**PRODUCT DISCHARGE CONTROL DEVICE FOR A FORM-FILL-SEAL MACHINE**

**PRODUCT DISCHARGE CONTROL DEVICE FOR A FORM-FILL-SEAL MACHINE**

**PRODUCT DISCHARGE CONTROL DEVICE FOR A FORM-FILL-SEAL MACHINE**

**PRODUCT DISCHARGE CONTROL DEVICE FOR A FORM-FILL-SEAL MACHINE**

<table>
<thead>
<tr>
<th>Designated Contracting States:</th>
<th>Inventors:</th>
</tr>
</thead>
</table>
| AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SI SK SM TR | • CURCÓ MASIP, Carmelo  
25191 LLEIDA (ES)  
• BONET ROSELL, Gil  
25191 LLEIDA (ES) |

**Date of publication of application:**  
23.05.2018 Bulletin 2018/21

**Proprietor:** Payper, S.A.  
25191 Lleida (ES)

**Representative:** Herrero & Asociados, S.L.  
Cedaceros, 1  
28014 Madrid (ES)

**References cited:**  

---

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

[0001] The present invention relates to a product discharge control device for a form-fill-seal machine which allows filling bags reliably and more quickly.

Background of the Invention

[0002] Form-fill-seal machines, referred to as FFS machines, using a tubular reel of plastic material are known, and the process starts from a tubular reel for forming a bag having a given length, which bag is filled with a product and is closed or sealed once it is filled.

[0003] One of the most important work stations in this process is the fill station, in which the bag previously formed in a previous station and transferred to the fill station by conveyance means is opened at the upper part to allow the bag fill nozzle to enter the bag and discharge the product that has been prepared upstream from the bag fill nozzle through the passage formed by blades of the nozzle as they open.

[0004] In this station, the bag is filled with the metered product amount by means of using a discharge device located upstream from the bag fill nozzle, which allows reducing the total time required to perform this filling and to thereby obtain the maximum working speed of the form-fill-seal machine, since the faster the product discharge into the bag is, the lower the work cycle of this station, and accordingly, the higher the working speed, and therefore, the higher the production capacity of the form-fill-seal machine.

[0005] The device typically used to discharge the product into the bag is called a gravity discharge tube, or a gravity acceleration tube. Examples of tubes of this type are shown, for example, in patent documents ES 2,334,474 and US 5168906.

[0006] One of the drawbacks of using these discharge devices, using either a system for regulation by means of a cone system or else using a system for regulating discharge by means of a discharge blade system, is that the discharge is done directly from the weighing unit (which weighs, meters and isolates the amount of product to be used for filling the bag) onto the discharge control device in the form-fill-seal machine and in synchronicity with the placement of the empty bag in the bag fill nozzle (with an advanced positioning of the discharge to optimize the moment of arrival of the product to the bag fill nozzle).

[0007] The fact that there is a coupling at the time of product discharge between both the weighing unit and the form-fill-seal machine means that at high working speeds one of them may condition the other and therefore mutually slow one another down due to synchronism.

[0008] A solution for decoupling both systems and improving the working speed at high speeds is for the discharge device to allow decoupling both machines from one another.

[0009] An improvement to the material discharge devices existing on the market basically consists of a gravity discharge tube, the distinguishing feature of which compared to the cone or the blades controlling the product discharge is that instead of being kept in a preferably open setting adapted to the maximum flow that can be unloaded towards the fill nozzle, they have the improved feature of being completely closed when they receive the discharge from the weighing unit, not allowing any product flow downstream.

[0010] Only when the form-fill-seal machine requests that the product be discharged is this discharge gate (in the form of a cone or blades) opened to allow product discharge from the hopper. This means that as soon as the weighing unit has discharged the product in the discharge control system downstream, a metering and weighing cycle starts up again regardless of the status of the form-fill-seal machine, and in the same manner, if there were a product discharge prepared in the discharge control device, this discharge can be done at the request of the form-fill-seal machine, even if the weighing unit has not finished preparing a new metered product amount.

[0011] The gates of the product discharge device are opened and closed by means of a pneumatic-type drive, so by means of adjustment mechanisms the optimal discharge opening can be regulated so as to obtain the minimum discharge time which thus allows maximizing the working speed of the form-fill-seal machine. This solution has some drawbacks: on one hand, the use of these devices controlled by pneumatic driving means for effecting the movements of the discharge blades has a limitation in controlling the opening and closing speeds, because the sudden stops upon reaching the end positions of the drives cause vibrations and collisions (particularly when closing the blades on the discharge opening), limiting in practice the maximum working speed of this device.

[0012] On the other hand, the fact that the pneumatic control positions are fixed, or improving the fact that the position of the opening thereof is adjustable by means of mechanical regulating systems, limit the application thereof when trying to optimally adjust the device for different products, so the format change or adaptation of the open position of the discharge gates will be done by hand.

