A safety brake mechanism mounted on a rotary drive shaft of an elevator incorporates a centrifugally actuable strike element pivotally shiftable to a stop position to engage a stationary stop member under the influence of centrifugal force at a predetermined maximum rotational speed of the drive shaft. A lock cam rotatably attached to the strike element bears against the outer periphery of an annular brake member on which the strike element is mounted for rotation with the drive shaft, and when the strike element shifts to said stop position, a torsion spring rotates the lock cam into a locking position between the strike element and the outer periphery of the brake member to hold the strike element in its stop position against the stationary stop member.

8 Claims, 6 Drawing Figures
LOCK DEVICE FOR ELEVATOR SAFETY BRAKE

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of my copending application entitled "Combined Overspeed Safety Brake and Reverse Holdback Mechanism for Elevators" filed on Apr. 8, 1971, under Ser. No. 132,283. The aforesaid previously filed application is directed to a disc brake in combination with two pairs of pawls or strike elements oriented in opposite directions on a rotary component of a brake mechanism attached to an elevator drive shaft and pivotal to stop positions for engagement with one of a pair of oppositely facing, stationary stop members under the influence of centrifugal force to stop the elevator drive shaft in either its normal direction of rotation or in a reverse direction at a predetermined rotational speed of the drive shaft indicative of an overload condition for mechanical failure. The two sets of oppositely oriented pawls are compactly combined on an annular brake member mounted on the elevator drive shaft to actuate a disc brake upon engagement with one of the stationary stop members to provide a controlled stopping of the elevator drive shaft upon the attainment of runaway speeds in the normal or reverse direction of rotation without undue mechanical shock to the elevator drive system. The above-identified copending application, Ser. No. 132,283 is in turn a continuation-in-part of an earlier filed application entitled "Overspeed Safety Brake for Elevators" filed on Oct. 26, 1970, under Ser. No. 83,703.

The brake mechanisms described in the aforesaid copending applications have proven to be effective safety devices for elevators. However, on some installations a problem has been encountered wherein the strike elements tend to bound off of the stationary stop members which they engage upon an emergency condition, thereby permitting the drive shaft of the elevator to continue to rotate until another strike element revolves around to a position in contact with its stationary stop member. The resulting, intermittent, stop-and-start rotation of the elevator head or drive shaft is of course undesirable. This problem is apparently limited to those installations where there is a resilient mounting of the elevator drive shaft assembly.

Having in mind the aforesaid difficulties associated with the centrifugally actuated strike elements or pawls of the brake mechanism described in the above-identified patent applications, I have developed a lock device which is combined with the pawls or strike elements in such a way as to be operative to hold the strike elements in their outwardly displaced stop positions in engagement with their respective, stationary stop members when the strike elements are actuated by an overspeed condition.

BRIEF SUMMARY OF THE INVENTION

This invention is particularly characterized by the combination with the brake mechanisms of the aforesaid copending patent applications of a lock cam rotatably attached to a centrifugally actuated strike element and spring loaded in such a way that when the strike element is pivotally shifted to its stop position, the lock cam is urged into a locking position wherein it bears against the outer periphery of an annular brake member on which the strike element is mounted and holds the strike element in its stop position outwardly displaced from the periphery of the brake member.

These operational advantages and improvements are achieved by providing a spring which engages the aforesaid lock cam and normally urges it in a rotational direction towards the peripheral surface of the aforesaid annular brake member, the cam having a flat edge portion which bears against the peripheral surface of the brake member with the result that the cam is restrained against rotational movement when the strike element to which it is attached is in its rest position of non-use. The outward displacement of the strike element away from the annular brake member under the influence of centrifugal force provides a space therebetween through which the cam is free to rotate to its locking position under the torsion effect of the spring to hold the strike element in its stop position in engagement with its stationary strike member.

In a preferred form of the invention, the aforesaid lock cam is of generally pie-shape and has an arcuate surface intersecting a straight edge portion which normally bears against the outer surface of the annular brake member, the arcuate surface permitting the cam to smoothly revolve against the arcuate periphery of the annular brake member when the strike element to which the cam is attached pivotally shifts away from the annular brake member under excessive speed conditions.

