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(71) Applicant: **Sanmak Industria de Maquinas S.A.**
89057-050 Blumenau SC (BR)

(72) Inventor: **Dos Santos, Jose Evandro**
Blumenau (Santa Catarina) (BR)

(74) Representative: **Baldi, Claudio et al**
Ing. Claudio Baldi s.r.l.
Viale Cavallotti 13
P.O. Box 187
60035 Jesi (Ancona) (IT)

(54) Feeding conveyor belt doser with adjustable production flow

(57) This patent application refers to a new doser to be used in color-based, grain sorting electronic machines for several kinds of granular products. The doser comprises a dosing machine (1) made of a hopper (2) to store the grains to be selected, a motor (3) to drive the feeding belt (4), which directs and leads the grains toward the feeder and conveyor chute (5), which in turn leads the grains to the exit (6) provided with a set of electronic reading optical sensors (8), a reading sensor (10), that selects the grains by their color, activating the ejecting air valve (7) with discharge nozzle (9), to select and separate the grains.

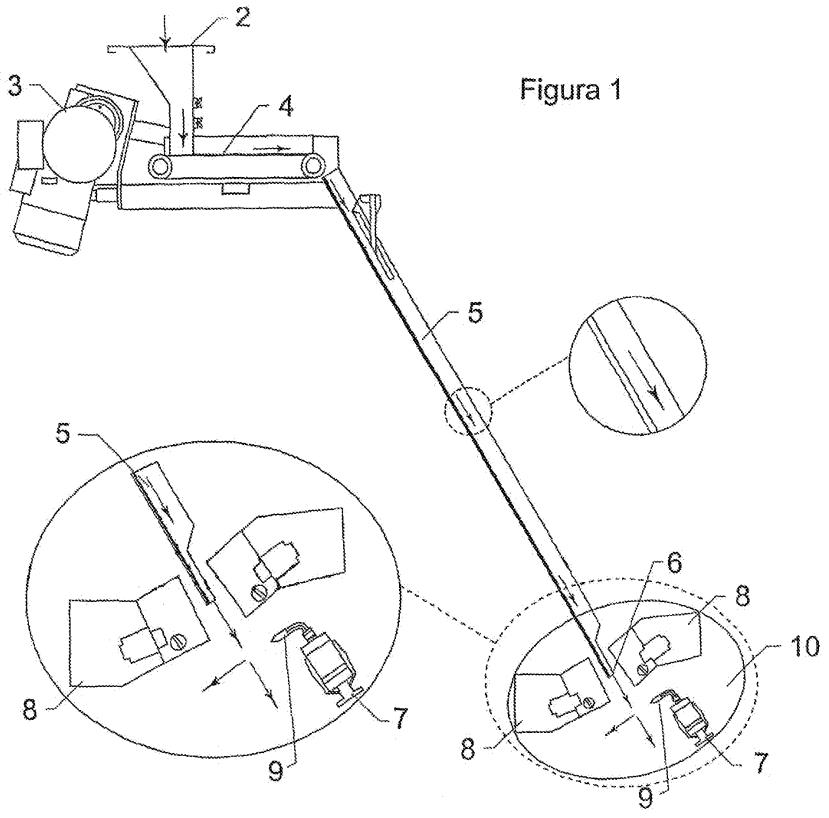

Figura 1

EP 2 039 438 A1

Description

[0001] The present patent application relates to a new doser to be used in color-based, grain sorting electronic machines, for the most varied granular products. The doser will be manufactured by electromechanical industries and used by the agro industrial sector and other grain sectors.

[0002] Currently, color-based, grain sorting electronic machines, particle-shaped objects, mainly granular products such as rice, coffee, lentils, maize, wheat, oat, soybean and a variable range of several particle and granular products, are traditionally known for consisting of a base, five operational phases, that is, feeding hopper, electromagnetic vibrator with vibratory chute (doser), conveyor chute, electronic optical reading sensors and ejecting valve.

[0003] The hopper is used to store the grains that will be used in the machine for the beginning of the electronic selection process of grains, which are conveyed by electromagnetic vibrators with vibratory chutes, subsequently conveyed by an inclined chute, thus causing a free fall of the grains that will be inspected when they pass through a specific internal point; such point is equidistant between two electronic optical systems, a reading sensor and a complex electronic system where the colors of the grains will be analyzed.

