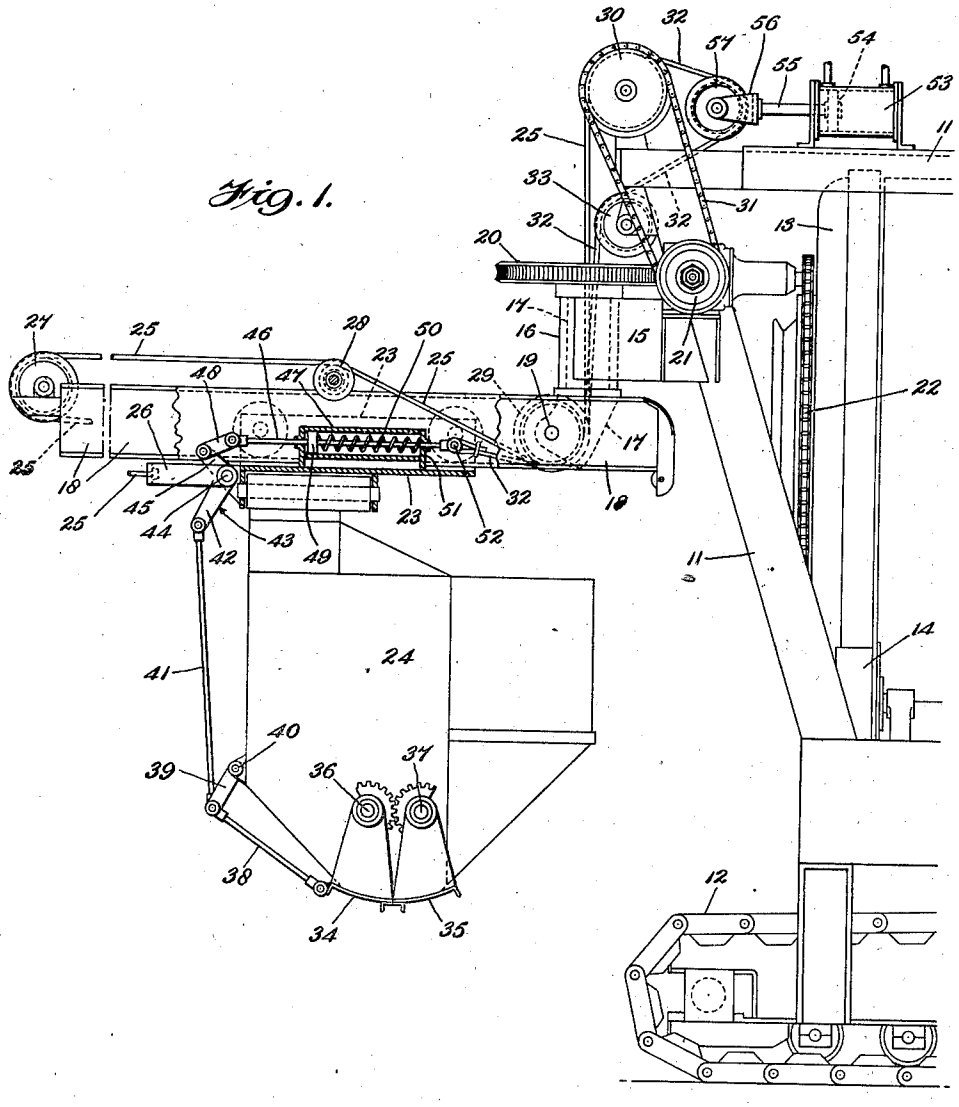
Jan. 21, 1947. S. SHAFER, JR 2,414,771

DISTRIBUTING APPARATUS FOR CONCRETE MIXERS

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Fig. 1.



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Fig. 2.

