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FEEDING OF POWDER OR OTHER FLUENT MATERIALS
IN SUBSTANTIALLY EQUAL QUANTITIES
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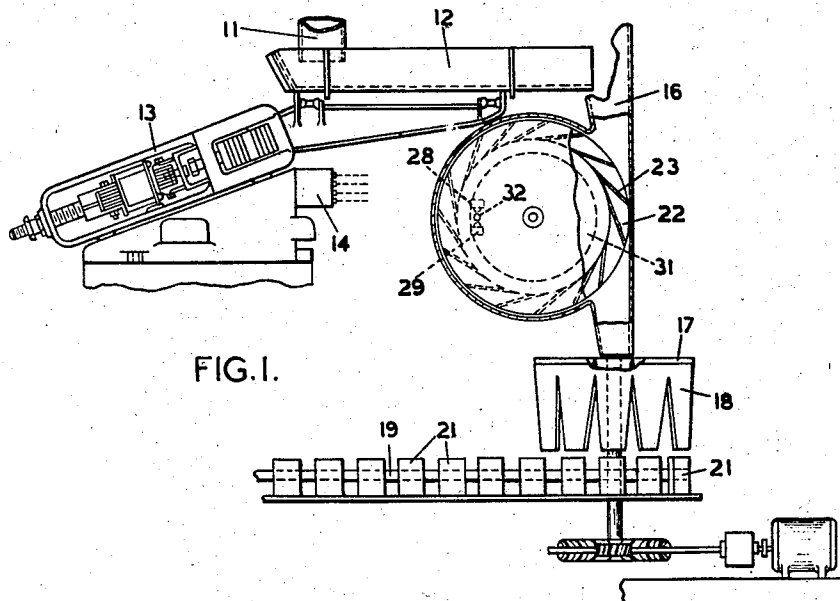


FIG. 1.

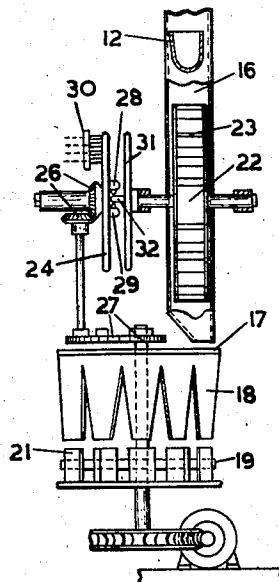


FIG. 2.

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4 Claims. (Cl. 141--132)

This invention relates to the feeding of powder or other fluent material such as, for example, granulated, flaky or other comminuted materials, in substantially equal quantities. Such materials will be referred to herein simply as "powder." The invention is particularly concerned with the feeding of powder in a continuous substantially uniform stream towards a series of delivery funnels which are moved in succession through the stream in such a manner that each receives the stream for substantially the same pre-determined period, the powder then passing from each funnel into a container movable in register with each funnel while it passes through the stream. Provided that the stream of powder flows at a substantially constant rate, therefore, each container receives substantially the same predetermined quantity of powder by volume.

It is sometimes found, however, that whilst the quantities received by the successive containers are substantially equal by volume, the weight of the volume changes from time to time for a variety of reasons depending to some extent on the kind of powder being fed. Thus, powder of a given kind may vary in density by reasons of atmospheric changes or by variation in the size of the individual particles making up the powder; or again by the degree of aeration given to the powder by turbulence during the feeding operation.

An object of the invention is to vary the rate of flow of the stream of powder in accordance with variation in the density of the powder so that the quantities received by the containers will be substantially equal in weight.

According to the present invention, powder is continuously fed in a stream at a predetermined rate towards a delivery station, the stream being arranged to impinge on successive vanes of a freely rotatable vaned wheel so as to cause rotation of the wheel at a substantially uniform rate, and there is arranged co-axially with the vaned wheel a rotatable controlling member driven at a predetermined rate in relation to the movement of the containers through the stream and corresponding to the normal rate of rotation of the vaned wheel and means responsive to relative rotation between the vaned wheel and the controlling members are provided for varying the rate of flow of the stream.

The stream of powder conveniently falls down a chute along a path substantially tangential to the vane wheel, the stream being produced by an electro-magnetic vibrating feed device of known kind, the speed of operation of the device being controlled by an electrical control unit. With such construction, the means for varying the rate of flow may consist of a pair of switches (one forward and one reverse) attached at spaced circumferential points on the rotatable controlling member and each being wired in the circuit of the control unit, there being a projection from the shaft of the vaned wheel arranged to pass between the two switches so that whenever a relative rotation occurs between the vaned wheel and the controlling member one switch or the other is operated to vary the rate of feed of the feed device.

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The discharge outlet of the chute is conveniently arranged above the path of movement of a series of delivery funnels carried by a rotatable drum, the discharge outlets from the delivery funnels, in turn being arranged above the path of movement of a series of cartons carried by a conveyor so arranged that each carton moves into register with a funnel before that funnel passes the chute.

