United States Patent [19]

Palm

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[54] **TIME INTERVAL SAMPLING MECHANISM**

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[52] **U.S. Cl.** ..... **73/423 R**

[51] **Int. Cl.** **G01n 1/04**

[58] **Field of Search** ..... 73/421 R, 423 R, 424, 425, 73/425.2

[56] **References Cited**

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[57] **ABSTRACT**

A motor driven suction pick-up means lifts small objects such as pharmaceutical tablets from a production stream at regular time intervals and delivers them to a collection point where representative samples of the product are accumulated. One, and only one, object per cycle of operation is seized and transported by the pick-up means.

12 Claims, 7 Drawing Figures

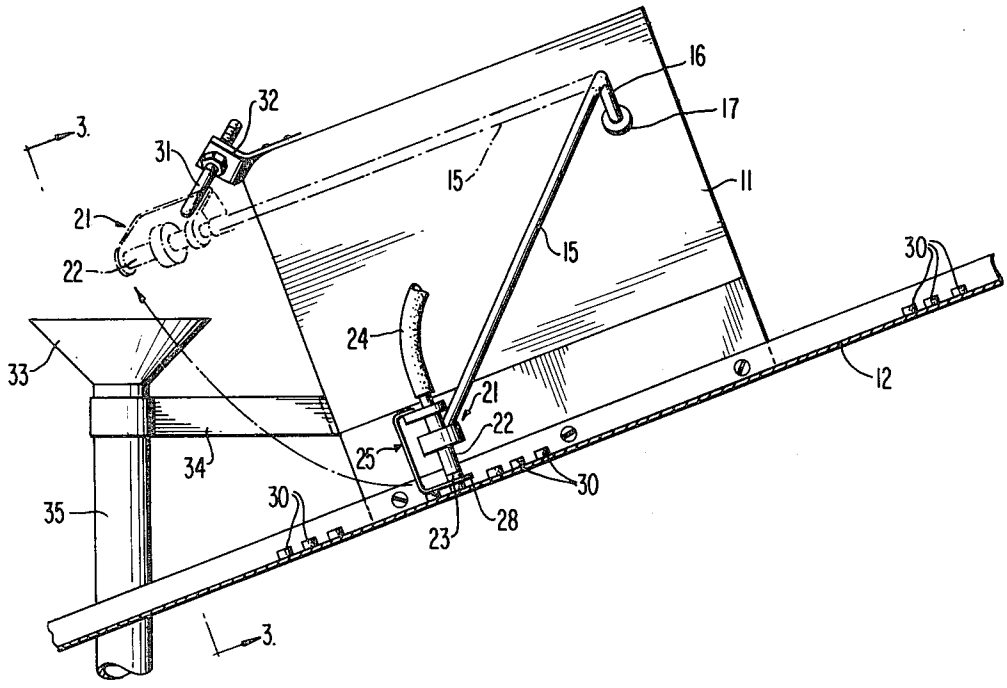


FIG.1

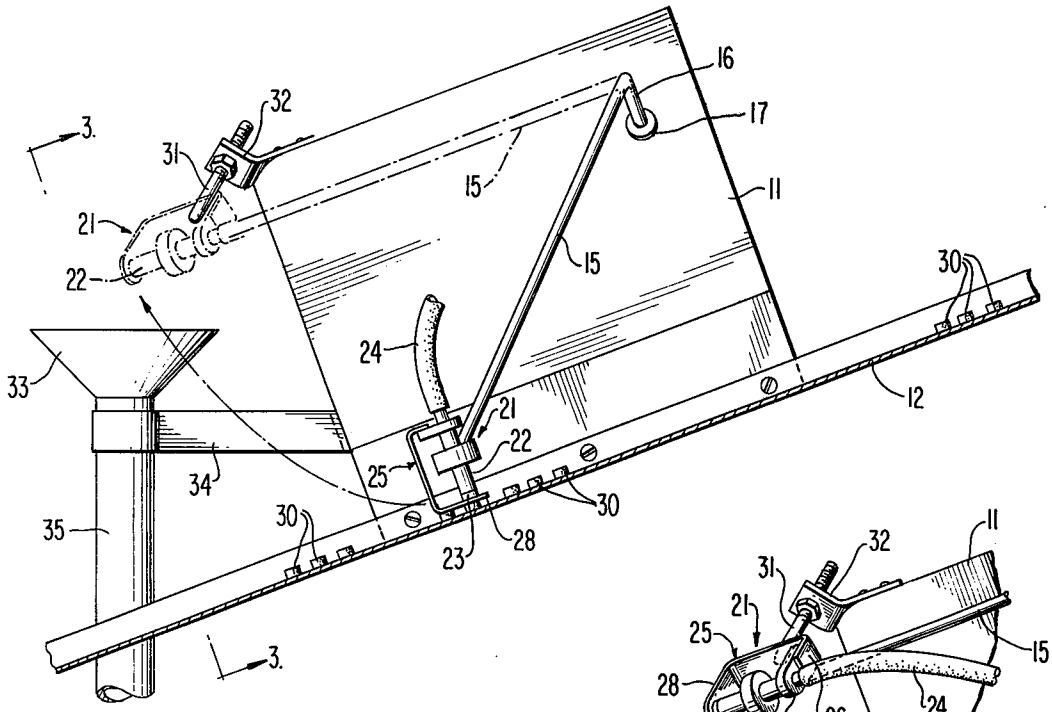


FIG.2

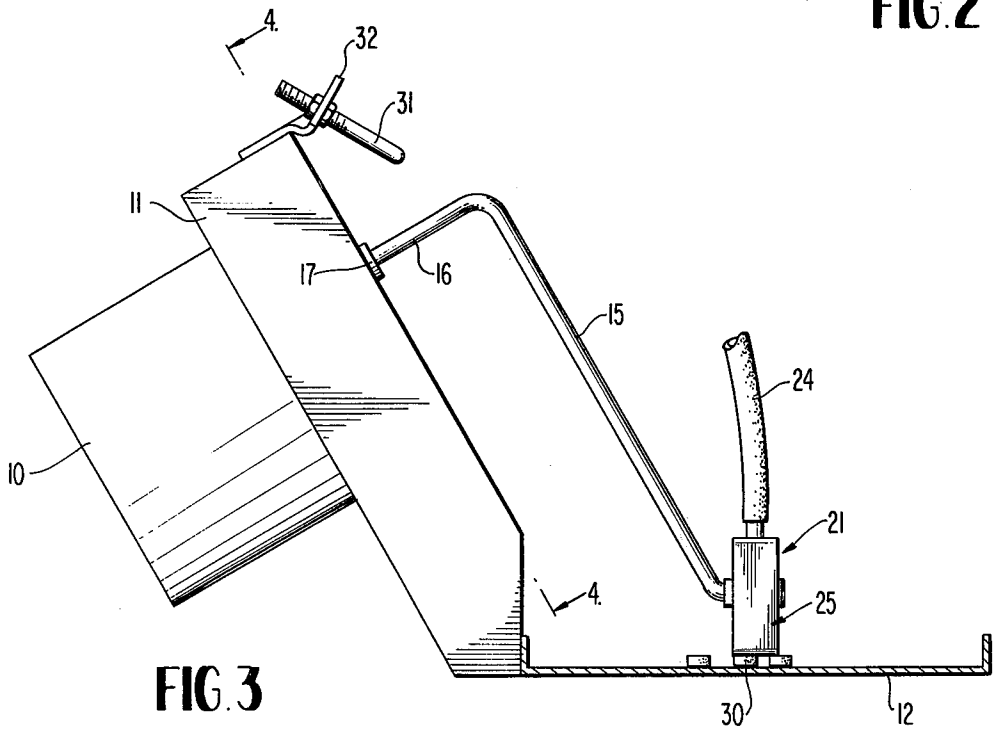


FIG.3

FIG.4

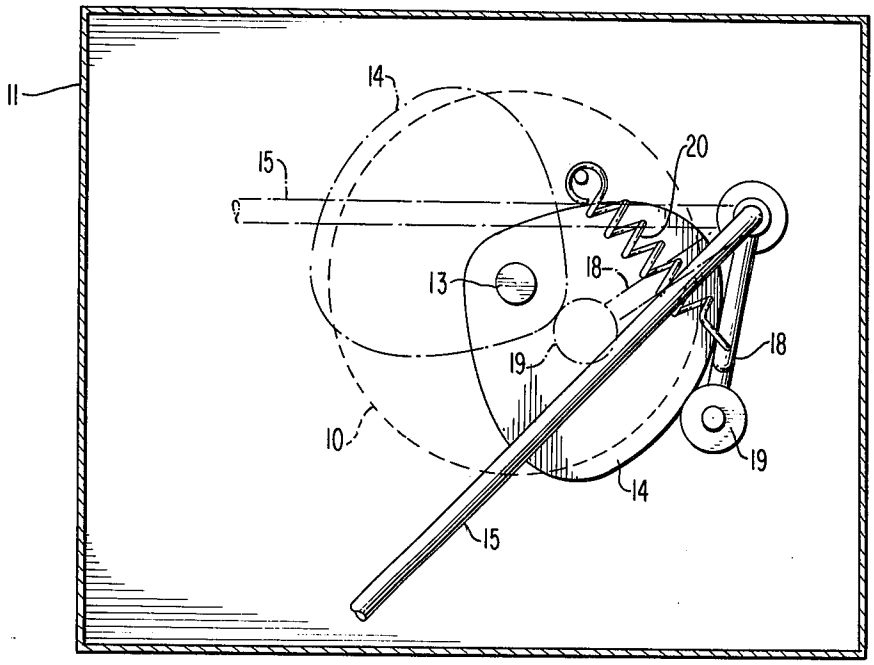
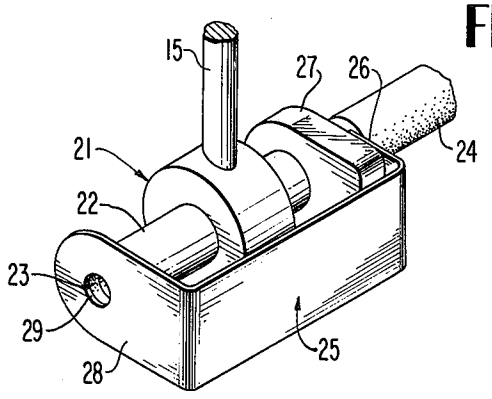


FIG.5



