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BRAKING MECHANISM

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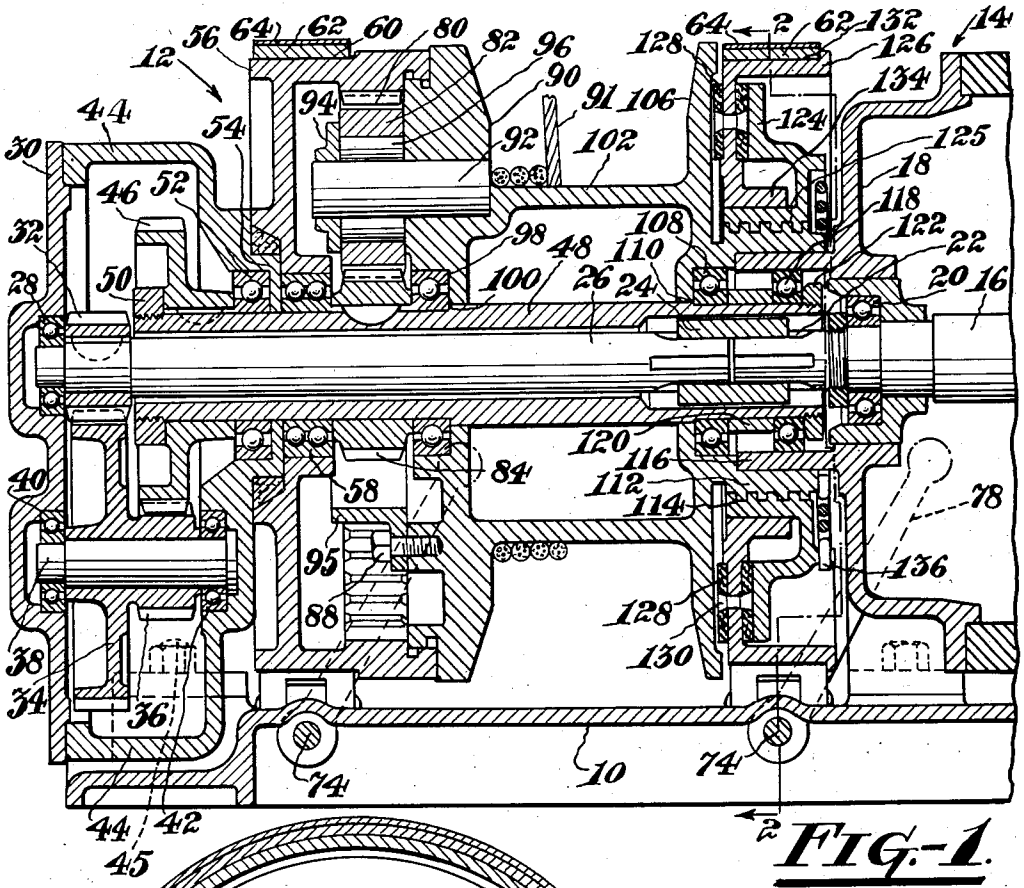

FIG.-1.

