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3,095,985

SILO UNLOADER CONVEYOR STRUCTURE

Filed June 19, 1961

2 Sheets-Sheet 1

FIG. 1

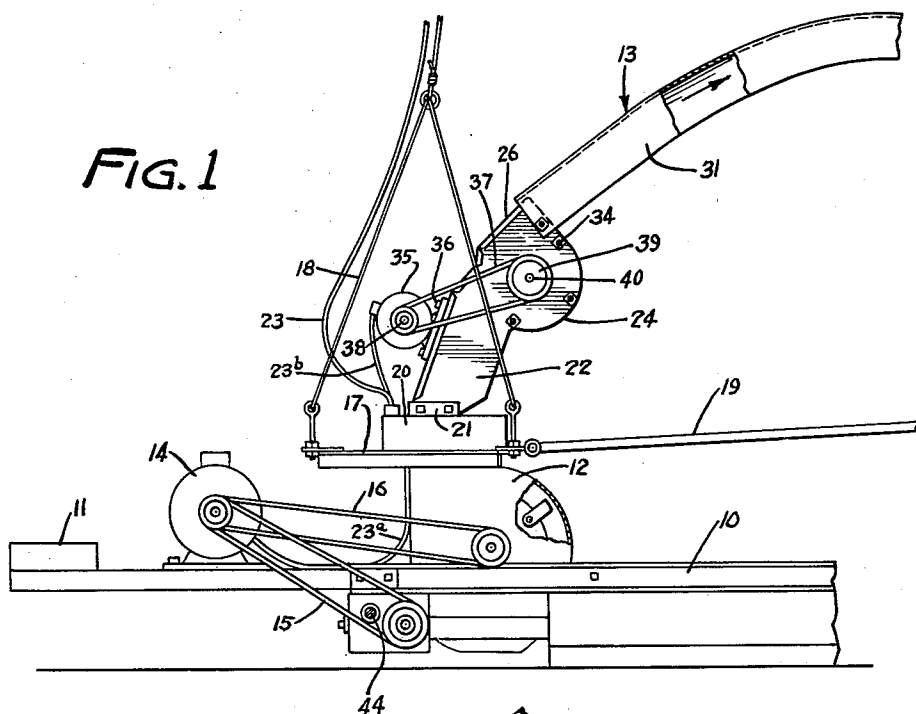
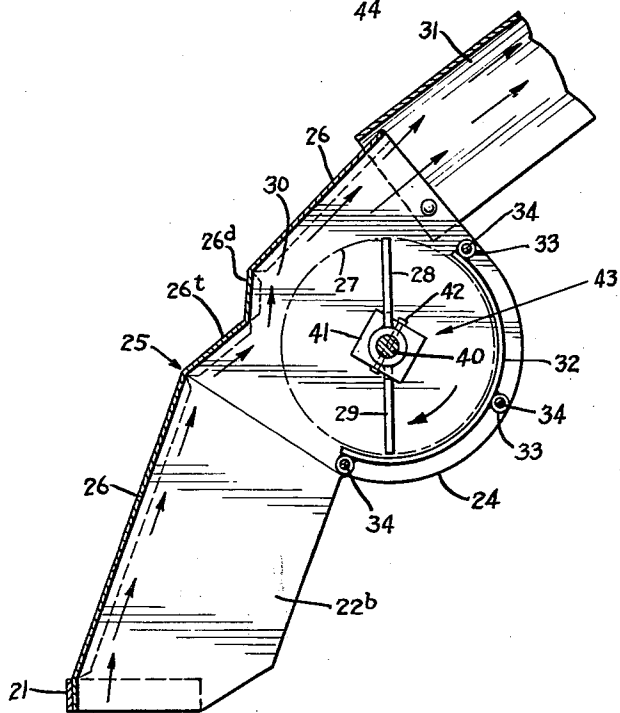