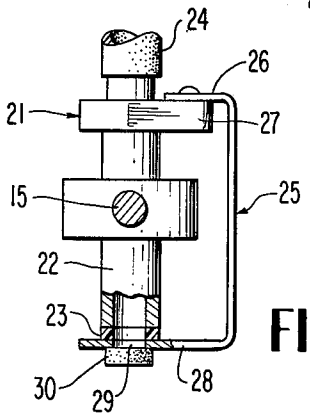


FIG.6

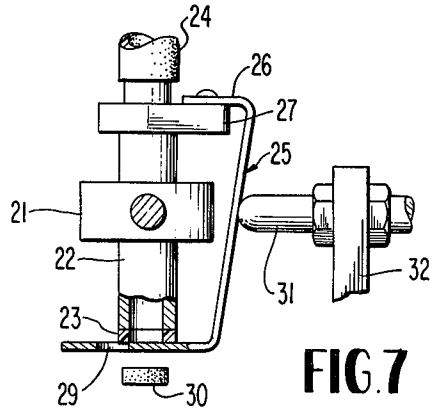


FIG.7

TIME INTERVAL SAMPLING MECHANISM

BACKGROUND OF THE INVENTION

A need exists in the pharmaceutical industry and elsewhere for a simplified, economical and reliable product sampler which may be attached easily to production machinery and which requires little or no maintenance after proper installation. At the present time, only haphazard arrangements are utilized for gathering representative samples of pharmaceutical tablets or similar small objects from production streams and hand sampling is probably the most widely used technique. This is neither economical or reliable and no satisfactory automatic devices for this purpose appear to be available.

Consequently, the objective of the invention is to satisfy the above need for a small object sampler which possesses the already-enumerated features and which may be readily adapted to a variety of product sizes and shapes.

Another objective is to provide a sampling mechanism of the mentioned character which may be modified slightly without great expense for slightly different applications or slightly different production machines and without changing the basic character of the invention.

Still another object is to provide a product sampling mechanism which possesses an efficient and unique vacuum pick-up means for pharmaceutical tablets and the like which will assure unfailingly picking up of one, and only one, specimen at a time and at regular time intervals to achieve representative sampling of the product.

Other features and advantages of the invention will become apparent during the course of the following description.

BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. 1 is a side elevation of the invention showing the same attached to a product output tray which per se is not a part of the invention mechanism.

FIG. 2 is a fragmentary perspective view of a product sample transport arm and suction pick-up means in relation to a discharge pin which effects the release of the sample over a collection funnel when the transport arm is elevated.