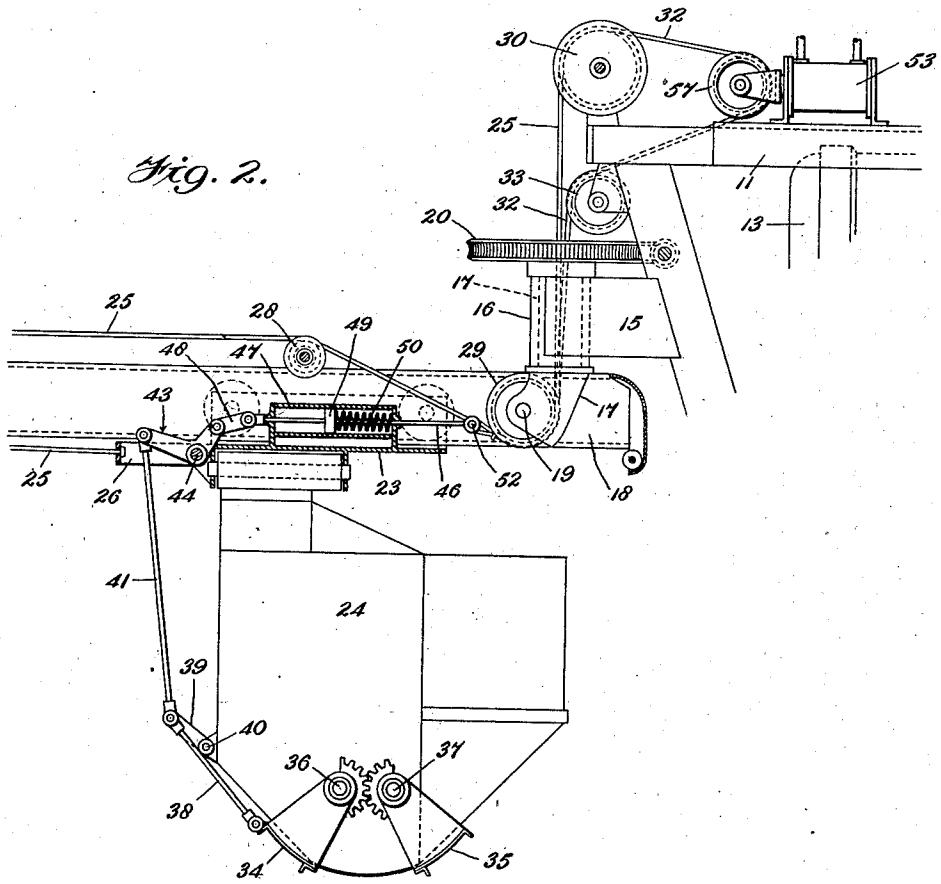
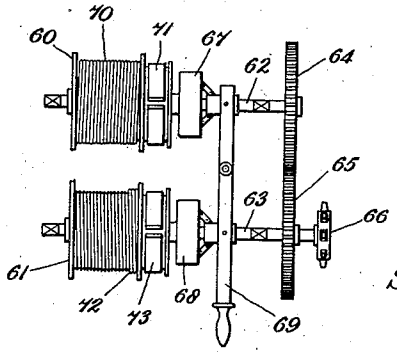


Fig. 3.



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DISTRIBUTING APPARATUS FOR CONCRETE MIXERS

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Application January 16, 1945, Serial No. 573,035

6 Claims. (Cl. 214—59)

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The invention relates to distributing apparatus for concrete mixers, and more particularly to apparatus of the boom-and-bucket type widely employed in connection with mixers especially designed for use in the construction of concrete roads and pavements, and has for its principal object the improvement of the mechanism for controlling the operation of the discharge doors or gates of the bucket.

In concrete mixing apparatus of the character indicated, it has long been common practice to provide an operator's station on the mixer proper, from which substantially all of the functions of the machine may be controlled. Among these functions are the outward and inward traverse of the bucket along the boom, as well as at least the opening of the discharge doors of the bucket. The mechanisms for controlling these latter functions have been developed along two general lines, according to one of which the bucket doors are retained in closed position by some form of detent, from which release is secured by a pull upon the traverse cable tending to move the bucket inwardly along the boom, when it is desired to discharge the bucket contents. Usually there is some form of lost motion connection between the traverse cable and the bucket which permits the detent to remain operative during outward traverse of the bucket, but which, upon reversal of the motion of the cable to draw the bucket inwardly, trips the detent whereby the doors may open by gravity. My prior Patent No. 1,451,308 granted April 10, 1923, discloses a control of this character.

With this type of mechanism, however, once the doors are opened, the operator has no further control over them until the bucket is returned to its loading position at the inward end of the boom—which action usually automatically closes and relatches the doors—and as a result the entire contents of the bucket are discharged upon the road bed with only such distribution or spreading thereof as may be accomplished through traverse of the bucket in one direction or the other along the boom during discharge.