In a particularly advantageous form of the improved brake mechanism, the strike elements or pawls are of arcuate shape generally conforming to the outer peripheral contour of the annular brake member and are connected to each other in pairs by means of links attached to each pair of strike elements at their opposite ends; and the lock cam for each pair of strike elements is fitted with a hub which is rotatably mounted on an elongated fastener serving to attach one end of a connecting link to one end of one of the strike elements. The cam spring takes the form of a torsion spring coiled around the hub with one free end thereof engaging the cam and tending to urge it in a rotational direction towards the peripheral surface of the aforesaid annular brake member about a rotational axis defined by the longitudinal axis of the fastener.

These and other objects and advantages of my invention will become readily apparent as the following description is read in conjunction with the accompanying drawings wherein like reference numerals have been used to designate like elements throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of the brake assembly of this invention;

FIG. 2 is a vertical section view of the brake assembly taken along lines 2—2 of FIG. 1 and showing one pair of strike elements;

FIG. 3 is a fragmentary, enlarged scale view of a portion of the brake assembly of FIG. 2 showing a strike element and its attached lock cam in their normal, rest positions;

FIG. 4 is an enlarged scale, fragmentary plan view of a portion of the brake assembly of FIG. 1 showing a link and lock cam mounting arrangement on one end of one of the strike elements;
FIG. 5 is a fragmentary, side elevation view of the link and lock cam assembly of FIG. 4 taken along lines 5–5 of FIG. 4, and FIG. 6 is a vertical section view of the lock cam and link assembly of FIG. 4 taken along lines 6–6 of FIG. 5.

DETAILED DESCRIPTION

Referring now to the drawings, I have shown in FIGS. 1 and 2 a double acting safety brake of the type disclosed in my copending application entitled "Combined Overspeed Safety Brake and Reverse Holdback Mechanism for Elevators," Ser. No. 132,283. Such a brake mechanism is designed to prevent runaway travel of an elevator in the downward direction under load and the influence of gravity, in either the normal direction of elevator drive shaft rotation or in a reverse direction. It is to be understood, however, that the particular lock device of this invention may be used with either such a brake mechanism having a double set of centrifugally actuated pawls or strike elements, or with a brake mechanism having a single set of strike elements to stop the elevator drive shaft in only its normal direction of rotation.

The double acting brake mechanism, in combination with which the lock device of this invention is disclosed herein, is mounted on the head or drive shaft 1 of an elevator and includes a disc brake assembly generally indicated by reference numeral 2. Brake assembly 2 includes as a primary component thereof a first annular member 4 in the form of a circular plate having an elongated, cylindrical hub portion 6 connected to drive shaft 1 by a key 8. Coupled to annular plate 4 at a location adjacent the outer periphery thereof are a first plurality of driving brake discs 12 which lie in planes normal to the longitudinal axis of rotation of head shaft 1, and which are laterally spaced along said axis. Discs 12 are coupled to annular plate 4 for rotation therewith by means of a first set of elongated connectors 14 threadedly attached at their inner ends to plate 4. A second plurality of annular, driven braking discs 16 are interleaved with driving discs 12, both sets of discs 12 and 16 extending in parallel planes. Driven discs 16 are coupled by means of a second set of elongated connectors (not shown) to annular wall portion 18 of an annular brake member 20, wall portion 18 being spaced apart from annular plate 4 along the longitudinal axis of head shaft 1 to accommodate brake discs 12 and 16 therebetween. Annular member 20 serves as a clamping device in cooperation with annular plate 4 to tightly hold discs 12 and 16 in frictional association with each other. The construction of brake assembly 2 is not discussed and described in further detail herein, as the particular form and construction of the brake assembly is not essential to the successful operation of the particular lock device which is the subject of this invention. Reference is made to my copending application, Ser. No. 132,283, for a detailed description of the brake assembly and its mode of operation.

The desired frictional pressure between the discs of brake assembly 2 may be adjusted by slidably shifting annular brake member 20 on hub 6 to move annular wall portion 18 thereof along the longitudinal axis of shaft 1 towards or away from circular plate 4. This is accomplished by utilizing a clamping ring 22 which bears against the outer end surface 20a of annular brake member 22 and is attached to hub portion 6 of annular plate 4 by a plurality of circumferentially spaced up screws 24. The tightening of up screws 24 will serve to shift clamping ring 22 and annular brake and clamping member 20 towards annular plate 4 with the result that the brake discs will be more tightly clamped together to increase the frictional coaction therebetween. In this way, the braking force applied by disc brake 2 can be increased or adjusted as required for a particular load on an elevator.

