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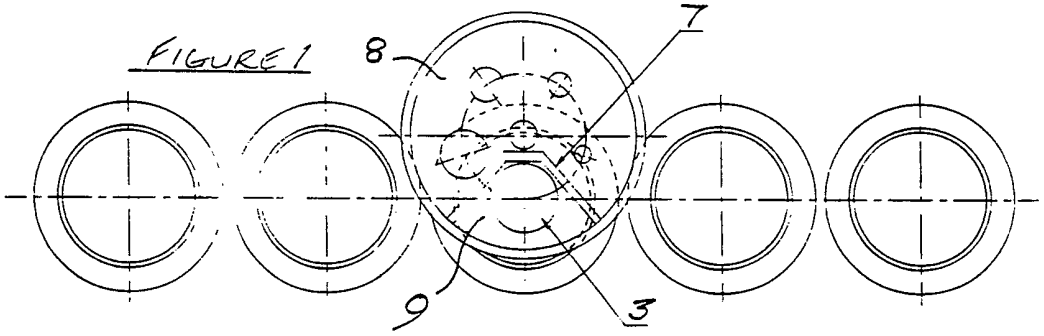
(54) Binary dosage system

(57) A method of, or apparatus for, adding contents to a container in which predetermined dosages are added in response to a binary signal. The binary signal is generated a measuring station and represents any deficiency in the actual quantity of the containers contents compared with a predetermined minimum value. The size of each dosage corresponds to a value represented by a digit of the binary signal. Doses of material in multiples of weight W, e.g. W, 2W, 4W, 8W and 16W are supplied from a case provided with a Power discharge shutter. In the case a rotary disc is provided with different sized through bores 3 of varying diameters corresponding to the weight multiples. A levelling blade 7 bearing against the top surface of the disc separates the case into a filling cavity 8 and a discharge cavity 9. In response to the digits of the binary signal the disc is rotated to position the required filled bores 3 one at a time in the discharge cavity and the shutter is opened to enable a container to be filled. The dosing stations may be linearly spaced.

