Sept. 16, 1969 G. J. VAN ELTEN 3,467,267

METHOD AND DEVICE TO EMPTY CLOSED SACKS FILLED WITH PARTICULATE MATERIAL

Filed June 27, 1967 4 Sheets-Sheet 1

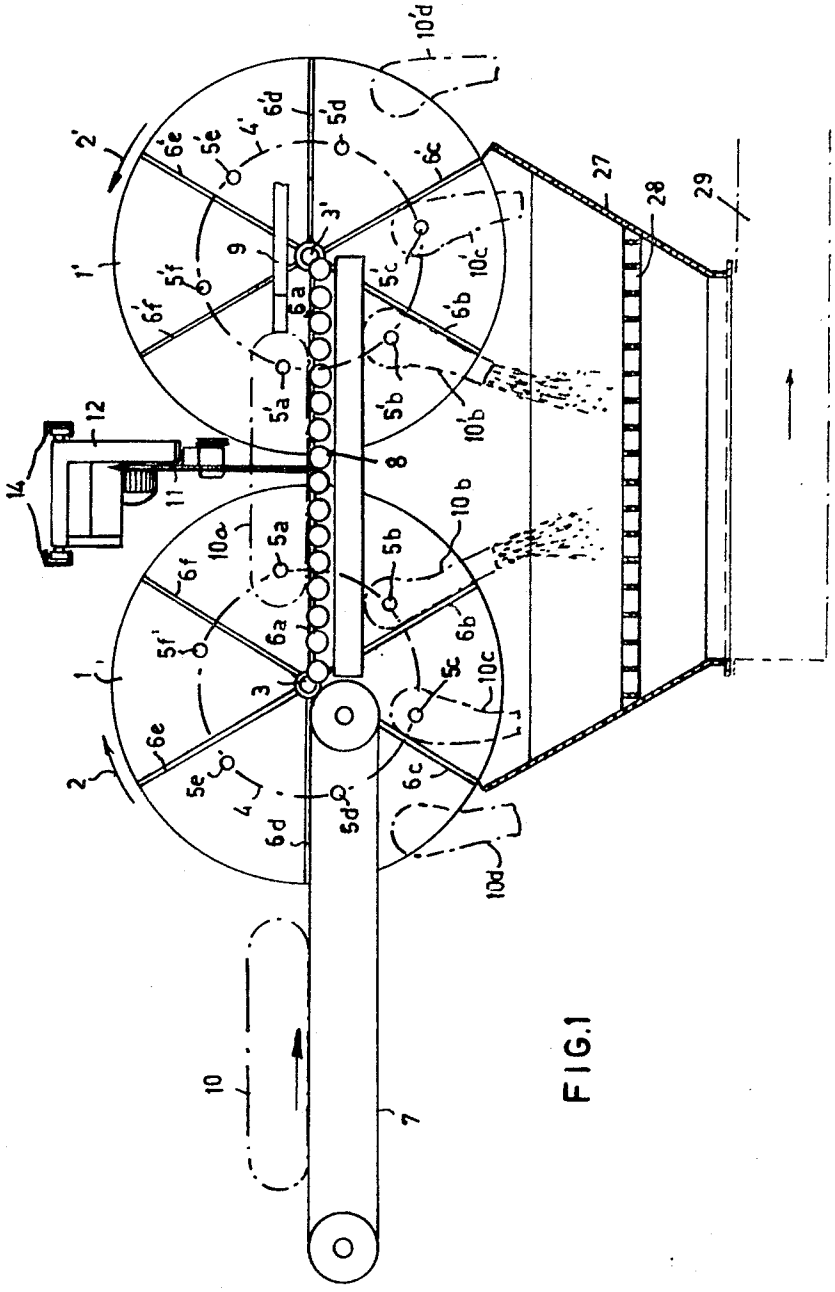

FIG.1

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METHOD AND DEVICE TO EMPTY CLOSED SACKS FILLED WITH PARTICULATE MATERIAL