Braking action is accomplished by stopping braking member 20 and driven discs 16 coupled thereto in response to emergency or overload conditions on an elevator or conveyor driven by head shaft 1. For the purpose of preventing runaway speeds of drive shaft 1 in its normal direction of rotation, indicated by the solid arrow in FIG. 2, a first pair of pawls or strike elements 26, 28 are pivotally attached to braking member 20 for rotation therewith. For purposes of distinguishing from a second set of pawls hereinafter described, pawls 26, 28 will be referred to as overspeed pawls. As is most clearly shown in FIG. 2, pawls 26, 28 are of arcuate shape and extend around a cylindrical segment 20b of brake member 20 in generally conforming relation thereto, pawls 26, 28 being extended both ends by links 30, 30a so that they will move together. Pawls 26, 28 are each comprised of end portions or arm sections 26a and 28a of enlarged width, and narrow arm sections 26b, 28b respectively. End portions 26a and 28a are relatively heavy with respect to opposed end portions 26b and 28b. A pair of pivot pins 32 and 34 extending through raised annular collars 20c and 20d of brake member 20 into inner wall portion 18 thereof serve to hold pawls 26 and 28 in place. Pivot pins 32 and 34 extend in a direction generally parallel to the rotational axis of drive shaft 1, reference being made to copending application, Ser. No. 132,283 for a more detailed description and showing of the pivotal mounting arrangement for the pawls. Seated in recesses 38 in the outer periphery of cylindrical portion 20b of brake member 20 are a pair of opposed coil springs 40 which engage narrow, relatively light weight arm sections 26b and 28b of pawls 26 and 28 through aligned recesses 42 therein, and which act to normally urge ends 26b and 28b of pawls 26 and 28 outwardly about pivot pins 32 and 34. In the normal position of use of pawls 26 and 28, enlarged outer end portions or arm sections 26a and 28a thereof will be pivoted inwardly against the peripheral surface of cylindrical section 20b of annular brake member 20.

Coil springs 40 are placed in compression by screws 44 which extend through light end portions 26b and 28b of pawls 26 and 28 and are adjusted as desired to impart a predetermined compression force to springs 40 so that at a predetermined rotational speed of drive shaft 1, heavier end portions 26a and 28a of pawls 26 and 28 will be urged outwardly by centrifugal force against the restraining pressure of springs 40. When this occurs, springs 40 will be compressed in opposition to the peripheral pressure of cylindrical segment 20b of annular brake member 20 and light end portions 26b and 28b of the pawls will swing inwardly until stop elements 46 thereon engage the periphery of cylindrical segment 20b of brake member 20. In this manner, stop elements 46 serve to limit the outward movement of pawl end portions 26a and 28a. In FIG. 2, pawls 26 and 28 are shown in the outwardly pivoted stop positions of end portions 26a and 28a which they will assume when the
predetermined rotational speed of shaft 1, indicative of an overload or runaway condition, has been reached. The outer or leading edges of heavy end portions 26a and 28a of pawls 26 and 28 are provided with contact surfaces in the form of shoulders 48 and 48a shaped and located to strike the upper end of a first, stationary stop block or member 50 when pawls 26 and 28 are urged outwardly to their maximum extent under the effect of centrifugal force at a predetermined, maximum rotational speed of shaft 1. An angled surface 52 at the upper end of stop block 50 serves as a contact surface for shoulders 48, 48a of pawls 26 and 28. Each of the pawls 26, 28 also includes an apertured extension lug or tab 54 by means of which the heavy ends 26a and 28a of the pawls are connected to links 30 and 30a. Stop block 50 is bolted to channel iron beams 56 and 57 forming parts of a support assembly for the drive unit (not shown) coupled to drive shaft 1. Stop block 50 is located in closely spaced relation to the rotary path of overspeed pawls 26, 28 with its contact surface 52 facing in countering relation to the normal direction of rotation of drive shaft 1 in the manner illustrated in FIG. 2. Stop block 50 is thus oriented so that its contact surface 52 will be in position to be struck by contact shoulders 48, 48a on either pawl 26 or 28 in cooperative, stopping engagement therewith when these overspeed pawls are pivoted outwardly to their stop positions in response to the attainment of a predetermined rotational speed of drive shaft 1 indicative of an emergency condition. In FIG. 2, pawls 26 and 28 are shown in their outwardly pivoted, stop positions with contact shoulder 48a of pawl 28 in engagement with contact surface 52 of stop block 50.

