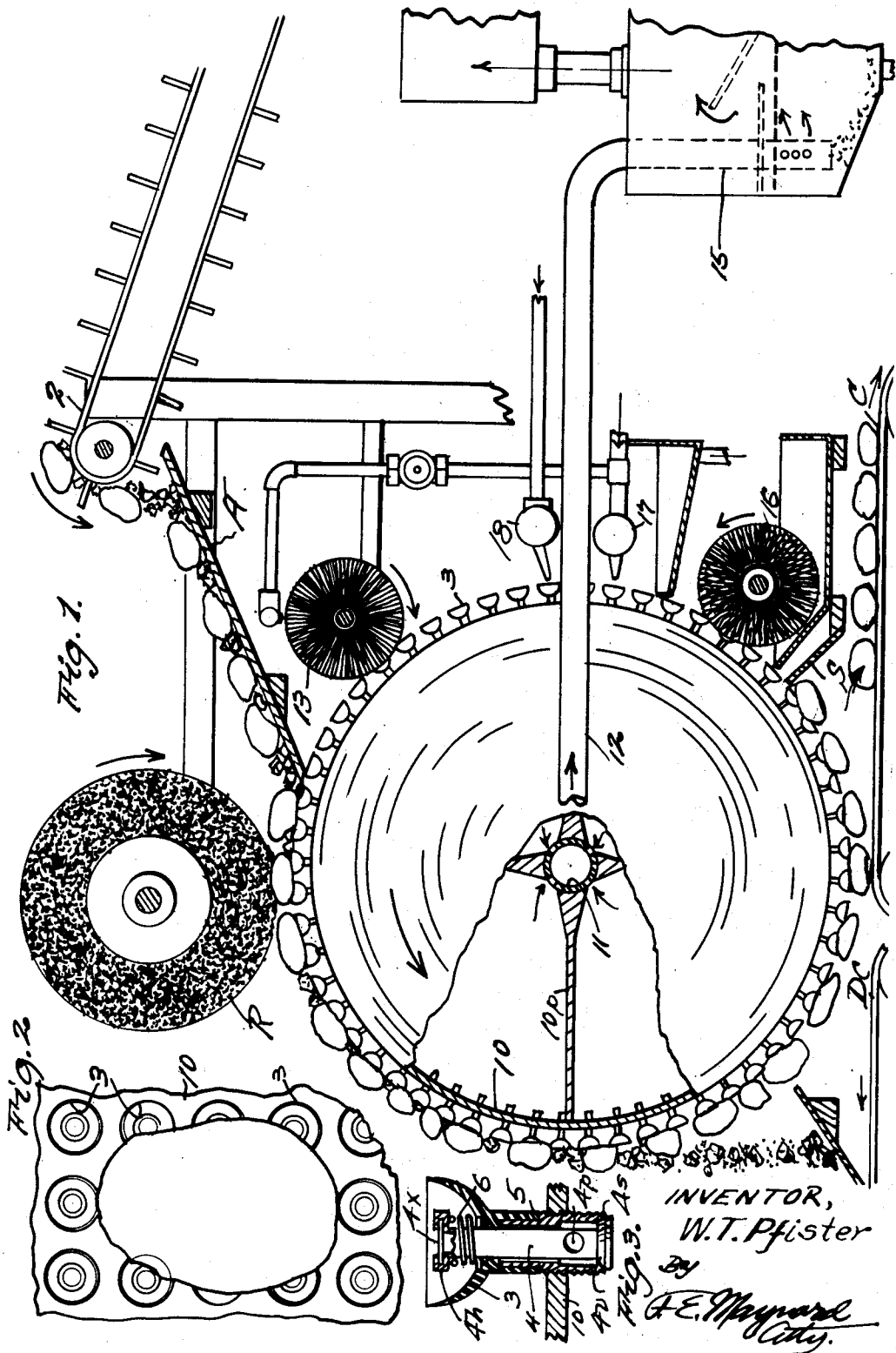


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VACUO-PNEUMATIC APPARATUS FOR SEPARATING
VEGETABLES, FRUITS, AND/OR OTHER BODIES
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VACUO-PNEUMATIC APPARATUS FOR SEPARATING VEGETABLES, FRUITS, AND/OR OTHER BODIES

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9 Claims. (Cl. 209—45)

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This invention is a vacuo-pneumatic, automatic, continuous running apparatus for the substantial separation of two classes of bodies one class including a large range having what may be regarded, for the utility of this invention, as having a generally smooth peripheral surface as exemplified by numerous varieties of sub-surface, earth grown vegetables, namely, potatoes, turnips, and beets; the other class being such detritus as may be machine dug along with the sub-soil vegetables—if and when such materia is to be treated by the machine of the instant invention.

