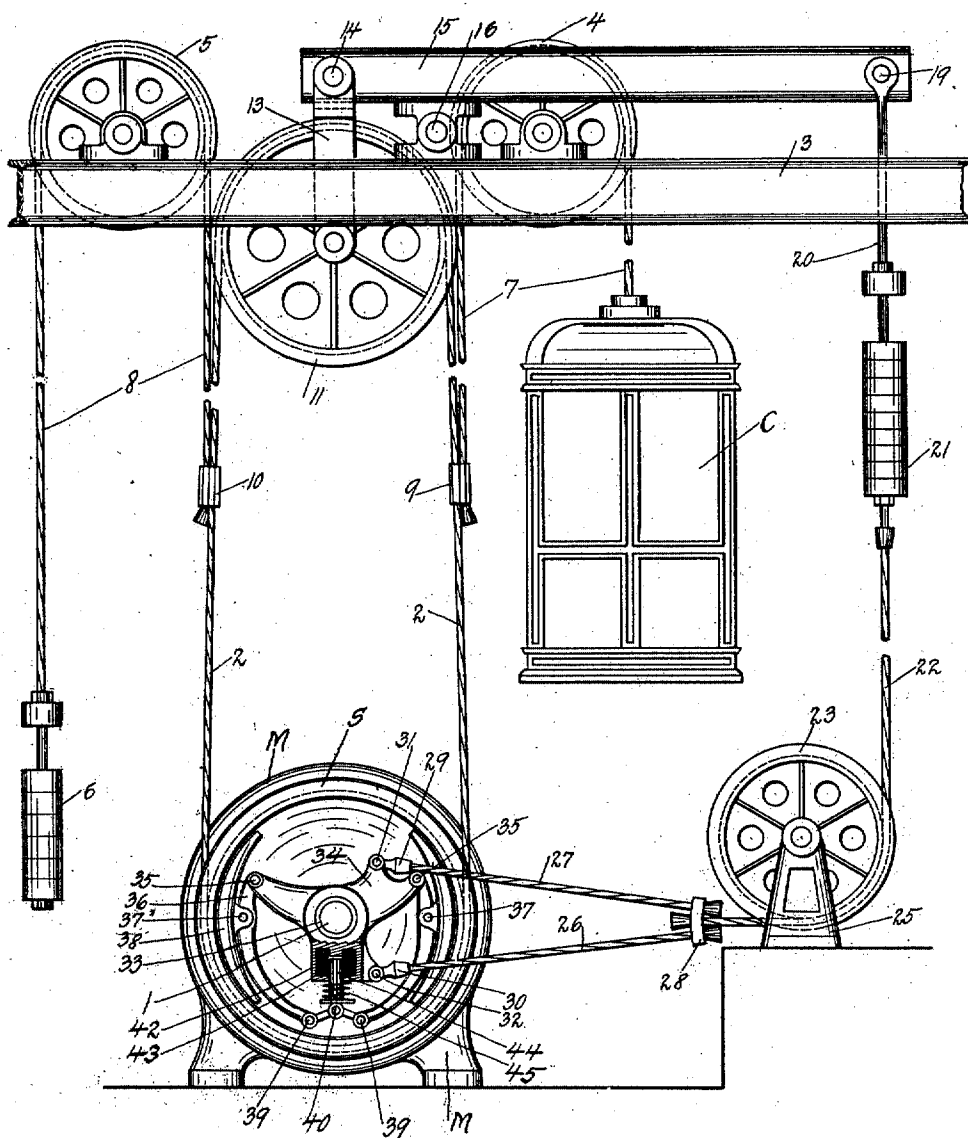


A. SUNDH.
COMBINED BRAKE AND TENSIONING DEVICE FOR TRACTION ELEVATORS.
APPLICATION FILED JUNE 24, 1907.

981,897.

Patented Jan. 17, 1911.



Witnesses

Ernest L. Gale, Jr.
James L. Bethell

By

Inventor
August Sundh
Attorney
C. M. Nissen

UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY,
OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COMBINED BRAKE AND TENSIONING DEVICE FOR TRACTION-ELEVATORS.

981,897.

Specification of Letters Patent.

Patented Jan. 17, 1911.

Application filed June 24, 1907. Serial No. 380,425.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Combined Brake and Tensioning Devices for Traction-Elevators, of which the following is a specification.

My invention relates to what are commonly known as traction elevator systems, and its principal object is the provision of improved and efficient brake apparatus therefor to minimize slipping of the driving cables upon the stopping of the elevator car.