In order to prevent reverse rotation of drive shaft 1, and thus to limit travel of an elevator or conveyor in a reverse direction, I have provided a second pair of pawls or strike elements 58, 60 which are also mounted on annular brake member 20. This second set of pawls is constructed and arranged to replace the standard holdback devices of the wedge or roller type conventionally employed on elevator and conveyor head shafts to prevent reverse rotation. To distinguish from the first set of overspeed pawls 26, 28, this second set of pawls 58, 60 will be referred to herein as holdback pawls. Pawls 58 and 60 are not shown and described in detail herein, as they form no essential part of the subject invention. Sufficient to say that pawls 58 and 60 are of the same, elongated, arcuate shape as overspeed pawls 26, 28 and are also mounted in generally conforming relation to the outer peripheral contour of cylindrical segment 20b of annular brake member 20. Pawls 58, 60 are spaced apart from overspeed pawls 26, 28 along drive shaft 1, and are located between annular collars 20c and 20d of brake member 20. Holdback pawls 58, 60 are mounted on annular brake member 20 in inverted or oppositely oriented relation to overspeed pawls 26, 28 and are connected together at their opposite ends by links 62. Like overspeed pawls 26, 28, holdback pawls 58, 60 are preferably comprised of relatively heavy end portions and light end portions, the heavy end 60a and the light end 58b of pawls 58 and 60 being shown in FIG. 1. Pivot pins 32 and 34 for pawls 26, 28 also extend through and serve to pivotally support holdback pawls 58, 60. Apertured connecting lugs 63 on pawls 58, 60 are utilized for connection to links 62 serving to hold pawls 58, 60 together. A spring arrangement essentially the same as that described above with respect to overspeed pawls 26, 28, but not shown and described herein, is utilized to spring-load holdback pawls 58, 60. At a predetermined rotational speed of drive shaft 1 in a reverse direction, opposite to the direction of rotation shown by the arrow in FIG. 2, holdback pawls 58, 60 will pivot outwardly to a stop position wherein contact shoulders 64 formed thereon will engage a cond, stationary stop block 66 having an angled contact surface 68 on its upper end. Second, stationary stop block or member 66 is positioned adjacent to annular brake member 20 in closely spaced relation to the rotary path of holdback pawls 58, 60 at a spaced apart location from first stop block 50. Stop block 66 is oriented oppositely from stop block 50 in the arrangement shown in FIG. 1 so that its contact surface 68 will face in a countering relation to reverse rotation of drive shaft 1. Contact surfaces 52 and 68 of stop blocks 50 and 66 are so located immediately adjacent to rotary paths of the overspeed and holdback pawls as to offer no interference to the rotation of annular member 20 when shaft 1 is rotating at a normal speed and the heavy, contact ends of both the overspeed and holdback pawls are pivoted inwardly by their respective springs.

In order to insure the retention of both overspeed pawls 26, 28 and holdback pawls 58, 60 in their outwardly pivoted stop positions, I have provided a lock device, the construction of which may best be understood by reference to FIGS. 4, 5 and 6. The lock device preferably takes the form of a cam 70 which is rotatably mounted on one of the pawls or strike elements of each set of pawls 26, 28 and 58, 60 the structure and mounting arrangement of one of the lock cams 70 being shown with respect to overspeed pawls 26, 28 in FIGS. 4 through 6. Cam 70 is apertured to receive a hub 72 having an elongated, cylindrical portion 72a projecting outwardly beyond one face of cam 70. Hub 72 is joined to cam 70, as by welding in the case of a steel cam. The rotational mounting of cam and hub assembly 70, 72 on the pawls may be accomplished in various ways, at different locations on the pawls. I have found it particularly convenient and effective to rotatably attach lock cam 70 to the pawls by utilizing an elongated fastener in the form of a shoulder bolt 74 which is also used to attach lock cam 70 to the overspeed pawl 26. As is most clearly shown in FIG. 6, elongated fastener 74 has a shank portion 74a which serves as a support member to rotatably support hub portion 72a. Shank 74a of fastener 74 extends through hub 72 as well as through an apertured end of link 30, with threaded end 74b of fastener 74 extending into end lug 54 of pawl 26 in threaded engagement therewith. Hub 72 and cam 70 are free to rotate on fastener shank 74a about an axis coinciding with the longitudinal axis of fastener 74. This particular mounting arrangement for cam 70 permits it to rotate independently with respect to the pawl on which it is mounted. The opposite end of connecting link 30, from that which is attached to pawl end lug 54, is provided with an elongated slot 76 to receive a screw 78 utilized to attach the opposite end of link 30 to end 28b of pawl 28. In this manner, link 39 is connected between adjacent ends 26a and 28b of pawls 26 and 28.

