This invention relates generally to a truck-type street sweeper having a motor driven pick-up brush and refuse hopper, and an elevator means for transporting refuse from said brush to said hopper through a refuse chute. More particularly, this invention relates to an elevator means floating freely in the street sweeper body and supported via a traverse bar intermediate the pick-up and discharge ends of said elevator means. In the preferred form of the invention, the elevator is supported on independent pivot supports at each side, said supports being movable in slots normal to said chute to permit said elevator to move away from said chute, and to roll and pitch thereon as refuse objects are transported between said elevator and said chute.

This application is a continuation-in-part of my co-pending application, Serial No. 570,293, filed March 8, 1956, now Patent No. 2,917,761, on a “Street Sweeper Hopper and Lift Mechanism.”

All truck-type street sweepers presently in use pick up dirt from the street by means of a large cylindrical broom mounted on an axis transverse to the truck, and driven through power connections with the truck engine in a direction of rotation counter to the relative movement of the street surface when the truck is in forward motion. The broom is supported with the bristle tips barely in contact with the street surface so that its rotation whisks refuse matter forward and upward into an upwardly sloping chute. An elevator means of the conveyor belt type is used to carry refuse upwardly through the chute to a discharge point at its upper end, at which the refuse falls into a hopper. Such street sweepers are also usually provided with a gutter broom on the right side, water spray means, means for lifting the brooms during non-sweeping travel, and hopper dumping means.

The present invention is concerned with the elevator means, and its co-action with the brush, chute, and hopper. In street sweepers heretofore known, the elevator means has frequently been damaged or broken down by the engagement of rocks, boards, or other bulky refuse objects between its moving surfaces and the chute. The bristles of the pick-up broom are large enough, strong enough, and driven with enough power to pick up relatively large objects and throw them into the intake end of the chute, where transverse bars on the moving belts or chains engage them and scrape them upwardly through the chute to the discharge end at which they are dumped into the hopper. Frequently, a refuse object which has greater thickness than the space between the surface of the chute and the moving chains jams in the chute, bending or breaking the chute, the chains, or the driving mechanism, before the power can be shut off.

Various means have been devised for increasing the ability of the elevator to pass large objects up through the chute without a high rate of destructive break downs. In almost all such means, however, it has been necessary to insure that the scraping surfaces of the elevator remain near to or in contact with the chute surface during normal operation, so that the elevator would be capable of efficiently transporting dirt, leaves, papers, and small objects, which comprise most of the refuse picked up. For example, most street sweeper elevators use moving transverse bars with rubber flap edges, usually referred to as squeegee bars, which are capable of lifting small refuse or of yielding to bulky objects. The effectiveness of this arrangement is limited to small stones and the like.

Another method of protecting the elevator has been to hang it in swinging support from the upper shaft of the conveyor system. This arrangement left the lower end of the elevator free to swing away from the chute when large objects were engaged at the pick-up end. However, the tolerance of such elevators diminishes toward the upper end of the chute, sometimes, a large object, after starting up the chute, jams in its upper part. Some alleviation of these difficulties has been accomplished by carrying the transverse squeegee bars on relatively loose and unsupported flexible chains between upper and lower pulleys or sprockets; this design suffers from the disadvantage of excessive chain wear and breakage.

Previous swinging or pivotally supported street sweeper elevators suffer from the disadvantage that they tend to drop a large amount of refuse load all the way back to the street whenever a bulky object is moving through the elevator. The lower part of the elevator remains displaced a very substantial distance away from the chute surface as the bulky object progresses through the upper part of the chute. Indeed, the displacement of the lower end of the elevator may be several times the thickness of the object itself. In most previous designs, the presence of a bulky object at one side of the elevator displaces the elevator, if it is displaceable at all equally across its entire width.

Of the many other disadvantages of previous designs, probably the most serious is the difficulty of repair of the elevator. In most previous designs, it has been necessary to remove substantial parts of the sweeper body, and to dismantle the elevator and its driving mechanism in order to replace its broken parts. It is a primary object of the present invention to provide a street sweeper pick-up assembly in which the elevator and its driving means comprise a unitary assembly supported in a free-floating manner within said chute, being displaceable away from the chute surface at either end or throughout its length.

Another object, incidental to the foregoing, is to provide an elevator means capable of displacement away from the chute surface at either side, or both sides, to prevent any rocking motion best suited to accommodate the load engaged at the moment.

Another major object of the present invention is to provide an elevator means, which, together with its driving means, can be readily removed from its mounting for repair, without disassembly of other parts of the street sweeper.

Another object of the invention is to provide a street sweeper elevator in which the conveyor chains are supported over their entire path in protecting channels.

