SIZING MACHINE FOR POTATOES AND THE LIKE

13 Claims, 9 Drawing Figs.

ABSTRACT: A sizing machine for potatoes and similar items wherein a series of narrow, elongate conveyors are arranged in mutually spaced, side-by-side parallel relationship to define a conveying and sizing deck for items deposited thereon. The individual conveyors are mounted and mechanism is provided for simultaneously expanding or contracting the screening spaces therebetween to vary screen size. The conveying and sizing deck is advantageously formed by the upper runs of endless conveyor belts of special sprocket-chain formation.
BACKGROUND OF THE INVENTION

Field

The invention is a machine for concurrently conveying and sizing potatoes and similar items.

State of the Art

Hereinafter, potatoes have been concurrently conveyed and sized by a type of endless conveyor that utilizes a chain link screen as a belt. Such a screen tends to bruise the potatoes and to catch those that are smaller at one end than the other and to break them as the belt passes over its supporting and drive rollers. Moreover, there is no way of changing the screen size other than to replace the belt. Another type of machine commonly employed utilizes a roller type of conveyor having a series of transversely extending rollers provided with cooperative circumferential concavities which provide screening openings that can be varied in size by varying the spacing of successive rollers. These also tend to bruise the potatoes and become clogged by oversize potatoes that merely ride in place on the rotating rollers. There are other types of sizers, but none are entirely satisfactory in operation.

SUMMARY OF THE INVENTION

It is the purpose of the invention to provide a sizing machine that will expeditiously handle large quantities of potatoes, without bruising them and without clogging, and that can be easily adjusted to pass potatoes of different sizes.

In accordance with the invention, the machine includes a series of narrow, elongate, individual conveyors arranged in mutually spaced, side-by-side, parallel relationship to define a sizing conveyor deck and mounted to be moved transversely relative to one another from time to time to vary the screen size.

Although the conveyors can conceivably be of any type that carry or impel the items to be sized along the deck from one end thereof to the opposite end, they are advantageously endless belt conveyors and particularly specially formed endless belt conveyors whose belts are formed as sprocket chains and are driven by respective sprocket wheels which are slidably mounted on a common drive shaft.

The individual conveyors are simultaneously moved transversely of the conveyor deck by respective distances necessary to maintain uniform spacing of such conveyors across the width of the conveyor deck. This is preferably accomplished by lever means connected to the respective conveyors by links of varying lengths, although various other means, such as a screw having longitudinal sections of varying thread pitch, could be employed.

THE DRAWINGS

In the accompanying drawings, which illustrate a particular construction presently contemplated as the best mode of carrying out the invention:

FIG. 1 is a top plan view of a sizing machine conforming to the invention, the same being adapted primarily for sizing potatoes and being mounted on wheels for haulage as a trailer behind an automotive vehicle;

FIG. 2, a side elevation;

FIG. 3, a front end elevation drawn to a larger scale;

FIG. 4, a vertical section taken on the line 4–4 of FIG. 3, drawn to a still larger scale and having an intermediate portion broken out for convenience of illustration;

FIG. 5, a fragmentary vertical section taken on the line 5–5 of FIG. 4;

FIG. 6, a similar section taken on the line 6–6 of FIG. 4;

FIG. 7, a rear end elevation of the sizing conveyor portion of the machine as seen from the line 7–7 of FIG. 2, other structures being removed and broken away for convenience of illustration;

FIG. 8, a view corresponding to that of FIG. 7, but showing the individual conveyors spread, i.e. spaced apart more widely than in FIGS. 3 and 7 so as to pass potatoes of larger size; and

FIG. 9, a horizontal section taken on the line 9–9 of FIG. 2.

DETAILED DESCRIPTION OF ILLUSTRATION EMBODIMENT

In the presently preferred construction illustrated, which includes a wheeled undercarriage 10 for haulage as a trailer behind an automotive vehicle by means of a conventional trailer hitch, neither vehicle nor hitch being shown, the machine additionally comprises a structural framework 11 mounted on the undercarriage 10 and, in turn, serving to receive and support a sizing conveyor 12 and operating mechanism therefor.

