May 13, 1958 E. C. RICHARDSON 2,834,452

AUTOMATIC GRAVITY TAKE-UP FOR BUCKET ELEVATORS

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FIG.1.

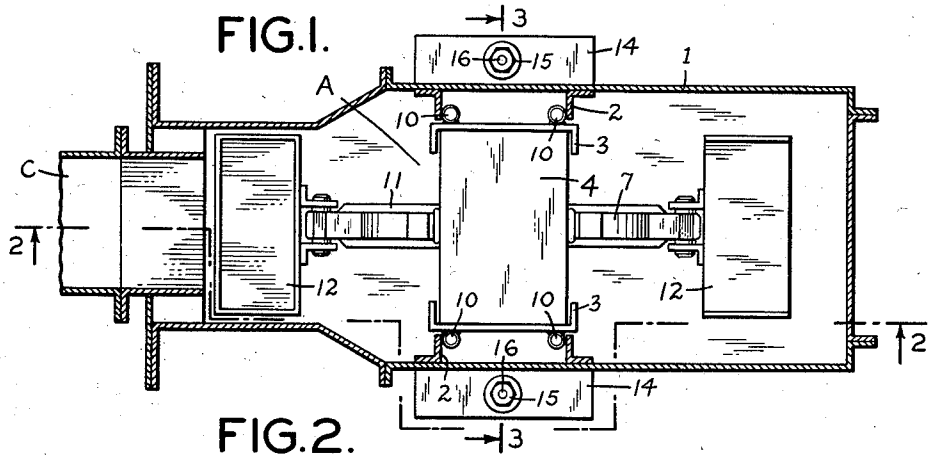
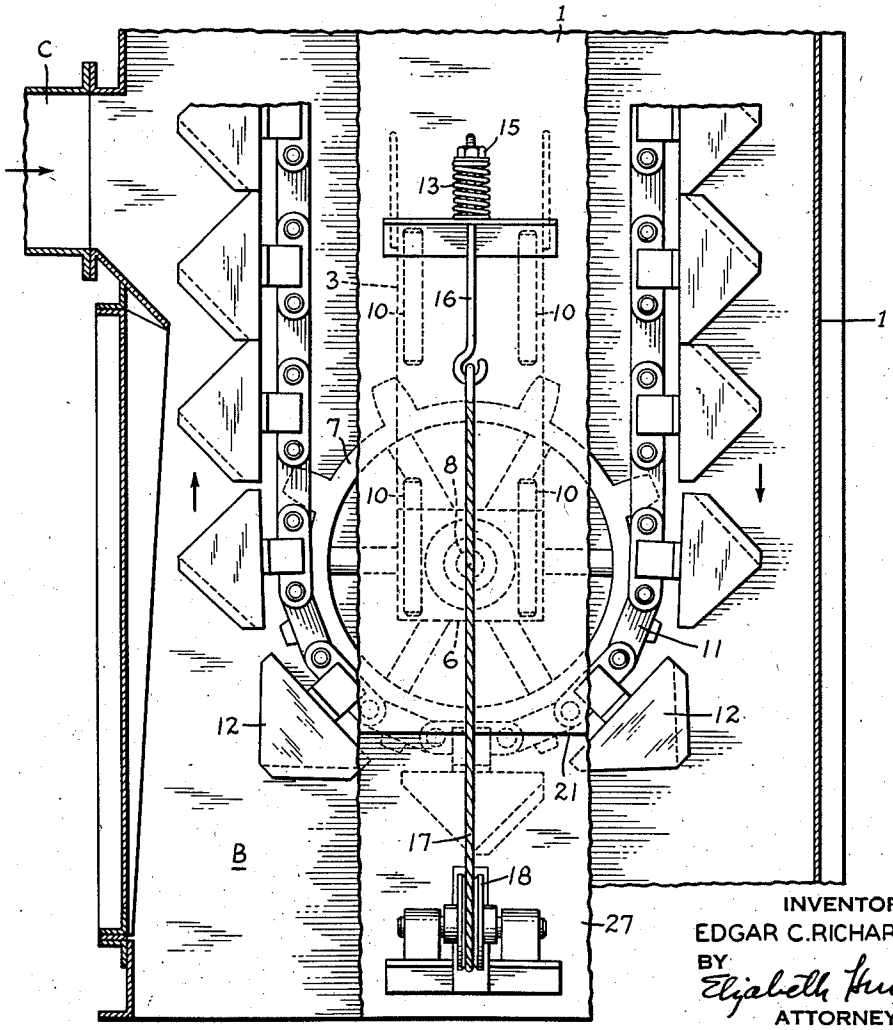


FIG.2.