The second type of control referred to above and typified in my prior Patents No. 1,729,553 granted September 24, 1929, and No. 1,805,602 granted May 19, 1931, employs an auxiliary cable or "tag line" to secure opening of the bucket doors. This form of control gives the operator some degree of control over discharge of the bucket contents after the doors are once opened, since by reversal of the direction of travel of the bucket, the doors may be again closed prior to

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complete discharge of said contents. However, although this type of mechanism gives the operator better control over the discharge of the bucket than does the first type, it still can be accomplished only through traverse of the bucket on the boom.

The first mentioned type of control has certain constructional and operating advantages over the second type, and these are preserved by the mechanism of the present invention, which at the same time provides a simple and positive control over the opening and closing of the bucket doors, effective at all times and under all conditions, through manipulation of the traverse cable itself, without the use of a tag line.

In the accompanying drawings forming a part of this specification there is illustrated two forms of apparatus suitable for attaining the objects of the invention, although as will be readily understood by those skilled in the art, various modifications thereof may be made within the scope of the invention, as defined by the appended claims.

In the said drawings:

Figure 1 is a side elevational view, partly broken away and in section, of the essential elements of a well known example of boom-and-bucket distributing apparatus for a paving mixer, with one form of bucket door control mechanism constructed and arranged in accordance with the present invention applied thereto, the parts being shown in the positions occupied when the doors are closed;

Fig. 2 is a view similar to Fig. 1 but showing the parts in the positions assumed when the doors are open; and

Fig. 3 is a plan view, largely diagrammatic, illustrating a modification whereby control of the doors may be effected through manipulation of the winding drums upon which the bucket traverse cables are wound.

Referring more particularly to Fig. 1 there is shown a portion of the discharge end of a paving concrete mixer, comprising a framework 11 mounted upon crawler treads 12 for ground traverse and having a mixing drum 13 mounted upon rollers 14 for rotation about a horizontal axis. The frame 11 carries a bracket 15 which supports a vertical bearing member 16 in which is journalled a vertical pivot sleeve 17 to the lower end of which the inner end of the boom 18 is connected by a horizontal pivot pin 19. The upper end of the sleeve member 17 carries a worm gear 20 arranged to be reversibly driven at will from a transmission mechanism 21 which in

turn is driven from the drum 13 by a chain and sprocket drive 22.

The boom 18 comprises a pair of parallel laterally spaced oppositely facing channel irons, upon which the wheeled bucket carriage or trolley 23 is mounted for longitudinal travel back and forth, and from which carriage the bucket 24 is hung. Outward travel of the bucket along the boom, i. e. from right to left, as viewed in Fig. 1, is accomplished by means of a cable 25, one end of which is attached to the carriage or trolley 23 by a bail 26, from whence the said cable extends outwardly to and partly around a sheave 27 mounted on the outer end of the boom. From the sheave 27 said cable extends inwardly above the boom to an idler pulley 28, thence beneath and partly around one of a pair of sheaves 29 mounted on the horizontal pivot pin 19. From the sheave 29 the cable passes upwardly through the tubular pivot sleeve 17 to a winding drum 30 mounted on the framework 11, to which drum the other end of the cable is made fast. The drum 30 is or may be of the general type disclosed in prior Patent No. 2,230,478 granted February 4, 1941, and may be reversibly driven from the transmission mechanism 21 by a chain and sprocket drive 31.

Inward travel of the bucket—from left to right, as viewed in Fig. 1—is accomplished by a cable 32, which passes partly around the other sheave 29, thence upwardly through the pivot sleeve 17 and over a frame-carried sheave 33 to the drum 30, to which the upper end of the cable is attached. The cables 25 and 32 are wound upon the drum in opposite directions so that upon rotation of the drum in say a clockwise direction (as viewed in Fig. 1) the cable 25 will be wound upon the drum while the cable 32 will be paid out therefrom, resulting in outward travel of the bucket along the boom, and when the drum rotation is reversed, the cable 32 will be rewound upon the drum and the cable 25 paid out, and the bucket will be drawn inwardly.

