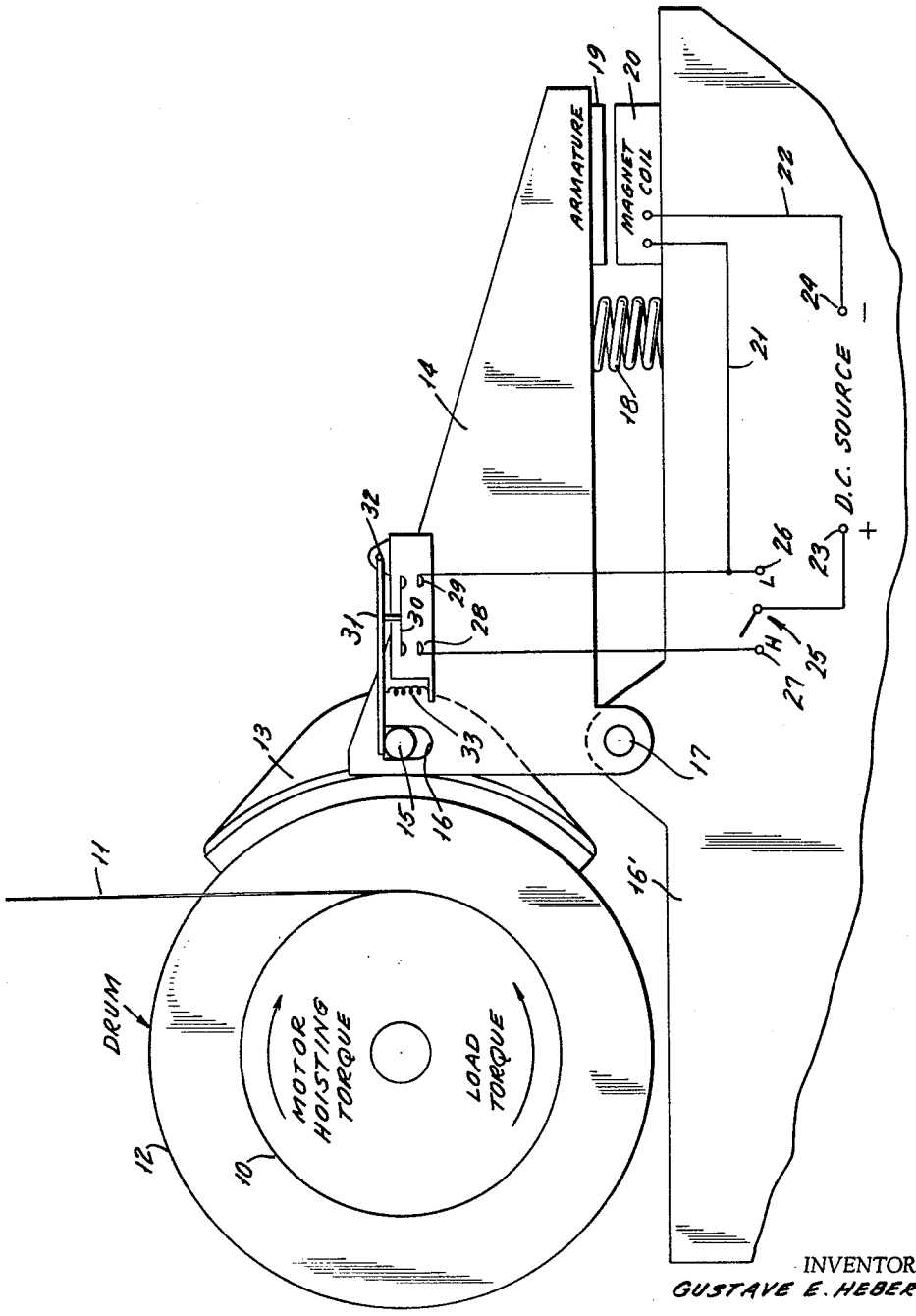
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LOAD RESPONSIVE BRAKE RELEASE

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LOAD RESPONSIVE BRAKE RELEASE

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This invention relates to a novel brake release structure, and more specifically relates to a novel brake release structure which can be used in hoist motor systems wherein an initial upward movement of the hoist load is required prior to release of the brake.

Brakes for use with hoists are commonly set by a spring force which is released by the energization of a magnet. This is a common and well known fail-safe arrangement, and could be applied, for example, with hoists of the type shown in copending application Serial No. 212,335, filed July 25, 1962, entitled A.-C. Hoist Control System in the name of Ronald I. Bohn and assigned to the assignee of the instant invention.

Generally, in such hoist control schemes, the brake release coil and hoist motor are energized simultaneously. However, the torque developed by the motor may be insufficient at the first hoist position of the hoist controller to overcome the weight of the load, the result being that the load will move down instead of up.