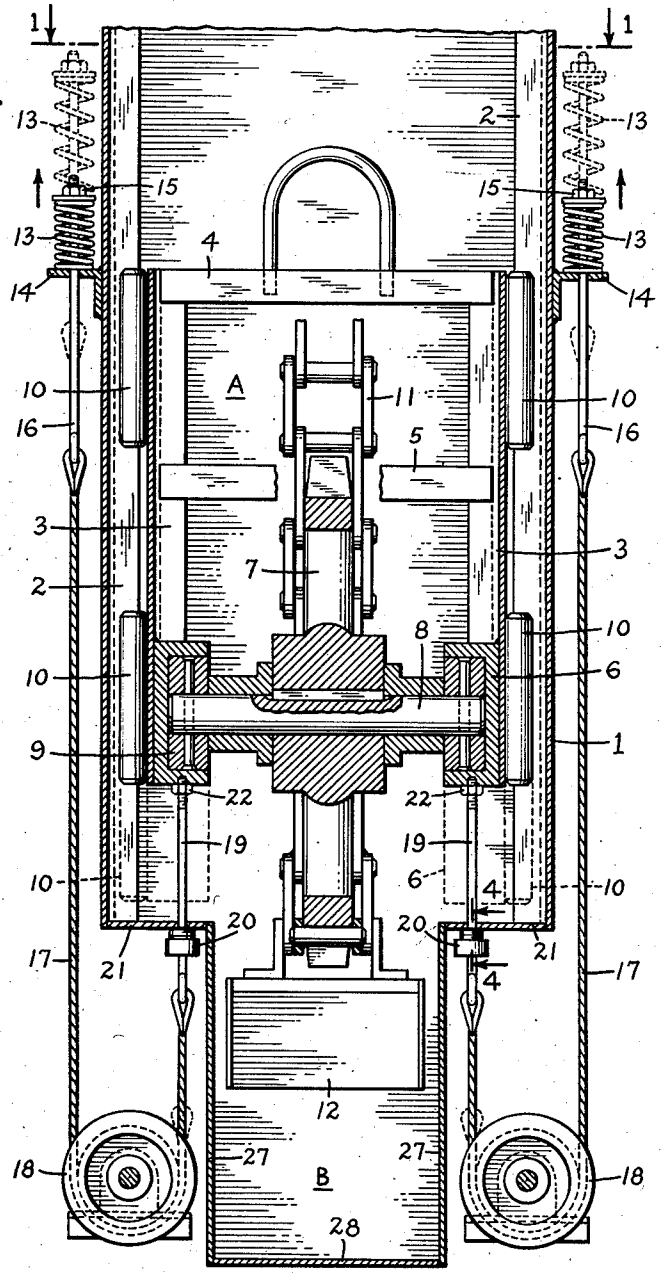
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FIG.3.



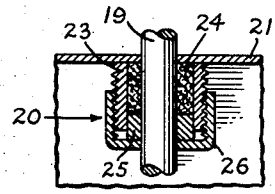


FIG.4.

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AUTOMATIC GRAVITY TAKE-UP FOR BUCKET ELEVATORS

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3 Claims. (Cl. 198—208)

This invention relates to improvements in gravity-take-up bucket elevator construction, and more particularly to a supplementary cable and spring attachment for internal automatic gravity take-up mechanisms of the floating box type.