[0004] After the grains are analyzed, the machine will automatically decide which kind of grains it will reject. This adjustment is made by the machine operator who uses electro-pneumatic ejecting valves so that the machine can eject from the grain flow track those grains considered defective due to their color, a factor determined by the previous machine adjustment.

[0005] In the past, these machines consisted of a feeding hopper, electromagnetic vibrators with vibratory chutes, feeding belts, electronic optical reading sensors and ejecting valves.

[0006] Regarding the state-of-the-art technology, the machines manufactured in the past and those of today differ from each other as to the way the grains are conveyed in the machine and as to their more modern electronic systems.

[0007] In the past and until nowadays, machines were/are manufactured with electromagnetic vibrators, with vibratory chutes for feeding and dosing it; however, the transportation of the grains was carried out by means of conveyor belts that have given place to conveyor chutes. The color-based, grain sorting electronic machines used to have belts to convey the grains to be selected and, if compared to the ones currently manufactured that feature conveyor chutes for the same purpose, besides the cutting edge technology used, can also be differentiated by the speed of the grains that pass through the center of the electronic optical reading sensor.

[0008] The color-based, grain sorting electronic machines that use conveyor belts have more limited features, because when the grains pass through the electronic optical reading sensor for inspection it is not possible to raise their speed for production increase, because if the belt speed is changed, the grains to be inspected move out of the track of the sensor reading center, thus jeopardizing the entire analysis system of the machine. This kind of machines is also limited for other applications, because they can only increase their production by means of electromagnetic vibrators with vibratory chutes, whereas the speed of the conveyor belts must be steady and can not have variations.

[0009] In the color-based, grain sorting electronic machines, when conveyor chutes are used, the speed of the grains passing through the electronic optical reading sensor for inspection has become faster. By replacing conveyor belts for conveyor chutes there has been an increase in the speed of the grains and the machine has become more productive.

[0010] The conveyor chutes are fastened in such an angle that they take advantage of the gravity force to accelerate and increase the speed of the grains passing through the reading sensor of the machine. Nevertheless, until today, the machine production doses are stili being made by means of electromagnetic vibrators with vibratory chutes.

[0011] The electromagnetic vibrator with vibratory chutes has a limitation as to the operation and production dosing of the machine. Through a pulsed electronic circuit that feeds the vibrator coil, a pulsed magnetic field that moves the vibratory chute, horizontally, forward and backward is also created. The machine production dosing is made through the movement of the vibratory chutes. According to the pulse frequency of the vibratory chute, the machine dose increases or decreases, that is, determined by the operator, the production increases or decreases according to the defect percentage, the colors contained in the product or by the machine limitation.

[0012] Currently, even with several innovations in this kind of vibratory chute pulsed dosing, are used to feed the grain sorting electronic machines, through pulsing doses, works with horizontal, forward and backward movements. Creating product aggregations (small batches) in the beginning of the conveyor chutes to their release for the optical systems reading. These aggregations, in certain production levels, make the optical system reading difficult, thus limiting production and the machine sorting quality, increasing its residue volume as well, that is, the percentage of grains rejected by the machine.

[0013] Aiming to find solutions for the previously mentioned problems and to produce a more practical and efficient doser, the author, after many tests and researches, has idealized and built this utility model whose purpose is to avoid aggregations of the products pulsed by the vibrators when feeding the grain selection electronic machines, having developed a new doser for the machines.

[0014] Another inventive point is the motorized feeding belt used as a doser and feeder of the machine produc-

tion flow, instead of the current pulsing electro-magnetic vibrators.

[0015] The device, purpose of the model hereof, can be better understood through the detailed description of the enclosed figures that, together with the following detailed numbered references, make the understanding easier.

[0016] Figure 1 - general side view of the doser, with enlarged details for a better visualization, and arrows indicating the track of the grains from the entrance through the optical sensor selection at the machine's exit.

[0017] Figure 2- general front view of the doser, with enlarged details for a better visualization of the alignment and the track of the grains on the chute, represented by solid lines and indicative arrows.