But it is to be understood that the vacuo machine is not confined to the treatment of sub-soil vegetables but may be employed for the separation of a large variety of bodies from other surface differentiated bodies—nuts or fruit which can be shaken from their trees and gathered or picked up from the surface soil by appropriate machines. Various industries may produce, or may manufacture divers goods in mass whose pieces or bodies may be separated into size or other grades, or from a by-product or waste or just detritus.

More definitely it is an object of the invention to provide an apparatus whose functioning principle involves the employment of a vacuous-pneumatic structure wherein is provided a suction mattress, preferably having a continuous peripheral or circumferential, effective surface, to which individual bodies, running in large numbers (passing through the machine), will be caused to adhere solely by atmospheric pressure acting on the desired bodies as these are so lodged on the said structure as to effect the functional opening of certain valves. And which valves form a part of the structure and control the establishment of a desired state of vacuum in pliant-lipped suction pockets or cups going to make the effective object-holding feature of the mattress.

The advance here is to enable the economical maintenance of a good degree of vacuum in a chamber of the structure, a degree that will actually (as has been effectively accomplished by apparatus of this invention) hold a good sized potato (for instance) to the mattress structure even as the adhering potato is orbitally moved downwardly in a vertical path—as from a high feeding locale to a lower stripping level as to each piece or body being sorted.

Further, an accomplishment of the invention is to provide a running structure having a suction mattress and said structure including a hollow, evacuated medium the outer wall of which

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has a surface system of pockets or cups having feathered edges to effectively and instantly conform to the adjacent and impinging surface of passing smooth-face bodies to be selected from other bodies or material to be continuously treated by passing onto and along with the running mattress of the structure or machine. In this connection, a purpose is to provide each suction cup with its own individual vacuum valve device, whereby when a given cup is sufficiently covered, as by a potato, then and then only will the closed cup or cups be effectively opened to the evacuated chamber of the running structure—which is herein shown as a closed, running drum. Such pieces as do not seal a cup but do press a valve open will be free to drop off from the cups.

The invention resides in certain advancements in this art as set forth in the ensuing disclosure and has, with the above, additional objects and advantages as hereinafter developed, and whose constructions, combinations and details of means and the manner of operation will be made manifest in the following description of the herewith illustrative embodiment; it being understood that modifications, variations, adaptations and equivalents may be resorted to within the scope, spirit and principles of the invention as it is claimed in conclusion hereof.

Figure 1 is a diagrammatic, vertical cross-section of the apparatus, and illustrates its sorting function. Figure 2 is an elevation of a portion of the sorting mattress cups; carrying a potato. Figure 3 is an axial section of a potato controlled, vacuum valve, in normal closed position as to the vacuum chamber.

Illustrated is one of divers possible combinations embodying the principle of this vacuo-pneumatic apparatus and showing the discharge belt 2 of a potato digging machine. The belt unloads detritus along with potatoes onto an inclined apron A whose lower end slides the aggregate material onto the top surface of the instant separator whose function is to cause the generally smooth-skinned potatoes to adhere, under atmospheric pressure, onto a presented, external system of pockets, feather-edged cups 3, for instance. In each of said cups are provided means controlled by such of the potatoes as may wholly cover or close a mouth or mouths of adjacent cups of the system.

A feature of the invention is a provided means to effectively press oncoming potatoes onto the top cups of the running system to effect the desired closing of the potato engaged cups; said

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means being here depicted as consisting of a rotary, sponge-like roller R to yieldably contact and press engaged potatoes to cup covering position.

Referring to Fig. 3; in the recess of each cup 3 there is exposed the head 4h of a vacuum valve stem 4 having on its lower end a poppet valve 4v which normally closes onto a seat 4s in the lower end of a valve shell 5. The shell screws into the wall, in this disclosure, of a running structure consisting of a rotary, closed drum or cylinder 10 whose periphery is substantially covered from side to side, that is, parallel to its axis, by the system of applied valve shells and their cups 3, which are fixed in any desired manner onto the outer ends of the valve shells.

Under the head 4h of each valve stem a light effort spring 6 overcomes the tension of a partial vacuum created in the drum 10 by way of a hollow, perforated, driving shaft 11 having a suitable swivel connection (not shown) to a suction pipe 12 evacuated by any suitable pump, not shown. The head 4h of the valve stem has a screen 4s to reduce dust flow into the stem, this being tubular and having outlet port 4p to the bore of the shell.

It is therefore clear that when potatoes lodge on the topmost cups of the mattress formed thereby around the drum the valves will be forced open against their springs 6 and the vacuum opened from the drum to the cups will cause atmospheric pressure to clamp the affected potatoes solidly onto the respective cups. The result is that as the drum revolves on its horizontal axis the tenaciously, air-pressed potatoes will be carried downwardly in a vertical arc by the rotation of the drum.