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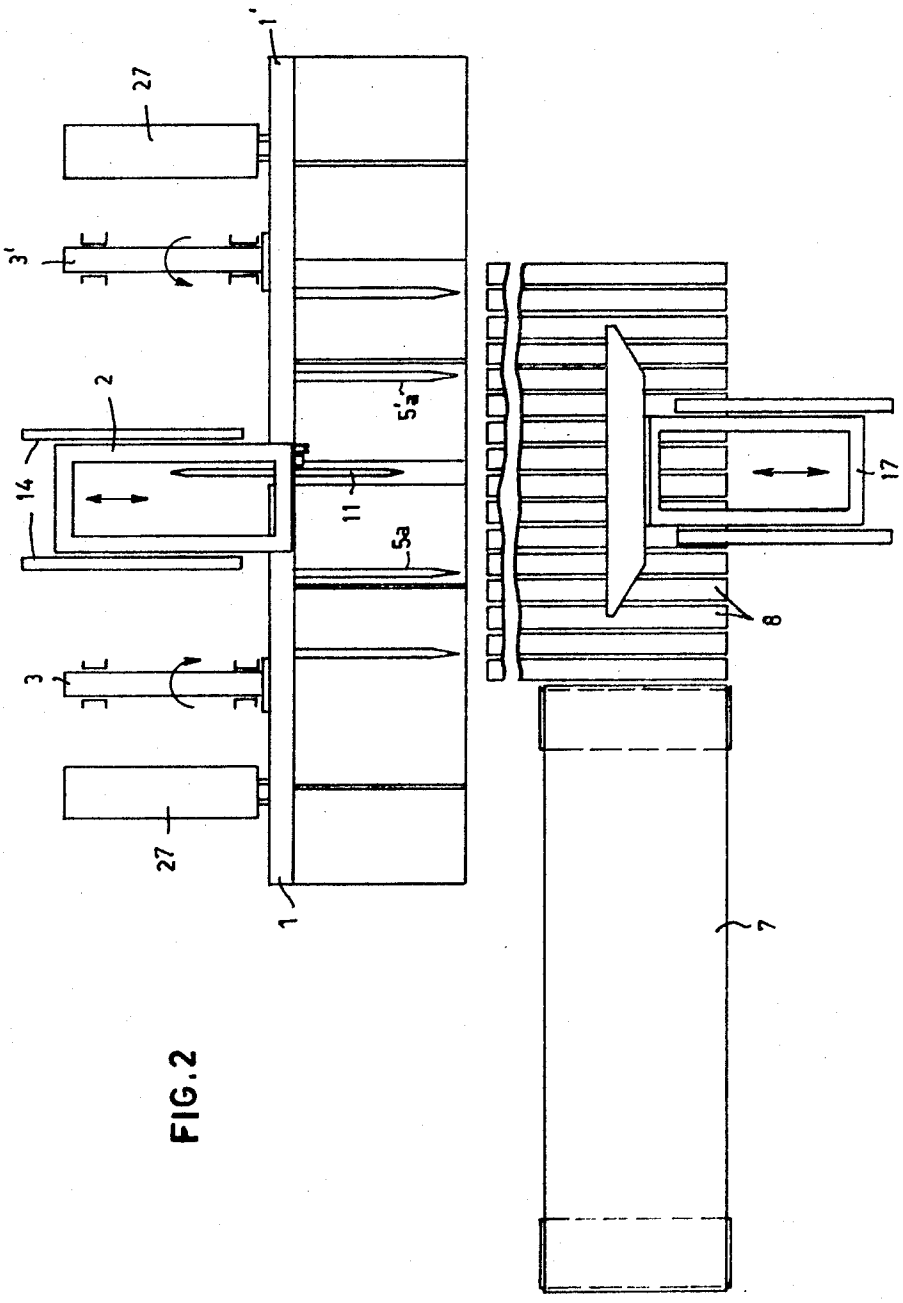

FIG.2

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METHOD AND DEVICE TO EMPTY CLOSED SACKS FILLED WITH PARTICULATE MATERIAL
Filed June 27, 1967 4 Sheets-Sheet 3