FIG. 2



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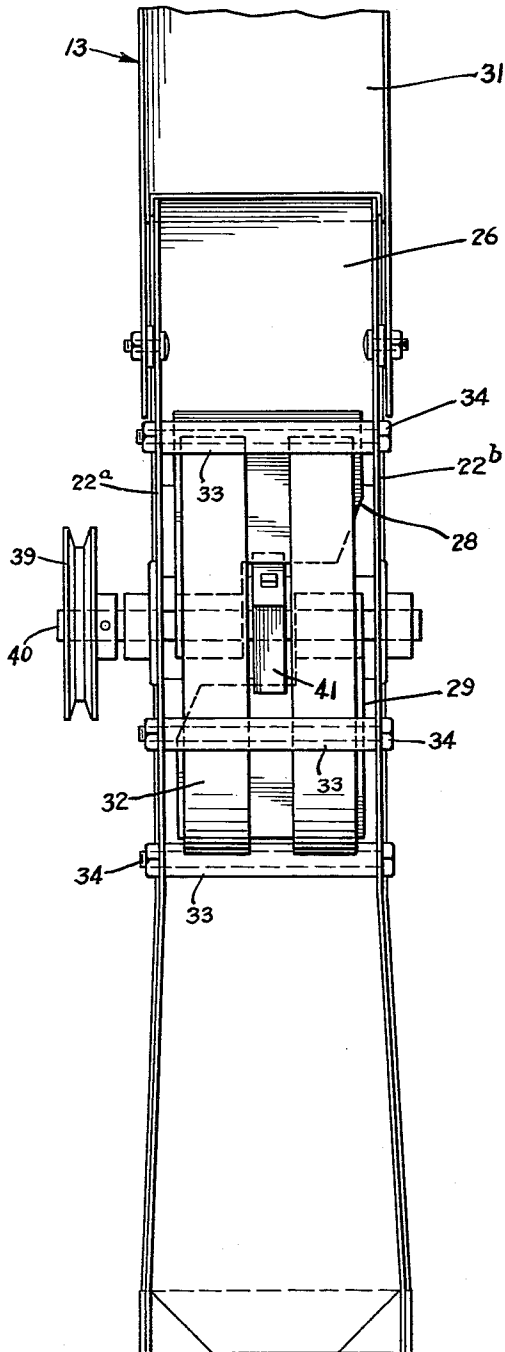


FIG. 3

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1

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SILO UNLOADER CONVEYOR STRUCTURE

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12 Claims. (Cl. 214-17)

This invention relates to new and useful improvements in silo unloader conveyor structure of the chute type generally disclosed in my prior Patent 2,877,907. More specifically this invention relates to new and useful means for supplying impetus or additional momentum or "boost" to ensilage for ejection from the silo.

It is therefore an object of this invention to provide new and useful means for conducting or assisting in the conducting of ensilage from the interior to the exterior of a silo.

A further object of this invention is the provision of new and useful booster impeller structure for a silo unloader or the like.

A further object of this invention is to provide a novel booster impeller means adapted to eliminate clogging or plugging of the booster.

Yet another object of this invention is the provision of a new and useful chute booster housing means.

Still a further object of this invention is the provision of new and useful chute structure for a booster impeller means, said chute structure having unique cooperation with the impeller means for providing a sufficient rate and character of discharge of ensilage from a silo or the like to avoid clogging or plugging.

A still further object of this invention is to provide a new and useful impeller structure for adding additional momentum to ensilage for conveying it from the silo, said structure being adapted to impart said additional momentum without impeding the smooth flow of material from the silo.

Another object of this invention is to provide a non-clogging booster impeller means having a housing constructed to facilitate passage of material into and beyond the impeller means.

It is a further object of this invention to provide a non-clogging chute booster housing in which the top wall thereof extends toward the impeller section of the booster impeller and approximately tangent to the circle described by the ends of the impeller blades when rotating, and then diverges away from said circle to form an enlargement or pressure relief space for air and ensilage passing through the chute and as it is given discharging impetus by the blades of the booster impeller.

Other and further objects of this invention reside in the specific constructional details of the housing for the booster impeller means, the booster impeller means and the cooperation thereof.

Other objects are those apparent and inherent in the invention disclosed in the drawings and description herein.

To the accomplishment of the foregoing and related ends, this invention then comprises the features herein-after fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the drawings in which the same numerals refer to corresponding parts and in which:

FIGURE 1 is a fragmentary side elevation of a silo unloader incorporating the present invention;

2

FIGURE 2 is an enlarged vertical section of the booster housing and a fragment of the chute extending therefrom; broken lines illustrate hidden parts; and

FIGURE 3 is an end elevation of the booster drawn to a still larger scale than FIGURE 2; broken lines illustrate hidden parts.

By reference to the drawings and specifically to FIGURE 1, there is shown a silo unloader of the type illustrated and described in Patent 2,877,907 having a collecting arm or gathering means 10 which engages the top surface of ensilage within a silo to convey ensilage radially of the silo and into the impeller housing 12. The collector arm is rotated over the surface of the ensilage within a tower silo by appropriate drive structure connected to shaft 44, but not shown.

Collector arm 10 is provided with the usual counterweight 11. The motor 14 is mounted on the extending portion of the frame of the collector arm and drives both the collector arm mechanism for rotation over the silage and for gathering of ensilage material therefrom, and the main impeller 12, for elevation of the ensilage and imparting discharge momentum thereto, by belts 15 and 16 respectively.

