Dec. 28, 1948. R. M. G. SCHIRO 2,457,604

MATERIAL DISTRIBUTING APPARATUS

Filed Sept. 17, 1946 2 Sheets-Sheet 1

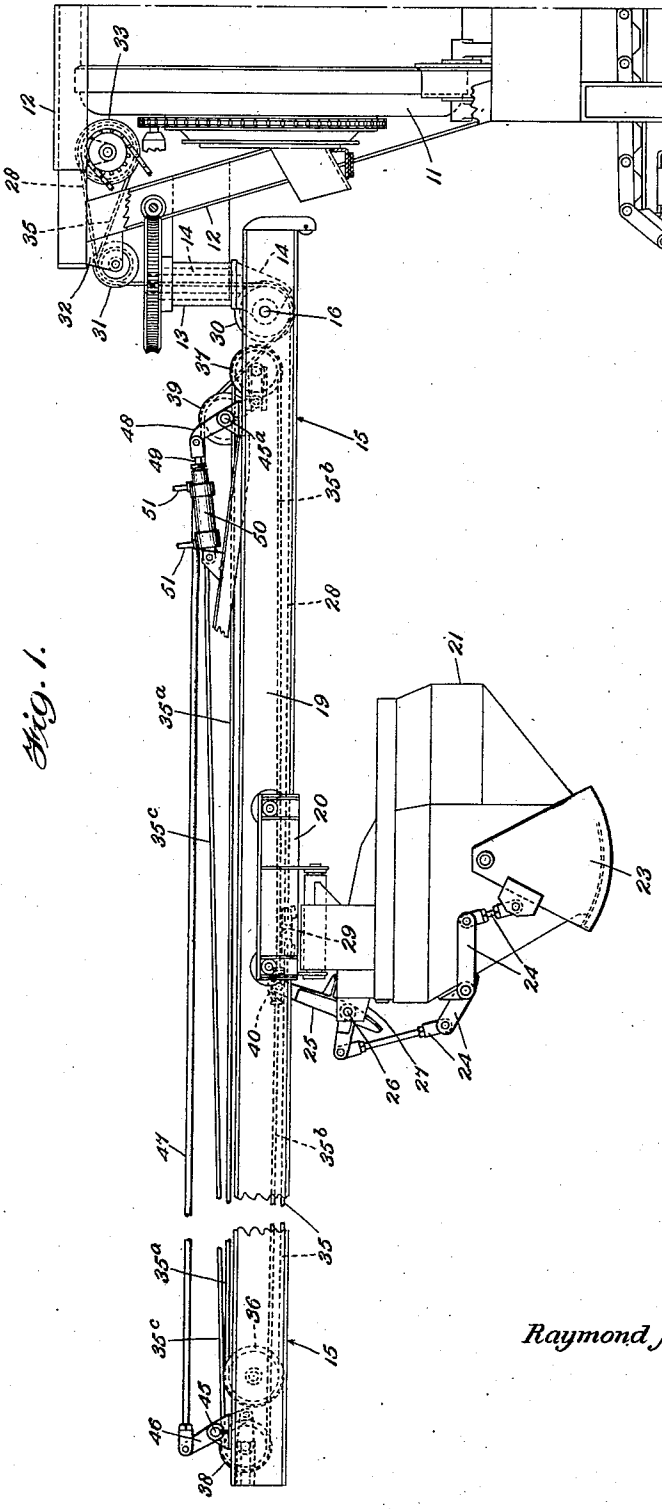


Fig. 1.

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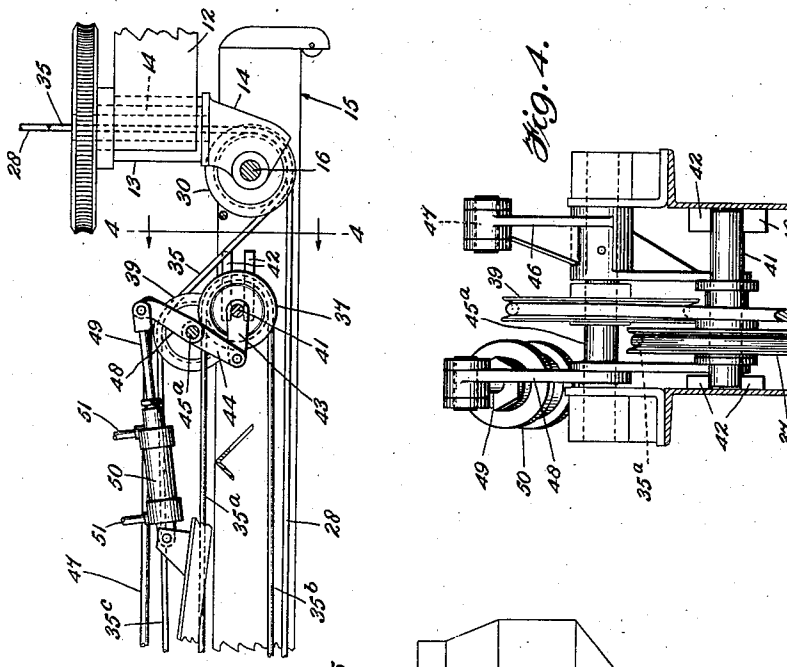


Fig. 4.