FIGURE 1



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

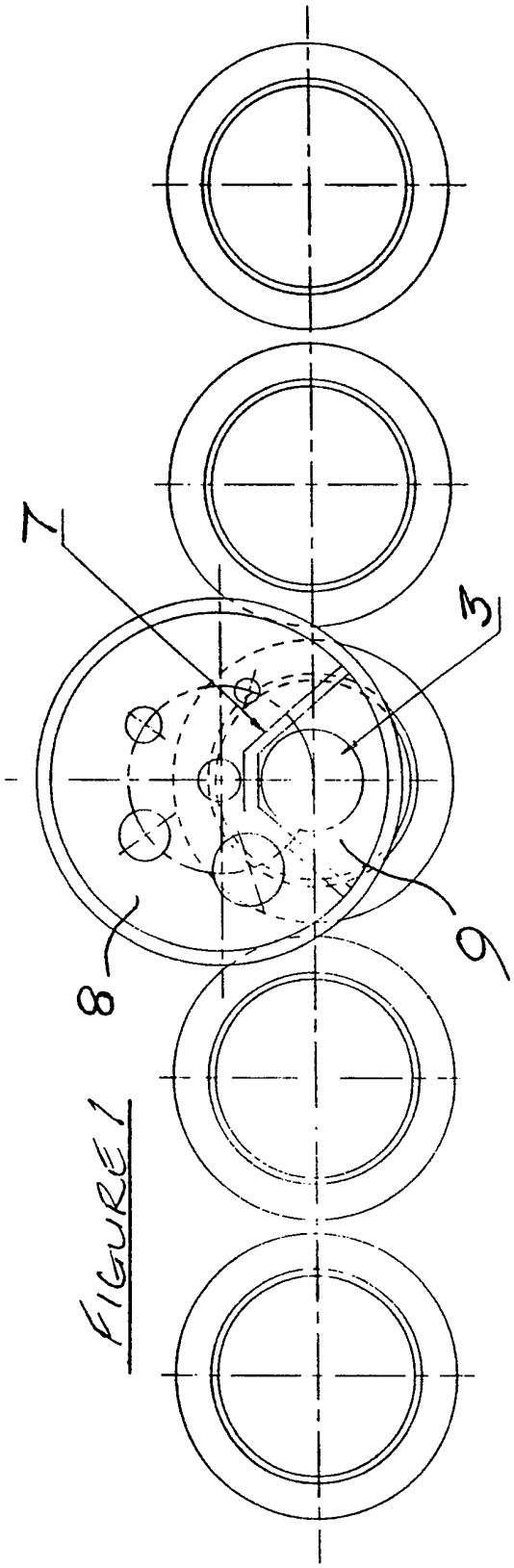

FIGURE 1

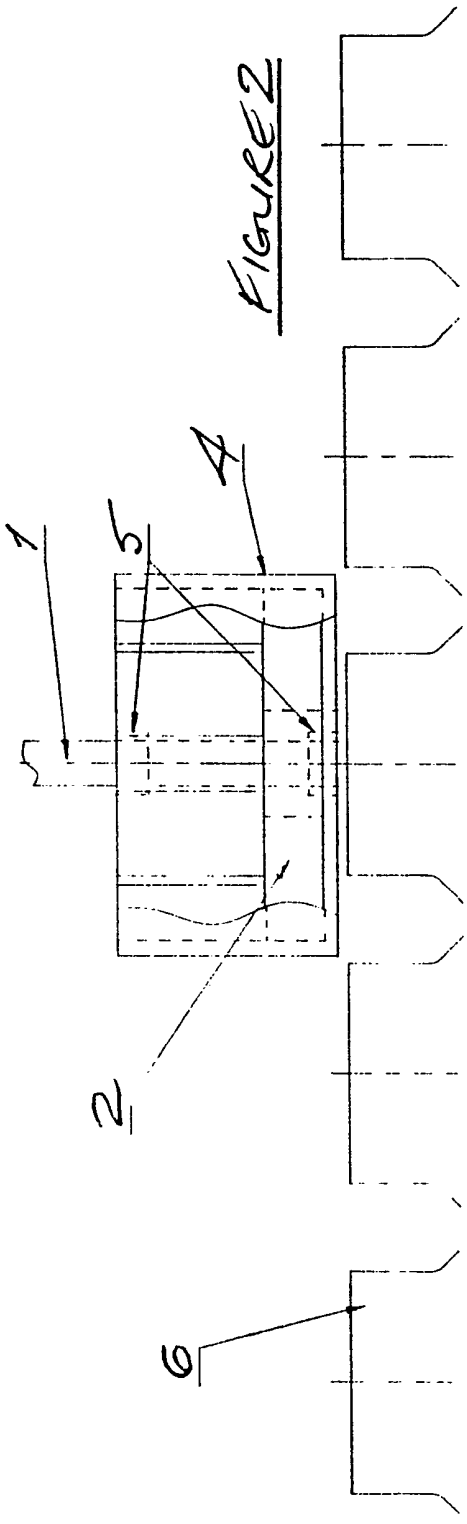

FIGURE 2

BINARY DOSAGE SYSTEM

Field of the Invention

The invention relates to a method and apparatus for adding contents to a container in response to a binary signal, and is more specifically concerned with ensuring that the quantity of the contents of a container is not less than a pre determined minimum value.

Background to the Invention

Conventional systems fill large numbers of containers using a process known as volumetric filling. This involves the addition to each container of a single charge of contents of a given volume.

The disadvantage of volumetric filling is that any variation in the amount of material in each charge results in a variation of the quantity of contents from container to container.

If, for example, the containers were being volumetrically filled with dry food materials, then variations in bulk density between charges would lead to uncertainty as to the weight of the food material contained in each container.

As a result, although volumetric filling can be used to so fill a batch of containers that the average weight of contents per container is above a pre determined level, the process

is not particularly suitable where the weight of the contents of each container must not fall beneath a predetermined value.