Coiled around hub portion 72a and fastener shank 74a on which hub 72 is mounted is a torsion spring 80. Spring 80 acts to normally urge cam 70 in a rotational direction towards the outer peripheral surface 20b of
annular brake member 20, as is indicated by the directional arrows for cam 70 in FIGS. 3 and 5. For this purpose, coil spring 80 has a first free end 80a which is hooked around the edge 70c of cam 70 most remote from the annular brake member peripheral surface 20b in the manner shown most clearly in FIGS. 3 and 5. The opposite, free end 80b of torsion spring 80 is hooked around the edge of link 30 most remote from edge 70c of cam 70. It will thus be appreciated that this mode of attachment of spring 80 to cam 70 and link 30 causes the torsion effect of spring 80 to act in such a way as to tend to rotate link 30 and cam 70 in opposite directions about shank 74a of fastener 74.

Cam 70 preferably is a plate having a pie-shaped configuration shown in FIGS. 2, 3, and 5. In addition to straight edge 70c, cam 70 has a second straight edge 70a which normally bears against the outer cylindrical surface 20b of brake member 20 and intersects arcuate peripheral surface 70b of cam 70. The engagement of cam straight edge 70a with brake member peripheral surface 20b prevents the rotation of cam 70 when strike element or pawl 26 is in its normal position of rest or non-use as illustrated in FIG. 3. When an overspeed condition is encountered in the normal direction of rotation of head shaft 1, pawls 26 and 28 pivot to their outwardly displaced stop positions with respect to peripheral surface 20b of annular brake member 20 under the influence of centrifugal force, as illustrated in FIG. 2. This creates a gap between pawl 26 and peripheral brake member surface 20b through which cam 70 is then free to rotate under the torsion effect of spring 80 to the lock position shown in FIG. 2. The dimensional extent of cam 70 along edge 70a lying between pawl 26 and peripheral brake member surface 20b is a predetermined distance sufficient to permit cam 70 to bridge the gap between pawl 26 and annular brake member surface 20b when pawl 26 is shifted to its stop position. Thus, arcuate surface 70b bears against peripheral surface 20b of annular brake member 20 with cam 70 rotated to its lock position, whereby cam 70 thus serves to hold pawl 26 in its outwardly displaced stop position. Arcuate peripheral surface 70b of cam 70 permits it to rotate smoothly against peripheral brake member surface 20b under the torsion effect of spring 80.

By virtue of the locking engagement of cam 70 between pawl 26 and peripheral brake member surface 20b, pawl 26 is firmly held in its outwardly displaced stop position shown in FIG. 2, under an overspeed, emergency condition. Since pawls 26 and 28 are linked together, pawl 28 will also be held in its outwardly displaced, stop position away from peripheral brake member surface 20b. In FIG. 2 heavy end 28a of pawl 28 is shown in stopping engagement against surface 52 of stationary stop member 50. It will be appreciated that heavy end 28a of pawl 28 can not pivot inwardly to its rest position and disengage from stop member 50 with its light end 28b pivoting outwardly about pivot pin 32 without encountering heavy end 26a of pawl 26 also pivoting outwardly about pivot pin 32 without heavy end 26a of pawl 26 also pivoting inwardly about pivot pin 34, and this is of course impossible because of the holding action of lock cam 70. Thus, even with head shaft 1 stopped and no centrifugal force operating to hold pawls 26 and 28 in their outwardly displaced stop positions, lock cam 70 will serve to hold one or the other of these pawls in engagement with stop member 50 to prevent the continued rotation of head shaft 1. Under any given emergency condition, it is of course possible that either contact surface 48 of pawl 26 or contact surface 48a of pawl 28 will strike stop member 50 first.