Fig. 2.

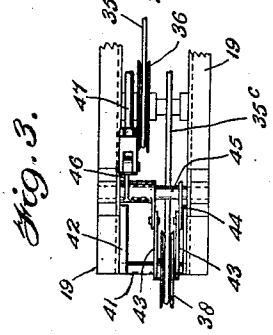


Fig. 3.

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MATERIAL DISTRIBUTING APPARATUS

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5 Claims. (Cl. 214—59)

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The invention relates to material distributing apparatus of the type in which a receptacle having a controllable discharge gate or door and mounted for traverse along an elevated trackway by power driven cable means is employed to receive the material at a station on said trackway and then transport it to any other place or places along the trackway, where, through remote control of the receptacle door, all or any desired portions of the material may be discharged. As a typical example of such apparatus there may be cited the well known boom and bucket mechanism widely used in conjunction with concrete mixers of the so-called "paver" type for the placement of concrete upon the sub-grade of a roadway or the like; and while not necessarily limited to this specific class of apparatus, for purposes of disclosure the invention has been illustrated and will be hereinafter described in connection therewith.

In general, the object of the invention is to provide an improved remote control for the discharge door or gate of the bucket or other receptacle, whereby the operator may have full control over such element at all times and under all normal operating conditions. More specifically, from his station on the mixing machine the operator may at any time cause opening of the bucket door to any desired extent within its limits of movement, similar closing of the door, and/or its maintenance in any desired position within such limits, all of which operations may be performed quite irrespective of the position of the bucket on the boom, or its rate and direction of travel thereon. Further, the control is effected through the medium of the cable means which are employed to traverse the bucket along the boom, without the use of a separate "tag line."

One form of the invention is illustrated in the accompanying drawings forming a part of this specification, in which:

Figure 1 is a side elevational view, partly broken away, of the boom and bucket distributing apparatus of a conventional "paving" concrete mixer, with bucket door control mechanism constructed and arranged in accordance with the present invention applied thereto, the parts being shown in the positions assumed when the bucket door is fully closed;

Fig. 2 is a sectional-elevational view, on a slightly larger scale, taken longitudinally of the boom, illustrating the positions of the parts when the door is fully open;

Fig. 3 is a fragmentary plan view, looking down on the outer end of the boom; and

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Fig. 4 is an enlarged transverse sectional view on the plane indicated by the line 4—4 of Fig. 2, looking in the direction of the arrows.

Referring more particularly to the said drawings, there is shown in Fig. 1 a portion of the discharge end of a "paving" concrete mixer having a mixing drum 11 rotatably mounted in a framework 12 which carries a vertical bearing 13 in which is journalled a tubular boom supporting member 14 to the lower end of which the inner end of the boom structure 15 is secured by a pin or shaft 16. The said boom structure comprises a pair of laterally spaced oppositely facing channel irons 19, the lower flanges of which provide a trackway upon which a wheeled trolley or carriage 20 is mounted for reciprocatory travel. The concrete distributing bucket 21 is appropriately attached to and carried by the said trolley, and the lower portion of such bucket is provided with a discharge opening 22 which is controlled by a swinging gate or door 23 operable between the positions illustrated in Figs. 1 and 2 respectively by means of linkage 24 terminating in a bell-crank lever 25 which is pivotally mounted at 26 in a bucket-carried bracket 27.

The trolley 20 and bucket 21 are drawn inwardly along the boom 15—i. e. from left to right as viewed in Figs. 1 and 2—by an in-haul cable 28 attached to the trolley or carriage by a cable anchor 29 and extending therefrom to and partially around one of a pair of sheaves 30 journalled on the pin or shaft 16, from whence such cable passes upwardly through the tubular boom pivot 14 to and partially around one of a pair of sheaves 31 mounted in a frame-supported bracket 32. From this sheave the cable 28 extends to and around a power driven winding drum 33 also carried by the frame 12 and provided with conventional controls (not shown) whereby it may be operated in either direction or held stationary at will.