Summary of the Invention

In one broad aspect, the invention provides a method of ensuring that the quantity of the contents of a container is not less than a predetermined minimum value, which method includes using a measuring station with means generating a binary signal; and one or more top-up stations at which one or more predetermined dosages of material are provided, each dosage being of a quantity which corresponds to the value represented by a digit of the binary section; the method comprising the steps of:-

(a) measuring at the measuring station the quantity of the contents of the container,

(b) either:

(I) providing a "zero" binary signal if the measured value is greater than or equal to the predetermined minimum, or

(II) if the measured value is less than the predetermined minimum, generating a "non zero" binary signal representing the difference between the two values.

(c) in the event of a "non zero" signal being generated by the measuring station, adding to the container at the, or at least one of the, adding stations at least one charge of content, the or each charge consisting of one or more dosages released in response to a "non zero" signal from the corresponding binary digit.

In another broad aspect, the invention provides apparatus for ensuring that the quantity of the contents of a container is not less than a predetermined minimum value comprising a measuring station, at which the quantity of the contents of the container is measured; means comparing the measured quantity with the minimum value; means generating a binary signal if the measured quantity is less than the minimum value; one or more top-up stations at which one or more predetermined dosages of material can be provided, each dosage being of a quantity which corresponds to the value represented by a digit of the binary signal; the arrangement being such that each provided dosage will be added to the container in response to a "non zero" signal from its respective binary digit.

Since relatively little processing of the measuring station's binary signal is needed, the apparatus can execute the method at a rate which meets current requirements for high speed filling of containers.

Brief Description of the Drawings

The invention will now be described, by way of example only, with reference to the following drawings in which:-

Figure 1 is a plan view of a top-up station which embodies part of the invention in relation to a number of containers,

Figure 2 is a side view of the top-up station and containers shown in Figure 1.

Description of an Embodiment

The embodiment to be described measures the quantity of the contents of the containers using a known kind of weigh cell,

and has a single, multi-dosage top-up station. However, it will be clear that a plurality of single-dosage top-up stations could be used.

The top-station shown in Figures 1 and 2 comprises a motor driven vertical drive shaft 1, at the bottom of which a rotatable disc 2 is mounted. The disc 2 has five through bores 3 of varying diameters.

Each through bore 3 is used to hold a single dosage of material, and is so sized that the quantity of material in the dosage corresponds to the value represented by a digit of the binary output of the weigh cell. If, for example, the output of the weigh cell was a five digit binary signal representing units of W, then the sizes of the dosages would be the following multiples of W:- W, 2W, 4W, 8W, and 16W.

The disc 2 is housed within a cup-shaped case 4, which is rotatably mounted on the drive shaft 1 via bearings 5. The case 4 is, in use, situated over a number of containers 6 which pass beneath the case 4 on a conveyor system (not shown). The case 4 is also attached to a fixed member (not shown) so that rotation of the drive shaft 1 has no effect on the orientation of the case 4 with respect to the containers 6.

The bottom of case 4 has an aperture which may be opened or closed by a shutter mechanism (not shown). The aperture is so positioned that it overlays each container 6 as it passes beneath the case 4, and that each of the bores 3 can be selectively positioned over the aperture by rotation of the drive shaft 1.

A levelling blade 7 bears against the top surface of the disc 2, and is so mounted on the case 4 as to define a filling cavity 8 and a discharge cavity 9. The filling cavity is,

in use, filled with the material which is to form the contents of the containers. As a result, any of the bores 3 situated within the filling cavity 8 will be filled, whilst the blade 7 prevents the material passing directly into the discharge cavity 9 unless it forms part of the dosage contained in a bore 3.

The weigh cell (not shown) is of a known kind, which produces a binary signal representing the difference between the measured weight of a container and a predetermined minimum weight, and can be positioned either directly beneath or upstream of the case 4.