[0018] The model hereof is characterized by a dosing machine (1), made of a hopper (2) to store the grains to be selected, a motor (3) that drives the feeding belt (4), which in turn directs and leads the grains toward the feeder & conveyor chute (5), which leads the grains to the exit (6); such machine is provided with a set of electronic reading optical sensors (8), a reading camera (10) that selects the grains by their color, activating the ejecting air valve (7) with discharge nozzle (9), to select and separate the grains, as previous configuration.

[0019] The conveyor chute (5) receives and conveys the grains in an aligned way up to their release at the exit (6) so that the sets of electronic reading optical sensors (8) can accomplish the reading procedures.

[0020] The motorized feeding belt (4) is used to dose and feed the machine production flow (1) and it transfers the grains from the hopper (2) to a conveyor chute (5) that receives the granular products, that is, the grains (detail of figure 2), aligning and conveying them, up to their release at the exit (6) so that the sets of electronic reading optical sensors (8) of the selecting machine (1) can accomplish the reading procedures.

[0021] Through an electronic feeding belt system (4), the machine (1) production is controlled by increasing or decreasing the motorized feeding belt (4) speed, and not by increasing the pulses of the electro-magnetic vibrators (not illustrated).

[0022] Dosing and feeding the machine (1) by a feeding belt (4) is carried out linearly and does not cause aggregations of grains on the conveyor chutes (5); such aggregations can interfere and directly damage the electronic optical sensors (8) reading of the reading sensor (10) of the machine (1).

Claims

1. Feeding conveyor belt doser with adjustable production flow is **characterized by** a dosing machine (1), made of a hopper (2) to store the grains to be selected, with a motor (3) that drives the feeding belt (4), which in turn directs and leads the grains toward the feeding and conveyor chute (5), which leads the grains to the exit (6) provided with a set of electronic reading optical sensors (8), a reading sensor (10) that select the grains by their color, activating the ejecting air valve (7) with discharge nozzle (9), to select and separate the grains.

2. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the feeding belt (4) directs and leads the grains toward the feeding and conveyor chute (5), which leads the grains to the exit (6) to be selected by their color by the set of optical sensors (8).

3. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the motorized feeding belt (4) can be used as doser and feeder of the machine (1) production flow.

4. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the motorized feeding belt (4) can transfer the grains to be selected from the hopper (2) to a conveyor chute (5), aligning and conveying the grains up to their release at the exit (6) so that the sets of electronic reading optical sensors (8) can accomplish the reading procedures.

5. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the feeding belt (4) can be controlled by increasing or decreasing the speed.

6. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the conveyor chute (5) receives and conveys the grains in an aligned way up to their release at the exit (6) so that the sets of electronic reading optical sensors (8) can accomplish the reading procedures.

7. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the set of electronic reading optical sensors (8) of the reading sensor (10) can select the grains by their color by activating the ejecting air valve (7) with discharge nozzle (9), to select and separate the grains.

8. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the feeding belt (4) allows the chute (5) to be dosed and fed linearly.

9. Feeding conveyor belt doser with adjustable production flow is **characterized by** the fact that the feeding belt (4) enables dosing and feeding without blocking the grains on the feeding and conveyor chute (5).