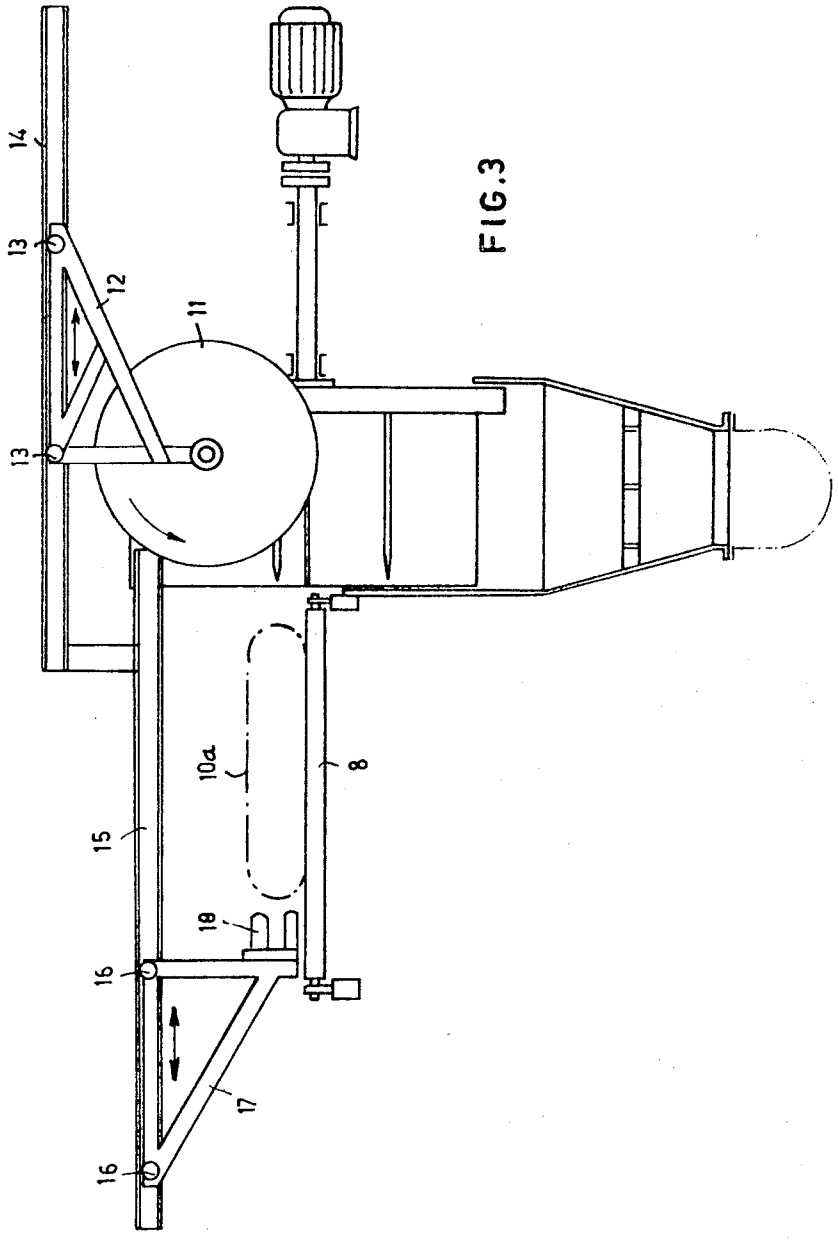

FIG.3

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METHOD AND DEVICE TO EMPTY CLOSED SACKS FILLED WITH PARTICULATE MATERIAL