The bucket 24 is of the bottom-discharge type, and its discharge opening is normally closed by a pair of intergeared door structures 34 and 35 which are pivotally mounted as at 36 and 37 respectively on the side walls of the bucket. As in my prior patents referred to above, the doors 34 and 35 are of the gravity-closing type, and are arranged to be opened by linkage comprising a link 38 extending from the door 34 to an arm 39 pivotally mounted at 40 on the front wall of the bucket, and a link 41 extending from the said arm 39 to the arm 42 of a bell crank lever 43 pivotally mounted at 44 on the trolley 23.

The second arm 45 of the bell crank is connected to a portion of the mechanism constituting the gist of the present invention, whereby the doors 34 and 35 may be opened and closed under all conditions, i. e. in any position of the bucket on the boom, and regardless of whether it be in motion or stationary thereon. This portion of the said mechanism comprises a rod 46 which slidably passes through a cylinder or guide structure 47 carried by the trolley 23, one end of which rod is connected by a link 48 to the bell crank arm 45. Within the guide structure 47 the rod 46 carries a collar 49 against which abuts one end of a coiled compression spring 50, the other end of which abuts an end wall 51 of the structure 47. The end of the rod 46 which extends through this wall is connected at 52 to the lower end of the inward-traverse cable 32.

A second portion of the present mechanism

comprises a fluid-pressure cylinder 53 which may be mounted on the frame 11 and in which works a piston 54 having a piston-rod 55 the outer end of which carries a stirrup 56 in which is journalled a sheave 57 about which is trained a portion of the cable 32, as will be clear from Fig. 1.

The spring 50 is of such strength or is so preloaded as to normally maintain the parts in the positions shown in Fig. 1, and to transmit to the trolley 23, without yielding, the pull exerted on the rod 46 by the cable 32 when the drum 30 is being driven in a counter-clockwise direction. It results that so long as the piston 54 in the fluid-pressure cylinder 53, and the sheave 57 actuated thereby, remain in the Fig. 1 positions, the trolley 23 and bucket 24 may be drawn inwardly on the boom as the cable 32 is wound upon the drum 30, without any relative movement between the rod 46 and the bucket 24 and without opening the bucket doors 34 and 35; and upon reversal of the winding drum 30 the trolley and bucket may be drawn outwardly on the boom by the cable 25, likewise without opening the doors since the cable 32 is paid out from the drum at the same rate that cable 25 is wound thereon and there is thus no tension on cable 32 which would overcome the spring 50. However, if while the bucket is either stationary on the boom or is being traversed in either direction thereon, fluid pressure be admitted to the cylinder 53 whereby to move the piston 54 and sheave 57 toward the right, i. e. to substantially the Fig. 2 position, the additional tension thus placed upon the cable 32, plus the fact that the length of cable 25 between the drum 30 and trolley 23 and the tension thereon remains relatively fixed, will cause the spring 50 to yield and be compressed within the guide structure 47. The rod 46 will thus be moved toward the right, from the Fig. 1 to the Fig. 2 position, which motion through the linkage 48, 43, 41, 39 and 38 will move the bucket doors 34 and 35 to their open (Fig. 2) positions. So long as pressure is maintained in the cylinder 53 to keep the sheave 57 in the Fig. 2 position, the doors will remain open, and during such time the bucket may remain stationary on the boom or be traversed in either direction thereon, as will be readily understood. Upon release of the pressure in cylinder 53 (with admission of pressure to the right hand end thereof if desired), the sheave 57 may return to its Fig. 1 position, permitting gravity and the spring 50 to restore the doors to closed position. Obviously, this may take place either before or after the entire contents of the bucket have been discharged, and regardless of whether the bucket be stationary or is travelling on the boom.

While the guide structure 47 which houses the compression spring 50 is illustrated in Figs. 1 and 2 as mounted on the trolley 23, obviously the invention is not dependent upon its disposition in this particular location. For instance, in some cases it may be desirable to mount the guide upon the bucket itself—for example, on the front of the bucket—so that the full space above the bucket is available for the trolley. In such case the cable 32 may be directly connected to the arm 45 of the ball crank lever 43, with the other arm 42 of said lever rather than the cable 32 being influenced by the spring 50. Other similar variations will readily suggest themselves to those skilled in the art, but wherever the spring be located, its function will be to normally prevent relative movement between the bucket and the cable portion 32 except when movement of the

sheave 57 overcomes the predetermined resistance of the spring.

