United States Patent

[11] 3,592,394

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[54] **CENTRIFUGAL BELT THROWER**
8 Claims, 7 Drawing Figs.

[52] U.S. Cl. 239/669, 198/128, 222/407
[51] Int. Cl. A01c 17/00
[50] Field of Search 239/669, 681, 687, 688; 198/128, 167; 222/406, 407

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Assistant Examiner—Michael Y. Mar
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ABSTRACT: This centrifugal belt thrower is provided with very flexible flaps supported in the discharge wheel and extended toward the belt by centrifugal force into contact with the material to be thrown. They flex when they encounter material on the belt, and the material is fed directly onto the belt entering through the periphery of the wheel.

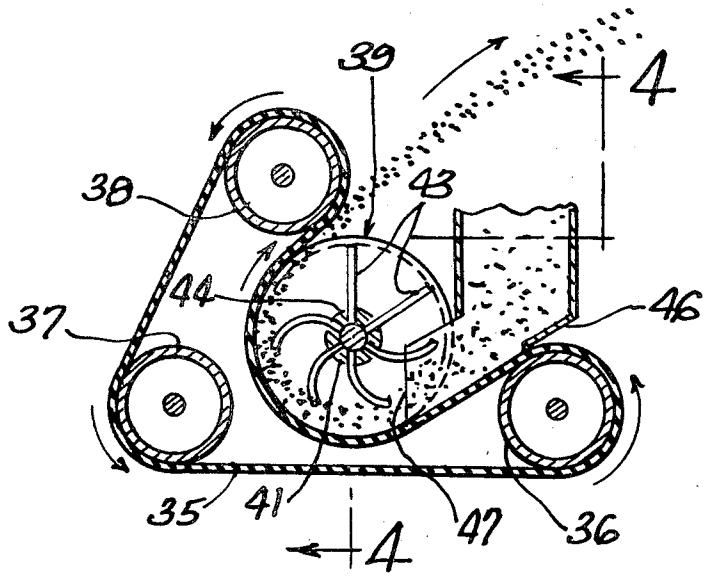


FIG. 1

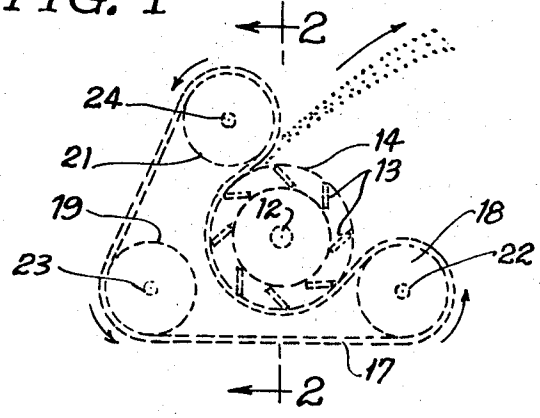


FIG. 2

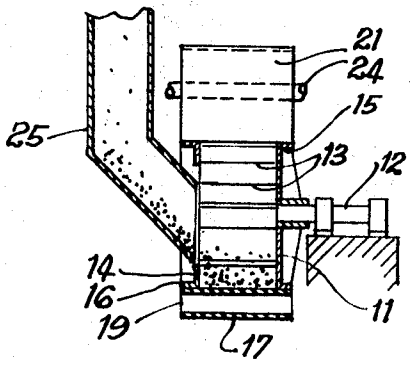


FIG. 3

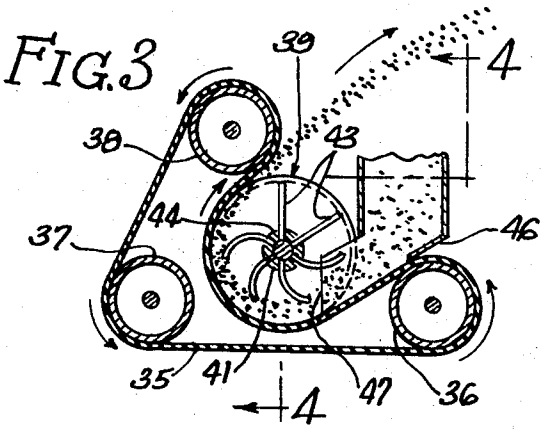


FIG. 4

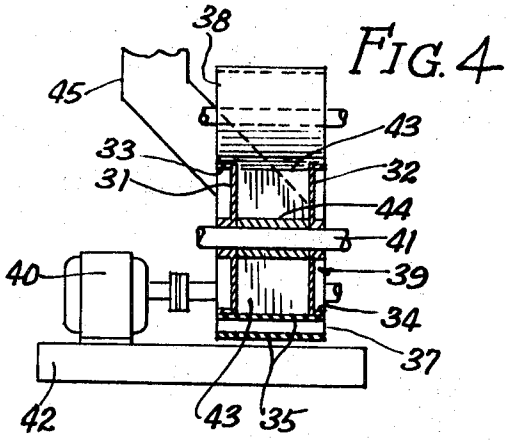


FIG. 5

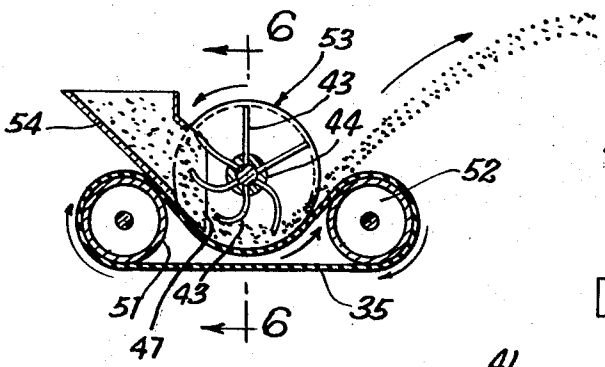


FIG. 6

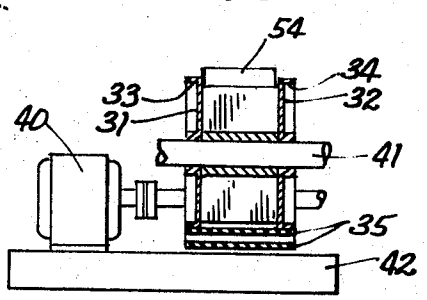
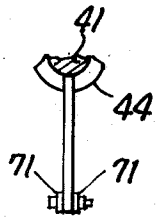


FIG. 7



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CENTRIFUGAL BELT THROWER

This application is a continuation-in-part of my pending application, Ser. No. 635,197, filed May 1, 1967, now abandoned.

Centrifugal belt throwers, unaided by flaps or vanes, have been used heretofore quite satisfactorily, especially if the incoming material is delivered to the belt with some substantial velocity. For instance, a discharge velocity of 3,600 f.p.m. might require a chute fall of 10 feet before engaging the belt. Such throwers, without vanes are shown in the A. D. Sinden U.S. Pats. Nos. 1,597,393, Aug. 24, 1926 and 2,210,505, Aug. 6, 1940.

