

Translation :

Technological field

The invention relates to a dosaging balance for the continuous discharge of bulk materials, having a weighing container with discharge aids and a dosaging screw or worm.

Some bulk materials can be divided into three groups : materials with difficult, medium or easy flowing properties. Those with easy flowing properties are usually all granulate-type materials, more particularly whole cereal grains and semolina. People often also talk of materials capable of trickling movement in the case of grains. It is well known what problems can be involved with the flow behaviour of caster salt and caster sugar. Mostly depending on the moisture content at the time concerned, these two materials can trickle easily like dry sand or in extreme cases can actually no longer be poured from the caster. Flours, bread flours etc. are generally classed among the difficultly flowing product categories, especially if flour is to be moved from small containers or through small apertures.

State of the art

When preparing foods and feedstuffs it is often necessary to mix mixture fractions together in relatively small quantities, or to mix small percentages of additives into relatively large batches. For example this is the case with soups and seasoning mixtures, or when manufacturing animal feed mixtures, also e.g. when dosaging flour into semolina in the production of pasta.

In every case, when automatic operation is concerned, it is required that the constituents be brought together in precisely establishable fractions by weight. Industrial practice has to have as trouble-free operation as possible. The known troubles with sugar and salt casters should not occur in automatic operations. Remedies can be provided in

two ways. The product to be dosaged is brought to have such a character that the material always remains in an almost tricklable state, in other words always remains capable of flowing easily. This often requires extra treatments such as drying, or the production of a special granulation, or a pulverulent form, which as a rule means adding to the cost of the raw material.

The second way is to complicate all the dosaging apparatus, so that neither blockages nor bridge formation are possible.

US-PS No. 3 151 782 shows a solution such as is used in various fields, especially for chemical substances. A common drive ensures both product supply from a preliminary container and also precise dosaging or the moving of a dosaging worm. Supplying from the preliminary container is effected through a shaking movement, a cover plate over the bottom aperture preventing material shooting through the aperture. However, many materials, especially foods and feedstuffs, tend to cake together when vibrations occur, so that there is no real dosaging help here with the vibrations. On the contrary, the shaking in fact endangers operational reliability.

A further dosaging apparatus according to the pre-characterising part of claim 1 is known from GB-A-931117.

#### Representation of the invention

The invention has as its object to provide a dosaging apparatus which is simple in construction, operationally reliable, and operates with precision, and is suitable especially for automatic installations for easy-flowing, medium-flowing and difficultly flowing bulk materials.

This object is achieved by the features of claim 1.

Practical tests have shown that it has been possible to achieve the object surprisingly well in every respect. It has been found that the novel dosaging apparatus has much

greater product independence than the known solutions, and that even in the case of difficultly flowing bulk materials a uniform dosaging, with great precision, is achieved in this way.

In dosaging balances, to promote product flow and to loosen-up the material, frequently a reel-like rotary element is arranged in the lower region of the weighing container. In many cases it is unavoidable that pulse-type movements are brought about on the product. The vertically acting component of the mechanical pulsations falsifies the accuracy of the ascertaining of the weight. In some cases pressures occur nevertheless in the bulk material, so that the discharge even by means of a micro-dosaging worm does not attain the desired uniformity for the discharging of the bulk material. In contrast, the horizontally moved clearing element has no detrimental effect on the weighing result. The flat bottom type of construction allows an optimal construction form for the weighing container, which can be constructed preferably as a simple vertical cylinder. The cylindrical form is ideal for most bulk materials, especially in the food industry field. The preferably lateral product transfer aperture allows product transfer outside of the varying product column in the weighing container. The dosaging worm takes over the material with constant conditions. Thus no product pressure effects or product compressions occur, which is more particularly important e.g. in the case of fat-containing products, since, in the case of any volumetric dosaging apparatus, fluctuations occur in dosaging accuracy in dependence on varying product density.

The invention further relates to a whole number of further particularly advantageous features.

Advantageously, clearing elements and dosaging worm have a common drive with two parallel drive shafts, the dosaging

worm being driven by means of a belt-type variable speed gear.

It is also possible to arrange clearing element and dosaging worm together with the drive as a block or unit assembly, and to construct the preliminary container as a readily separatable part of selectable size. But in this way the new invention makes it possible to achieve the positive effects of uniform and precise dosaging with very simple constructional means.

Conveniently the upper clearing element is of two-bladed construction, and the lower of four-bladed construction. Uniform product replenishment from the container, and dosaged supply to the dosaging worm, are ensured with a very small number of elements.

A further advantageous idea is to construct the air lock to be controllable for selective ventilating and venting of the weighing container. In the cycle of filling and emptying the weighing container the air pressure conditions are regulated, on the one hand when filling, with a view to keeping the installation clean, on the other hand when emptying, with a view to keeping the said pressure in the container constant, to prevent corresponding disturbing of the weighing result.

In many uses, several dosaging balances can feed a collecting balance and together form a dosaging group. Both the collecting balance and the dosaging balances can be constructed as differential balances.

#### Description of the invention

The invention will now be described in more detail hereinafter with reference to various constructional examples. In the drawings :

Fig. 1 is a perspective view of the central elements of the micro-dosaging apparatus,

Fig. 2 is a view of Fig. 1 with a section through the weighing container,

Fig. 3 shows a section on 4 - 4 of Fig. 2,

Fig. 4 shows a section on 3 - 3 of Fig. 2,

Fig. 5 is a schematic view of the drive of the micro-dosaging apparatus,

Fig. 6 shows an entire micro-dosaging group.