The opening and closing of the bucket door is at all times under the control of the operator, who may fill the bucket with a batch of concrete and then discharge varying portions thereof at a plurality of spaced locations, while the mixer proceeds with the preparation of another batch. Patches or cavities which do not require a complete bucketful of concrete may thus be supplied with substantially just the right amount necessary for each of them, with the balance of the bucket contacts being retained in the bucket for discharge at other locations after traverse of the bucket on the boom and/or swinging of the latter to position the bucket at such locations. Thus it will be seen that the operator may start to discharge the bucket at any of its various positions on the boom, and regardless of whether the bucket is moving outwardly or inwardly or is stationary on the boom, may discharge whatever amount is necessary, stop the discharge while the bucket still retains concrete, and subsequently discharge the balance of the batch wherever and whenever desired.

In lieu of the fluid pressure device 53, 54, separate winding drums for the inward and outward bucket-traverse cables may be employed to attain the same results, and an example thereof is illustrated more or less diagrammatically in Fig. 3. Although it is perfectly feasible to mount such drums 60 and 61 upon a single shaft, they are here shown as mounted upon separate shafts 62 and 63 which are interconnected by gears 64 and 65 for rotation in opposite directions by means of a drive sprocket 66. The respective shafts are provided with appropriate clutches 67 and 68 by means of which they may be connected at will to the drums 60 and 61, and since the said clutches should never be engaged simultaneously, they may be conveniently controlled by a single lever 69 by means of which they may alternatively engaged, there of course being a neutral position (shown in Fig. 3) in which neither clutch is engaged. The drum 60 may receive the inward-traverse cable 70 and has a friction or other suitable brake 71 associated with it, while the drum 61, which may accommodate the outward-traverse cable 72, has a similar brake 73 associated with it. The mechanism on the bucket and bucket trolley may be the same as shown in Figs. 1 and 2.

With this modified form of control, outward traverse of the bucket along the boom may be secured by moving the control lever 69 to engage clutch 68, thereby coupling shaft 63 to drum 61 and causing the cable 72 to be wound thereon. At this time clutch 67 of course is disengaged whereby drum 60 is free to rotate on shaft 62 and permit the inward-traverse cable 70 to be withdrawn therefrom, the brake 71 preferably being applied with just sufficient force to prevent the drum from overrunning the cable. Conversely, by engaging clutch 67 and lightly applying brake 73, the bucket may be drawn inwardly on the boom.

So long as the braking action on the free drum is not in excess of that necessary to prevent merely the overrunning of such drum, the force transmitted by the traverse cable thereof will not be sufficient to overcome the resistance of spring 50, and therefore the bucket doors will not open. However, if during traverse in either direction the braking action on the unclutched drum be increased whereby to further retard or stop its rotation, motion of its cable will likewise be retarded or stopped, with the result that the spring 50 will yield and the bucket doors will be opened, as described above. On the other hand, upon release of the excess braking action, gravity and the force of spring 50 will again close the doors.

The doors may also be opened when the bucket is stationary on the boom by momentarily engaging either clutch while simultaneously fully braking the other drum. The engaged clutch of course should be disengaged almost instantly to prevent undue strain being placed upon the cables and other parts of the machine, and if it be desired to hold the doors open the second brake should be fully applied as the clutch is released, to prevent reverse rotation of its drum which would permit gravity and spring 50 to reclose the doors. When thus held open, closing of the doors may be effected by releasing either or both brakes.

It may be noted that in the bucket control systems disclosed in the above mentioned patents, and heretofore in general use, the traverse cables, as well as the tag line when used, are of fixed length in relation to the bucket. The present invention, on the other hand, provides means which in effect permit stretching or elongation of the traverse cable, and by such stretch or cable expansion the bucket doors may be opened to the extent desired, and subsequently closed through cable retraction. Such operation of the doors may be effected whenever the operator desires, at any location of the bucket on the boom, and regardless of whether the bucket is stationary or is traversing the boom in either direction.