The principle of the present invention is to provide a lost motion connection between the brake release control structure and the hoist motor, wherein brake release is possible only after the lost motion has been absorbed during the initiation of a hoisting operation. Thus, hoisting operation cannot be initiated by the operator unless he is at a controller position which provides sufficient torque for lifting the load.

In a particular embodiment of the invention, the lost motion connection cooperates with an auxiliary contact which is connected in series with the brake release magnet. Thus, the brake release magnet cannot be energized until the hoist motor has moved the load through a relatively small lost motion distance, thus assuring that upward motion can be initiated before the brake is released.

Accordingly, a primary object of this invention is to prevent release of a brake in a hoist control system until sufficient torque is available for assuring the upward motion of a load.

Another object of this invention is to remove, from the discretion of the operator, the determination of a controller position sufficient to move a load upwardly before release of a hoist brake.

These and other objects of this invention will become apparent from the following description when taken in connection with the accompanying drawing which illustrates a side plan view of a portion of the brake release structure of a hoist constructed in accordance with the invention.

Referring to the drawing, I have illustrated therein the output shaft **10** of a motor hoist which is, for example, connected to a hoist rope **11**. The hoist rope **11** can go over an overhead series of pulleys (not shown), and then come downwardly to terminate in a lifting hook. As indicated by the arrows in the figure, the motor hoisting torque is in a clockwise direction, while load torque or the torque exerted on the motor by a load will be counterclockwise.

In accordance with standard techniques, a brake drum **12** of any standard type and which can have any desired length is secured to the output shaft **10** of the hoist motor. The drum **12** then cooperates with an appropriate brake shoe **13** which again can be of any standard type, and is

carried from a brake cradle **14** by means of a pin **15** in the usual manner. The cradle **14** is then pivotally mounted to a support structure **16'** at pivot **17**.

In accordance with the present invention, cradle **14** receives pin **15** in a lost motion slot **16** which is elongated in a direction which is tangential to drum **12**.

A relatively strong spring **18** is then provided to the right of pivot **17** to normally bias shoe **13** into engagement with drum **12**. In order to release drum **12**, the cradle **14** carries a magnetic armature **19** which is in spaced relationship with respect to a magnet coil **20**. The magnet coil **20** is provided with two energizing leads **21** and **22** which are connectable to any appropriate power source such as the terminals **23** and **24** of a D.C. source. The D.-C. source is then connected to magnet coil **20** by the operation of a two-position switch **25**.

When it is desired to lower a load secured to rope **11**, the switch **25** closes at terminal **26** labeled "L" (for lower) so that the D.C. source is directly connected to magnet coil **20**. The energization of magnet coil **20** attracts armature **19** and compresses spring **18** so that the cradle **14** rotates in a clockwise direction around pivot **17**. This releases shoe **13** from drum **12** so that the lowering operation can proceed.

In accordance with the invention, and where the load is to be hoisted rather than lowered, the control switch **25** is connected to terminal **27** which is labeled "H" (for hoist).

An auxiliary switch means which includes stationary contacts **28** and **29** which cooperate with a movable bridge contact **30** is then carried from cradle **14**. Contacts **28** and **29** are connected in series with the D.C. source terminal **27** and the magnet coil **20**. Thus, in order for the magnet coil **20** to be energized, bridge **30** must be moved downwardly and into engagement with contacts **28** and **29**. The bridge **30** is carried on a lever **31** which is pivotally mounted at pivot **32** wherein the switch structure is all carried from cradle **14**. The left-hand end of lever **31** is held in engagement with the top of pivot pin **15** by means of a spring **33**.

In operation, it will now be understood that the switch arm **30** will move downwardly with respect to contacts **28** and **29** only when the pin **15** moves to the bottom of slot **16**. Thus, when the operator operates the controller for a hoisting operation which will close switch **25** to terminal **27** and apply appropriate voltages to the motor for hoisting torque, if the torque is insufficient to cause a hoisting operation, pin **15** will not move downwardly in lost motion slot **16** so that a circuit is not completed through magnet coil **20**. Thus, the brake is not released.

When, however, the operator energizes the appropriate controller position on his controller so that the motor hoisting torque is sufficient to begin to lift the load, the motor shaft **10**, drum **12** and brake **13** will all begin to rotate about the motor shaft axis so that pin **15** will move to the bottom of lost motion slot **16**. This will cause bridging contact **30** to engage contacts **28** and **29** whereby an electrical circuit is completed to magnet coil **20** which causes the cradle **14** to rotate about pivot **17** to release the brake shoe **13**.

Accordingly, it will be seen that a brake release structure is provided which is operable only when sufficient torque is applied to the motor to insure that a hoisting operation will follow the release of the brake.