Filed June 27, 1967 4 Sheets-Sheet 4

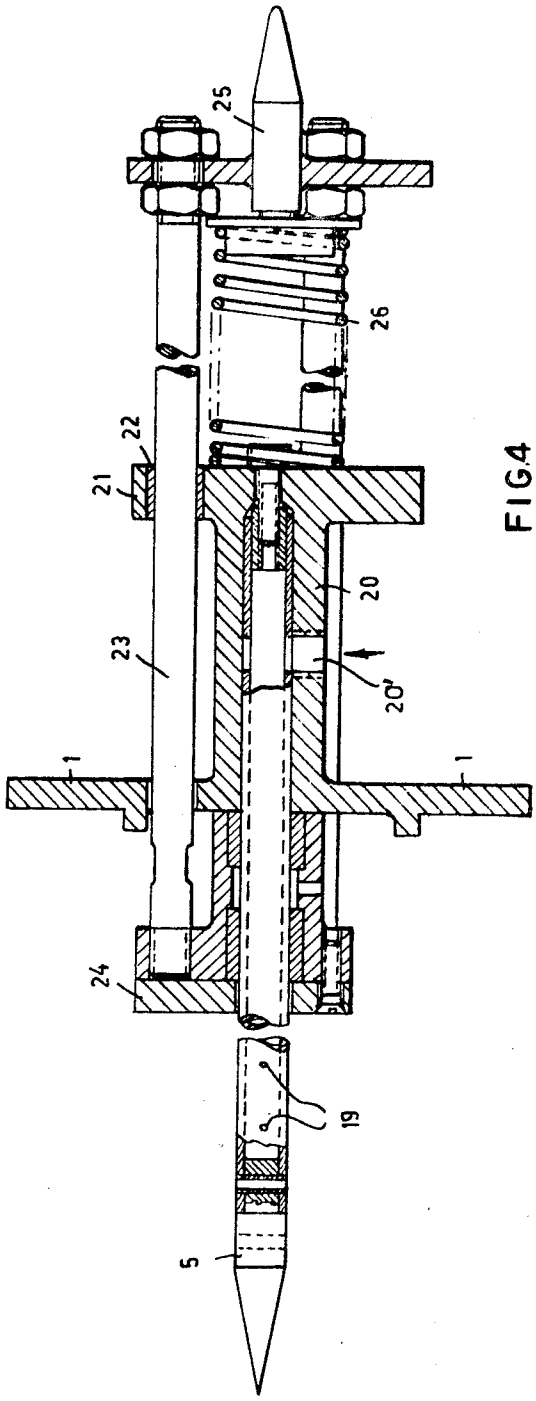

FIG.4

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3,467,267

METHOD AND DEVICE TO EMPTY CLOSED SACKS FILLED WITH PARTICULATE MATERIAL

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Int. Cl. B65b 69/00
U.S. Cl. 214—305 14 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for emptying sacks containing particulate material in which the filled sack is fed by conveyors and impaled, at its opposite ends, on lances. The sack, with its opposite ends impaled, is cut open, transverse the sack and intermediate its opposite ends, and the cut open ends of the sack are then tipped downwardly and the sack is emptied. In emptying the sack, air is blown, either continuously or intermittently, through the lances and into the sack in a direction away from the cut, opened end. When emptied, the sack ends are removed from the lances.

The invention relates to a method and apparatus for emptying closed sacks filled with particulate material and, more particularly to a method and apparatus for automatically emptying large quantities of closed sacks at high efficiency and at a high rate, with practically no material loss.

According to known practices, sacks are opened at one end, and the contents of the sack are emptied by hand. This has the disadvantage of much manual labor, is expensive, and much of the material is left in the sacks. To economize, much of such material is supplied in bulk instead of sacks. However, bulk supply is often impossible or uneconomical.

In the instant invention, particulate material supplied in sacks is emptied from the sacks mechanically. This is accomplished by the perforation of a wall of the sack near two opposite ends by means of one or more parallel lances. The sack-wall is then cut open between the ends. The sack-ends are then tipped along axes parallel to the lances, and the cut, open ends are downwardly inclining, the sack is emptied and the emptied sack-ends are stripped from the lances.

In this manner, the sacks are simply emptied practically without any left-over material in the sack-ends.

The degree to which the sacks are emptied may be further increased, according to the invention, by blowing air from the lances in directions leading mainly away from the cut opening. The emptying operation may be accelerated by interrupting the blowing, whereby the ends of the sack will alternately swell and contract, so that a pumping action is exerted on the material to be removed.

The invention also refers to a device for performing the method which is characterized by two spaced juxtaposed wheels, on parallel horizontal shafts and synchronously and stepwise rotatable in opposite directions around the axes of the shafts. Each wheel has an equal number of lances, equally distributed along an inner circle concentric with the shaft. These lances are parallel to the axes. In the space between the wheels, a cutting device is movable back and forth. Each wheel carries a number of radial carrier partitions at advance angles with respect to the lances and arranged in an equal number with these lances such that with the wheels stopped, two of the carrier partitions on the wheels are opposite and in the extension of each other to support together a sack which has been engaged by the cooperating lances of both wheels.

The invention will now be described with reference to the annexed diagrammatic drawing of an embodiment.

FIG. 1 shows a front view partly in section of a device according to the invention.

FIG. 2 shows a plan view of the apparatus of FIG. 1.

