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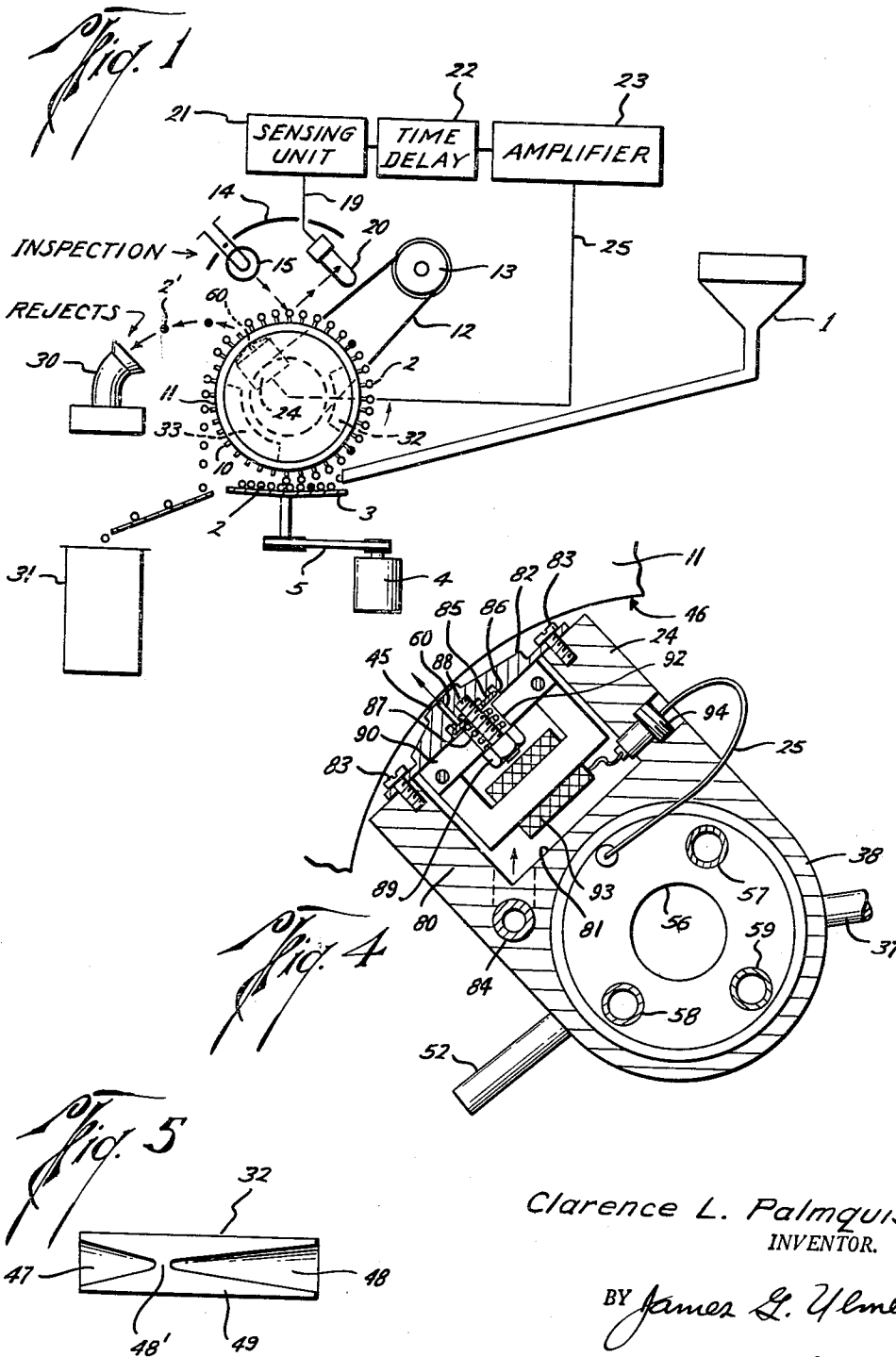
C. L. PALMQUIST