#### Ways of carrying out the invention

The following refers to Fig. 2. Here, the entire unit is constructed as a dosaging balance 1 which comprises a weighing container 2 with discharge aids 3 and a dosaging worm 4. The material<sup>5</sup> is fed in through an inlet<sup>6</sup> union 6 which can be closed by a valve 7. By means of an air lock 8 either room air can be admitted through an aperture closable with valves 9 or, with the valve 9 closed, dust-containing air can be aspirated during the filling of the weighing container 2.

The lower portion of the entire apparatus is shown partly broken away in Fig. 1, the said lower portion being constructed as a unit assembly 10. The upper boundary of the unit assembly is constituted by a fastening flange 11 which is bolted to an associated flange 12 of the weighing container 2 or in the case of frequently changing products is connected by means of rapid-action fastenings. The discharge aid 3 comprises<sup>a</sup> two-blade-type clearing element 13 which is driven by means of a vertical shaft 14. The clearing element 13 moves at a short distance immediately above a load relief floor 15 which is situated substantially horizontally. The load relief floor 15 is shown with horizontal and vertical hatching in Fig. 4 in a plan view, and it has a sector-form product throughfall aperture 16. The clearing element 13 conveys the material into a pre-dosaging chamber 17 between a true floor 18 and the load relief floor 15, and above the floor 18 a second clearing element 19 performs the task of effecting

the actual discharge from the pre-dosaging chamber 17 into the introduction region 20 of the dosaging worm 4. Owing to the lateral situation of the product throughfall aperture 16, and the presence of the load relief floor 15 above the introduction region or its lateral product transfer aperture 20, the latter is relieved of the burden of the product 5 in the weighing container 2. In this way the product is discharged in preferably 3 steps from the weighing container 2 through the dosaging worm. The clearing element 13 has both mixing and discharge-aid functions, and passes the material into the pre-dosaging chamber 17. From the pre-dosaging chamber 17 it is discharged by the second clearing element 19 into the introduction region 20. Only from the introduction region 20 is the material fed by the dosaging worm 4 in the particular quantity selected to the discharge station, which is effected preferably in free fall, in other words without <sup>impediment to</sup> the discharge from the dosaging worm 4. The clearing elements 13 and 19, also the dosaging worm 4, are driven by two parallel-situated drive shafts 21, 22, a drive belt 23 and a common drive 24. The drive 24 can be constructed as a remote-controllable variable <sup>ratio</sup> speed/gear. In by far the most cases it is sufficient if the drive shafts 21, 22 respectively are given a predetermined rotational speed ratio. When the dosage is increased or reduced the two rotational speeds are correspondingly modified.

The entire dosaging unit is suspended or supported on weighing elements 25. The weighing elements indicate a total weight which includes all the mechanical elements as well as all the product supported in the weighing container, including the product on the way to the dosaging worm 4 and situated in the dosaging worm 4. The dosaging balance 1 operates as a differential balance. The weighing container 2 is filled periodically. After the filling the precise dosage rate can be taken by taking the difference of the

weight values, on the basis of the reduction in weight, or the precise dosage can be established and controlled by weight reduction calculated in advance. So that no air pressure fluctuations disturb the weight indications, the weighing container 2 is aspirated only during the filling, but during emptying it is connected to the ambient air pressure. The precise rotational speed <sup>of the dosaging worm</sup> for a specific dose output can be maintained in disturbance-free operation. This rotational speed can then be kept constant during the filling of the weighing container, or in the event of an identical dosaging task preselected again and thereafter compared with the differential weighing value.

In many dosaging tasks a plurality of different products have to be supplied to a common mixing balance 30, as is shown as an example of embodiment in Fig. 6. Here three dosaging balances 1 are shown, which are controlled by a common computer 31. The individual dose is transferred in each case to the common mixing balance 30.



C l a i m s

1. Dosaging balance (1) for the continuous discharge of bulk materials, which has a container (2) with discharge aids (3) and also a dosaging screw or worm (4), wherein

a) the container (2) has at least in part a flat floor (15, 18) above which a horizontally moved clearing element (13, 19) is arranged, with a product transfer aperture (20) to the dosaging worm (4);

b) the clearing element (13, 19) is constructed as a clearing element effective in two planes, and a load relief floor (15) is arranged between the two clearing element arms (13, 19), so that the product transfer aperture from the container (2) to the dosaging worm is relieved of pressure, also wherein

c) the container (2) is constructed as a closed container with a product infeed aperture or inlet union (6), characterised in that the container (2) is a weighing container with an air lock (8), and the dosaging apparatus is suspended or supported as a dosaging unit on weighing elements, and the dosaging balance thus formed is constructed as a differential balance.

2. Dosaging balance according to claim 1, characterised in that the air lock (8) is controllable for selective ventilating and venting of the weighing container (2).

3. Dosaging balance according to one of claims 1 or 2, characterised in that the clearing elements (13, 19) and the dosaging worm (4) form together with the drive (24) a unit assembly, and the weighing container (2) is constructed as a selectable-size, easily separatable component.

4. Dosaging balance according to one of claims 1 to 3, characterised in that the clearing elements (13, 19) and



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the dosaging worm (4) have a common drive (24) with two parallel drive shafts (21, 22), the dosaging worm (4) being driven preferably by means of a belt-type change speed gear.

5. Dosaging balance according to claim 4, characterised in that the upper clearing element (13) is of two-blade construction, and the lower clearing element (19) four-blade.

6. Dosaging balance according to one of claims 1 to 5, characterised in that a plurality of dosaging balances (1) supply a mixing balance (30) and together form a dosaging group.