An upwardly sloping conveyor 13, usually a conventional belt conveyor provided with retaining slats, receives the potatoes or other items to be sized from a hopper 13a at its lower end and elevates them to its upper end for discharge onto one end of the sizing conveyor 12. The potatoes or other items are usually dumped into the hopper 13a from a truck or other transport vehicle, or are brought to such hopper by another conveyor.

The sizing conveyor 12 comprises a series of elongate, individual conveyors 14, FIG. 1, arranged in side-by-side mutually spaced, substantially parallel relationship to collectively define a sizing conveyor deck 15. The conveyors 14 are narrow relative to the width of the conveyor deck 15 and the spaces 16 therebetween are open so that such conveyor deck is, in effect, a screen for sizing the potatoes or other items as they are being conveyed from the receiving end 15a of the conveyor deck to the discharge end 15b thereof.

In this illustrated embodiment the conveyors 14 are of endless belt type, the upper runs 17a, FIGS. 2 and 4, of the belts 17 thereof forming the conveyor deck 15. The belts 17 sprocket advantageously form a sprocket chain formation, the means for driving the conveyors being respective sprocket wheels 18 slidable mounted on a drive shaft 19 of polygonal configuration. Such drive shaft is journaled at its opposite ends in bearings 20, FIGS. 1 and 2, attached to the framework 11. Each belt 17 is advantageously formed by molding rubber 17a or some other elastomer, such as a suitable plastic material, about the outer peripheral face and lateral sides of a conventional sprocket chain 17c. The inner peripheral face of such chain is left open for the reception of sprockets of a sprocket wheel 18, which, as here shown, is at the forward loop end of the belt.

The opposite loop end of the sprocket belt runs over an idler, which need not be but preferably is another sprocket wheel 21 journaled on an antifriction bearing 22, FIG. 5 whose inner race 22a projects at each end of the bearing and is secured at one end to a bearing hanger 23 that has a rearwardly projecting bracket arm 23a, FIG. 4, slidable supported by a transversely extending shelf member 11a of the framework 11. Secured in adjusted position against the other end of the inner race 22a of the bearing 22 by means of a bolt 24 is an arm 25 which carries at its lower end a belt-tightening idler sprocket 26 that rides on the lower run 17d of the conveyor belt 17.

It is preferred to positively support the upper runs 17a of the belts 17, and, for this purpose as well as to provide a rigid backbone for each conveyor, a corresponding series of elongate supporting rails 27 are mounted on the drive shaft 19 for back and forth movement therealong with the conveyors 14. Each rail 27 is supported at its forward end on the shaft 19 by rigid securement, as by welding, to a corresponding bracket arm 28, FIG. 5, which is slidable mounted upon such shaft 19. The bracket arm 28 is fitted with a rotatable socket member 29, which directly receives the polygonal drive shaft 19 and permits it to rotate without affecting such bracket arm. Each rail 27 is supported at its rearward end by rigid securement, as by welding, to a corresponding bearing hanger 23.

As illustrated in FIG. 2, drive shaft 19 is driven from a forward countershaft 30 by a sprocket drive, indicated generally 31, such forward countershaft in turn being driven from a rearward countershaft 32 by a sprocket drive 33. Countershaft 32 is driven from a motor or engine 34 by a belt drive 35.

To catch and remove the undersized potatoes or other items that drop through the openings 16 of the conveyor deck 15, a
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belt conveyor 36, FIGS. 1 and 2, is provided directly below such deck between the upper and lower runs 17a and 17d of the belts 17 and extending transversely across the width of the deck. It is convenient to drive the head roller 37 of such belt conveyor from rearward countershaft 32 by a sprocket drive 38, gearbox 39, and shaft 40, the gearbox providing for reversible direction of movement of conveyor 36 as and when desired by means of a gear-shifting handle (not shown). This feature is common and forms no part of this invention.