An electrical transfer and support ring assembly 20 has a portion rotatably secured to the impeller housing 12 and a circumferentially stationary portion supported by angle members 17 in turn supported by cables 18 to hold the entire mechanism appropriately according to the requirements of use. The torque arm 19 serves to hold the chute means 13 circumferentially stationary with respect to the silo as the collector arm 10, the impeller 12 and the drive means (not shown) rotate over the surface of the ensilage. An electrical cable 23 conducts power from an outside source to ring 20 through which a sliding contact is made to cable 23a for motor 15.

All of the foregoing structure is clearly disclosed and described in my Patents 2,794,560 and 2,877,907, to which reference is made for further disclosure. Inasmuch as it forms no part of this invention per se, it will not be further described herein.

Ring 20 is provided with an apertured upturned flange and has bolted thereto a U-collar 21, which collar is welded to the bottom of the booster housing 22 on the outside thereof and serves to secure the booster housing to the ring.

Booster housing 22 is shown fabricated of sheet metal and comprises side plates or panels 22a and 22b of the specific form shown, which with top panel 26, form an inverted U-trough booster chute. Panels 22a and 22b are enlarged as at 24 in the form of a partial circle to provide an appropriate profile for the booster impeller 43 and are spaced apart to accommodate the impeller 43.

At a point spaced somewhat from the impeller 43 and the intake of the chute booster housing, as at point 25, the side panels are cut so that the top panel 26, connecting the side panels 22a and 22b, extend in toward the impeller at 26t on a line substantially tangent to the circle illustrated by the broken line 27, which is a circle described by the ends or tips of the impeller blades 28 and 29 as they rotate. (As will be appreciated, panel 26 has downwardly turned side edge flanges which overlap the panels 22a and 22b throughout its extension and are appropriately secured thereto by spot welding or otherwise.) Impeller 43 is shown with two blades 28 and 29 but more can be used as desired. While still some distance from the circle 27 described by the impeller blade tips, however, the side panel cuts are such that panel 26 diverges from said circle 27 at 26d to form an enlargement on extended spacing of the housing at 30. This also is the point approximately at which materials being conveyed would engage the chute.

Chute 31 is of U-trough section having its side flanges

overlapping and pivotally secured to the housing 22 as shown, and directs ensilage impeller by the booster out the door of the silo. Booster housing 22 and chute 31 may be of any appropriate conduit form and may be open at the bottom as here shown. They are formed so that materials received while moving vertically are exhausted in a horizontal direction.

Extending between side panels 22a is the impeller guard comprised of the curved bars 32 which are welded or otherwise secured to spacers 22 that are bolted to the side plates 22a and 22b by bolt assemblies 34 as shown.

While it has previously been the practice to provide a top panel for the booster housing which is spaced very closely from the tips of the impeller blades 28 and 29 of the booster impeller, it has now been determined that this is not only unnecessary but undesirable. When the top of the housing of the impeller lies so close to the tips of the blades 28 and 29, jamming often results. This jamming occurs particularly between the ends of the impeller blades and such closely spaced material confining wall for directing ensilage into the impeller blades. It has now been determined that it is highly desirable to provide relief for the spaced top wall of the chute adjacent the impeller which relieves air turbulence and provides space for material being impelled to minimize any tendency to jam. A smoother uninterrupted flow of ensilage material can be achieved in this manner and any back pressure against the flow of material immediately prior to its engaging the blades or paddles of the booster impeller is also relieved.

As will be appreciated, the material received from the main impeller is conveyed in the direction of the arrows of FIGURE 2 and in the main immediately adjacent the back or top wall 26 which serves as the principal material confining and guiding wall. Portion 26t will direct material in a direction substantially tangential to circle 27 whereupon it will be engaged by at least the tips of the impeller blades 28 and 29, but portion 26d will provide an enlarged spacing between the back wall and the circle inscribed by blades 28 and 29. Thus, there is a relief passageway 30 of extended spacing immediately adjacent the position at which the material is contacted by the tips of blades 28 and 29 to minimize jamming. A portion of wall 26 between portion 26d and wall 31 will continue conveying the material in a direction to the exterior of the silo.

An outside angle of from 125° to 145° between portions 26t and 26d has been found to be very satisfactory. In production units, the angle between panel portions 26t and 26d is approximately 135°.

It has been found that the offset or relieved portion formed by panel 26d should be positioned substantially adjacent the point where the material is directed into the booster by the portion 26t. It has been further found that wall portion 26t as well as wall 26 should be spaced away from the nearest point of circle 27 a distance of from one-half to three inches and preferably one inch.