Vertical bucket elevators comprising an endless chain or belt provided with buckets and travelling around two vertically spaced pulleys or sprockets are well known. In certain conventional types of such elevators, the lower pulley, or tail sprocket, is journaled into a sliding or "floating" box so that it is free to move vertically up and down in the boot portion of the elevator to compensate for variations in the length of the chain, to take up slack and to ride up on accumulations which may form beneath the buckets in the bottom of the boot. Platforms may be provided in the sliding box for insertion of weights of desired magnitude to exert downward pressure on the entire assembly, with a view to maintaining the sprocket in engagement with the chain. However, when material being elevated accumulates in the bottom of the elevator boot, below the tail sprocket and chain, or pulley and belt, due to "dribbling" from the feed and discharge spouts and to surges in the feed rate, the entire take-up mechanism may tend to rise unduly and prevent proper engagement of the chain links with the tail sprocket teeth or of the belt with the pulley. On the other hand, slackening of the chain or belt due to stretching or heat expansion, may cause the mechanism to fall unduly and to ride too low in the boot and to disengage from the sprocket wheel or pulley. In such cases adjustments may be made, for example by adding weights to, or withdrawing them from the floating take-up mechanism. Such adjustments are manual, requiring the presence of an operator and are disadvantageous in that either the casing must be opened, permitting dust and gases to escape or, alternatively, that operation must be discontinued while changes are being made, or outside weight carrying levers provided, destroying the gas tight character of the equipment.

It is an object of the present invention to provide an auxiliary attachment to internal gravity take-ups for vertical bucket elevators which is completely automatic and which will insure efficient action of the take-up device by holding it constantly in place at its required position in the boot of the elevator in positive engagement with the elevator chain or belt.

A further object is to provide such an attachment in which a resilient action is provided which is completely automatic.

A further object is to provide a dust- and gas-tight installation.

A still further object is to provide an accessory device to hold the gravity take-up in place which is substantially entirely outside the elevator casing, above ground and easily accessible and in sight of the operators, and yet exerts its downward pull internally of the elevator casing.

With the above objects in view, the invention consists of the features of construction, combination of elements

and arrangement of parts as hereinafter illustrated and described.

The annexed drawings illustrate schematically the boot section of an enclosed bucket elevator provided with a sliding frame gravity take-up device and the improved auxiliary cable and spring attachment of the invention.

Briefly stated, my improved structure provides for an auxiliary downward pull on the floating box take-up mechanism of an enclosed vertical bucket elevator, the pull being exerted resiliently for example by means of two or more springs located on opposite sides of the assembly and externally of the elevator casing. The external springs are connected to the floating take-up box through a rod and cable system trained around pulleys and passing into the enclosed casing in gas-tight relation as by means of a suitably packed gland. To accommodate entrance of the connection, the elevator boot may be suitably modified, for example, as shown in the drawing, by reducing the width of the bottom portion, as by a horizontal step, sufficiently to permit the pulling rods to pass vertically through the housing of the boot.

Referring to the drawings, Figure 1 is a horizontal section, taken along line 1—1 of Figure 3, of a vertical enclosed bucket elevator system. Figure 2 represents a side elevation of Figure 1, partly in section, looking along line 2—2 of Figure 1, showing the automatic-take-up regulating mechanism of the invention, with the casing partly broken away to disclose the tail sprocket with the bucket-carrying traveling elevator chain. Figure 3 is a vertical section, partly broken away, of the elevator system taken along line 3—3 of Figure 1. Figure 4 is a sectional detail, taken along line 4—4 of Figure 3, of the packing gland system shown at 20 on Figure 3, through which the sliding rods of the take-up mechanism enter the sealed elevator casing in gas-tight relation, and are free to move axially therethrough.

In the drawings, like characters denote like parts throughout. Numeral 1 represents the main portion of a rectangular, substantially gas-tight elevator casing, equipped with four vertical bars or rails 2, welded internally to the casing, forming a channel for the sliding or floating take-up mechanism, shown generally at A in Figure 3, and comprising frame members 3 to which are welded horizontal plates 4 and 5. Journal boxes 6 carry sprocket wheel 7 supported on cylindrical rod 8, keyed to journals 9. Vertical cylindrical bars 10 are welded to the side frames 3 of the floating member, and serve as guides and stop bars for the movement of the sliding take-up assembly. Chain 11 passes around sprocket wheel 7, and is equipped with buckets 12, dipping into lower boot section B, which is stepped down at 21 and 27, and provided with bottom 28 which completes the lower portion of the dust- and gas-tight boot.