Elevating conveyor 13 is also conveniently driven from rearward countershaft 32 by the sprocket drive 38 and another sprocket drive 41.

As a feature of the invention, means are provided for simultaneously moving the individual, longitudinally directed, conveyors 14 of the machine transversely of the conveyor deck 15 so as to increase or decrease the widths of the respective screen, i.e., sizing, spaces 16 between the rocker conveyors, thereby expanding or contracting the sizing screen provided by such conveyor deck and changing the screening size thereof. As here illustrated, see FIGS. 3, 7, and 8, an a also as a specific feature of the invention, such means take the form of lever arms 42 fixed to and projecting from respective roller shafts 43, and multiple links 44 for each lever arm extending it with the individual conveyors 14, respectively, of a corresponding series of such conveyors. A pair of the lever arms 42 has its individual lever arms positioned adjacent to the opposite ends, respectively of its roller shaft 43, FIG. 9, and these shafts extend along opposite lateral sides of the conveyor deck 15, serving to actuate respective series of the individual conveyors 14 lying at opposite sides of a similar, centrally located conveyor 44 that is coincident with the longitudinal axis of the deck.

Each lever arm 42 is connected progressively along its length with the conveyors 14 of its series of such conveyors by means of multiple links 45 to 49, which vary progressively in length from shaft end 43 of the lever arm to the other so as to extend to the several transversely movable conveyors of the series. As shown, FIGS. 7 and 8, the rearward set of lever arms at respectively opposite lateral sides of the conveyor deck is pivotally connected to the sliding bracket arms 23a of the respective conveyors by pivot connections 50, while the forward set is similarly connected to the supporting rails 27 of the respective conveyors by pivot connections 51.

For enabling manual adjustment of screening size, one of the rocker shafts 43 is provided at one of its ends with a handle 52, FIGS. 7 and 8, affixed rigidly thereto, and linkage 53, 54, and 55, connects that end of the rocker shaft with the corresponding end of the roller shaft at the opposite side of the conveyor deck. Accordingly, screening size can be adjusted as desired by manipulating handle 52.

The lever and linkage arrangement just described is easily designed with proper dimensions to effect uniform widening or narrowing of all the screening, i.e., sizing, spaces or slots 16 between the individual conveyors 14 and 44 on any given size adjustment effectuated by handle 52.

Within the broader purview of the invention, if other types of conveyors are employed to make up a similar sizing and conveying deck, other types of size-adjusting mechanisms may be employed, for example, a vari-pitch screw arrangement as previously mentioned.

It is advantageous to also provide means for orienting the potatoes or other items to be sized so that their longitudinal axes will be more or less aligned with the direction of travel thereof along the longitudinal axis of the deck and longitudinally along the individual conveyors. For this purpose, one or more series of flexible fingers 56, corresponding in number with the number of sizing spaces or slots 16, are suspended above the conveying deck, conveniently by attachment to respective transverse members 116 of the frame 11. As illustrated, such fingers are advantageously short lengths of rubber hose bent to arcuate formation so that they extend into the respective paths of travel of the potatoes or other items immediately above the spaces or slots 16 and to one side thereof and are directed toward the oncoming items.

Whereas this invention is here described and illustrated with respect to certain forms thereof, it is to be understood that many variations are possible.

We claim:

1. In a sizing machine for potatoes and similar items, a series of relatively narrow, elongate, individual conveyors arranged in side-by-side, mutually spaced, substantially parallel relationship, with the spaces therebetween open and parallel so as to collectively define a conveyor deck in the form of a screen having elongate parallel slots, extending longitudinally of the deck and of the line of conveyor travel, for sizing said items as they are being conveyed;

means mounting said conveyors for transverse movement relative to one another substantially uniformly from end to end thereof so as to maintain the parallel relationship of said conveyed and said slots;

means for driving said conveyors at a uniform rate of travel; and

means for simultaneously moving said conveyors transversely of the conveyor deck in the manner specified so as to increase or decrease the widths of the respective spaces between individual conveyors while maintaining said parallel relationship.