The structure and mounting arrangement of lock cam 70 has been described above in conjunction with its mounting on overspeed pawls 26 and 28. As is illustrated in FIG. 1, an identical lock cam 70 is rotatably mounted on apertured end lug 63 of holdback pawl 60 by means of an elongated fastener 74. Cam 70 is rotatably mounted on fastener 74 in exactly the same manner as described above with respect to FIGS. 4, 5 and 6. In like manner, cam 70 functions to lock holdback pawls 58, 60 in their outwardly displaced stop positions when an emergency, runaway condition is encountered in the reverse direction of rotation of head shaft 1 from that illustrated by the directional arrow in FIG. 2. It also should be noted that various types of coupling means other than the particular disc brake assembly 2 described herein may be utilized between headshaft 1 and annular brake member 20 to stop head shaft 1 with minimum mechanical shock when brake member 20 is stopped by either the overspeed or holdback pawls under an emergency, runaway condition.

I contemplate that various changes may be made in the size, shape and construction of the locking device for an elevator brake mechanism disclosed herein without departing from the spirit and scope of my invention as defined by the following claims.

I claim:

1. A combined brake mechanism and brake locking device for a rotary drive shaft of an elevator comprising:

an annular brake member mounted on said drive shaft for rotation therewith;

an overspeed strike element pivotally mounted on the outer periphery of said annular brake member for rotation therewith and pivotally shiftable about an axis extending generally parallel to the rotation axis of said drive shaft from a rest position of non-use immediately adjacent to the peripheral surface of said brake member to a stop position outwardly displaced from the periphery of said brake member under the influence of centrifugal force at a predetermined rotational speed of said drive shaft, said overspeed strike element having a contact surface thereon;

a stationary stop member positioned adjacent to said annular brake member in closest axial relation to the rotary path of said overspeed strike element and having a contact surface thereon facing in countering relation to the normal direction of rotation of said drive shaft in position to be struck by said contact surface on said overspeed strike element in cooperative, stopping engagement therewith when said strike element is pivoted outwardly to said stop position in response to the attainment of said predetermined rotational speed;

coupling means between said drive shaft and said annular brake member to stop said drive shaft in response to the stopping of said brake member;

a lock cam rotatably mounted on said strike element for independent rotational movement with respect thereto; and

a spring engaging said cam and normally urging said cam in a rotational direction towards the peripheral surface of said annular brake member, said cam bearing against the peripheral surface of said
brake member and being restrained against rotational movement thereby when said strike element is in said rest position, the outward displacement of said strike element away from said brake member providing a space therebetween through which said cam is free to rotate to a locking position when said strike element pivots to said stop position, and said cam being of sufficient dimensional extent across the portion thereof lying between said strike element and the peripheral surface of said annular brake member when said cam is rotated to said locking position as to bridge said space and bear against said brake member, whereby said cam locks said strike element in said outwardly displaced stop position even when said shaft is not rotating and there is no centrifugal force acting to hold said strike element in said outwardly displaced, stop position.

2. A brake mechanism and locking device for a rotary drive shaft of an elevator as defined in claim 1 wherein:

said lock cam has an aperture therein through which a hub extends, said hub having a portion thereof projecting outwardly beyond one face of said cam and being rotatably mounted on a support member about which said cam and hub are free to rotate; and

said spring is a torsion spring coiled around said hub portion projecting outwardly beyond said cam, and urging it towards the peripheral surface of said annular brake member.

3. A brake mechanism and locking device for a rotary drive shaft of an elevator as defined in claim 1 wherein:

said overspeed strike element is connected to a second, overspeed strike element by a pair of link members attached to said strike elements at their opposite ends, each of said strike elements being of elongated, arcuate shape generally conforming to the outer peripheral contour of said annular brake member, whereby said pair of strike elements assume a generally circular configuration extending around the peripheral surface of said annular brake member;

a contact surface on said second strike element circumferentially spaced about the periphery of said annular brake member from said contact surface on the other strike element; and

an elongated fastener attaching one end of one of said link members to one end of one of said strike elements, said lock cam being rotatably mounted on said elongated fastener for rotary movement about an axis coinciding with the longitudinal axis of said fastener.