FIG. 3 is a cross sectional view of the mechanism taken on line 3—3 of FIG. 1.

FIG. 4 is an elevational view of a motor driven cam and associated parts of the transport arm taken on line 4—4 of FIG. 3, partly in section and parts omitted.

FIG. 5 is an enlarged perspective view of a suction pick-up unit carried by the transport arm.

FIG. 6 is a side elevational view of the suction pick-up unit in an operative condition to pick-up and transport a product sample.

FIG. 7 is a similar view of the pick-up unit with the latter conditioned to release the sample for dropping into the collection funnel.

DETAILED DESCRIPTION

Referring to the drawings in detail, wherein like numerals designate like parts, a synchronous electric motor-gearhead assembly 10 is suitably mounted on a mechanism body portion or housing 11, which is bolted to one side flange of a product output tray or slide 12 forming a part of a production machine for pharmaceutical tablets or similar small objects. The shaft 13 of the motor-gearhead assembly 10 carries a cam 14 whose rotation generates the required oscillation of a product sample transport arm 15.

As shown in the drawings, the arm 15 is disposed exteriorly of housing 11 for movement in an arc above the tray 12 as indicated in FIG. 1. A right angular extension 16 of the arm 15 is suitably journaled in a bearing means 17 on the housing to provide a rotational support for the transport arm. Within the housing 11, a crank extension 18 of the arm 15 carries a follower roller 19 which is held in active engagement with the profiled edge of the cam 14 by a suitable spring 20 having a connection with the crank extension 18. The rate of oscillation of the arm 15 is fixed by the rotational velocity of the synchronous motor-gearhead assembly. Typical velocities are 1 to 10 RPM.

Attached to the free end of transport arm 15 is a suction pick-up unit 21 consisting of a sleeve 22 having a suction nozzle element 23, such as an elastic ring, at its lower end. The other end of the sleeve 22 is connected by a flexible hose 24 to a remote suction source, not shown. A sample release spring 25 has an upper extension 26 secured to a rigid lug 27 on sleeve 22. At its lower end, the spring 25 has a right angular, flat extension 28 substantially in sliding contact with the nozzle element 23, and provided with an aperture 29 adapted to register with the bore of the nozzle element when the spring is in a relaxed state as illustrated by FIG. 6. At this time, the suction pick-up unit is conditioned to pick up a single tablet 30 or like small object from the production tray 12, as will be further discussed.

A sample release pin or post 31 is axially adjustably secured by screw-threaded means to a rigid support bracket 32 near one upper corner of the housing 11, well above the tray 12 and spaced somewhat from one side thereof. The pin 31 is adjusted axially and locked in the precise position to engage and deform the spring 25 in the manner illustrated in FIG. 7 when the transport arm 15 and pick-up unit 21 are at the upper limit of their travel shown in broken lines in FIG. 1. As shown in FIG. 7, the pin 31 deforms the spring 25 sufficiently to shift the aperture 29 out of registration with the suction port of nozzle element 23 so that the suction is interrupted and the particular object 30 which is held and transported by suction is instantly released.

Upon such release, the object 30 will fall by gravity into a sample collection funnel 33 positioned below the pin 31 and secured by a bracket 34 to the body or housing 11. The funnel is connected to a sample conveyor tube 35 which is flexible and which leads to some external collection container for samples, not shown. When the spring 25 separates from the pin 31, it will return due to its tension to the normal position shown in FIG. 6 ready to seize the next sample object when the arm 15 returns the pick-up unit 21 over the product tray 12.

With the mechanism installed on the tray 12, as described, the small objects 30 will continuously pass downwardly on the tray in a procession or stream. The transport arm 15 is designed so that the pick-up unit 21, when in the active position, FIGS. 1 and 3, will be over the center of the production stream of objects on the tray and immediately above them.

When this condition exists, one and only one object 30 will be seized by vacuum at the port 29, the particular object completely covering the vacuum port so that no other objects can be captured. This will occur when

the arm 15 is in the maximum down position. The cam 14 is designed to insure a dwell of the assembly or unit 21 at both extremes of movement of the arm 15 shown in FIG. 1, thus assuring adequate time for the picking up and releasing of each sample.

The captured object 30 continues to be held by vacuum at the port 29 while the transport arm 15 removes it from the tray 12 and carries it toward the release position above funnel 33. At this position, the pin 31 will be engaged by spring 25 and the arm 15 continues to move upwardly slightly to produce deformation of the spring sufficient to interrupt suction and release the object 30 into the funnel 33, as previously described.