What is claimed is:

1. In distributing apparatus for concrete mixers, comprising a boom, a bucket mounted thereon and provided with a discharge door, cable means for traversing the bucket along the boom, and means for alternatively tensioning different portions of said cable means to move the bucket in opposite directions on the boom: means for opening and closing said bucket door regardless of the position, rate and direction of travel of the bucket on the boom, comprising connections between said door and one of said cable portions; a yieldable connection between such cable portion and the bucket, arranged to transmit the normal traversing force provided by said cable tensioning means to the bucket without yielding and without actuation of the bucket door; and means operable at will to place additional stress upon said cable means whereby to overcome said yieldable connection and cause movement of the door in one direction, said means also being operable at will to relieve such additional stress to cause movement of the door in the opposite direction.

2. In distributing apparatus for concrete mixers, comprising a boom, a bucket mounted thereon and provided with a discharge door, cable means for traversing the bucket along the boom, and means for alternatively tensioning different portions of said cable means to move the bucket in opposite directions on the boom: means for opening and closing said bucket door to various degrees, regardless of the position, rate and direction of travel of the bucket on the boom, comprising connections between said door and one of said cable portions whereby the latter may move the door; a yieldable connection between such cable portion and the bucket, arranged to transmit the normal traversing force provided by said cable tensioning means to the bucket without yielding

and without actuation of the bucket door; means operable at will to place variable amounts of additional stress upon said cable means whereby to overcome said yieldable connection and cause varying degrees of movement of the door in one direction, said means also being operable at will to relieve such additional stress whereby to cause varying degrees of movement of the door in the opposite direction.

3. In distributing apparatus for concrete mixers, comprising a boom, a bucket mounted thereon and provided with a discharge door which is movable to its closed position by gravity, cable means for traversing the bucket along the boom, and means for alternatively tensioning different portions of said cable means to move the bucket in opposite directions on the boom: means for opening and closing said bucket door to various degrees, regardless of the position, rate or direction of travel of the bucket on the boom at the time, comprising connections between said door and one of said cable portions whereby the latter may move the door to its open position; a yieldable connection between such cable portion and the bucket, arranged to transmit the normal traversing force provided by said cable tensioning means to the bucket without yielding and without actuation of the bucket door; and controllable means for placing variable additional stress upon said cable means to overcome said yieldable connection whereby the cable means may cause variable degrees of movement of the door toward its open position, said controllable means being likewise operable to relieve such additional stress whereby gravity may move the door toward its closed position.

4. In distributing apparatus for concrete mixers, comprising a boom, and a bucket traversely mounted thereon, said bucket having a discharge door, an instrumentality for traversing the bucket on the boom, and means for actuating the same: connections between said instrumentality and the door whereby the latter may be opened and closed in controlled manner through relative movement between the bucket and the instrumentality; means normally restraining said relative movement whereby traverse of the bucket by the instrumentality may be made without actuation of the door; and means opposed to said restraining means, operable at will to cause controlled relative movement between the bucket and the instrumentality and thereby produce movement of the door to any desired position from fully closed to fully open.

5. In distributing apparatus for concrete mixers, a boom; a bucket reciprocatably mounted thereon and having a discharge door and means for operating the same; a cable for traversing the bucket on the boom, said cable having a connection with the door operating means whereby the latter may be actuated through relative movement between the cable and bucket; yieldable means for preventing, up to a predetermined limit, said relative movement between the bucket and cable; means for tensioning the cable below said limit to traverse the bucket on the boom without actuation of the door operating means; a movable sheave about which said cable is trained; and means operable at will to move said sheave and thus increase the tension on said cable to above said limit, whereby to cause the yieldable means to yield and relative movement to occur between the bucket and cable with consequent actuation of the door operating means.

6. In distributing apparatus for concrete mixers, a boom; a bucket reciprocatably mounted thereon and having a discharge door and means for operating the same; a cable for traversing the bucket on the boom, said cable having a connection with the door operating means whereby the latter may be actuated through relative movement between the cable and bucket; resilient means for preventing, up to a predetermined limit, said relative movement between the bucket and cable; means for tensioning the cable below said limit to traverse the bucket on the boom without actuation of said door operating means; a movable sheave about which said cable is trained; and a fluid pressure device for moving said sheave to increase the tension on the cable to above said limit, whereby to cause said resilient means to yield and relative movement to occur between the bucket and cable with consequent actuation of the door operating means.

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