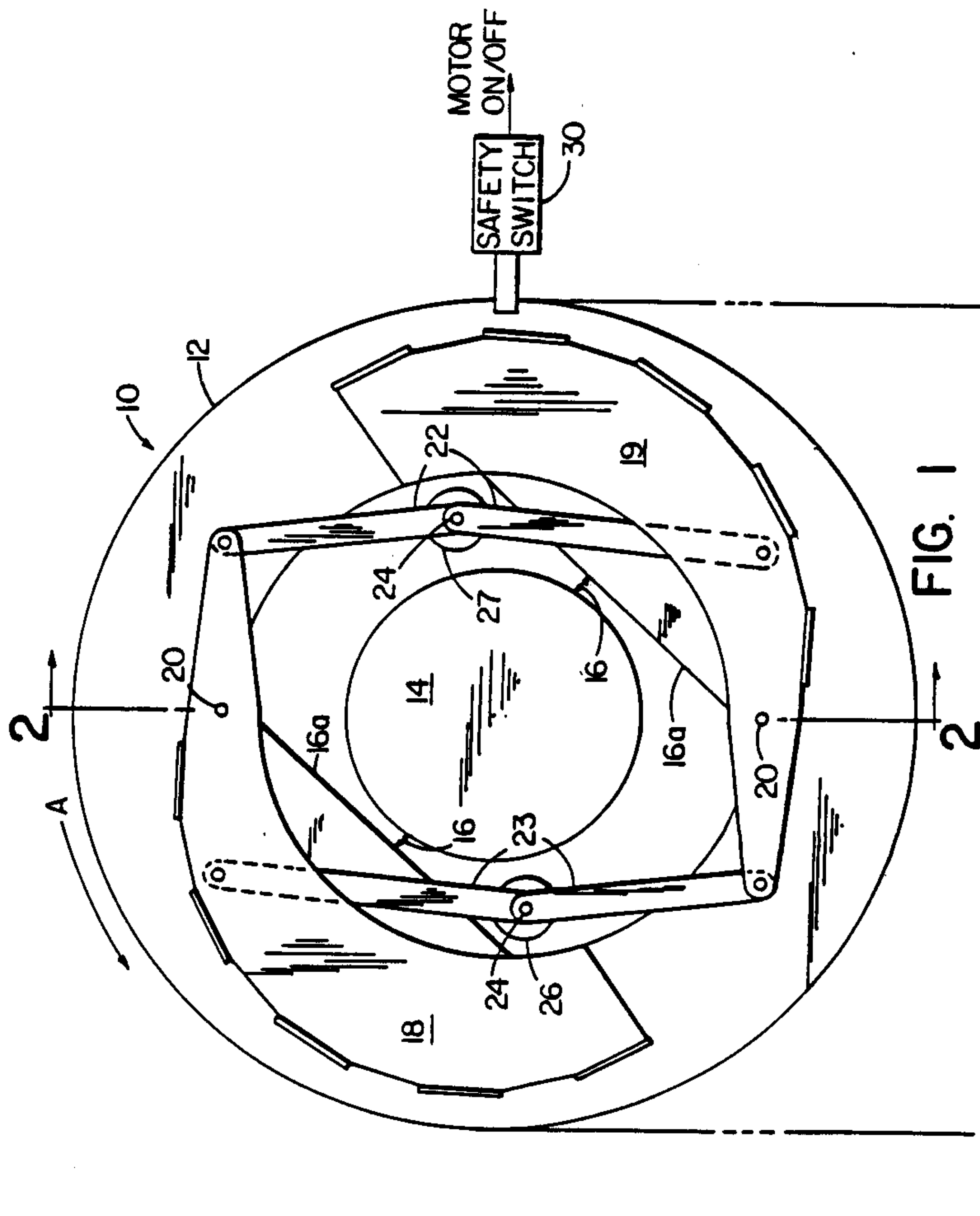

FIG. 1

Elevator Governor

This invention relates to elevator systems, specifically, the speed governors commonly used in elevator systems.

The typical elevator governor may consist of a disc that is driven by a governor rope secured to the car of the elevator, and may include at least one flyweight mounted on the disc. The flyweight responds to excessive speed by progressively moving outward under its own centrifugal force to push against a spring force, ultimately stopping the disc at a certain speed, which abruptly stops the rope. The rope is secured to an elevator safety mechanism actuated by the governor operation to bring the elevator car or the counterweight to a safe stop.

Most regulations on the construction of elevators specify that governors should also operate at a speed increase of about 20%-40% over maximum to deenergize the elevator drive motor. Typically this is done by operating a safety switch. This operation is in addition to the operations of the mechanical safety mechanism that typically slows the elevator car and/or counterweight by engaging a guide rail when the car or counterweight moves down.

One type of governor has a rubber roller that is mounted on a lever, and rolls over a polygon-shaped disc so that the disc may be progressively stopped when the lever is lifted or moved as a function of the disc speed.