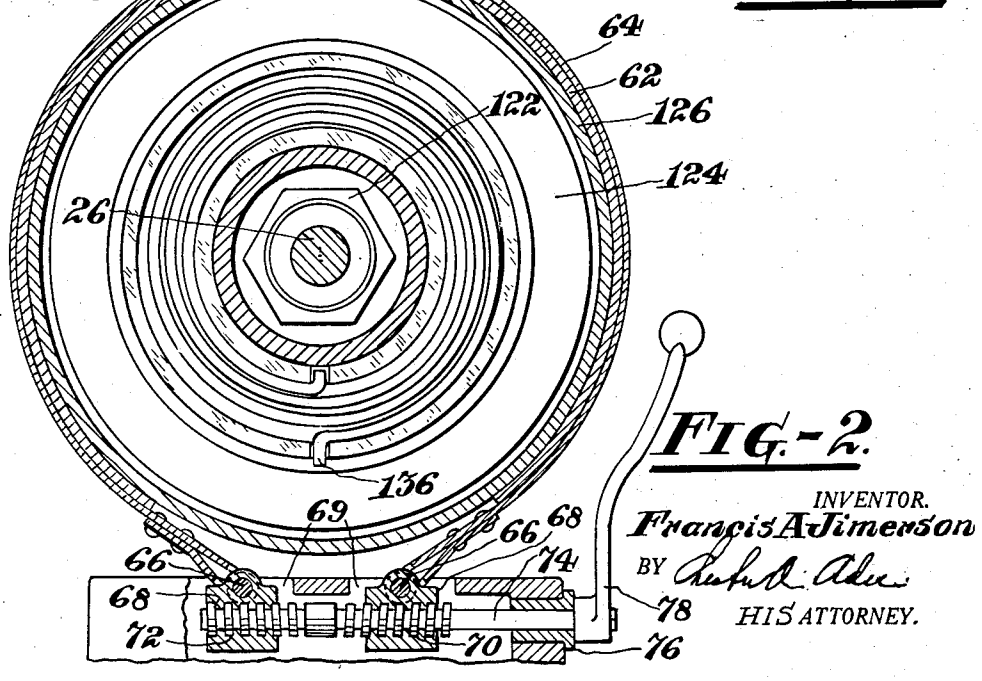

FIG.-2.

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BRAKING MECHANISM

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2 Claims. (Cl. 188—82)

This invention relates to hoists and more particularly to a braking device for the same.

One object of the invention is to maintain control of the load at all times and prevent it from dropping rapidly when not being raised.

Another object of the invention is to made said braking device automatic and operable as soon as the load begins to drop.

Other objects of the invention will be in part obvious and in part pointed out hereinafter.

In the drawing,

Figure 1 is a longitudinal sectional view through the improved hoist, and

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

This invention more particularly contemplates the provision of a controlling brake mechanism to be applied to a hoist which is driven by an electric motor as distinct from a hoist which is driven by an air motor of the piston type. In the latter it will be obvious that as soon as the power which was applied for raising the load was cut off the motor itself automatically acted as a powerful brake and thus prevented the load from rapidly dropping. When a hoist is driven by an electric motor, however, and the current is cut off when the load is raised, there is nothing to prevent the load from dropping rapidly except the inertia of the parts. The speed of the dropping load would, under these conditions, accelerate very rapidly and easily become sufficient to wreck the armature by centrifugal force.

This serious disadvantage has been overcome in my invention by a simple braking device which is automatic in its action, and practically instantaneously effective as soon as the load begins to drop.

Referring to the drawing wherein similar characters of reference denote corresponding parts throughout, 10 designates the base frame of my improved device which is adapted to support both the hoist 12 and the motor 14 for driving the hoist. The motor 14 may be of the electric type having a uni-directional of other motion. The armature shaft 16 of the motor is supported in the usual end cover 18 by means of the bearing 20. Suitable means are provided for coupling the hoist 12 to the motor 14 and in this instance the armature shaft 16 has a projecting end formed with a series of splines 22 extending longitudinally thereon. A coupling 24, as is usual in splined connections, has a series of internal grooves extending longitudinally therethrough and the splined shaft 16 enters this coupling for a short distance. Into the other end of this coupling 24 is secured in a similar manner the main shaft 26 of the hoist 12.

The other end of the shaft 26 is supported in a bearing 28 carried by a cover 30 which encloses that end of the hoist 12. The main shaft 26 is driven in this way at the speed of the motor due to the direct coupling to the armature shaft 16. This speed is preferably reduced before being applied to raise a load by a system of reduction gearing operated by a pinion 32 suitably keyed to the main shaft 26 adjacent the cover 30. Meshing with the pinion 32 is a relatively large gear 34 with a pinion 36 adapted to rotate at similar speed and for this purpose being formed in this instance integral with the large gear 34 and supported in conjunction therewith upon the shaft 38. The shaft 38 is supported at one end in the cover 30 by a bearing 40 and at the other end by a bearing 42 which is secured in a housing 44 enclosing these gears. The housing is secured by bolts 45 to the base 10.