Although this invention has been described with respect to its preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred, therefore, that the scope of this invention be limited not by the specific disclosure herein but only by the appended claims.

What is claimed is:

1. A load responsive brake comprising a brake drum, a brake shoe, support means for said brake shoe, a brake engaging means, a brake release means, a motion responsive switch means, and a lost motion connection means; said lost motion connection means being connected to said brake shoe by said lost motion connection means, said support means being movable with respect to said brake drum between a brake engaging and a brake disengaging position; said brake engaging means comprising a biasing spring connected to said support means for normally biasing said brake shoe into engagement with said brake drum; said brake release means comprising magnet coil means energizable for moving said support means toward said brake disengaging position against the biasing force of said biasing spring; said lost motion connection means permitting rotation of said brake drum for a predetermined distance while said brake shoe engages said brake drum; said motion responsive switch means being operatively connected to said lost motion connection means; said switch means being closed when both said brake drum and said brake shoe rotate through said predetermined distance; and an energizing circuit for energizing said magnet coil; said energizing circuit beng connected in series with said switch means.

2. The device substantially as set forth in claim 1 wherein said lost motion connection means includes a pin secured to one of said brake shoe or support means and an elongated slot in the other of said brake shoe or support means; said pin extending through said slot.

3. The device substantially as set forth in claim 2 wherein said slot is elongated in a direction which is parallel to a line tangent to said brake drum.

4. A brake control structure for a hoist to prevent release of a brake before sufficient lifting torque is provided by said hoist; said hoist having a motor; the shaft of said motor being operatively connected to a brake drum; said brake control structure including a brake shoe, support means for said brake shoe, a brake engaging means, a brake release means, a motion responsive switch means, and a lost motion connection means; said support means being connected to said brake shoe by said lost motion connection means, said support means being movable with respect to said brake drum between a brake engaging and a brake disengaging position; said brake engaging means comprising a biasing spring connected to said support means for normally biasing said brake shoe into engagement with said brake drum; said brake release means comprising magnet coil means energizable for moving said support means toward said brake disengaging position against the biasing force of said biasing sprng; said lost motion engaging means permitting rotation of said brake drum for a predetermined distance while said brake shoe engages said brake drum; said motion responsive switch means being operatively connected to said lost motion connection means; said switch means being closed when both said brake drum and said brake shoe rotate through said predetermined distance; and an energizing circuit for energizing said magnet coil; said energizing circuit being connected in series with said switch means whereby said brake shoe is released only when there is initial moton of said brake drum to assure sufficient lifting torque for said hoist.

5. In a brake; a brake drum having an engaged and disengaged position with respect to said brake drum, a brake shoe, a pivotally mounted cradle for supporting said brake shoe, and electrically energizable means for rotating said cradle to move said brake shoe from its said engaged position to its said disengaged position; said brake shoe being connected to said cradle by a lost motion connection; a switching means; said switching means having an operating member connected to said lost motion connection; said switching means being moved to a closed position responsive to relative movement between said brake shoe and cradle in said lost motion connection; and energizing means for energizing said electrically energizable means; said energizing means being connected in series with said switching means.

6. In a brake; a brake drum having an engaged and disengaged position with respect to said brake drum, a brake shoe, a pivotally mounted cradle for supporting said brake shoe, and electrically energizable means for rotating said cradle to move said brake shoe from its said engaged position to its said disengaged position; said brake shoe being connected to said cradle by a lost motion connection; a switching means; said switching means having an operating member connected to said lost motion connection; said switching means being moved to a closed position responsive to relative movement between said brake shoe and cradle in said lost motion connection; and energizing means for energizing said electrically energizable means; said energizing means being connected in series with said switching means; said lost motion connection including a pin secured to one of said brake shoe or support means and an elongated slot in the other of said brake shoe or support means; said pin extending through said slot.

7. In a brake; a brake drum having an engaged and disengaged position with respect to said brake drum, a brake shoe, a pivotally mounted cradle for supporting said brake shoe, and electrically energizable means for rotating said cradle to move said brake shoe from its said engaged position to its said disengaged position; said brake shoe being connected to said cradle by a lost motion connection; a switching means; said switching means having an operating member connected to said lost motion connection; said switching means being moved to a closed position responsive to relative movement between said brake shoe and cradle in said lost motion connection; and energizing means for energizing said electrically energizable means; said energizing means being connected in series with said switching means; said lost motion connection including a pin secured to one of said brake shoe or support means and an elongated slot in the other of said brake shoe or support means; said pin extending through said slot; said slot being placed in said cradle and being elongated in a direction which is parallel to a line tangent to said brake drum.

No references cited.