The booster impeller is driven by a motor 35 which is secured to the booster housing in any suitable manner here shown as the bolts 36. Cable 23b connects motor 35 to power cable 23. Belt 37 connects the pulley 38 on the motor with the pulley 39 on the shaft 40 of the impeller. As shown in Patent 2,877,907 the blades 28 and 29 are freely pivotable on shaft 40 and are provided with driving force by the block 40 when suitably secured to shaft 40 as by pin 42. Reference is made to Patent 2,877,907 for further specific details of the booster impeller mechanism.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

What is claimed:

1. A housing for a booster impeller for a silo unloader or the like comprising, a pair of side panels having one end adapted to be secured to receive the discharge of a main impeller, an enlargement in each of said side panels and spaced from said end and adapted to provide suitable profiles to cover the sides of a booster impeller, each side panel having an edge portion extending in a direction the projection of which would be tangent to the circle described by the blade tips of a booster impeller in said housing, each side panel having an edge portion adjacent thereto diverging away from said circle before the tangentially oriented portion thereof reaches said circle, and a panel connecting said side panels and following the contour of said tangential and diverging oriented portions of said side panels.

2. The housing of claim 1 in which said connecting panel approaches no closer than one inch to the circle described by the blade tips of said booster impeller.

3. An impeller housing comprising an inverted chute-like member of two side panels secured together by a top panel, one end of said chute-like member being adapted to receive materials to be impelled, another portion of said chute-like member being formed to receive an impeller, an impeller having blades mounted in said another portion, said impeller housing characterized by having the top panel of said inverted chute-like member make its closest approach to said impeller approximately at the point where the materials entering said impeller housing will be engaged and given impetus by said impeller.

4. The structure of claim 3 in which said top panel clears said impeller blades at their point of closest approach by no more than three inches.

5. A booster impeller housing comprising a chute member having side panels and a connecting top panel, a portion of said booster impeller housing being enlarged to receive a booster impeller, said chute characterized by having a portion of said connecting top panel on the intake side of said booster impeller extending in a direction such that an extension thereof would lie substantially tangent to a circle described by the blades of the booster impeller as it rotates, and the portion of said top panel immediately following said tangentially disposed panel diverging from the location of a booster impeller in said housing and forming an angle of from 130° to 140° relative to said tangentially arranged top panel portion.

6. The booster impeller housing of claim 5 in which said diverging top panel portion and said tangentially oriented top panel portion form an angle of 135°.

7. The combination of a main impeller assembly having a discharge portion and a booster impeller assembly having an intake portion and a discharge portion, the intake portion of said booster impeller assembly being positioned to receive material from the discharge portion of said main impeller assembly, said combination characterized by having the housing of said booster impeller assembly arranged with the top portion approaching the booster impeller most closely immediately preceding its rotating periphery, the portion of closest approach of said top portion to said booster impeller taking the form of a portion extending toward said booster impeller at an angle such that an extension thereof would be substantially tangent to a circle described by the blade tips of said booster impeller as it rotates and the portion of said top portion immediately following thereafter diverging from said tangentially oriented portion to form an angle of from 130° to 140°.

8. The combination of claim 7 in which said angle is substantially 135°.

9. In a silo unloader or the like having means adapted to receive material in a substantially vertical direction and for conducting it from the silo in a substantially horizontal direction, the improvement comprising an impeller mounted in cooperation with said means for supplying additional impelling impetus to said material, said im-

5

peller mounted in cooperation with said means, said means having a wall portion adapted to direct material tangentially into the periphery of said impeller and said wall portion being configured to provide a greater spacing between said periphery of said rotary means at the position at which said material would engage said periphery than immediately preceding said position.

10. In a silo unloader having a discharge chute and an impeller positioned therein for adding momentum to material being conducted from the silo, said impeller comprising means rotatable about substantially a horizontal axis, the portions distal from the axis of said impeller inscribing a circle, said impeller rotating in a direction to convey material adjacent the back wall portion of said chute means from the silo, the improvement comprising said back wall portion being of such configuration as to guide material into that portion of said circle immediately there adjacent, said portion terminating short of said circle and continuing in a direction of enlargement at the

6

point where said material engages said circle and thence in a direction continuing the material from the silo.

11. The structure of claim 10 further characterized by an offset portion in said back wall forming a relief passage immediately adjacent said circle.

12. An impeller assembly of the type having a housing with side wall portions joined together by a top wall portion, said housing being adapted to receive material to be impelled and conduct it to an impeller positioned in said housing, the improvement comprising having said impeller housing top wall portion converge toward said impeller approximately to the point at which materials flowing in said housing are engaged by said impeller and then diverging from said impeller to provide clearance for materials impelled.

References Cited in the file of this patent

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