3,058,588

INTERNAL EJECTION APPARATUS

Filed Sept. 21, 1959

2 Sheets-Sheet 1



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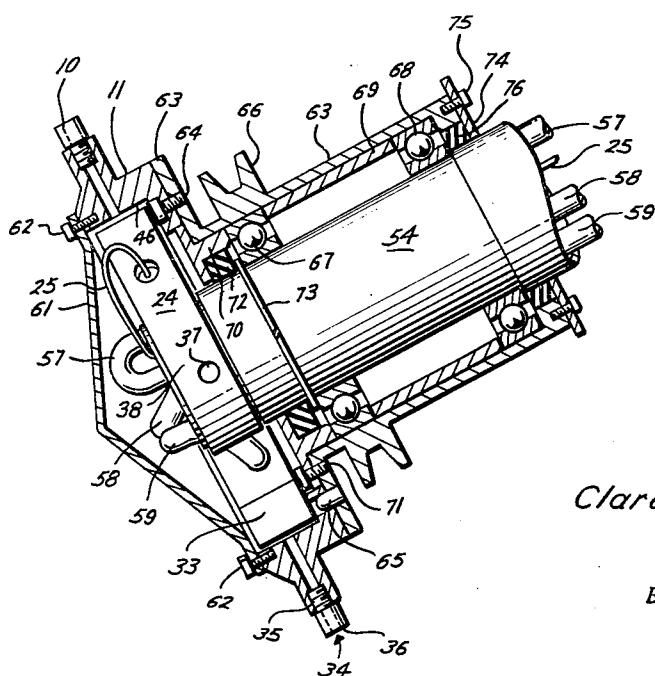
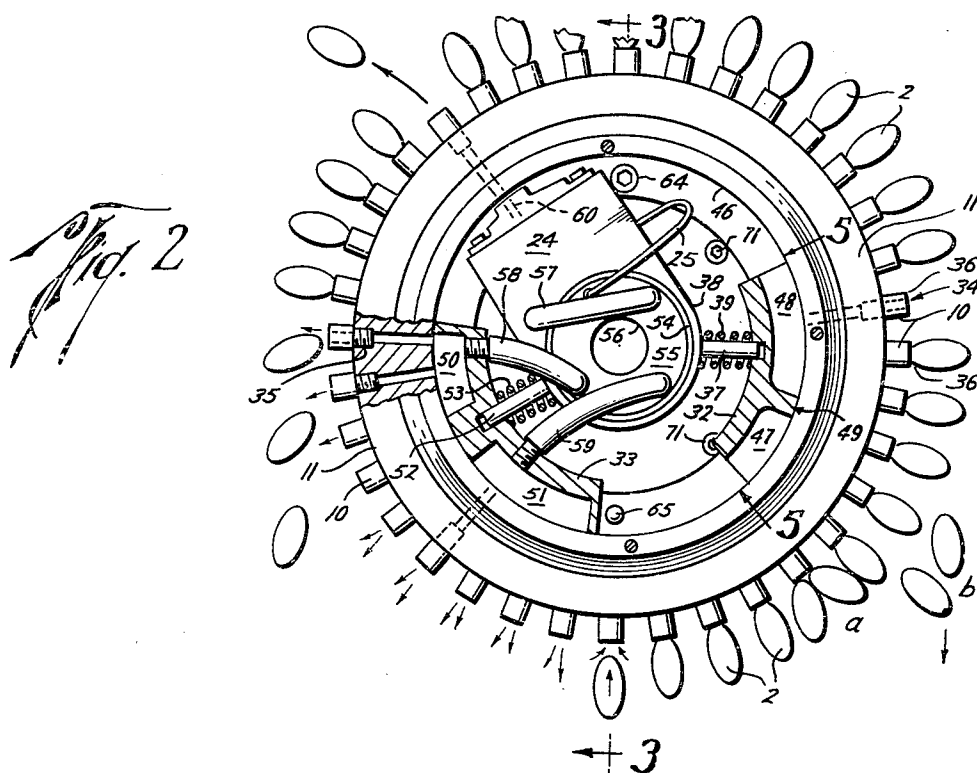
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INTERNAL EJECTION APPARATUS

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6 Claims. (Cl. 209—74)

This invention relates to apparatus for handling and conveying objects, and particularly for doing so in machinery used for photoelectric sorting or counting of small objects such as beans, seeds, capsules and the like.