Although I have shown my invention as applied to the frictional driving apparatus of an elevator system, it should be understood that it may be applied also to frictional driving apparatus in other connections. Furthermore it is obvious that those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire therefore not to be limited to the precise construction herein disclosed.

The tendency of modern times is toward the erection of very high buildings, more particularly office buildings in large cities, but such construction of high buildings is limited by the development in the elevator art. While the ordinary type of elevator is satisfactory in most instances, there still remain many undesirable features when applied to high buildings. For instance, in the modern high building it is difficult to provide for the great length of cable necessarily used in a high speed elevator system; the winding drum must be of very large proportions to take care of this great length of cable and to produce the high speed of car travel. The space required for the necessary machinery is excessive and cannot well be spared in many cases. The comparatively recent development of the traction elevator system has eliminated many objectionable features found in the ordinary type of elevator installation, but one objectionable feature still remaining is the normal tendency of the cables to slip upon stopping. A purpose of my invention is to overcome this objectionable feature.

Referring to the accompanying drawing which illustrates my invention applied to one type of traction elevator system, M des-

ignates a motor, preferably an electric motor, which furnishes the requisite motive power to lift or lower the car C.

S designates a grooved traction sheave, pulley or drum rigidly secured to the motor shaft 1. Associated with this sheave are the endless cables 2 which are driven thereby when the motor operates.

6 designates a counterbalance suspended by the cables 8 which pass up over the grooved sheave 5 and are rigidly connected to the cables 2 by a clamping device 10. The elevator car C is suspended in a similar manner by cables 7 which pass up over a pulley or sheave 4 and are rigidly fastened to the driving cables 2 by a clamping device 9.

The cables 7 and 8 may be merely connected to the cables 2 by the clamps 9 and 10, or they may be integral therewith, in which latter case the clamps 9 and 10 may serve to connect to the hoisting cables the cable or cables passing over the sheave 11. In either case the cables from the drive sheave to the car and counterweight are in effect continuous. Although the drawings only show a single driving cable, a plurality of cables are usually employed, and this feature is so well known that further illustration is deemed unnecessary. It will be understood that the claims which specify a cable in connection with the drive sheave are intended to cover the equivalent construction in which a plurality of cables are employed. The sheaves 4 and 5 are mounted on the overhead fixed beams 3.

Pivotaly mounted at 16 is a tilting lever 15 which carries at one end the sheave 11 and at the other end the weight 21. In this instance the sheave 11 over which the cables 2 pass is suspended from one end of the tilting lever 15 at 14 by means of the yoke 13. At or near the other end of the tilting lever 15 is pivotaly connected at 19 the rod 20, to the lower end of which is connected the tension weight 21. To the lower end of the rod 20 or the tension weight 21 is connected a cable 22 passing under a direction sheave 23 mounted on the fixed bearings supported by the standards 25.

28 designates a clamping device which serves to connect cable 22 with the two cables 26 and 27 which in turn are respectively connected to the connectors 30 and 29 and pins 32 and 31 to a multiple-armed brake lever

34. This brake lever or member is, in this instance, shown as a single device and is mounted loosely on the motor shaft 1, preferably with a layer of bearing metal 33 intervening.

5 The lower portion of the brake member 34 comprises a casing 42 which contains a magnet solenoid or coil 43. Projecting into this solenoid is a plunger or core 44 which is connected by a toggle 40 to the auxiliary
10 brake levers 36, 36 which are pivoted to the multiple-arm brake lever 34 at 35, 35. Between the pivotal connections 39 and 35 on the auxiliary levers 36 are pivoted at 37, 37
15 the brake shoes 38, 38, which are associated with the inner surface of the rim of the driving sheave S or the inner surface of a rim projecting therefrom.

Normally a spring 45 forces the magnet
20 plunger 44 downwardly and operates the toggle 40 to spread apart the brake levers 36, 36 and apply the brake shoes against the rim of the driving sheave S.

The tension weight 21 acting through the
25 lever 15 and suspended sheave 11 maintains taut the cables 2, or places a predetermined tension or strain upon said cables. The main purpose of the weight 21, however, is to balance the lever 15 and to maintain taut
30 the portion of the cables 2 which extend between the clamps 9 and 10 and pass over the sheave 11, the weight of the car and counterweight 6 being depended upon to normally effect sufficient tension in the driving cables
35 2 and sufficient frictional engagement between the same and the driving sheave S.

Now, it is important that the driving cables of a traction elevator should slip very little, if any at all, particularly when stopping,
40 for not only does slipping tend to rapidly wear out the cables, but also makes it difficult to stop the car in the desired position at a floor landing.