But when delivery from such a height is not possible, as when receiving grain from a common grain wagon, having a low discharge opening, rigid vanes have been employed, as is illustrated in FIGS. 1 and 2 of this drawing. Such throwers have yielded discharge velocities in excess of 3,000 f.p.m.

The present invention, as illustrated in FIGS. 3 to 6, is provided with flexible flaps, of rubber, of rubber-covered material, or other flexible and durable material, which may be secured in the discharge wheel in any suitable manner.

When rigid vanes, mounted in the discharge wheel around which the belt is partially wrapped, are used it is the commercial practice to feed the incoming material laterally into the central portion of the discharge wheel, in the manner shown in FIGS. 1 and 2. It is impractical and inadvisable to attempt to feed the incoming material directly onto the belt through the periphery of the wheel, as there is the inevitable likelihood that the material, whatever its particle size, will become trapped between the belt and the edges of the vanes, and damage the belt and and the vanes. For example, tramp iron could wreck the vanes.

However, by employing the flexible flaps of the invention, the incoming material may be fed directly onto the belt in the direction of the belt travel and into the periphery of the discharge wheel, and whatever may be the particle size of the material or the thickness or depth of the incoming supply stream, the flaps will readily be deflected by the slower moving material and the flaps will pass over the material. No jamming will occur. Lumpy material, such as ear corn, may be thrown satisfactory. Foreign objects such as wood and tramp iron will not damage the flaps.