FIG. 3 shows a side view of the device of FIGS. 1 and 2.

FIG. 4 shows a side view in diagrammatic section of one of the lances with its belonging stripper.

According to the drawing, and in particular according to FIG. 1, two juxtaposed spaced wheels, **1**, **1'** respectively, are driven synchronously stepwise in opposite directions, according to arrows **2**, **2'** respectively, on their shafts **3**, **3'** respectively. The wheels **1**, **1'** each have an equal number of six lances **5**, **5'**, equally distributed along an inner circle **4**, **4'**, concentric with the shafts **3**, **3'** and extending parallel to the shafts **3**, **3'**. These lances are indicated as **5***a*, **5***b*, **5***c*, **5***d*, **5***e* and **5***f* in a clockwise arrangement for wheel **1** and counter-clockwise as **5***a'*, **5***b'*, **5***c'*, **5***d'*, **5***e'* and **5***f'* for wheel **1'**. Each of the wheels **1** and **1'** has a number of radial carrier partitions **6**, in equal number to the lances **5** and with a considerable extension in the direction of the shafts **3**, **3'**. With respect to each corresponding lance, every radial carrier partition has an advance angle in the direction **2**, **2'** of rotation. This advance angle is determined by the width of the sack to be emptied, as will appear. The radial carrier partitions **6** are indicated as **6***a*, **6***b*, **6***c*, **6***d*, **6***e*, and **6***f* and at **6***a'*, **6***b'*, **6***c'*, **6***d'*, **6***e'* and **6***f'* and correspond to the lances **5**, **5'**, respectively.

In the plane of the shafts **3**, **3'**, the working surfaces of two connecting conveyors, viz. belt conveyor **7** and roller conveyor **8** having driven rolls, are disposed. These supply filled sacks in a direction transverse to the shafts **3**, **3'** such that the filled sacks come to lie longitudinally between the shafts **3**, **3'** and are held in this position by stop **9**. A sack is shown in this position in FIG. 1 at **10***a*, while the sack on conveyor **7**, which is in the course of transportation is indicated as **10**.

Centrally, between wheels **1**, **1'**, the rotating cutter wheel **11** is movable back and forth on carriage **12**, running on wheels **13**, in rails **14**, disposed above the cutter wheel **11**, e.g., on a frame (not shown). Parallel to the rails **14** but slightly lower, as shown in FIG. 3, the rails **15** are disposed for guiding rollers **16**, supporting a frame **17** to which a pressing piece **18** is disposed. This pressing piece **18** functions to press sack **10***a*, lying in readyness on the roller conveyor **8**, onto the lances **5***a* and **5***a'*, of the wheels **1**, **1'**.

As shown in FIG. 4, every lance **5** is a hollow tube having a number of spaced perforations **19** along its length. The interior of each hollow tube is connected to a source of compressed air by a connection **20'** so that air flows away from the perforations **19** in a transverse direction. The lance **5** is arranged in the wheel **1** and is connected to a sleeve **20**, having a flange **21**, with a guiding bushing **22** for a rod **23**. This rod extends again through wheel **1** and carries a stripper **24**, movable over the lance **5**. This stripper is adapted to remove an emptied sack **10** from the lance **5**. At the end of rod **23**, opposite to the stripper **24**, the rod has a pressing piece **25** for the operation of the stripper. Pressure spring **26** acts as a buffer between the pressing piece **25** and the back side of the flange **21**. For operating the pressing piece **25**, a motor **27** is disposed on both sides of the device and outside of the shafts **3**, **3'**, respectively. Motor **27** slides the pressing pieces and strippers **24** over the several lances **5**.

Below the wheels **1**, **1'** is disposed a collecting hopper

27, having a grid 28, and leading to a conveyor 29, or the like, for the removal of the loose material.