The foregoing and other objects, and the manner in which they are attained will be clearly apparent from the following description of an illustrative specific embodiment, which is illustrated in the accompanying drawings, in which:

Figure 1 is a right side view of a street sweeper including the combination of the present invention with associated street sweeper components;

Figure 2 is a fragmentary left side view showing the elevator driving means;

Figure 3 is a longitudinal vertical sectional view.
through the rear part of the street sweeper of Figure 1, showing the elevator in its normal operating position;

Figure 2 is a fragmentary view similar to Figure 3, but showing the operation of the elevator when it is transporting a bulky refuse object;

Figure 5 is a sectional view of a longitudinal section through the elevator, taken as indicated by the arrows 5—5 in Figure 3;

Figure 6 is an enlarged side view of the elevator assembly;

Figure 7 is a plan view of the elevator assembly with the central portion broken away to reduce the relative width of the drawing; and

Figure 8 is a fragmentary part of a transverse sectional view taken in the direction of the arrows 8—8 in Figure 6.

In Figure 1 a street sweeper, indicated generally by the numeral 15, is seen to be comprised principally of a four-wheel truck chassis 11 carrying a driver's cab 12 and engine section 13 in the forward part, and a street sweeper assembly 14 in the rear part.

The street sweeper assembly 14 includes a sweeper body 15 which houses a refuse hopper and a water tank, not seen in this view.

A disc shaped gutter brome 16 is provided at the right side of the street sweeper 10 to whisk refuse from the side of the track to the area between the track wheels 17 under the truck chassis 11. A cylindrical pick-up brome 18, transversely disposed at the rear of the street sweeper 10 is driven by means to be disclosed hereinafter in the direction of the arrow 19 to whisk refuse in the path of the street sweeper 10 forwardly and upwardly into the intake end 20 of an upwardly sloping chute 21.

A conveyor belt type of elevator 22, seen in dashed line outline in Figure 1, and in sectional view in Figure 3, is used to push refuse through the chute 21 to its upper or discharge end 23, where the refuse falls into a hopper 24 inside of the sweeper body 15.

As set forth in detail in my co-pending application Serial No. 570,293, the gutter brome 16 is mounted on a vertically swinging arm assembly 25, pivoted at 26, supported with sector hinge 27, and by a swinging roller support 28 pivoted at 29. The swinging roller support 28 is yieldably sustained by a spring 30, which terminates on a nub 31 carried on an adjusting screw 32. The gutter brome is driven by hydraulic motor 33 which rides freely on the swinging arm 25, and is supplied with hydraulic fluid under pressure through lines 34.

The pick-up brome 19 rotates on a shaft 35, each end of which is carried on an independent vertically swinging arm 36 to provide a knee action operation which allows the brome 18 to adjust to the contour of the road surface, in a manner described in detail in my co-pending application, Serial No. 570,293.

The pick-up brome arm 36 is pivoted at 37 and yieldably carried on spring 38, which is adjustable at its lower end by nut 39 and adjustment screw 40.

When it is desired to move the street sweeper 10 with the pick-up brome 18 in non-sweeping position, the brome 18 and its associated parts, such as the arm 36 and the side shoe 41, can be retracted from the road surface by retraction of the hydraulic cylinder 42, pivoted link 43, and chains 44.

A second hydraulic cylinder 45 may be employed to push the pick-up brome 18, and its associated parts, out of the way for dumping, while simultaneously unlatching a refuse hopper latch 46, and swinging open a refuse hopper gate 47 by means of pull rod 48.

The elevation reveals the left side of the portion of the street sweeper assembly in which the elevator 22 is mounted. A portion of the elevator 22 is visible through an opening 49 in the side of the street sweeper chute 20.

A reversible hydraulic motor 50 is carried on the elevator 22 and comprises a part of its assembly, being mounted on a drive shaft 51 at its left end 52 external to the chute 21. Hydraulic motor 50 is driven by means of hydraulic fluid supplied through an interconnecting flange 53 and 55 of left and right supporting pins 57 and 58 respectively.

The supporting pins 57 and 58 pass through holes 59 and 60 in the side walls 61 and 62 of the chute 21, and project inwardly in alignment with each other, through slots 63 and 64 in left and right side panels 65 and 66 respectively of the elevator 22.

It is a preferred feature of the present invention to locate the axes of supporting pins 57 and 58 very near the center of gravity of the elevator 22. It is then found that the elevator rides normally with substantially uniform light bearing on the bottom surface 67 of the chute 22.

When a large refuse object, such as a rock 68 illustrated in Figure 4, is pushed into the chute 22 by the pick-up brome 18, the pin support permits the entire elevator assembly 22 to be displaced away from the chute bottom surface 67. The elevator assembly 22 is thus free to be lifted, or to roll laterally or to pitch fore and aft as refuse objects of different shapes and sizes are transported.

Figures 6, 7, and 8 show the present specific embodiment of the invention in enlarged detail. The right and left side panels 65 and 66 are bolted by bolts 69 to the flanged ends 70 of rigid cross members 71 and 72 to form a rigid frame structure for the entire elevator 22.

The drive shaft 51 is journaled in bearings 73 and 74, which are bolted to bearing brackets 75 and 76, which are welded to the left sides of side panels 65 and 66 respectively.