Lumps of earth and pieces of rock and gravel, having, almost always, sharply angular facets and indentations, will not be able to effectively close the mouth of an engaged cup. When adapted to vegetable digging machines, as here shown, even large lumps in the detritus which may open a valve will fail to seal the cups to a degree that will cause detritus pieces on the cups to be held but the detritus will freely fall to a dirt conveyor DC suitably driven in a direction away from the lower portion of the drum. At the same time, the sorted potatoes held by contacted cups will pass under the axis of the drum or carrying structure of mattress valves and upon engaging a suitable and fixed stripper S will be pulled from the effective cups and drop onto an adjacent carry-off belt C or other desired disposal means, which may discharge to a pick-up vehicle travelling with the digging machine of which the feeder belt 2 is a part.

A feature of the invention is a rotary device such as a roller or brush 13, normally kept wet with water and having the purpose of wetting the lips of the cups as they pass so that sealing effect of a lodged potatoe will be facilitated.

Another feature of the invention is that such dust as may enter the tubular valve stems is, instead of being whirled and tumbled in the vacuum chamber of the drum 10, quickly led toward the perforated shaft 11 by means of a set of radial partitions 10p fixed in the drum. The suction pipe 12 takes off the dust and leads it to an air washer or dust trap 15 from which the cleaned air passes to the given air pump which establishes the desired vacuum.

Also, a feature is that as the cups pass up from the carry-off belt C they are brushed by a rotary, suitably driven brush 16, and when desired are

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washed by jets of water from a manifold 17, and further cleaned and dried by air jets from an air manifold 18.

The degree of the vacuum and the size and arrangement of the mattress forming cups will be determined by the kinds and nature of bodies and objects, natural or manufactured, to be sorted in a running mass aggregate. It is possible that a plurality of the vacuo-drums may be associated for successive operation in a given run of materia.

Attention is drawn to the great advantage of readily holding the desired degree of vacuum in the drum by reason of use of valves which operate under control of bodies which, per se, are to be sorted. All cup valves not pressed open by the smooth surface bodies to be recovered or by dirt lumps and the like stay closed and conserve the vacuum and those pieces which do not seal on the cups fall away and let the adjacent valves quickly close thus reducing vacuum loss which is easily kept by the respective pump to the necessary tension.

What is claimed is:

1. The combination, in a given-body sorting apparatus, of a horizontal axis, hollow, running drum structure having an exterior mattress, means for maintaining a suction within the interior chamber of said drum structure, and vacuum valves in the cups connecting the said chamber to the cavities of the cups to effect pneumatic adhesion of imposed, cup-closing bodies which are to be sorted, and means for feeding said bodies to a desired area of the drum structure; said cups having flexible, object conformative lips, and presser means for yieldably pressing the sortable bodies onto the cups to close the same and effect operation of the valves by said bodies.

2. The combination of claim 1; and exhaust means connected to the drum structure to facilitate exhaust of incidental dust from the exhausted chamber.

3. The combination of claim 1; and means arranged adjacent to the cups for eventually stripping the bodies from the effective cups.

4. The combination of claim 3; and means arranged adjacent to the drum for brushing and washing the cups of the mattress subsequent to the stripping action.

5. The combination of claim 1; and a water supply means arranged adjacent to the path of and for wetting the lips of the cups to facilitate adhesion of the imposed, covering bodies to be sorted.

6. Means for continuous sorting of given bodies from an aggregate mass and including a rotary drum and means to exhaust and maintain a vacuum in the chamber of the drum, means for running a body and aggregate stream onto the drum, and a vacuum mattress on the periphery of the drum and including a system of separated, individually functioning suction cups having flexible lips and each having therein a normally-closed, repressible vacuum valve operatively controlled by said bodies as lodge on and substantially seal adjacent cups whereby to evacuate the closed cups by connections thereof leading to the said chamber, and means for pressing said bodies onto the cups.

7. The means as set forth in claim 6; and including a stripping means arranged adjacent the drum for stripping adhering bodies from the effective cups.

8. In an apparatus of the class set forth; a

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system of flexible wall suction cups each having exposed in the cavity thereof a vacuum valve adapted for repressive engagement with given objects to be taken by and closing the cups, and means for maintaining a vacuum in the suction cups whereby to hold thereto an object which has opened an engaged valve; the cup walls having thinned-lipped, object sealed mouths.

9. Vacuo-pneumatic apparatus for running operation of vegetable bodies from a stream of detritus and including a hollow running drum rotatable on a horizontal axis, means for maintaining a vacuum in the drum, an external system of thin, flexible-lipped suction cups on the periphery of the drum having exposed in their cavities valves engageable with and functionally opened to the drum chamber by said bodies as they cover individual cups whereby to hold

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the effective bodies as the drum rotates, and means for supplying the stream of bodies to a desired area of the drum.

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