Of course it is to be understood that controlling apparatus, although not shown, is used to control the operation of the car. Such controlling apparatus may be an electric switch in the car for effecting the supply of current to the motor or cutting off the
45 same, and at the same time releasing or applying an electro-magnetic brake apparatus. It is evident that when such electro-magnetic brake apparatus is applied to stop the motor shaft, and consequently also the driving sheave S, the acquired momentum of the
50 car and its counterweight will tend to continue the motion of the driving cables and cause them to slip on the driving sheave S. The time when this slipping is most likely
55 to occur is, therefore, when the car switch is moved to stopping position to effect the braking action on the motor shaft itself. Furthermore, the momentum of the moving parts causes a momentary stretching of the
60 cables when the brake is applied to the

motor shaft or directly to the driving sheave, and this is followed by a rebound if too much slipping does not take place. This rebound relieves the cables 2 of tension, and therefore slackens them and permits further
70 slipping to take place. My invention utilizes the momentum of the moving parts to put an extra tension on the cables 2 at the time that slipping is most likely to occur.

The operation is as follows: Let it be assumed that the brake magnet shown in the drawing is energized to release the brake shoes 38, 38, and that the motor actuates the driving sheave S in a clockwise direction to move the elevator car upwardly. The counterweight 6 will then descend and the weight 21 simply balance the lever 15 and the parts connected thereto or place a small extra tension on the cables 2, 2 extending upwardly from the driving sheave S, the sheave 11 revolving as the car ascends. The brake member 34, since it is loosely mounted on the motor shaft 1, does not revolve with the latter, but remains approximately in the position shown. Now when the current is cut off from the driving motor M and the brake magnet solenoid 43, the brake spring 45 at once forces the brake shoes 38, 38 into engagement with the rim of the driving sheave S. The momentum of the moving parts will now tend to further revolve the driving sheave S and also the entire brake apparatus, since the brake shoes are held against the rim of the driving sheave S by the strong spring 45. As soon, however, as the brake apparatus comprising the brake member 44 and its attached mechanism begins to rotate, which will be in the same direction as that of the sheave S, a pull will be exerted upon the cable 26. This pull
105 will be transmitted to the cable 22 and tension weight 21 and the tilting lever 15. A downward pull upon this lever 15 at the connection 19 will effect the lifting of the opposite end of the lever as well as the
110 sheave 11, and by lifting the sheave 11 an extra tension is placed upon the endless driving cables 2, such tension being in proportion to the momentum acquired by the moving parts which rotate the brake apparatus. It will therefore be seen that the frictional engagement between the driving cables 2 and the sheave S is increased in proportion to the braking action required. In the case of an alternating current motor
120 having a heavy rotating rotor, the momentum of such rotor itself would be considerable and could be utilized in the manner explained to actuate the brake apparatus, a primary braking action being produced by
125 the brake shoes and a secondary braking action by the increased frictional engagement between the cables 2 and the sheave S. In any event, however, the slackening of the cable extending between the sheave S and 130

the car and the tightening of the cable extending from the sheave S to the counterweight, when the car ascends and the motor is being stopped, will tend to produce slipping, but this tendency is counteracted by the operation of the lever 15 in the manner explained.

The lengths of the arms of the lever 15 may be varied as desired and the connections so arranged that the car may be brought to a gradual stop while the momentum is being overcome. It should be noted that the electro-magnetic brake apparatus heretofore mentioned as applied directly to the motor shaft may be omitted, and the brake apparatus herein shown be depended upon entirely, for the reason that the sheave S is connected to the motor shaft 1 and rotates therewith. Therefore when the brake shoes are applied to the rim of the sheave S, and the rotation of said brake shoes with the sheave S limited by the connections between the member 34 and the cables 2, the motor shaft will be retarded and stopped, as well as the driving sheave S.

If the solenoid 43 receives current to release the brake shoes and allow the parts to assume their normal position, and the motor receives current so as to rotate the sheave S in a counter-clockwise direction, the elevator car will be lowered, and upon the application of the brake apparatus herein shown to stop the travel of the car, the brake member 34 will cause a pull upon the cable 27. The result will be the same as before, namely, the application of a primary braking action on the inner surface of the rim of the sheave S, and a secondary braking action as to frictional engagement between the cables 2 and the sheave S.