The class of machine with which I am primarily concerned employs photoelectric equipment for classifying the objects as they are conveyed past an inspection point and mechanical or air ejectors to remove the objects from the region of the conveyor according to their classification. The conveying means in such machines with which I am primarily concerned comprise a wheel or drum with a partial vacuum inside and a number of ferrules spaced about the periphery of the drum to form passageways from said partial vacuum to the atmosphere. The drum rotates so as to dip into the product, with the result that the pieces are held to the tips of the ferrules by atmospheric pressure attempting to enter the vacuum within the drum.

Machines of this type have achieved speeds of sorting and counting as high as several hundred units per second. In the high speed handling of agricultural or manufactured products of appropriate size, however, a heretofore existing limitation was present in the available means for ejecting the product. Machinery heretofore available employed either an external mechanical kicker actuated by a solenoid or an external electromagnetic air valve which removed the product from the vicinity of the conveyor by means of an external air blast. Further, prior to my invention, apparatus of this general type was made to release the pieces from the ferrules prior to their ejection so that they entered into a free fall trajectory, during which free fall the ejector would strike or blow the objects to be separated out of the trajectory. In machines of the type just described the ejector operated upon the objects as they tumbled in the free fall, and the ejection operation was entirely outside the vacuum drum. This fact led to a number of limitations upon the speed, efficiency, versatility and usefulness of the entire machine.

My present invention relates to an improved apparatus which performs the ejection operation from within the vacuum drum, and it is for that reason that I have called my invention an internal ejection apparatus.

It is, therefore, one object of my invention to provide a sorting and cutting machine with an internal ejector.

It is a second object of my invention to provide an electric sorting machine in which the fluid blast which performs the ejection operation is concentrated more directly upon the product to be ejected.

It is a third object of my invention to provide a sorting machine in which the position of the product at the moment of the application of the ejection force is exactly controllable rather than random as is now the case resulting from the fact that the product is now rejected after release from the conveyor and during a free fall.

It is a fourth object of my invention to provide an ejection apparatus in which the stream of ejecting fluid follows the product as it departs from the point of ejection, and thereby to increase the resolution of the ejection operation.

It is a fifth object of my invention to provide a conveying and ejecting apparatus in which the product which is not intended to be removed from the conveyor at the

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point of ejection can be left on the conveyor and removed at some later point.

It is a sixth object of my invention to provide a conveying and ejecting apparatus in which the ejection operation may be performed at more than one point around the periphery of the conveying drum and thus permit multiple ejections and classifications.

It is a seventh object of my invention to provide an ejection apparatus in which the amount of kinetic energy which must be imparted by the ejection apparatus is materially reduced which results in an increase in the maximum speed of operation and an improvement in the efficiency of the separation.

It is an eighth object of my invention to provide an ejection apparatus which will reduce the dispersion of the paths of the ejected products so that they may be collected more effectively in bins of their respective categories.

It is a ninth object of my invention to provide a conveying and ejecting apparatus particularly useful in counting product by virtue of having the ability to carry a specified number of the product past the ejection point without interruption.

It is a tenth object of my invention to provide a material handling and ejecting apparatus which reduces possibility of damage to delicate products such as, for example, blanched peanuts which are easily spoiled by splitting into halves under rough handling.

Other objects and advantages of my invention will be readily ascertainable from this disclosure by those skilled in the art. While I shall describe and illustrate my invention in connection with a photoelectric sorting or counting machine, it will be understood that I do not intend to limit myself to the particular embodiment which I have set forth herein. For example, it will readily be seen that while air is the most commonly used ejection fluid, water, inert gases, or any other fluid medium may be used. It is further apparent that the conveying and ejecting apparatus which I have invented is equally useful in machines actuated by magnetic, electrostatic, or other types of sensing elements as it is in photoelectrically actuated machines.

These objects are accomplished in my device by providing in general a rotary vacuum drum with suction holes in it for picking up objects and an internal air ejector for removing selected ones of said objects from said drum by directing a blast of air through said holes.

Having thus described the objects and purpose of my invention, I now identify the following drawings to illustrate the same.

FIGURE 1 is a drawing which depicts the interrelationship of the components of an electric sorting or counting machine.

FIGURE 2 is a partial cut away view of the vacuum drum with the internal air ejector and other related parts therein and looking along the normal to the plane of rotation.