Meshing with the pinion 36 is a larger gear 46 which is suitably keyed to a hollow shaft 48. The hollow shaft 48 will therefore be driven through the reduction gearing at any desired relative speed to the main shaft 26 depending upon the chosen ratio of these gears. The gear 46 is maintained in position on the hollow shaft 48 by a nut 50 which holds it against a bearing 52 supporting the hollow shaft 48 in the housing 44. A flange 54 on the housing 44 extends at the other side of the bearing 52 and abutting this flange 54 is a brake drum member 56 supported on the hollow shaft 48 by a bearing 58.

The brake drum member 56 has an external braking surface 60 upon which a brake band 62 is adapted to act and prevent its rotation with the hollow shaft 48. The brake band mechanism comprises a band 64 preferably of metal secured to the brake band 62, which is preferably of a friction material, and this metal band 64 is anchored at its ends to pins 66 carried by supports 68 on the casing 10. One of the supports 68 preferably has a left hand thread 70 and the other support preferably has a right hand thread 72. A shaft 74 having right and left hand threads thereon is inserted in the supports 68 and extends through a bearing 76 on the casing 10 where a handle 78 may be secured thereto. The supports 68 are arranged in slideways 69 so that they can move towards and away from each other in the casing 10 when the shaft 74 is rotated in one direction or the other.

A portion of the brake drum 56 extends beyond the braking surface 60 and has an internal gear 80 formed thereon. Meshing with this internal gear 80 is a drum driver comprising a plurality of pinions 82 arranged in planetary fashion. These pinions 82 mesh with a pinion 84 suitably keyed to the hollow shaft 48.

A winding drum 90, which is adapted to accommodate the hoisting rope 91 carrying the load to be raised, is supported upon the hollow shaft 48 around which it may be driven by the drum driver.

To this end the winding drum 90 has a flange abutting the braking drum 56 and into this flange projects a plurality of stub shafts 92. The other end of each stub shaft is supported in a hub 94 on a cover 95 which is secured to the winding drum by bolts 88. The planetary drum driver pinions are free to revolve on the stub shafts 92 whereon they are supported by frictionless bearings 96.

The winding drum 90 rotates freely on the hollow shaft 48 and is journaled at the driven end on a bearing 98 which abuts a shoulder 100 on the shaft. It will be seen from this construction that when the nut 50 at the end of the hollow shaft 48 is drawn up tightly all the parts between the shoulder 100 and the nut will be held securely in position.

A reduced portion 102 on the hoisting drum is provided in order that the rope 91 may be wound therearound, and in order to keep the rope in position a second flange 106 is provided at the other end of the reduced portion 102. This end of the drum 90 having the flange 106 is supported on the hollow shaft by a bearing 108 which abuts a second shoulder 110 on the shaft 48. Extending from the flange 106 is a projecting portion 112 in the form of a hub having threads 114 on its periphery. The threads 114 in this instance may be right-hand. The inner surface of the hub 112 projects over an extension 116 of the cover 18 upon which it is free to rotate and the shaft 48 is supported in the extension 116 by the bearing 118. A spacer 120 is provided between the bearings 118 and 108 and on the end of the hollow shaft 48 is a nut 122 which may be used in a similar manner to the nut 50 at the other end of the shaft to hold the parts against the shoulder 110.

Cooperating with the thread 114 on the hub 112 of the winding drum is a clamping member 124 which has an internal threaded hub 125 engaging the thread 114. The clamping member 124 is preferably spaced from the flange 106 on the hoisting drum and between these two members is a friction member 126 having clutch facings 128 of some friction material projecting on either side thereof and secured in position by the rivets 130. The friction member 126 has an annular flange on its periphery forming a braking surface 132. The braking surface 132 is similar to the braking surface 60 at the other side of the hoist and has a similar brake band 62 acting thereon. The mechanism for manually operating this second brake is identical with that employed for operating the first and a description of the same at this point is therefore omitted.