2. The combination set forth in claim 1, wherein the individual conveyors are of endless belt type, the several conveyors being arranged with one set of runs of the belts uppermost to provide the conveyor deck.

3. The combination set forth in claim 2, wherein the conveyor belts are of sprocket chain formation, and the means for driving the conveyors include a set of sprocket wheels for the respective belts, and drive means for the sprocket wheels.

4. The combination set forth in claim 3, wherein the sprocket wheels are mounted in common on a drive shaft for free sliding movement back and forth along said shaft.

5. The combination set forth in claim 4, wherein elongate rails are included as trackway supports on which the upper runs of the belts are arranged to travel, respectively, said rails being mounted for space-increasing and for space-decreasing movement simultaneously with the belts.

6. The combination set forth in claim 2, wherein each conveyor belt comprises an endless sprocket chain having its outer periphery and sides covered with a flexible belting material and its inner periphery open for the reception of sprockets.

7. The combination set forth in claim 1, additionally including conveyor means extending transversely of and directly below the conveyor deck for receiving and removing items that pass therethrough.

8. A conveyor belt, comprising a sprocket chain having one of its longitudinal sprocket-receiving surfaces and its lateral surfaces covered with flexible conveyor belt material and its other longitudinal sprocket-receiving surface open for the reception of the sprockets of a sprocket wheel, the said conveyor belt material being an elastomer molded closely around and directly to said chain.

9. In a sizing machine for potatoes and similar items, a series of relatively narrow, elongate, individual conveyors arranged in side-by-side, mutually spaced relationship, with the spaces therebetween open so as to collectively define a conveyor deck in the form of a screen having elongate slots, extending longitudinally of the deck and of the line of conveyor travel, for sizing said items as they are being conveyed;

means mounting said conveyors for transverse movement relative to one another;

means for driving said conveyors; and

means for simultaneously moving said conveyors transversely of the conveyor deck so as to increase or decrease the widths of the respective spaces between individual conveyors, said means comprising lever means and multiple length connecting said lever means with the respective conveyors.

10. The combination set forth in claim 9, wherein there are sets of levers at opposite ends of the conveyor deck, each set
comprising levers at opposite sides of the conveyor deck, there being sets of multiple links at said opposite sides, respectively, of the conveyor deck interconnecting the respective levers with conveyors located on that side of the longitudinal axis of said deck.

11. The combination set forth in claim 10, wherein there is a conveyor substantially coincident longitudinally with the longitudinal axis of the conveyor deck and between series of conveyors at respective opposite sides of said deck, said conveyor being fixed against movement transversely of said deck.

12. In a sizing machine for potatoes and similar items, a series of relatively narrow, elongate, individual conveyors of endless belt type and sprocket chain formation arranged in side-by-side, mutually spaced relationship with one set of runs of the belts uppermost and the spaces therebetween open so as to collectively define a conveyor deck in the form of a screen having elongate slots extending longitudinally of the deck and of the line of conveyor travel, for sizing said items as they are being conveyed;

6 means mounting said conveyors for transverse movement relative to one another including a set of sprocket wheels for the respective belts and a drive shaft on which the sprocket wheels are mounted in common for free sliding movement back and forth thereon; drive means for the sprocket wheels; and means for moving the conveyors transversely of the conveyor deck comprising lever means and multiple links connecting said lever means with the respective conveyors.

13. The combination set forth in claim 12, wherein the means for moving the conveyors transversely comprise levers adjacent to opposite ends, respectively, of the conveyor deck, a set of multiple links for each lever connecting its lever to corresponding end portions of the conveyors, means rigidly interconnecting said levers for synchronous movement, and means in common for operating said levers.