FIGURE 3 is a partial section view of the vacuum drum and related components with said section being taken along the axis of rotation.

FIGURE 4 is a top view, partly cut away, of the internal air ejector showing its internal construction.

FIGURE 5 is a view of the interrupter shoe looking at its face.

Referring now to FIG. 1, I have provided a hopper 1 positioned to direct product 2 to a feed bowl 3. Feed bowl 3 is driven by a motor 4 through belt 5.

The holding nozzles or ferrules 10 are carried by a rotatable vacuum drum 11 which is powered through belt 12 by motor 13.

An inspection housing 14 contains a light source 15 and a photoelectric tube 20. Photoelectric tube 20 is con-

nected to sensing unit 21 by wiring 19, and said sensing unit is electrically connected with the time delay 22. Time delay 22 is electrically connected to amplifier 23, which is in turn connected to internal ejector 24 by wire 25.

Reject bin 30 is provided to collect rejected product 2 shown as solid in FIG. 1. Accepted product bin 31 collects accepted product 2.

Inside vacuum drum 11 I have provided an interrupter shoe 32 and a cut-off shoe 33.

Referring next to FIG. 2, a passageway 34 extends through the holding nozzles or ferrules 10 and the wall of vacuum drum 11. Ferrules 10 are screwed into vacuum drum 11 by means of threads 35. Ferrules 10 may be of non-bruising material such as rubber or plastic. The outer tip 36 of ferrules 10 is a seat for product 2.

Interrupter shoe 32 is slidably carried upon rod 37 which is fixed to collar 38 of ejector 24. Spring 39 is supported by rod 37 and presses shoe 32 outwardly from collar 38 and against the inner surface 46 of vacuum drum 11.

Shoe 32 is provided with a first tapered recess 47 and a second tapered recess 48 (FIG. 5), both opening against the inner surface 46 of vacuum drum 11. Separating tapered recesses 47 and 48 is a continuous portion—48 of the face 49 of shoe 32.

Cut-off shoe 33 is provided with a first recess 50 which opens to the inner surface 46 of vacuum drum 11. Cut-off shoe 33 is also provided with a second recess 51 which opens against the inner surface 46 of vacuum drum 11.

Cut-off shoe 33 is slidably carried by rod 52, and rod 52 is fixed to collar 38 of ejector 24. Spring 53 is supported by rod 52 and presses shoe 33 outwardly from collar 38 and against the inner surface 46 of vacuum drum 11.

Air ejector 24 is fixed to vacuum manifold 54 by collar 38. Air ejector 24 has an outlet 60 surrounded by small shoe 45. End plate 55 of vacuum manifold 54 has a central hole 56 leading from the space inside the vacuum drum 11 into the vacuum manifold 54. Wire 25 passes through end plate 55 to air ejector 24.

Air hose 57 passes through vacuum manifold 54 and its end plate 55 to air ejector 24. Air hose 58 passes through vacuum manifold 54 and its end plate 55 to cut-off shoe 33. Hose 58 communicates with cavity 50 in cut-off shoe 33.

Hose 59 passes through vacuum manifold 54 and its end plate 55 and communicates with cavity 51 in cut-off shoe 33.

Referring next to FIG. 3, a drum cover 61 is attached to vacuum drum 11 by screws 62. Drum hub 63 is attached to vacuum drum 11 by screw 64 and is held in position on vacuum drum 11 by pin 65. A pulley 66 encircles drum hub 63 and is integral therewith.

Vacuum manifold 54 passes through drum hub 63 and supports it through ball bearings 67 and 68. A first ball bearing 67 and a second ball bearing 68 connect drum hub 63 rotatably with vacuum manifold 54. A bearing spacer 69 separates first ball bearing 67 from second ball bearing 68. A bearing retainer 70 is fixed to drum hub 63 by screws 71.

Bearing retainer 70 also holds a first oil seal 72 in position between bearing retainer 70 and vacuum manifold 54. Retainer ring 73 aids the holding of first ball bearing 67.

Disk retainer 74 is fixed to drum hub 63 by screws 75, and it holds second oil seal 76 in position between drum hub 63 and vacuum manifold 17.