4. A brake mechanism and locking device for a rotary drive shaft of an elevator as defined in claim 3 wherein:

said spring is a torsion spring coiled around said elongated fastener with one free end thereof engaging said cam and tending to urge said cam in a direction towards the peripheral surface of said annular brake member about said axis by the torsion effect of said spring.

5. A brake mechanism and locking device for a rotary drive shaft of an elevator as defined in claim 4 wherein:

the other end of said torsion spring bears against said one link member and tends to rotate said one link member in a direction opposite to the rotational direction of said cam, by the torsion effect of said spring.

6. A brake mechanism and locking device for a rotary drive shaft of an elevator as defined in claim 1 wherein:

said cam has a straight edge normally bearing against the outer surface of said annular brake member and intersecting arcuate peripheral surface of said cam, the contact of said straight edge of said cam with the arcuate peripheral surface of said annular brake member preventing the rotation of said cam when said strike element is in said rest position, and said arcuate peripheral surface of said cam permitting the smooth rotation of said cam against the peripheral surface of said annular brake member when said strike element pivots to said outwardly displaced stop position.

7. A double acting brake mechanism and combined brake locking apparatus for a rotary drive shaft of an elevator comprising:

an annular brake member mounted on said drive shaft for rotation therewith;

an overspeed strike element pivotally mounted on the outer periphery therewith and pivotally shiftable about an axis extending generally parallel to the rotational axis of said drive shaft from a rest position of non-use to a stop position outwardly displaced from the periphery of said brake member under the influence of centrifugal force at a predetermined rotational speed of said drive shaft, said overspeed strike element having a contact surface thereon;

a first, stationary stop member positioned adjacent to said annular brake member in closely spaced relation to the rotary path of said overspeed strike element and having a contact surface thereon facing in countering relation to the normal direction of rotation of said drive shaft in position to be struck by said contact surface on said overspeed strike element in cooperative, stopping engagement therewith when said overspeed strike element is pivoted to said stop position in response to the attainment of said predetermined rotational speed;

a holdback strike element for limiting reversed rotation of said drive shaft pivotally mounted on the outer periphery of said annular brake member for rotation therewith and pivotally shiftable about an axis extending generally parallel to the rotational axis of said drive shaft from a rest position of non-use to a stop position outwardly displaced from the periphery of said brake member under the influence of centrifugal force at a predetermined rotational speed of said drive shaft, said holdback strike element having a contact surface thereon facing in the opposite direction from said contact surface on said overspeed strike element;

a second, stationary stop member positioned adjacent to said annular brake member in closely spaced relation to the rotary path of said holdback strike element and having a contact surface thereon facing in countering relation to reverse rotation of said drive shaft from said normal direction of rotation in position to be struck by said contact surface on said holdback strike element in cooper-
ative, stopping engagement therewith when said holdback stop element is pivoted to said stop position;
coupling means between said drive shaft and said annular brake member to stop said drive shaft in re-
sponse to the stopping of said brake member;
first and second lock cams rotatably mounted on said overspeed strike element and said holdback strike
element respectively for independent, rotational movement with respect thereto; and
spring means engaging each of said lock cams and normally urging said cams in a rotational direction
towards the peripheral surface of said annular brake member, said cams bearing against the per-
ipheral surface of said brake member and being restrained against rotational movement thereby
when said strike elements are in said rest positions, the outward displacement of either one of said
strike elements to its stop position away from said brake member providing a space therebetween
through which one or the other of said cams is free
to rotate to a locking position under the force ex-
erted by said spring means wherein one or the other of said cams so rotated will bear against said
annular brake member and hold its respective strike element in its outwardly displaced stop posi-
tion.
8. A double acting brake mechanism and brake lock-
ing apparatus for a rotary drive shaft of an elevator as
defined in claim 7 wherein:
each of said lock cams is attached to its respective
strike element by means of an elongated fastener;
and
said spring means for each of said cams comprises a
torsion spring coiled around each of said elongated
fasteners with one end of each of said springs en-
gaging one of said lock cams and tending to urge
said cams inwardly towards the outer periphery of
said annular brake member by the torsion effect of
said springs.

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