The bucket and carriage are traversed outwardly on the boom by an out-haul cable 35 which is also anchored to the carriage at 29, and extends therefrom to and partly about a sheave 36 mounted on the boom adjacent the outer end thereof. From here, a run 35^a of this cable extends inwardly to and partly around a sheave 37 adjacent the inward end of the boom, from whence a run 35^b extends outwardly to and partly around a sheave 38 at the outward end of the boom, from which sheave a run 35^c extends inwardly to and partly around an idler sheave 39. From this idler the cable 35 extends downwardly to and partly about the second of the pair of sheaves 30, thence

upwardly through the tubular boom pivot 14 to and partly around the second of the pair of sheaves 31, from whence it passes to the winding drum 33 about which it is wound in a direction opposite to that of in-haul cable 28.

The run 35b of the out-haul cable is attached to the bell-crank lever 25 of the door operating linkage by a clip 40, as shown in Figs. 1 and 2, and the runs 35a and 35b in effect constitute a free running bight or loop in the cable, the position of at least a portion of which may be shifted relative to the boom at will, whereby to impart to such portion a movement other than its normal running bucket-traversing motion, which additional movement is employed to effect partial or complete opening and closing of the bucket door at the volition of the operator. This shifting of the loop is accomplished as follows:

The sheaves 37 and 38 are each shiftably mounted on the boom 15 by having their shafts 41 appropriately mounted in guides 42 for reciprocation longitudinally of the boom, which movements are effected through links 43 and rock arms 44 carried by rock-shafts 45 and 45a, the latter of which may conveniently serve to journal the idler sheave 39. The said rock-shafts each carry an arm 46 which arms are interconnected as by a rod 47, and the shaft 45a is further provided with an actuating arm 48 to which is connected the piston rod 49 of a double acting reciprocating fluid pressure motor or ram 50 carried by the boom 15. Fluid under pressure may be supplied to and exhausted from the respective ends of the cylinder of such motor through suitable conduits 51 which extend to the operator's station on the mixer, where they are provided with appropriate conventional controls for securing the desired movements of the motor.

Through the construction described, complete control may be had over the bucket door 23 at all times, whereby such door may be partly or completely opened, closed and/or maintained in any desired position at will, regardless of whether the bucket be stationary on the boom, or travelling at any rate in either direction thereon. For example, assuming the bucket to be stationary at any point on the boom, and the bucket door 23 closed as in Fig. 1, if it be desired to partially or fully open said door to discharge concrete from the bucket, the controls at the operator's station on the mixer will be manipulated to supply fluid pressure to the left hand end of the cylinder of the motor 50, thereby forcing its piston and piston rod 49 toward the right. This motion is transmitted through the arm 48, rock-shaft 45a, arms 46 and connecting rod 47 to the rock-shaft 45 to move it in synchronism with the rock-shaft 45a. The movement of the two rock-shafts in turn is transmitted through their respective arms 44 and links 43 to the shafts 41 of the sheaves 37 and 38, which are thereby simultaneously shifted toward the left, to the positions shown in Fig. 2 if the door is to be fully opened, or to any desired position short thereof if the door is to be only partially opened.

This shifting of the sheaves 37 and 38 results in a shifting of the position of the loop or bight formed in the out-haul cable 35 relative to the boom and bucket, and produces a lengthening of the run 35c of such cable, a corresponding shortening of its run 35a, and a movement of the run 35b toward the left without either lengthening or shortening thereof. Since the cables 28 and 35 are not at this time in motion to traverse the bucket on the boom, but on the contrary are holding it stationary thereon, the effect of this movement of the cable run 35b is to rock the bell-crank lever 25 on its pivot 26, which motion is transmitted through the linkage 24 to the bucket door 23 to open the same. The extent of such opening is dependent upon the extent of movement of the cable run 35b toward the left, and therefore if the motor 50 be stopped at any point short of its limit of rightward movement, opening of the door will be likewise stopped at a corresponding point in its swing, in which position it will be maintained so long as the motor piston remains at rest. Obviously, a reversal of the motor 50 will effect a partial or complete closing of the door in a similar manner.

The mechanism is equally effective to control the door when the cables 28 and 35 are running to traverse the bucket in either direction on the boom. Suppose again that the door is closed as in Fig. 1, and the winding drum 33 is being operated to cause the cables to move the bucket outwardly, i. e. from right to left. Both cables 28 and 35 will be running freely around their several sheaves, with that portion of the cable 28 between the anchor 29 and the sheave 30, that portion of the cable 35 between the anchor 29 and sheave 36, and run 35b of the latter cable, all moving from right to left, while runs 35a and 35c of the out-haul cable will be moving from left to right. Since all portions of both cables will be running at a uniform rate of speed, and since the run 35b is moving in the same direction as the anchor 29 and bucket 21, there will be no relative movement between the said cable run and bucket which would effect a shifting of the bell-crank 25 with consequent actuation of the door.