Referring next to FIG. 4, my internal air ejector 24 includes an ejector mount 80 with a recess 81 therein. Ejector cover 82 is bolted across the mouth of recess 81 by bolts 83 to create an air-tight chamber in the recess 81. Air intake fitting 84 on ejector mount 80 communicates with recess 81 and connects with air hose 57.

Ejector cover 82 has a hole 60 therethrough communi-

cating from chamber 81 to the space outside the air ejector 24. Valve seats 85 are provided at the inner-end of hole 60. Washer 86 rests on valve seats 85 to shut off the flow of air out of recess 81 through hole 60.

Armature washer 86 is biased against the valve seats 85 by spring 87. Spring 87 and washer 86 are held in alignment by bolt 88 which is screwed partly into ejector cover 82. The spring 87 reacts against nut 89 which is screwed onto bolt 88. Bolt 88 and nut 89 also hold magnetic core 90 against the ejector cover 82.

Core 90 has an open flux gap 92. Magnetic core 90 carries a solenoid coil 93 to which electric current is supplied from amplifier 23 through wire 25. Wire 25 passes through ejector mount 80 by means of sealed connector plug 94.

Now that I have identified the parts which make up my apparatus, I shall proceed to explain their operation.

The hopper 1 and feed bowl 3 (FIGURE 1) are arranged and operated to maintain at all times a steady level of products 2 in the feed bowl 3. The feed bowl 3 is rotated by motor 4 through belt 5, and the product 2 is carried into proximity with the holding nozzles or ferrules 10 which extend outwardly from the periphery of the vacuum drum 11.

A partial vacuum is maintained inside the vacuum drum 11 by means of the exhaust opening 56 in end plate 55 of vacuum manifold 54. The ferrules 10 contain open passageways 34 which lead from the partial vacuum within drum 11 to the atmosphere. Air is sucked into the vacuum drum 11 through the ferrules 10. As the vacuum drum 11 is rotated in close proximity to the feed bowl 3 so that the tips 36 of the ferrules 10 come into contact with the product 2 carried on the feed bowl 3, the product 2 is picked up singly on the tips 36 of the ferrules 10 by pressure of atmosphere attempting to enter the vacuum drum 11 through the ferrules 10.

The product 2 is then carried by the ferrules 10 past the inspection housing 14 which contains light source 15 and photoelectric tube 20. Observations are made of the product 2 in the inspection housing 14 by reflecting light from source 15 off the product 2 to photoelectric tube 20. The signal from tube 20 passes through wire 19 to the sensing unit 21 where a decision to accept, reject, or otherwise classify is made and sent to the time delay unit 22.

After a ferrule 10 on vacuum drum 11 has rotated past the point of viewing, it passes over the ejector nozzle or orifice 60. The internal air ejector valve 24 is mounted inside the vacuum drum 11 in this embodiment. Ejector 24 contains apparatus for passing short blasts of air or other fluid in response to the command of the electric signal from the amplifier 23. Delay unit 22 stores the signal from the time of the observation to the time of the ejection, and then activates amplifier 23 which operates ejector 24 through wire 25. The photoelectric, sensing, time delay, and amplifier components may be of conventional type.

Coming next to FIG. 3, the space inside the vacuum drum 11 is partly closed from the atmosphere by the drum cover 61 which is attached to drum 11 by screws 62, and by the drum hub 63 which is attached to the drum 11 by means of screws 64 and positioning pin 65.

The vacuum drum 11 rotates with the drum hub 63 and the drum hub 63 rotates around the vacuum manifold 54 and is rotatably supported on manifold 54 by the ball bearings 67 and 68 which are separated by the bearing spacer 23.

A first oil seal ring 72 is held in place between the drum hub 63 and the vacuum manifold 54 by the bearing retainer 70 which is held against hub 63 by screws 71. The retainer ring 73 further holds the bearing 67 and the oil seal 72 in position. A second oil seal 76 is held in place between the manifold 54 and the drum hub 63 by the disc retainer 14. The oil seals 72 and 76 complete the closing off of the space within the vacuum drum 11

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from the atmosphere. The drum hub 63 and attached vacuum drum 11 are rotated by belt 12 by means of pulley 66.

The inner surface 46 of the vacuum drum 11 is ground smooth and round. Interrupter shoe 44 has its face 49 ground to fit smoothly within the ground inner surface 46 of the vacuum drum 11 and to make an air-tight sliding seal therewith when the ground surfaces are oiled.