The friction member 126 is preferably supported for free rotation upon the clamping member 124 by means of a projecting hub 134 engaging the hub 125 of the clamping member 124. Attached by its outer end to the clamping member 124 is a spring 136 of the flat spiral type having its inner end engaging the hub 112 on the winding drum. This spring is adapted to be placed under an increased tension and released from such by longitudinal movement back and forth of the clamping member 124 on the threaded hub 114 of the winding drum.

In the operation of the device and in order to raise a load, the motor is set in operation whereupon the armature shaft 16 will revolve the main shaft 26 which in turn acting through the reduction gears at the opposite end thereof will revolve the hollow shaft 48. For the purpose of this description this revolution may be clockwise when raising a load. Revolution of the shaft 48 will cause the pinion 84 to rotate the pinions 82 of the planetary drum driver. If the brake 62 has not been tightened upon the brake drum 56 the drum driver will merely rotate the brake drum 56 without in any way moving the winding drum 90.

The brake 62 is therefore tightened upon the brake drum 56 to prevent its rotation, whereupon the pinions 82 of the planetary drum driver will roll around the internal gear 80 and cause the stub shafts 92 to revolve the winding drum 90 and the rope 91 will wind thereon to raise the load.

The other band brake 62 has been tightened upon the friction member 126, preventing its rotation with the drum. As the winding drum revolves the clutch facings 128 will frictionally engage the clamping member 124 holding it against rotation and the thread 114 being right-handed will move it away from the winding drum against the tension of the spring 136. The spring 136 will now commence to wind up and at a certain point the increased tension thereof will overcome the friction exerted by the clutch facings 128 upon the clamping member 124 to permit the winding drum to rotate the clamping member around the clutch facings 128. The clutch facings are, of course, held immovable by the tightened brake band 62 acting upon the braking surface 132. The load can therefore be hoisted to any height.

When the load has been hoisted to desired height the motor may be entirely cut off thus stopping rotation of the winding drum in a clockwise direction and permitting the force of gravity to act upon the load to move the drum in the opposite direction by means of the rope 91. As soon as the drum starts to revolve in the opposite direction the increased tension on the spring 136 will be relaxed thus permitting the clutch facings 128 to gain control and frictionally rotate the clamping member 124 moving it back longitudinally along the thread 114 in the direction of the flange 106 on the winding drum. This longitudinal movement will continue for a brief instant and then the clamping member 124 will force the clutch facings 128 against the flange 106 creating a braking action which becomes continually greater until movement of the winding drum ceases. It will readily be seen that the braking action of the clutch facings 128 upon the winding drum will occur almost instantly with the dropping of the load and that the winding drum can attain no great speed before this occurs.

If it is desired to lower the load, this can be done by gradually releasing the brake band 62 on the friction member 126 and controlling the velocity of its descent thereby.

From the foregoing it will be seen that a braking device, automatic in operation and particularly adaptable to electric motor operated hoists, has been provided. While the braking

device has been described in connection with an electric motor drive, it will be apparent that its use is not confined to this type, but may be applied to other forms of drive with equal facility. The braking action is practically instantaneous with the dropping of the load and is entirely automatic.

I claim:

1. A brake for a rotary member, comprising non-rotary friction means adjacent the rotary member and movable longitudinally with respect thereto, a clamping member threaded to the rotary member and being movable longitudinally of the rotary member and the friction means to prevent retarding frictional engagement between the clamping member and the friction means, and a spiral spring connected to the members and being subjected to tension during rotation of the members and acting upon cessation of rotation of the members to effect frictional locking engagement between the friction means and both members.

2. A brake for a rotary member, comprising non-rotary friction means adjacent the rotary member and movable longitudinally with respect thereto, a clamping member rotatable with the rotary member and being held released from the friction means upon rotation of the rotary member, a spiral spring connected to both members for clamping the friction means into frictional engagement with both members upon cessation of rotary movement of the members, and brake means for locking and releasing the friction means.

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