However, if the motor 50 be now actuated to effect a shift of the sheaves 37 and 38 toward the left as above described, the effect will be to add the rate of such shift to the running speed of the cable run 35b, and since the in-haul cable 28 will prevent any acceleration of the rate of travel of the bucket on the boom, there will be relative movement between the said cable run 35b and the bucket which will result in rocking of the bell-crank lever 25 and consequent opening of the door. Here again the degree to which the door is opened will correspond to the extent to which the motor piston is moved; and if the motor be reversed while outward travel of the bucket continues, during the return shift of the sheaves 37 and 38, i. e. toward the right, the cable run 35b will be decelerated to a speed below that of the bucket, with consequent movement of the bell-crank 25 in the opposite direction and closing of the door.

Obviously, the mechanism will function in a similar manner during inward travel of the bucket, except that in this case a shift of the sheaves 37 and 38 toward the left to effect opening of the door will decelerate the cable run 35b to a speed lower than that of bucket travel, while an opposite shift of the sheaves to close the door will accelerate the run 35b to a speed above that of the bucket. In all cases however, the shift of the run 35b of the loop or bight of cable 35 is in such direction relative to that of bucket movement as to produce relative movement between the cable run and bucket which moves the bell-crank 25 in the proper direction to secure the desired door movement.

While the loop or bight has been here described as being formed in the out-haul cable 35, it could be employed in the in-haul cable 28 equally as well, if desired.

What is claimed is:

1. In material distributing apparatus of the class described, the combination of a linear trackway; a material receptacle traversably mounted on said trackway and provided with a discharge controlling door; a traverse cable connected to said receptacle for moving it along the trackway; means for driving said cable; guide means carried by the trackway and engaged by the traverse cable to provide a running loop thereof extending along the trackway; connections between a portion of said cable loop and the receptacle door, operable through relative movement between the receptacle and said loop portion to open and close said door; and means for shifting said loop-forming guide means at will to volitionally variable extents, to produce controlled movement of said cable loop portion relative to the receptacle, with correspondingly controlled movement of the door.

2. In material distributing apparatus of the class described, the combination of a trackway; a material receptacle traversably mounted thereon, said receptacle having a discharge controlling door; means for traversing the receptacle on the trackway, comprising a cable having a portion connected to the receptacle and extending along the path of travel thereof; means for moving said cable in either direction at will; means disposing a second portion of said cable parallel to said first portion and co-extensive with said path of travel of the receptacle, said second cable portion being movable in the same direction as said first portion for receptacle traverse; door operating mechanism carried by the receptacle, having an actuating connection with said second cable portion; and means for imparting movement other than receptacle-traversing movement to said second cable portion in either direction at will, whereby to actuate said door operating mechanism.

3. In material distributing apparatus of the class described, the combination of a boom providing an elongated trackway; a bucket traversably mounted on said trackway, said bucket having a discharge controlling door; a cable connected to said bucket for traversing the same along the trackway; sheaves shiftably mounted on said boom for forming a running loop in said cable, said loop having a portion paralleling and substantially co-extensive with the path of travel of the bucket; door operating mechanism carried by the bucket, having an actuating connection with said loop portion; and means for shifting said sheaves at will to change the position of the loop on the boom and thereby cause actuation of said door operating mechanism through relative movement induced between said loop portion and bucket.

4. In material distributing apparatus of the class described, the combination of a boom providing an elongated trackway; a bucket traversably mounted on said trackway, said bucket having a discharge controlling door; a sheave carried by the boom adjacent each end thereof and mounted for reciprocatory movements relative thereto; a cable connected to the bucket for traversing the same on the trackway, said cable being trained about said sheaves to provide a running lop therein having a portion paralleling and substantially co-extensive with the path of travel of the bucket on the trackway; door operating mechanism carried by the bucket, having an actuating connection with said loop portion; and means for simultaneously shifting said sheaves in either direction at will, whereby to impart movement to said loop portion relative to the bucket with resultant actuation of the door operating mechanism.

5. In material distributing apparatus of the class described, the combination of a boom providing an elongated trackway; a bucket traversably mounted on said trackway, said bucket having a discharge controlling door; a sheave disposed on the boom adjacent each end thereof, said sheaves being mounted for movements longitudinally of the boom; a cable connected to the bucket for traversing the latter on the trackway, said cable being trained about said sheaves to provide a running loop having a portion paralleling and substantially co-extensive with the path of travel of the bucket on the trackway; door operating linkage carried by the bucket, having an actuating connection with said loop portion; means interconnecting said sheaves for simultaneous movement thereof; and fluid pressure means carried by the boom for moving said sheaves in either direction at will to vary the position of the cable loop on the boom, whereby, through acceleration and deceleration of the movement of the portion of said loop which is connected to the door operating linkage in relation to movement of the bucket, said linkage may be operated to open and close the door.

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