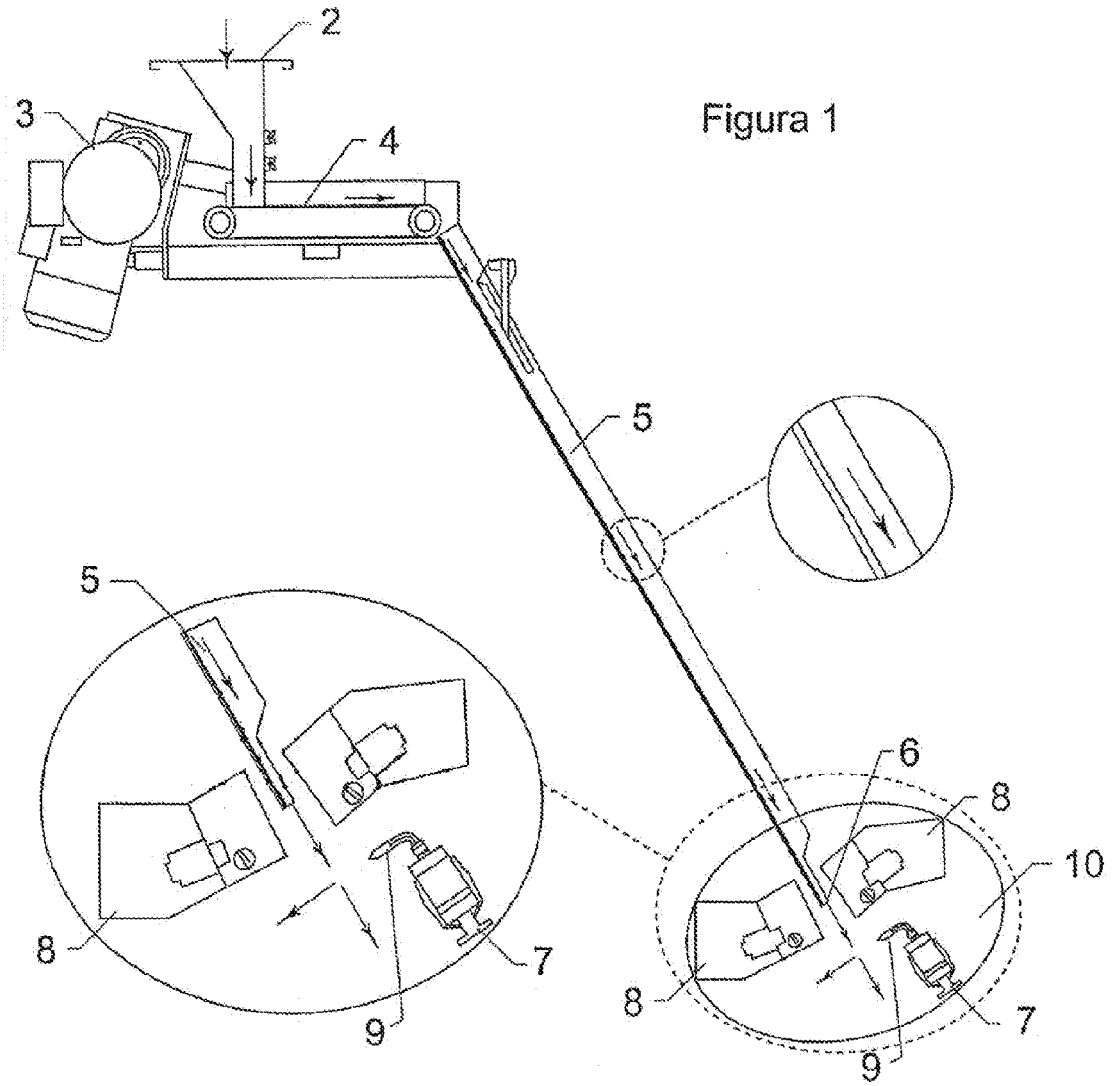

Figura 1

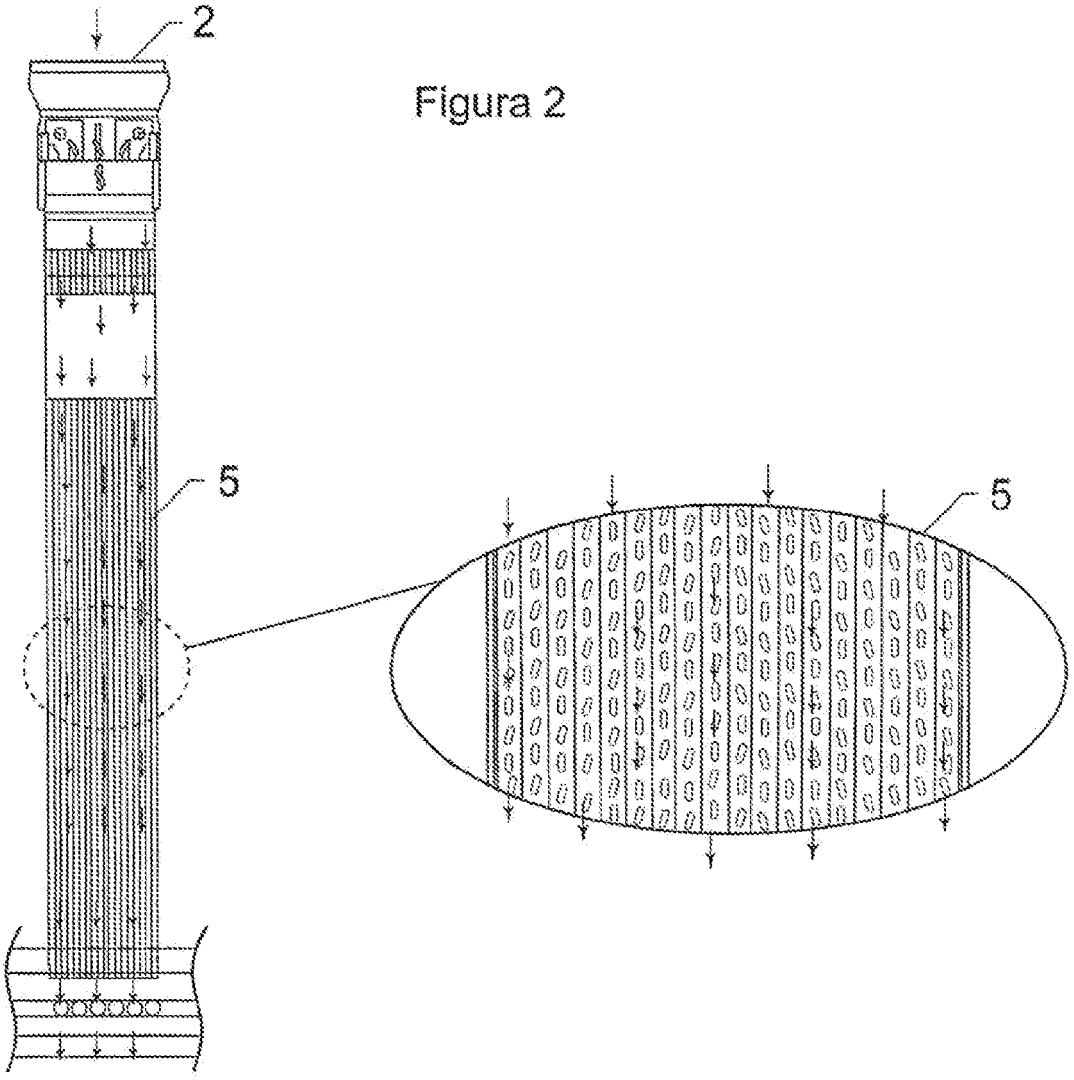

Figura 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 10 1787

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 0 413 522 A (TOYO GLASS CO LTD [JP]) 20 February 1991 (1991-02-20) * figure 1 *	1	INV. B07C5/02 B07C5/36
Y	US 3 977 526 A (GORDON RODERICK J ET AL) 31 August 1976 (1976-08-31) * figure 1 *	1	
Y	US 4 624 367 A (SHAFER JOHN L [US] ET AL) 25 November 1986 (1986-11-25) * figure 1 *	1	
Y	US 3 197 647 A (HERBERT FRAENKEL) 27 July 1965 (1965-07-27) * figure 1 *	1	
Y	US 2003/127366 A1 (IKEDA NORIMASA [JP] ET AL) 10 July 2003 (2003-07-10) * figure 1 *	1	
Y	US 2004/206409 A1 (YANO TAKESHI [JP] ET AL) 21 October 2004 (2004-10-21) * figure 2 *	1	TECHNICAL FIELDS SEARCHED (IPC) B07C

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	19 June 2008	Wich, Roland

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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European Patent Office

Application Number
EP 08 10 1787

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 08 10 1787

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claim: 1

   Specific combination of a hopper, a feeding belt, a chute, sensors and air valves

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2. claim: 2

   Specific combination of a feeding belt and a chute

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3. claim: 3

   Using the feeding belt as a doser

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4. claim: 4

   Transfer and alignment of grains by the feeding belt

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5. claim: 5

   Increasing or decreasing the speed of the feeding belt

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6. claim: 6

   Receiving and conveying in an aligned way on a conveyor chute,

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7. claim: 7

   Specific embodiment of the sensors and activation of air valves

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8. claim: 8

   Linear feeding by the feeding belt

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9. claim: 9

   Dosing and feeding from a feeding belt without blocking

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 10 1787

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82