Cut-off shoe 33 is pressed outwardly against the inner surface 46 of vacuum drum 11 by spring 53. Tapered recesses 47 and 48 are placed in shoe 32 to control the length and suddenness of the interruption and leave adequate bearing face. As each ferrule 10 slides across the central part 48 of shoe 32 said ferrule is momentarily sealed off from the vacuum. This interruption briefly loosens the product and this loosening serves to settle the product more firmly on the ferrule. This interruption also serves to cause all product units in excess of one to drop away from the respective ferrules 10. I have depicted the occasional presence of two units of product on one ferrule at *a*, and at *b* I have shown other excess product which is falling away after having been removed by the interrupter shoe 32. Interrupter shoe 32 is placed ahead of the inspection unit 14 and ejector outlet 60 on the path of rotation, but after the low point where new product is picked up, in order to make sure that only one piece of product per ferrule is carried past the inspection housing 14 and ejector orifice 60 and that each piece is firmly seated.

A second shoe 33 known as the cut-off shoe, is provided after the ejector orifice 60 on the cycle of rotation. Shoe 33 is slidably fitted against the ground inner surface 46 of the vacuum drum 11 and is slidably supported against the drum 11 by rod 52 and spring 53.

A first cavity 50 in shoe 33 opens against the ground inner surface 46 of vacuum drum 11. Air at elevated pressure is maintained in cavity 50 through hose 58, which passes through vacuum manifold 54. The air in the cavity 50 flows outward through each ferrule 10 as it rotates past cavity 50 and breaks away any product which has a tendency to stick or seal to the ferrule.

Such sticking can result from residual vacuum in the case of smooth surfaced products which form an air-tight seal over the tip of the ferrule. This seal breaking will also overcome any tendency of the product 2 to stick physically to the tip of the ferrule 10 especially when a wet product is being handled. All ferrules will thus be cleared to pick up new products as they rotate past cavity 50 in shoe 33. The amount of air pressure used may be adjusted as necessary to remove all of the product and at the same time not to blow the product away so forcefully as to damage or scatter it.

A second cavity 51 provided in cut-off shoe 33 opens against the ground inner surface 46 of vacuum drum 11. High pressure air is introduced intermittently into this cavity by means of hose 59 which passes through vacuum manifold 17. Hose 59 is a purging hose which is used to cleanse the ferrule of any product fragments or dirt which have been sucked into the ferrule. High pressure air may be blown through purging hose 59 as may be required to keep the ferrules free of debris.

Referring again to FIGURE 4, and to my earlier description of the parts shown thereon, when electricity is applied to the coil 93, a magnetic flux exists across the air gap 96. This magnetic flux exerts a physical force upon the washer 86 which moves it away from the valve seats 85 against the action of the spring 87 and toward the core 90. During time intervals when the ejector valve is to emit air to eject product, the coil 93 is thus energized, and the magnetic force raises the washer and permits air to flow past the inner and outer edges of washer 86 and out through hole 60.

The outlet orifice 60 on the air ejector 24 is surrounded by a small shoe 45. In handling some products shoe 45 is positioned close to the ground inner surface 46 of the

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vacuum drum 11 but not in sliding contact therewith. I have shown such an arrangement. This arrangement is appropriate where little vacuum interrupter action is required by the shoe 45 and where its main function is to limit the scattering of the air blast as it passes from the ejector orifice 60 toward the ferrule 10 through the vacuum space. As an alternative embodiment, the shoe may be constructed to come into air-seal contact with the inner surface 46 of the vacuum drum 11 where the nature of the product being handled makes it desirable to shut off the vacuum before the air blast goes out from the ejector 24 or where it is desirable to have the starting and stopping of the air blast through the ferrule 10 sharpened by the chopping action of the shoe 45 sliding over the inner end of the passageway 34.

More than one internal ejector 24 may be operated in connection with one vacuum drum 11, and by appropriate adjustment of a second set of time delay unit 20, and amplifier 23 (second units not shown) the ejection of different categories of products may be effected at different points along the path of rotation. It was heretofore suggested that it was necessary to release all of the product from the ferrule 10 at the same point upon the cycle whether it was to be ejected or not, but this invention solves the problem of eliminating that necessity and thereby affords great accuracy, speed and versatility.