The operation of the device described is as follows:

A sack 10*a*, supplied by the conveyors 7 and 8 abuts against the stop 9, which operates a controlling mechanism for moving the pressing piece 18 to the right in FIG. 3 and thereby impaling the sack 10*a* on the lances 5*a* and 5*a'*. The carrier partitions 6*a* and 6*a'* meanwhile support the sack 10*a* from below. Simultaneously with the impaling of this sack 10*a*, the cutter wheel 11 is reciprocated from left to right in FIG. 3, the sack 10*a* being thereby cut through in the middle. Subsequently to the cutting through of the sack wheels 1 and 1' rotate synchronously in opposite directions through an angle of 60°. The ends of the sack so impaled and filled with material, empty themselves into hopper 29. This action is enhanced by air pressure on the contents of the sack, through perforations 19 in the lances 5, in directions opposite from the open ends of the sack pieces on the lances. This pressure may, moreover, be applied interruptingly so that the sack ends will alternately swell and contract, resulting in a pumping action promoting the emptying operation. On having trice rotated by 60°, the sack concerned has arrived in position 5*d*, 5*d'*. Motors 27 then shoves the strippers along the lances 5, to the left in FIG. 4, thus removing the halves from the lances which, thereupon, will be ready for receiving a fresh full sack.

With each rotation through 60°, a succeeding sack comes on to the lances which then are in positions 5*a* and 5*a'*, so that the operation is continuous.

The strippers 24, moved forwardly along the lances 5 by the air motors 27, will be moved into the position of FIG. 4 when a sack 10 is impaled on the lances 5, without the operation of the air motor, as these air motors will be in the positions 5*d* and 5*d'*. During the cycle the sacks move into the position 10, 10*a*, wherein they are halved, the ends thereupon going into the positions 10*b*, 10*b'*, 10*c*, 10*c'*, whereas the sacks are stripped in the positions 10*d*, 10*d'*.

The invention is not restricted to the described example but comprises all variants.

I claim:

1. A method of emptying closed sacks filled with particulate material comprising the steps of perforating the wall of the sack adjacent the opposite ends with parallel lances at each of said ends and impaling said ends on said lances, cutting the wall of the sack between the ends on said lances and, in cutting said wall, dividing said sack into two parts with each said part open where said wall was cut, tipping said ends of the sack on said lances about axes, while downwardly inclining the open cut end of the sack, blowing air from the lances into said impaled ends of said sack in directions leading mainly away from said open end and emptying said ends and, thereafter, stripping the empty sack ends from said lances.

2. Method according to claim 1, in which the air blown from said lances is interrupted.

3. Method according to claim 2, in which the lowest wall of the sack is supported as said sack is cut and said sack ends are tipped.

4. Method according to claim 3, in which said sack wall is cut transverse to its longitudinal direction on its opposite sides.

5. Method according to claim 4 in which the opposite sides of said sack are perforated by said lances.

6. Method according to claim 5 in which said sack shoves strippers over the lances during the perforation of the wall of the filled sack and said strippers are shoved back after emptying of the sack.

7. Method according to claim 6 in which said wall of the sack is cut parallel to said lances.

8. Method according to claim 7 in which said lances are rotated stepwise and in opposite directions to each other about parallel axes.

9. Apparatus for emptying particulate material from closed sacks comprising two spaced juxtaposed wheels, means for rotating said wheels on parallel horizontal shafts and in synchronously and stepwise rotating in opposite directions, each of said wheels having a number of lances in equal number and equally distributed along an inner circle concentric with the shaft of said each wheel, said lances on each of said wheels being parallel to said shaft, a cutting device arranged for a back- and forth movement between said wheels, said wheels each having a number of radial carrier-partitions at advance angles with and arranged in equal number on each of said wheels, said means for rotating said wheels including means for stopping said wheels every time carrier partitions on said juxtaposed wheels are opposite and in position to jointly support a sack and means for moving said cutting device for cutting a sack jointly supported on said carrier partitions.

10. Apparatus according to claim 9, in which each of said lances has mounted therein a stripper, means for displacing said stripper on said lances as a sack is impaled therein and a motor means for returning said displaced stripper on said lances for stripping an emptied part of the sack from said lance.

11. Apparatus according to claim 10, in which said apparatus includes conveyor means for delivering filled, unopened, sacks to said wheels and means for moving a sack from said conveyor onto said lances and for impaling the end of said moved sack onto said lances.

12. Device according to claim 11, in which each of said lances has a hollow portion having a supply opening and a number of small outlet openings disposed over the active lance portion.

13. Apparatus according to claim 12, in which said advance angle of the partitions is adjustable for receiving various dimensions of sacks.

14. Apparatus according to claim 13 in which the position of the lances is radially adjustable.

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