From the foregoing it is readily seen that no matter in which direction the hoisting motor may be rotating nor in which direction the car and counterweight may be traveling, as soon as the brake is applied directly to the sheave S those portions of the driving cables extending upwardly from the sheave S are placed under extra tension and the entire braking effect is gradual and with increasing power depending upon the amount of momentum to bring the hoisting apparatus and the car gradually to rest. The slackening or slipping of the cables is diminished or prevented, and any rebounding or teetering of the car or counterweight upon bringing the same to rest is rendered substantially immaterial and ineffectual for any harmful purpose in the proper operation of the system.

The drawing shows my invention applied to one type of traction elevator, but it is not intended to be limited to the system illustrated, since it could readily be applied to other traction elevators to accomplish the objects of the invention.

Having thus described my invention, what I claim as new and desire to have protected by Letters Patent of the United States, is:—

1. In a traction elevator, the combination with a car, of a driving motor, a brake for the motor, flexible driving connections between the car and the motor, and means to maintain such connections under an increased tension when the brake is applied.

2. In a traction elevator, the combination with a car, of a driving motor, a brake for the motor, cable connections between the motor and the car, and means operated by the application of the brake to take up the stretch or slack in said connections.

3. In a traction elevator, the combination with a load carrying device, of a motor, hoisting mechanism driven by said motor, power transmitting means connecting said hoisting mechanism and said load carrying device, brake apparatus for said hoisting mechanism, and means operated by said brake apparatus for increasing the tension in said power transmitting means when said brake apparatus is applied.

4. In a traction elevator, the combination with a car, of hoisting apparatus, a brake for said hoisting apparatus, a cable connecting said hoisting apparatus and the car, a means for maintaining the cable under tension, and means to increase the tension in the cable when the brake is applied.

5. The combination with a driving pulley, of a driven pulley, an endless flexible member surrounding said pulleys, a means to apply tension to said connecting member, a brake apparatus associated with the driving pulley, and connections between said brake apparatus and said tensioning means.

6. The combination with a driving pulley, of a driven pulley, a flexible member connecting said pulleys, a brake associated with said driving pulley, a means to maintain said connecting member under tension, and a connection between the brake and said tensioning means to effect an increase in tension in said member when the brake is applied.

7. The combination with a driving pulley, of a driven pulley, a cable connecting said pulleys, a brake associated with one of said pulleys, means for applying tension to the said cable, and connections to effect increase of tension in said cable when the brake is operated.

8. The combination with a driving pulley, of a driven pulley, a cable connecting said pulleys, a brake associated with one of said pulleys, means connected to the other said pulley for applying tension to the cable, and means operated by the brake when applied to actuate said tensioning means to produce increased tension.

9. The combination with a driving member, of a brake associated therewith, a driven

member, a flexible member uniting said driving and driven members, means connected to the driven member for holding the flexible member under tension, and a connection between said brake and said tensioning means.

10. In a traction elevator, the combination with a friction member, of a load carrying device, power transmitting means connected to said load carrying device and in frictional engagement with said friction member, brake apparatus associated with said friction member, and means actuated by the impressed motion of said brake apparatus when applied to increase the frictional engagement between said power transmitting means and said friction member to produce a secondary brake action.

11. In a traction elevator, the combination with an elevator car, of a traction pulley or drum, a flexible cable connected to the car and in frictional engagement with said drum, a primary brake mechanism for said traction drum, and means actuated by the impressed motion of said primary brake mechanism to increase frictional engagement between said cable and traction sheave to produce a secondary braking action.

12. The combination with a motor, of a driving sheave connected thereto, a brake for said sheave, a pivoted lever, a driven sheave connected to said lever, a cable uniting said sheaves, and a connection between said brake and said lever to increase the frictional engagement between said cable and the driving sheave when the brake is applied upon stopping.

13. The combination with a motor, of a frictional driving mechanism operated thereby, brake apparatus for said frictional driving mechanism, a lever pivoted on a fixed support, a sheave connected to one arm of said lever and a weight connected to the other arm thereof, a car and a counterweight, a driving cable connecting the car and counterweight and associated with said frictional driving mechanism, a connection between said driving cable and said sheave, and a connection between the brake apparatus and said first-named weight.

14. The combination with a driving shaft, of a brake apparatus pivoted thereon, a frictional driving drum mounted on said shaft to rotate therewith, a load carrying device, flexible power transmitting means connected to said load carrying device and in frictional engagement with said frictional driving drum, and connections between said brake apparatus and said power transmitting means to increase the frictional engagement between the latter and the frictional driving drum when said brake apparatus is applied to stop said frictional driving drum.