Two compression springs 13 are mounted on bars 14 attached to the outside of the casing member 1, above the normal position of the top of the sprocket wheel, and are held partially compressed between bars 14 and nuts 15 screwed onto the threaded ends of hooked rods 16 passing through the springs and attached by flexible wire rope or cable 17, passing around pulleys 18, positioned outside the elevator casing and below the normal position of the bottom of the sprocket wheel, to hooked rods 19, through packing gland 20, in the intermediate bottom portion 21 of the boot B and attached by lock nuts 22 to the bottom of journal box 6 of the floating frame.

In the packing gland 20 shown in detail in Figure 4, sliding rod 19 passes through threaded pipe nipple 23, welded to the horizontal intermediate portion 21, of the boot B, and packed at 24 with suitable packing material such as graphite asbestos packing. Follower ring 25 and pipe cap 26 complete the gland and ensure a gas- and dust-tight boot casing.

In operation, the traveling elevator chain **11**, with buckets **12**, passes around sprocket wheel **7** in the lower boot portion B of the elevator mechanism. The standard automatic take-up assembly will initially be counterweighted or otherwise adjusted to establish proper chain or belt tension. The accessory coil springs **13** are partially compressed and thus normally tend to elongate upwardly in the direction of the arrow. This force is translated to a downward pull on the floating box mechanism which houses the sprocket wheel. The extent of the pull will depend upon the character of the spring employed, which can be selected to suit the particular requirements of the operation, and to exert the desired resilient down-thrust. In general, two springs, each providing a downward force of between about 10 pounds and about 50 pounds are satisfactory.

Material being elevated is fed to the elevator at C (Figure 2), enters the buckets **12** and is lifted to the top of the casing (not shown) and discharged in the usual way. Inevitably, a certain amount of spillage occurs, causing a gradual accumulation at the bottom of the boot B, underneath the tail sprocket and chain, causing the gravity take-up to gradually ride up, resulting in improper engagement of the chain links with the teeth of the tail sprocket. In such case, the spring-activated tension exerted on the sliding frame of the gravity take-up mechanism acts to keep the tail sprocket down so that its teeth and the chain, mesh properly at all times. Moreover, the constant tension of the springs on the tail sprocket causes the buckets to remove excess accumulated material from the elevator boot and thus to overcome the usual difficulties experienced when the gravity take-up and tail sprocket ride up on such accumulations. Thus, if for any reason, the take-up assembly starts to rise, the coil springs automatically compress further to counteract the rise. On the other hand, as the chain or belt stretches due to wear, the gravity take-up assembly automatically lowers in its guides and when this happens, the coil springs expand vertically upward tightening the flexible cables and holding the take-up assembly in position. Thus as the tension in the chain changes during operation, the coil springs either extend or compress to automatically maintain constant resilient tension, and thus provide a snubbing action to hold the gravity take-up assembly in place.

The auxiliary, spring activated tension mechanism of my invention is particularly adapted for use in elevators in which hot or corrosive materials are being elevated such as cinders, lime, insecticides etc., and in connection with which hot, corrosive dusts and gases, such as sulfur-containing or chlorine-containing gases or the like may be present. Under such operating conditions the high temperatures cause repeated expansion and contraction of the chain, making frequent adjustments necessary. When such adjustments must be made by the addition to or removal of auxiliary weights from the platform of the gravity take-up box, it is usually necessary to open the casing, thus permitting escape of noxious dusts and gases to the surrounding area.

An advantage of my spring-activated mechanism over the application of auxiliary weights to the gravity take-up mechanism is that its action is automatic, there being no necessity for any manual adjustments, nor for opening the gas- and dust-tight casing in operation, with resulting escape of noxious dusts and gases into the surrounding area. Furthermore, while the downward tension is exerted directly on the gravity take-up box frame, nevertheless, the springs themselves are outside the elevator casing, and thus are not subject to heat expansion nor to damage by the corrosive action of the hot dusts and gases.