Referring now to the drawing,

FIG. 1 shows in dotted lines a side view of a centrifugal belt thrower which is old in the commercial art, but not equally well shown in the patented art, hence it is here shown to illuminate the advance made by the present invention.

FIG. 2 is a vertical sectional view on line 2–2 of FIG. 1.

FIG. 3 is a central vertical sectional view of one form of the present invention.

FIG. 4 is a vertical sectional view taken on line 4–4 of FIG. 3.

FIG. 5 is a central vertical sectional view of another form of the invention.

FIG. 6 is a vertical sectional view taken on the line 6–6 of FIG. 5.

FIG. 7 is a lateral vertical endwise view of a further form of the invention, showing a flap with bars 71.

Referring first to FIGS. 1 and 2, it may be noted that an imperforate disc 11 is secured on shaft 12, and rigid vanes such as 13 are secured to this disc and extend to a centrally apertured disc 14 to which they are secured. The two discs are thereby caused to rotate together, and on their peripheral flanges 15 and 16 the lateral margins of the belt 17 are guided as the belt passes around the pulleys on rollers 18, 19 and 21. Power for driving the belt may be applied to shaft 12 or to any of the shafts 22, 23 or 24.

A feed chute 25 is provided to deliver material by gravity into the central space between the inner margins of the vanes 13. It will be apparent, as experience has shown, that small granular particles, such as kernels of corn or soy beans, for example, will be readily dispersed among the vanes upon the belt and will be discharged or thrown by the belt for piling in bins or elsewhere.

However, experience has revealed that when the rigid vanes and discs are being rotated to yield a belt speed in excess of 3,000 f.p.m., for example, ear corn will bounce off the edges of the vanes, instead of falling in between them, and will not achieve a uniform trajectory. In addition, excess shelling occurs along with fracturing of the ears.

Turning now to the invention illustrated in FIGS. 3 and 4, there are shown two flanged imperforate discs 31 and 32 whose peripheral flanges 33 and 34 support the lateral margins of the belt 35, which may conventionally be made of rubber, or be rubber covered. Rollers or pulleys 36, 37 and 38 guide the belt and cause it to wrap partly around the discharge wheel, generally indicated as 39, on whose shaft 41 the imperforate discs 31 and 32 are fixed in spaced-apart positions. Any one of the rollers may be driven by a motor or other power means, although the one adjacent the feed chute usually will be the driven one.

Only a base member 42 is indicated, but conventional framework (not shown) for supporting all these parts and the motor 40 may be assumed, along with known and conventional adjustable supports for pulleys 37 and 38, permitting their adjustment relatively to the discharge wheel to alter the discharge trajectory.

Secured to the shaft 41 by any suitable means are flexible rubber or rubberized flaps such as 43. If desired, wedges 44 may be bolted to the shaft to grip and clamp the flaps securely thereto.

A material input chute is shaped and positioned as shown, and has its upper portion 45 offset as shown in FIG. 4 to avoid the emerging stream of thrown material. The lower end portion of the chute has a bottom flange 46 and a pair of vertical opposite sidewalls, such as the one sidewall 47 which is shown in FIG. 3. The sidewalls enter the wheel 39 just inside the opposite discs, the chute terminal thus being arranged to deliver all the material onto the belt 35 and into the peripheral portion of the wheel between the discs 31 and 32, directly into the pathway of the rotating flaps.

The flexible flaps may extend radially as close to the belt as may be desired, and shall have a width which affords a free-swinging but close clearance with the end discs 31 and 32, as well as with the chute sidewalls such as the wall 47.

When ear corn, for example, usually accompanied by shelled corn and sometimes even by foreign objects such as tramp iron, wood and stones, enters the thrower from the input chute, the flexible flaps readily deflect to accept both small and large objects. Centrifugal forces acting on the flaps will aid them in urging all the material to approach or attain belt speed. The curved, deflected portions of the flaps, being subject to centrifugal forces, act tangentially upon the material urging it forwardly along the belt and parallel to the belt surface, and also act radially, pressing the material against the belt, augmenting the frictional function of the belt to produce acceleration of the material.

The device shown in FIGS. 3 and 4 does not require a feed chute of substantial height. Discharge velocities on the order of 3,000 to 4,000 f.p.m. are readily attained equaling or approximating the selected belt speed; this form may be used when longer contact of the material with the belt is desired, without serious scattering of the material.