15. The combination with a driving pulley, of a brake apparatus for said driving

pulley and movable about the axis of the shaft of said pulley, a pivoted lever mounted on a fixed support, a car and a counterweight, a driving cable connecting said car and counterweight and in frictional engagement with said pulley, connections between one arm of said lever and said driving cable, and connections between the other arm of said lever and said brake apparatus.

16. In an elevator, the combination with a motor operable in either direction, of a driving pulley connected thereto, brake apparatus for said pulley, and pivoted to rotate on an axis substantially coincident with that of the motor shaft, a car and a counterweight, a driving cable connecting said car and counterweight with an intermediate portion in frictional engagement with said pulley, and connections between said brake mechanism and said driving cable to increase the frictional engagement between said driving cable and said driving pulley by the application of said brake mechanism to said pulley when rotating in either direction.

17. The combination with a motor, of a driving pulley connected thereto, brake mechanism pivoted loosely on the shaft of the pulley, flexible power transmitting means driven by said pulley, a lever pivoted on a fixed support, a tensioning device connected to one arm of said lever, a sheave suspended from the other arm of said lever, a cable associated with said sheave and connected to said power transmitting means, and a double connection between said brake mechanism and said tensioning device to effect the application of a secondary braking action in stopping the driving pulley in either direction, by increasing the frictional engagement between the power transmitting means and the driving pulley.

18. In an elevator, the combination with a motor, of frictional driving apparatus connected thereto, an endless cable forming a loop, one end of said loop being associated with the frictional driving apparatus, a pulley associated with the other end of said loop, a pivoted lever, a connection between one arm of said lever and said pulley, a tensioning device connected to the other arm of said lever, a brake apparatus loosely pivoted as a whole, and connections between said brake apparatus and said tensioning device.

19. In an elevator, the combination with a motor, of frictional driving apparatus operated thereby, an endless cable engaging the driving apparatus, a car and a counterweight, cables connecting the car and counterweight to said endless cable on opposite sides of the frictional driving apparatus, brake mechanism for the frictional driving apparatus, and means operated by said brake apparatus for increasing the tension in said endless cable.

20. In an elevator, the combination with

a motor, of driving apparatus, a load carrying device, power transmitting means connecting the load carrying device and the driving apparatus, and means movable with the driving apparatus to apply tension to said power transmitting means.

21. In an elevator, the combination with frictional driving apparatus, of a car and a counterweight, a driving cable connecting the car and counterweight and in frictional engagement with said frictional driving apparatus, and means operated by momentum of the moving parts applied through the driving apparatus upon stopping to increase frictional engagement between the driving cable and said frictional driving apparatus.

22. The combination with a plurality of pulleys, of a flexible member in engagement with said pulleys, brake mechanism pivoted for movement about the axis of one of said pulleys and having a shoe movable into frictional engagement with the pulley, and means connected to the brake for applying tension to the flexible member as the brake mechanism moves with the pulley.

23. In an elevator, the combination with a motor, of a frictional driving drum, a driven pulley bodily movable with respect to said frictional driving drum, an endless cable in frictional engagement with said driving drum and passing over said driven pulley, brake mechanism pivoted for movement about an axis substantially coincident with that of the shaft of the driving drum, and connections between said driven pulley and said brake mechanism to apply tension in said cable in proportion to the power with which the brake mechanism is rotated by the driving drum when applied thereto.

24. In a traction elevator, the combination with a motor operable in either direction, of frictional driving apparatus connected thereto, a car and a counterweight, a cable con-

necting said car and counterweight and in frictional engagement with said frictional driving apparatus, a pivoted beam or lever mounted on a fixed support overhead, a flexible connection between one arm of said lever and the driving cable, a tensioning device connected to the other arm of said lever, electro-magnetic brake apparatus pivoted to rotate as a whole and comprising brake shoes associated with a part of said frictional driving apparatus, and cables connecting different points of said brake apparatus to said tensioning device to effect the upward movement of said arm of the lever with the flexible connection and the tightening of the driving cable on the frictional driving apparatus when the brake apparatus is applied and rotated by momentum in either direction.

25. In compound brake apparatus, the combination with a driven shaft, of a pulley connected to rotate therewith, brake apparatus associated with said pulley and rotatable as a whole, a cable in frictional engagement with said pulley, and connections between both portions of said cable extending from said pulley and said brake apparatus to increase the tension in said portions and the frictional engagement between said cable and said pulley, to produce a secondary braking action upon the application of said brake apparatus and the rotation thereof in either direction by momentum of said pulley or parts moving therewith.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST SUNDH.

Witnesses:

CHAS. M. NISSEN,
JAMES G. BETHELL.