Bringing the rods through the elevator casing by way of the packed gland, which is simple yet dust- and gas-tight, prevents escape of dust and noxious gases into the surrounding atmosphere. Use of the pulleys and flexible cables permits mounting the springs above ground, and in plain sight and makes installation and maintenance easy.

The position of the spring and cable assembly external to the elevator casing, permits constant visual observation of the amount of chain wear resulting in elongation, by noting the distance that the coil springs have expanded upward from their initial setting.

The spring mechanism of the invention exerts its auxiliary downward pressure on the sprocket wheel resiliently, thus exerting a snubbing action which controls either rise or fall of the take-up mechanism.

The entire mechanism of my invention is simple of construction, involving a minimum number of parts, all of conventional and readily available materials easy to install and maintain and of low initial cost.

While the above describes the preferred embodiments of my invention, it will be understood that departures may be made therefrom within the scope of the specification and claims.

I claim:

1. In a vertically disposed bucket elevator including an endless bucket belt, a lower sprocket wheel, a shaft fixed thereto and rotatable therewith, and a floating gravity take-up assembly adapted to rotatably support either end of said shaft and adapted to move freely in vertically disposed guides; a substantially gas-tight casing surrounding said sprocket wheel, said shaft, said floating assembly and said guides, and means for imparting a constantly applied down-thrust to said floating take-up assembly, said means including an axially movable first rod passing through said casing through a gas-tight packing gland, means inside the casing for connecting said rod to said floating assembly, and arranged, when said rod is under tension, to impart down-thrust to said assembly, and means mounted outside said casing and adjacent thereto at a position above the normal position of the top of the sprocket wheel and connected by means of a second rod and flexible cable to said rod to maintain said rod under axial tension.

2. In a vertically disposed bucket elevator including an endless chain bucket belt, a lower sprocket wheel, a shaft fixed thereto and rotatable therewith, and a floating gravity take-up assembly adapted to rotatably support either end of said shaft and adapted to move freely in relatively vertically disposed guides; a substantially gas-tight casing surrounding the entire elevator including said sprocket wheel, said shaft, said floating assembly and said guides and means for imparting a constantly applied down-thrust to said assembly, said means including an axially movable first rod passing through said casing through a gas-tight packing gland, means inside the casing for connecting said rod to said floating assembly and arranged, when said rod is under tension, to impart down-thrust to said floating assembly, and a pair of compression springs vertically mounted outside said casing and adjacent thereto on opposite sides thereof, at positions above the normal position of the top of said sprocket wheel and connected, by means of second rods and flexible cables passing around pulleys located at positions adjacent the said casing, on opposite sides thereof and at positions below the normal position of the bottom of the sprocket wheel, to said first rod to maintain said first rod under axial tension.

3. In an enclosed, vertical bucket elevator assembly including an endless chain bucket belt, a lower sprocket wheel, a shaft fixed thereto and rotatable therewith, and an internal, floating gravity take-up device adapted to rotatably support either end of said shaft and to move freely in vertically disposed guides; a substantially gas-tight casing surrounding the entire elevator including said sprocket wheel, said shaft, said floating assembly and said guides, and means for imparting a constantly applied down-thrust to said floating take-up assembly, said means comprising the combination of a pair of compression springs located externally of the elevator casing on op-

posite sides thereof and fixedly mounted adjacent thereto at positions above the normal position of the top of the sprocket wheel, a pair of assemblies comprising first rods, cables and second rods, holding said springs partially compressed, the said first rods being attached to opposite sides of the bottom portion of the take-up device within the elevator casing, and passing out of the elevator casing through a substantially gas-tight packing gland, flexible cables located outside said elevator casing, connecting said first rods and said second rods, said

second rods passing through said springs and being capped with nuts to hold the springs partially compressed, said cables passing around fixed pulleys located outside the elevator casing at opposite sides thereof below the normal position of the bottom of the sprocket wheel.

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