The simpler arrangement of FIGS. 5 and 6 may also be utilized. The structure of its cylindrical discharge wheel may be identical with that shown in FIGS. 3 and 4, and identical reference numerals are used wherever applicable in the drawing. Only two pulleys 51 and 52 are used, along with the discharge wheel 53. The short chute 54 is properly shaped to deliver all the material onto the belt directly into the peripheral portion of the wheel, between the side terminal walls of the chute, such as 47, which are positioned just inside the flanged discs 31 and 32 which support the belt.

Thus incoming material enters the wheel on the belt tangentially to the wheel and into the pathway of the outer margins of

the rotating flaps. Motive power may be applied to either pulley, as desired.

FIG. 7 is a larger scale edge view of a flap, having a pair of reinforcing plates or bars 71, extending along the margins of the flap parallel to the belt, and bolted on the flap, for easy replacement. These bars should be applied to all the flaps, and they serve two important functions, to add concentrated weight where it will substantially increase the centrifugal force which the flap can exert, and also improve the wearability of the flap.

Belt throwers made in accordance with this invention, having imperforate end walls in the discharge wheels and a feed chute discharging tangentially into the periphery of the wheel do not draw in air as does a centrifugal fan or blower to be mingled with the discharging material. But movements of large amounts of air is a fault characteristic of some prior art throwers. Scattering of the thrown material by currents of air is avoided by this invention.

Preferably, the flaps used in this invention may be so flexible that they hang limp when at rest, and are able to apply no useful force to the material on the belt unless they are responsive to the large centrifugal force which high-velocity rotation creates in them. Yet they can yield at high velocity to pass over large masses or large objects, and at once thereafter exert great centrifugal force on the material being carried by and on the belt.

It should be understood that this invention is not intended to be limited to the illustrated details of construction, but embraces such additions, modifications and variations of structure and material as fall within the scope of the appended claims.

Having shown and described my invention, I claim:

1. A centrifugal belt thrower comprising an endless belt,

a cylindrical discharge wheel having circular end walls and annular means thereon for supporting lateral margins of the belt,

a first and second pulley positioned to hold the belt engaged with a substantial peripheral arc of the wheel,

means for delivering particulate material through the peripheral margins of the wheel onto the belt between said end walls,

means for propelling the wheel, pulley and belt at high velocity to cause the material on the belt to be centrifugally pressed against the belt and to be accelerated thereby and to be discharged as an airborne stream therefrom tangentially of the second pulley,

and a plurality of angularly spaced-apart flexible flaps supported centrally of the wheel and freely oscillatable about such support with their outer margins radially extendable only by velocity-created centrifugal force into proximity with the belt and thereby exerting radial centrifugal pressure on said material thus pressing the material against the belt, but adapted to be retracted and swung freely rearwardly out of radial position by encounter with material entering the wheel to permit passage of the material under said margins onto the belt.

2. Apparatus in accordance with claim 1, in which the entering stream of material at a lower lineal velocity than the belt and wheel velocity is guided to be interposed in the path of the rotating deflectable flaps causing the flaps to deflect rearwardly and angularly to ride on the entering stream while applying radial centrifugal force thereto.

3. Apparatus in accordance with claim 1, in which the flaps are made of material having the flexibility of rubber and rubberlike material.

4. Apparatus in accordance with claim 1, in which the flaps are so freely flexible as to exert no propelling force upon the material on the belt in absence of centrifugal force resulting from rapid rotation of the wheel.

5. Apparatus in accordance with claim 1, in which the material-delivering means includes side guide plates intersecting the wheel periphery and extending into the wheel between the vertical margins of the flaps and end walls.

6. Apparatus in accordance with claim 1, in which the belt, wheel and the deflectable flaps coact to admit a virtually uniform stream of material into the wheel at low velocity and discharge from the belt at high uniform velocity a virtually uniform stream of material normally.

7. Apparatus in accordance with claim 1, in which the flaps are reinforced along their outer edges parallel to the belt surface with heavy wear-resistant material.

8. Apparatus in accordance with claim 1, in which the flaps are so flexible that when at rest none maintains a radial position except whenever hanging vertically from its central support but all maintain radial positions at high velocity except when their edges encounter and are deflected rearwardly by material carried on the belt.