The motor 10 continues turning, causing the transport arm 15 to resume its downward motion, and as soon as spring 25 disengages pin 31, it will return to the normal object pick-up position of FIG. 6 so that another sample object may be seized when the arm reaches its lowermost position above the tray 12.

The rate of sample collection is governed by the speed of the motor gear head assembly, and is always fixed for a particular motor. The motor may be changed in order to change the sampling intervals. It is assumed that the rate of object passage on the tray 12 is much greater than the rate of sampling, so that no synchronization is required. The unit 12 dwells over the product stream for ample time to allow at least one object 30 to pass near the nozzle aperture and be captured.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

I claim:

1. A sampling mechanism for small objects moving in a production stream comprising a body portion adapted for attachment to a discharge tray on which said production stream of small objects are moving, a transport arm for individual samples of small objects taken from said production stream mounted for oscillatory movement on said body portion and adapted to move between a down position close to and above said stream to an elevated sample object release position, power means to produce continuous oscillation of said transport arm between said positions at a substantially constant speed including means to cause the arm to dwell at both the down and elevated positions, a suction pickup unit carried by the transport arm including a resilient valve means which is normally positioned on the pick-up unit to activate suction for seizing one and only one small object from said production stream when said arm is in said down position, and means engageable with said resilient valve means when said arm is in the elevated object release position and moving the valve means sufficiently to disable the suction and thereby release the transported small object from the suction pick-up unit at a sample collection point.

2. A sampling mechanism as defined by claim 1, and said power means comprising a rotational motor means coupled with said transport arm, and said means to cause the arm to dwell comprising a cam driven by the motor means and operatively connected to said transport arm.

3. A sampling mechanism as defined by claim 2, and said transport arm having a crank extension carrying a cam follower element, and a spring connected with said arm and urging said follower element into engagement with a profile face of said cam.

4. A sampling mechanism as defined by claim 1, wherein said suction pick-up unit includes a sleeve attached to the transport arm and connected with a flexible conduit leading to a source of suction, said sleeve carrying a suction nozzle element at its lower end, said resilient valve means comprising an apertured spring element attached to said suction pick-up unit and the aperture of the spring element adapted to register with the bore of said sleeve and nozzle element when the spring element is relaxed.

5. A sampling mechanism as defined by claim 4, and said means engageable with said resilient valve means comprising a rigid element secured to said body portion substantially above said production stream to cause yielding of said valve means when said arm is in the elevated object release position.

6. A sampling mechanism as defined by claim 5, and said rigid element comprising a pin element adapted to contact the spring element and to deform the same for shifting the aperture of the spring element out of registration with the bore of said sleeve and nozzle element, and means to support the pin element and adjust the same axially forwardly or rearwardly and to lock the pin element in a selected adjusted position.

7. A sampling mechanism as defined by claim 4, and said spring element being a generally L-shaped element having an arm spaced from and generally parallel to said sleeve and a transverse extension extending across the lower face of said suction nozzle element, the aperture of the spring element being formed through said transverse extension.

8. A sampling mechanism as defined by claim 1, and a sample object collection funnel means positioned near and below said last-named means to receive the sample objects released by the suction pick-up unit.

9. A sampling mechanism as defined by claim 8, and conveyor means for sample objects connected with said funnel means and leading to a collection receptacle for sample objects.

10. A time interval small object sampling mechanism comprising an oscillatory transport arm for movement between a down sample pick-up position and an elevated sample release position relative to a moving stream of small objects to be sampled at regular intervals, means to drive the oscillatory arm at a substantially constant velocity and to cause the arm to dwell at said down and elevated positions, a suction pick-up device carried by said arm and movable therewith and adapted to capture a single sample object from the production stream when the arm is in said down position, and means engaging a movable component of the pick-up device when the arm is in said elevated position and causing the pick-up device to release the captured object.

11. A structure as defined by claim 10, wherein the suction pick-up includes a suction nozzle having a port, and said movable component of the pick-up device comprising a resilient valve element having a port adapted to register with the port of the suction nozzle when said arm is in said down position and said resilient valve element is relaxed.

12. The structure as defined by claim 11, and said means engaging a movable component comprising a fixed rigid element in the path of movement of the resilient valve element.

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