Another type of governor has a flywheel which operates a linkage that clamps the elevator governor rope. In this device the flywheels are forced against the inside surface of the governor housing, stopping the disc and applying force to the rope.

Among the disadvantages to these and other similar governors is that the response time, that is, the time required to engage the safety mechanism after the maximum speed condition has occurred, is relatively long and also variable. In most cases the reason is that the governor disc can only be stopped at discrete angular positions. This is particularly true of governors having polygon-shaped discs. They also suffer from knocking noise, as a result of the shape of the discs. This noise is evidence of the inherent discontinuous type of operation such governors provide. These and other governors respond only to speed increase of the governor rope above a predetermined value, not to excessively high accelerations (second derivative changes).

According to the invention there is provided an elevator governor characterised by:

a stationary surface;

a disc that is rotatable by a rope around the stationary surface, the disc having at least one surface opposite the stationary surface that defines a wedged or tapered space between the stationary surface and the disc;

a pair of weights that are pivotally mounted on the disc and mechanically interconnected so that the weights pivot simultaneously in the same radial direction; and

a roller which is carried on the disc and located between the disc and the stationary surface and connected to the weights to be progressively moved into the tapered area as the weights pivot in a first direction in response to disc rotational speed, said roller mechanically connecting the disc and the stationary surface when the weights pivot to a first position.

According to the invention there is also provided an elevator governor including a fixed cylindrical surface, a flywheel rotatable coaxially of said cylindrical surface, said flywheel having at least one wedging surface defining a tapered space between said fixed surface and said wedging surface, a pair of flyweights pivotally mounted on said flywheel and at least one braking roller carried by said flywheel and located in said tapered space between said cylindrical and wedging surfaces, said roller being connected to both said flyweights so as to be progressively moved into said tapered space upon pivotal movement of said flyweights under centrifugal force so that said roller will engage said fixed and wedging surfaces to brake said flywheel at certain pivotal positions of said flyweights corresponding to excessive speeds of said flywheel.

Preferably the inertial masses of the flyweights about their pivot points are different and acceleration of said flywheel results in different pivotal movements of said flyweights, the connection of said roller with said flyweights serving to move said roller into contact with said fixed and wedging surfaces to brake said flywheel at certain differential pivotal positions of said flyweights corresponding to excessive acceleration of said flywheel.

In a preferred form of the present invention, a microswitch may be located adjacent to the disc so as to be activated when the weights move out about their pivot points to a certain position. This microswitch may be used to deactivate the drive motor of some form, as in some prior art governor applications, when the car or counterweight is ascending.

Other features, benefits, and attributes of the invention may be apparent from the following description of a preferred exemplary embodiment of the invention with reference to the accompanying drawings wherein:

Fig. 1 is an elevational view of a governor embodying the present invention; and

Fig. 2 is a section on the line 2-2 in Fig. 1 of certain parts of the governor.

In the governor 10 shown in Fig. 1, a flywheel 12 or disc rotates coaxially around a cylindrical fixed or stationary surface 14. This flywheel or disc is configured relative to the stationary surface so as to have at diametrically opposite points tapered areas or gaps 16, in this case, achieved by providing basically parallel surfaces 16a on diametrically opposite points around the stationary surface. (As developed later in this description, these tapered gaps provide a wedge braking surface which is used to rapidly decelerate the flywheel as it rotates in direction A). The flywheel is connected to a rope which may be connected to an elevator car or counterweight so that the flywheel is rotated as either the car or counterweight moves.

The governor in Fig. 1 includes two flyweights 18,19 which are generally located on diametrically opposite sides of the disc. Each of these weights pivots around its own pivot point 20 on the disc. They are interconnected by two rod pairs 22,23. One pair is connected to one side of the flyweight with respect to its pivot or rotational point, and the other is connected on a diametrically opposite side with respect to that pivot point. As a result, when one flyweight pivots, it automatically imparts similar pivoting force to the other flyweight. When the counterweights pivot outwardly under centrifugal force each rod pair moves inwardly - towards the stationary surface. At the pivot point 24, between each rod 25, there is a braking or stopping roller 26,27 which has a roughened or spline-like surface 28 (see Fig. 2). As the flyweights move outwardly, each rod pair is moved progressively towards the center of rotation, and each roller is thereby moved towards the center of rotation also. In addition, however, each roller is also moved in the clockwise direction (opposite direction A), due to the pivoting of the weights that occurs around their pivot points. When the flyweights move far enough outwardly, each roller will engage the circular stationary surface and be located at the tapered area or gap. When this occurs, the roller is jammed or wedged hard into the tapered area. This brings the disc to a very rapid stop, applying force to the rope. As in prior art safety mechanisms, this force may be used to operate a safety device of some sort that is connected to either the car or the counterweight, depending on the installation of the governor.