While the embodiment which I am using to describe my invention shows the ejector 24 to be located within the vacuum drum 11, it is only necessary for the nozzle or orifice 60 of the ejector 24 to be positioned at the inner end of passageway 34. For some applications it is desirable to have the ejector itself located outside the vacuum drum 11 and to introduce the blast of air from the ejector 24 to the passageway 34 by means of a tube.

This invention requires less energy of the fluid pulse than in the case of external ejection for several reasons, one being that efficient separation is aided by the fact that the nonrejected product stays on the ferrule 10 for a discrete period of time and is carried past the point of separation.

Another reason is the fact that in external air ejection, after release from the ferrule 10 it has been found necessary to blast the product in a direction different from, and to some extent opposite to, its direction of travel at the moment of leaving the ferrule. Thus, considerable energy was consumed in overcoming the momentum of the particle. The present apparatus imparts the ejecting energy at right angles to the direction of motion of the product so that there is no component of the ejecting energy operating against the kinetic energy of the product. The energy is thus all expended in displacing the product from its path.

It will readily be seen that the heretofore existing difficulties of aiming and directing the fluid blast to the product have been eliminated inasmuch as the product is still held captive on the tip of the ferrule when the blast is introduced against it. It was heretofore suggested that since the product had to be released from the ferrule prior to the external ejection the external ejector had to be carefully and precisely spaced and aimed to achieve satisfactory separation.

The positional adjustment of the external ejector was therefore extremely critical, and even when adjusted to the optimum position and direction it could not achieve the effectiveness of the internal ejection because of the dispersion of the fluid stream between the tip of the outlet and the product. The orifice could not be placed close to the falling product, particularly in case of irregularly shaped product, because some product would tumble out of trajectory and strike the nozzle and some would tumble away from the orifice and receive less blast. This resulted in considerable variation of the ejection trajectory. These problems are solved by my invention.

The apparatus of my present invention further increases

the efficiency of separation in that the short blast of air momentarily follows the product away from the ferrules 10 after it is rejected. This is because the separation is not in a direction out of the plane of rotation of the vacuum drum, with the result that the ferrule tends to point toward the product as the ejected product departs.

My invention further increases the definition of the pulse of air or other fluid which is used for the separating operation. The present apparatus has as an important advantage the capacity to sharpen the beginning and ending edges of the air pulse by the chopping effect of the ferrules passing rapidly over the outlet of the ejector.

The apparatus of my invention is adapted to accomplish a continuous ejection as is desirable in counting operations. My machine can be employed to count and separate any specified number of products, such as capsules for filling shipping containers. When adapted for use as a counting machine, the sensing unit is set to cause the ejector to eject continuously until the desired count has passed the separation point. With external ejection, continuous flow through the ejector was not feasible because product falling upon the transverse fluid stream would be deflected at random angles by the stream and would bounce from it.

It will further be seen that in my invention it becomes possible to use multiple rows of ferrules laterally spaced relative to each other on the vacuum drum. Separate ejection outlets may be provided under each row of ferrules in that event. Such multiple row separation was not feasible in the case of external ejection because of interference between the ejection streams.

I claim:

1. In a machine for high-speed photoelectric sorting or counting of articles of the type which comprises a vacuum drum with a rotating periphery and holes in said periphery adjacent ferrules for holding articles by atmospheric pressure while they are rotated past an electric eye and further including a collecting vessel and means for releasing said articles from said ferrules for passage through a trajectory into said vessel, the improvement for better separation of articles according to their classification comprising in combination an ejection nozzle situated inside said vacuum drum and positioned to aim outwardly through each of said ferrules upon rotation past said nozzle, and means for selectively ejecting fluid from said nozzle through each of said ferrules when the article carried by said ferrule is to be ejected from the vacuum drum, said ejection nozzle and said ferrule being so related at the moment of ejection with respect to the trajectory and receptacle as to accurately direct the ejected article into said vessel.