The shaft 51 carries a pair of sprockets 77 and 78, supported in alignment with the upper ends of the side panels 65 and 66, and keyed at as 79 to rotate with the rotation of shaft 51.

At the lower or pick-up end of the elevator 22, a pair of rotatable sheaves or pulleys 80 and 81 are similarly supported in alignment with the left and right side panels 65 and 66 respectively on pulley brackets 82 (Figure 6) and 83 (Figure 3).

The pulley brackets 82 and 83 are adjustable longitudinally relative to their supporting side panels 65 and 66 since each is bolted to its side panel by means of bolts 84 received in slots 85 in the side panel. Each of the pulleys 80 and 81 is held in adjustment against the forces experienced during use by means of its own adjusting screw 86 and 87 respectively, threaded through brackets 88 and 89 on the inner sides of the side panels 65 and 66 respectively, and bearing on the upturned ends 90 and 91 of the pulley brackets 82 and 83.

The left and right sides of the elevator 22 are each provided with a flexible link chain loop 92 and 93, respectively, mounted to ride on the sprockets 77, 78 and the pulleys 80 and 81, when driven by rotation of the shaft 51.

It is an important and advantageous feature of the present invention that the chains 92 and 93 are supported throughout their length between the pick-up and discharge ends of the elevator 22, and in both directions of travel by protective channels 94 welded on the upper and lower edges of each of the side panels 65 and 66.

The chains 92 and 93 carry a number of transverse squeeze bars 95, spaced at regular intervals around the entire conveyor loop. Each of the squeeze bars 95 consists of a piece of angle iron 96 welded to the chains 92 and 93 at each end, and provided with a stiff rubber flap 97 bolted to the back of the L 96 by means of a flag plate 98 and bolts 99. If desired, fabricant may be
applied to each of the chains 92 and 93 by means of a grease cup 100. It will be seen that the elevator 22, although in engage
ment with the pick-up brush 18, the chute 21, and the refuse hopper 24, is an entirely independent assembly, being free to move away from the bottom surface 67 of the chute 21, and to pitch and roll thereon. The elevator 22 is not permitted to yaw, however, or to move longitudinally with respect to the chute 21, being restricted in its freedom of movement by the engagement of the supporting pins 57 and 58 with the slots 63 and 64. The entire elevator is free to make a slight lateral shifting, if stress is experienced during operation required to do so, since pins 57 and 58, and the width of the chute 21 permit some lateral play. Also, it will be noted that gravity urges the elevator 22 into the normal position illustrated in Figure 3. Even in this position, however, the elevator 22 does not bear heavily upon the bottom surface 67 of the chute 21, since the pins 57 and 58 bear upon the upper ends of the slots 63 and 64 in the normal operating position. Preferably, the upper edges of the slots 63 and 64 are provided with a bearing surface of increased thickness as indicated at 161 and 162 in Figure 5.

It will also be appreciated that the provision of an adjustable and rotating member at the lower end of each side panel, such as are provided here by the pulley brackets 82 and 83 and the pulleys 80 and 81, are merely refinements, since the chains 92 and 93 could be made to slide around the lower ends of the side panels 65 and 66 in stationary U channels, although the frictional wear would be considerably increased thereby.

It will be appreciated that I have described the foregoing specific embodiment as illustrative of my invention only, and it is not my intention to restrict the scope of the invention to the specific details or particular arrangements described, but intend the scope of my invention to cover all forms falling within the limits defined by the following claims.

1. In a street sweeper, a refuse hopper, an upwardly inclined chute extending to said hopper, and elevator means for transporting refuse to said hopper along the surface of said chute, said elevator means comprising: an elevator frame extending longitudinally from a lower pick-up end to an upper discharge end near said hopper, and including two side panels disposed substantially parallel to said chute; a flexible conveyor means associated with each of said side panels; transverse members supported at each end by one of said conveyor means to move refuse through said chute; motor means mounted on said elevator frame for driving said conveyor means; a single slotted track means in each of said side panels and disposed in a plane substantially normal to said chute and approximately centered between said pick-up and discharge ends thereof; and pin means at each side of said chute engaging said slotted track means to support said elevator side panels.

2. In a street sweeper, a refuse hopper, an upwardly inclined chute extending to said hopper, and elevator means for transporting refuse to said hopper along the surface of said chute, said elevator means comprising: an elevator frame disposed substantially parallel to said chute and including a pair of side panels, each of said panels having a single slot normal to said chute near the center thereof longitudinally adjustable lower end members on each of said side panels; a guide channel on the upper and lower edges of each of said side panels; elevator rotatingly mounted at the upper end of each of said side panels and in alignment therewith; a loop of flexible chain around each of said side panels and supported in said supporting channels and driven by said sprockets; transverse scraper means supported at each end on said flexible chains; motor means mounted in said elevator frame to drive said sprockets; and pin means at each side of said chute engaging said slot to support said elevator means while yielding to pitching and rolling movements thereof.

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