There is a special relationship between the two counterweights. Preferably, the mass of one counterweight is greater than the mass of the other, and thus the centrifugal force of one is greater than the other at a given speed. This creates two different levels of governor operation. At one level, the weights simply move outwardly as a result of the increase in centrifugal force with speed. At a "tripping speed" the governor operates. (To that extent, the mass of the two weights may be simply added together to compute the overall force applied to the rollers in forcing them into the tapered area, since they are mechanically connected together by the pairs of rods.) According to the second level, the rollers may be moved into position to engage the tapered area at a speed below tripping speed (below the speed at which the roller contacts the stationary surface) if there is sufficient acceleration or deceleration force applied. The reason is this: The two weights do not exert the same centrifugal force about their pivot point, because their masses are different. Because the centrifugal forces are therefore different, there is a small net mass, so to speak, which is responsive to acceleration changes.

One way to achieve this operation was mentioned: simply have one weight have a greater mass than the other. The same result could also be achieved, of course, by arranging the pivot point so that the centrifugal force around one pivot point is greater than the centrifugal force around the other pivot point. (The criteria is basically that the inertial mass around the pivot point of one weight be somewhat greater than the inertial mass around the pivot point of the other weight so that there is a centrifugal force unbalance at all speeds.)

Though not specifically shown in the drawing (because it is well known in the art), a microswitch 30 may be located just along the outside of the rotating disc in a position to be engaged by the counterweights when they move outwardly when the car ascends (the disc rotates opposite direction A).

It will be seen that the preferred form of governor is extremely simple and inexpensive, and requires no maintenance. An intriguing feature is that the disc can be abruptly stopped at any point in its angular rotation around the stationary surface, unlike prior art governors that can only stop at discrete positions. As a result, the tripping action of this governor is extremely precise and rapid, and subject to no variations as a result of the position of the disc when maximum speed is achieved. Another feature is that the governor also responds to acceleration, which results from the unbalance in the centrifugal force of the two weights. Prior art governors, on the other hand, typically respond only to speed conditions, not acceleration.

One skilled in the art may, of course, make various changes and alterations to the particular embodiment that has been shown and described without departing from the scope of the invention embodied therein.

Claims

1. An elevator governor characterised by:

a stationary surface;

a disc that is rotatable by a rope around the stationary surface, the disc having at least one surface opposite the stationary surface that defines a wedged or tapered space between the stationary surface and the disc;

a pair of weights that are pivotally mounted on the disc and mechanically interconnected so that the weights pivot simultaneously in the same radial direction; and

a roller which is carried on the disc and located between the disc and the stationary surface and connected to the weights to be progressively moved into the tapered area as the weights pivot in a first direction in response to disc rotational speed, said roller mechanically connecting the disc and the stationary surface when the weights pivot to a first position.

2. The governor described in claim 1, characterised by:

the pivot points and masses of the weights being selected so that the rotational force of one weight about its pivot point is greater than the other as the disc rotates.

3. The governor described in claim 2, characterised by:

the weights being mechanically connected by two linkages;

each linkage having two sections connected at a pivot point located between the disc and the stationary surface;

one linkage being attached between a first position on one weight and a first position on the second weight, the second linkage being attached between a second position on one weight and a second position on the other weight, the first positions being approximately 180° from the second positions around each weight's pivot point; and

the roller being attached at the pivot point between the sections of one of the linkages.

4. An elevator governor including a fixed cylindrical surface, a flywheel rotatable coaxially of said cylindrical surface, said flywheel having at least one wedging surface defining a tapered space between said fixed surface and said wedging surface, a pair of flyweights pivotally mounted on said flywheel and at least one braking roller carried by said flywheel and located in said tapered space between said cylindrical and wedging surfaces, said roller being connected to both said flyweights so as to be progressively moved into said tapered space upon pivotal movement of said flyweights under centrifugal force so that said roller will engage said fixed and wedging surfaces to brake said flywheel at certain pivotal positions of said flyweights corresponding to excessive speeds of said flywheel.

5. An elevator governor as described in claim 4 wherein the inertial masses of the flyweights about their pivot points are different and acceleration of said flywheel results in different pivotal movements of said flyweights, the connection of said roller with said flyweights serving to move said roller into contact with said fixed and wedging surfaces to brake said flywheel at certain differential pivotal positions of said flyweights corresponding to excessive acceleration of said flywheel.

6. An elevator governor substantially as herein described with reference to the accompanying drawings.

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Applicant:
Otis Elevator Company (USA-New Jersey), Ten Farm Springs, Farmington, Connecticut 06032, United States of America.

Inventor:
Werner Koppensteiner, Rosagasse 18/32, A-1120 Wien, Austria.

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Address for Service:
Frank B Dehn & Co, Imperial House, 15-19 Kingsway, London WC2B 6UZ.

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