2. In a high-speed photoelectric sorting or counting machine of the type which comprises a vacuum drum with a rotating periphery and with holes in said periphery and holding nozzles adjacent said holes for holding articles while they are carried past a photoelectric cell, and further including a collecting vessel and means for releasing said articles from said ferrules for passage through a trajectory into said vessel, the improvement for increasing the accuracy of the sort or count which comprises in combination an ejection nozzle inside said vacuum drum, said ejection nozzle being positioned to aim outward through said holding nozzles as they are rotated past said ejection nozzle, and means for selectively ejecting a blast of fluid out from said ejection nozzle and through said holding nozzle if the article is to be ejected, said ejection nozzle and said holding nozzle being aligned substantially in the plane of rotation whereby the tangential velocity due to rotation and the radial velocity imparted by the ejection fluid are vectorially added to increase the velocity of the ejected articles away from the vacuum drum.

3. In a photoelectric sorting or counting machine of the type which comprises a rotating drum with holes in its

periphery and ferrules adjacent said holes for holding objects against the tips of said ferrules by atmospheric pressure and further including a collecting vessel and means for releasing said articles from said ferrules for passage through a trajectory into said vessel the improvement for more precisely ejecting and recovering selected objects and retaining positive control of the remaining objects past the ejection point, comprising in combination a nozzle inside said vacuum drum directed to aim through said holes and ferrules when they are rotated past the ejection point, means for selectively starting and stopping a flow of fluid out of said nozzle to eject a blast of fluid through said holes and ferrules if the held object carried by the ferrule is to be ejected from the ferrule, said nozzle and ferrule being substantially aligned at the time of ejection to focus the force of the fluid blast upon the departing article within minimum turbulence and make the trajectories of such ejected objects uniform, said object being carried past the ejection point by said ferrule if the object is not to be ejected at that point.

4. In a machine for photoelectric sorting or counting of articles at high speed of the type which comprises a vacuum drum with a rotating periphery and holes in said periphery adjacent ferrules for holding articles by atmospheric pressure while they are rotated past an electric eye the improvement for multiple separations comprising in combination a first ejection nozzle positioned inside said vacuum drum to aim outward through said ferrules as they are rotated past said first ejection nozzle, means for selectively ejecting a blast of fluid out of said first ejection nozzle through said ferrule if the article carried by the ferrule is to be ejected at that point, said article being carried by said ferrule past said first ejection nozzle if it is not to be ejected there, a second ejection nozzle positioned in said drum behind said first ejection nozzle to aim outward through said ferrules at a time after said ferrules have rotated past said first ejection nozzle, means for selectively ejecting a blast of fluid out of said second ejection nozzle through said ferrules if the article carried by the ferrule is to be ejected at said second ejection nozzle.

5. In the method for high-speed sorting or counting of articles which includes passing through a supply of the articles a holder having serial nozzles, applying a differential pressure to secure said articles to said nozzles, rotating said nozzles with said articles past an observation point, photoelectrically observing said articles and thereby creating differing electrical signal responses, and utilizing said signal responses to eject from said articles an article creating a predetermined signal response, the improvement for better separation of the sort or count comprising in combination the steps of holding the articles on said nozzles until substantially the time of ejection, directing a blast of fluid outward through one of said nozzles at a fixed point on its path of rotation in response to said predetermined signal response to eject the article held by said nozzle along a single trajectory, holding said articles on said nozzles and rotating said nozzles with said articles past said point if said predetermined signal response is not present, and releasing from said nozzles articles carried past said point.

6. In the method for high-speed sorting or counting of articles which includes passing through a supply of the articles a holder having serial nozzles, applying a differential pressure to secure said articles to said nozzles, rotating said nozzles with said articles past an observation point, photoelectrically observing said articles and thereby creating differing electrical signals in response to said observation step, releasing said articles from said nozzles into a trajectory, utilizing the signal to eject from the articles an article creating a predetermined signal response, the improvement comprising in combination the steps of holding the articles on said nozzles until substantially the time of ejection, directing a first blast of

fluid outward through each of said nozzles at a first point on their path of rotation in response to a first predetermined signal response to eject the article along a first trajectory, holding said articles on said nozzles and rotating said nozzles with said articles past said first point if said first predetermined signal response is not present, and directing a second blast of fluid outward through each of said nozzles at a second point on said path of rotation in response to a second predetermined signal response to eject the article along a second trajectory. 10

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