Once a container 6 has been weighed, the binary output of the weigh cell is stored in an electronic memory. If the weigh cell is positioned upstream of the case 4, a timer circuit will operate to trigger a processor unit after a predetermined delay corresponding to the time taken for the container 6 to travel from the weigh cell to the case 4.

A sensor (not shown) on the shaft 1 provides the processor with information as to which of the bores 3 is situated within the cavity 9. The processor will then sample the relevant digit of the binary signal in the memory. If a "non zero" signal is detected, then the processor will open the shutter to allow the dosage of material to drop from the bore 3 into the container 6. If a "zero" signal is detected, the shutter will remain closed. The drive shaft 1 is then rotated until the next bore overlays the container 6, and the processor samples the next digit of the binary signal. This process is repeated until the disc 2 has completed a single revolution.

In this way the container 6 can be filled to the accuracy of the smallest dosage.

An example of an output of the weigh cell is 10101, representing

a deficiency in the weight of the container's contents of 21W (say). In response to this signal, the processor will release three of the dosages corresponding to the three "non zero" binary digits: 16W, 4W and W.

Although in this example a "non zero" signal is given by a binary 1 (or on), it is possible for a binary 0 (or off) to correspond to a "non zero" signal.

In the case of embodiments having a plurality of single dosage top-up stations, each top-up station could comprise a known kind of volumetric filling apparatus, which is arranged to provide one size of dosage (for example, 4W).

These top-up stations could be situated in a linear array above the conveyor. Each top-up station is actuated by a processor, which operates in a similar way to the one used in relation to the multi-dosage top-up station.

Further weigh cells and sets of top-up stations may be arranged downstream of those just described, so that the process of weighing and, where necessary, adding contents to a container is repeated. In this case, the container can be more accurately weighed by the further weigh cells, and the associated top-up stations can deliver correspondingly smaller dosages.

CLAIMS:

1. A method of ensuring that the quantity of the contents of a container is not less than a predetermined minimum value, which method includes using a measuring station with means generating a binary signal; and one or more top-up stations at which one or more predetermined dosages of material are provided, each dosage being of a quantity which corresponds to the value represented by a digit of the binary signal; the method comprising the steps of:-

(a) measuring at the measuring station the quantity of the contents of the container,

(b) either:

(I) providing a "zero" binary signal if the measured value is greater than or equal to the predetermined minimum, or

(II) if the measured value is less than the predetermined minimum, generating a "non zero" binary signal representing the difference between the two values.

(c) in the event of a "non zero" signal being generated by the measuring station, adding to the container at the, or at least one of the, adding stations at least one charge of contents, the or each charge consisting of one or more dosages released in response to a "non zero" signal from the corresponding binary digit.

2. Apparatus for ensuring that the quantity of the contents of a container is not less than a predetermined minimum value comprising a measuring station, at which the quantity of the

contents of the container is measured; means comparing the measured quantity with the minimum value; means generating a binary signal if the measured quantity is less than the minimum value; one or more top-up stations at which one or more predetermined dosages of material can be provided, each dose being of a quantity which corresponds to the value represented by a digit of the binary signal; the arrangement being such that each provided dosage will be added to the container in response to a "non zero" signal from its corresponding binary digit.

3. A method according to claim 1, in which the quantity of the contents of the container is measured by weighing the container.

4. Apparatus according to claim 2, in which there is provided a top-up station comprising a rotatable member, mounted, in use, above the container and having a series of through bores for holding a series of dosages of varying sizes; means rotating the member; and means selectively releasing the dosages; the arrangement being such that the given dosage is selected by rotating the member until the bore containing that dosage overlays the container.

5. A method according to claim 2 or claim 3, in which the dosages are so sized as to enable the method to form the sole means of filling the container.

6. A method or apparatus according to any of the preceding claims, in which a plurality of top-up stations is provided, each of which, in use, provides one dosage of material in response to a "non zero" signal from its corresponding binary digit.

7. A method substantially as described herein with reference to the accompanying drawings.

8. Apparatus substantially as described herein with reference to, and as illustrated in, the accompany drawings.

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