With the normal rate of rotation of the vaned member predetermined by the rate of flow of the stream necessary to pass a given quantity of powder into each carton, therefore, the controlling member may be driven at the same rate from any suitable part of the apparatus, change gears being provided for making predetermined changes in the desired quantity of powder.

By way of example, the invention will now be described in greater detail with reference to the accompanying drawings, as applied to an apparatus for packaging powder in cartons. In the drawings:

Figure 1 represents diagrammatically such an apparatus, and

Figure 2 is an end view of the apparatus.

In general, powder is fed from a main feed pipe 11 into a tray 12 of channel section which is vibrated by an electro-magnetic vibratory feed device 13 of known construction, the rate of operation of the device being variable by an electrical control unit 14. The tray 12 discharges a stream of powder into a chute 16 arranged above a rotatable carrier member 17 on the periphery of which is arranged a series of contiguous discharge funnels 18 the upper edges of which are sufficiently sharp to avoid powder accumulating on the edges. The chute 16 is so arranged that each discharge funnel 18 passes in turn below the outlet of the chute.

Below the carrier member 17 is arranged a chain conveyor 19 carrying a spaced succession of cartons 21, the conveyor 19 guiding the successive cartons 21 into register with successive funnels 18 and maintaining them in such registration over about 180° of the movement of the carrier member 17. In this manner, each carton 21 receives the stream for substantially the same predetermined period, and assuming uniformity of flow, therefore, each carton receives substantially the same predetermined quantity of powder by volume.

Mounted for free rotation on anti-friction bearings is a vaned wheel 22 the vanes 23 of which are arranged to pass into the path of the stream so that the latter impinges on successive vanes 23 and causes the wheel to rotate at a substantially uniform rate. The vanes 23 are arranged substantially tangentially to the body portion of the wheel, and the later is arranged so that the first contact of the powder is with the tips of the vanes. In this manner, as the vanes 23 pass through the stream, they are inclined outwardly and downwardly and thus facilitate the free fall of the powder from the vanes.

Arranged co-axially with the vaned wheel 22 is a rotatable controlling member 24 driven by gearing 26 and 27 at a predetermined rate in relation to the movement of the cartons through the stream and corresponding to the normal rate of rotation of the vaned wheel 22 for a given rate of discharge of powder.

A pair of switches 28 and 29 are carried at spaced circumferential points on the controlling member 24 and each being wired through slip ring connections 29 in the circuit of the control unit 14 of the vibratory device 13, the switch 28 being arranged to cause a decrease and the switch 29 an increase in the rate of vibration.

Connected to the vaned wheel 22 for rotation therewith is a disc 31 carrying a switch-actuating member 32 arranged to project with slight clearance into the space between the switches 28 and 29, so that, upon relative

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rotation between the controlling member 24 and the disc 31, one or the other of the switches will be actuated.

The normal rate of rotation of the vaned wheel 22 is predetermined by the rate of flow of the stream necessary to pass a given quantity of powder into each carton 21, and the controlling member is driven at the same rate from any suitable part of the apparatus, and in order to provide for definite changes in the desired quantity of powder, the gearing 27 may include change gears.

In operation, it will be seen that if any change in density of the powder takes place, the rate of rotation of the vane wheel 22 will tend to increase or decrease according as the powder is heavier or lighter, thus causing the actuating member 32 to operate one or the other of the switches 28 and 29 to decrease or increase the rate of feed of the powder by the vibratory device 13. In this manner, therefore, variations in the weight of powder fed to the successive cartons 21 can be maintained between tolerable limits.

I claim:

1. Apparatus for feeding powder in a continuous stream at a controlled rate towards a series of containers, comprising means for moving the containers through the stream, a freely rotatable vaned wheel so arranged that the stream impinges on successive vanes of the wheel so as to cause rotation thereof at a rate substantially proportional to the flow of powder, a rotatable controlling member driven at a predetermined rate in relation to the movement of the means for moving the containers and corresponding to the normal rate of rotation of the vaned wheel and means responsive to relative rotation between the vaned wheel and the controlling member for

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varying the rate of flow of the stream, such responsive means acting in the sense tending to equalise the rotation of the vaned wheel and the rotatable controlling member.

2. Apparatus as in claim 1, comprising an electromagnetic vibratory feed device for feeding the powder, and control means for varying the rate of operation of the feed device, said control means being connected to the rotatable controlling member.

3. Apparatus as in claim 2, wherein the control means comprises a pair of switches attached at spaced circumferential points on the rotatable controlling member and each being wired in the circuit of the feed device, and a switch-actuating member rotatable with the vaned wheel and arranged to project with slight clearance into the space between the switches.

4. Apparatus as in claim 1, comprising a series of delivery funnels carried by a rotatable drum, a conveyor arranged to move the series of containers successively into register with successive funnels, and a chute arranged above the path of movement of the funnels and adapted to receive the stream and guide it into the path of movement of the funnels at a position beyond that at which the containers move into register with the funnels.

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