[0013] This regulation of the open position can be automated, but with a system for automatically positioning the opening stop, two basic drawbacks would remain unsolved: the limitation to the opening/closing speeds of the blades of the discharge devices, and the possibility of optimizing the discharge cycle by means of positioning the discharge blades in different positions during product discharge for the purpose of minimizing the total discharge time, for example, with a first opening for maximizing the discharge, while the outlet opening is filled with product, and a second position to finish discharging the residue when the product slides down over the actual surface of the discharge blades.

to store a block (object group) of a plurality of objects in a state where the objects are congested in a block, suppress the scattering magnification of the objects when the objects are dropped off to prevent failures such as seal bite in a filling device disposed below, shorten the dropping length of the objects, and reduce the contact resistance of the objects to the receiving opening during the objects are dropped off to attain the discharging speed of the objects.

EP2843379A1 discloses a weighing hopper including a hopper body, a gate, an opening and closing means, a rotary shaft, first and second bearing units, and a partition wall which partitions a region in which the weighing hopper is placed into a center region and outer regions located at both sides of the center region.

Therefore, the purpose of the present invention is to overcome the limitations existing in the current state of the art of devices which, controlled by pneumatic drives, do not allow working with high opening/closing speeds of the blades of the product discharge device in a product discharge control device with the required reliability, for example, at form-fill-seal speeds of about 2,400 to 2,750 cycles per hour.

Description of the Invention

The discharge control device solves the aforementioned drawbacks and has other advantages that will be described below.

A product discharge control device for a form-fill-seal machine according to the present invention is defined in independent Claims 1 and 2. Other optional features are described in the dependent claims.

As a result of these features, both the speed of the product discharge control elements and the position thereof during the discharge cycle can be controlled in an optimal manner, resulting in a shorter discharge time for discharging metered product amount through the fill tube connecting the described discharge device with the bag fill nozzle of the form-fill-seal machine located downstream. The reduction of this discharge time is what allows obtaining shorter work cycle times of the form-fill-seal machine and increasing the working speed thereof. Furthermore, the fact that the device is provided with a motorized drive allows making specific adjustments to the discharge control means for each product, metered fill amount and type of bag fill nozzle located downstream, without having to make mechanical adjustments to the system, only by means of the parameterization of opening positions and speeds of the control system of the motor, resulting in a reduction of the required adjustment times in the case of having to make a change in the product to be packaged or a change in the value of the metered fill amount.

Advantageously, said open position of said discharge control elements can be regulated, for example, with an angle of opening comprised between 50° and 90°, and furthermore, said discharge control elements are also movable during the discharge cycle to a regulating position, in which the angle of opening is increased to make it easier to discharge all of the product from inside the hopper.

Advantageously, the motorized driving means comprise the use of a servomotor, because it allows effecting in a controlled parameterizable manner both the positions and the speeds of the control elements during the discharge cycle.

According to two alternative embodiments, said discharge control elements are swinging blades.

Brief Description of the Drawings

To better understand the preceding description, a set of drawings is attached in which a practical embodiment is schematically depicted by way of non-limiting example.

Figure 1 is a perspective view of a product discharge control device which does not form a part of the claimed invention;
Figures 2 and 3 are elevational views of a product discharge control device, which does not form a part of the claimed invention, in an open position and in a closed position of the discharge control elements;
Figure 4 is an elevational view of the driving means of the product discharge control device of the present invention according to a first embodiment; and
Figure 5 is an elevational view of the driving means of the product discharge control device of the present invention according to a second embodiment.

Description of a Preferred Embodiment

The drawings depict the product discharge control device comprising a hopper 1 where the metered product amount used for filling the bag is discharged and a fill tube 2, connecting the discharge control device according to the present invention to the fill nozzle of the form-fill-seal machine.

The control device also comprises discharge control elements 3 that are movable between an open position in which product discharge is allowed, and a closed position in which product discharge is prevented, which allows receiving in this closed position a new metered product amount discharge released by the metering and weighing system located upstream.

Said discharge control elements 3 are arranged between the hopper 1 and the fill tube 2, as seen in the drawings, and allow controlling product discharge towards the fill nozzle of the form-fill-seal machine.

Said discharge control elements 3 are swinging blades, although they could be any suitable discharge control element that is equivalent in terms of function.

The driving means which allow the movement of said discharge control elements 3 comprise a connecting rod-crank mechanism that will be described below.
Said connecting rod-crank mechanism comprises a crank 8 connected to the output shaft of the motor 7 and a second connecting rod 4 connected thereto at one of its ends. The other opposite end of this second connecting rod 4 is in turn connected to one of the ends of the lever 5 integral with the rotating shaft of one of the discharge control elements 3. The rotational movement of the first lever 5 is transmitted to the second lever 6, which is integral with the rotating shaft of the second of the discharge control elements 3, in a synchronous manner by means of the synchronizing connecting rod 9.

When the discharge control elements 3 are in the closed position, said crank 8 and said connecting rod second 4 are in a dead center position, i.e., in the position defined by the kinematics of this mechanism, in which an increase in rotation of the crank 8 in the same direction makes the second connecting rod 4 move in the direction opposite the one in which it was moving up until this time, which allows adjusting the position of the discharge control elements on the discharge hopper outlet profile, without any collisions occurring at the closing point, since the connecting rod-crank mechanism itself limits the maximum angular position the discharge control elements 3 reach with respect to the discharge hopper outlet profile.

It should be indicated that the discharge control elements 3 can also be placed in different positions of the angle defined by said discharge control elements 3 during the product discharge cycle to obtain the shortest discharge time of all the product contents. Said positions of the discharge control elements can be fixed during the entire discharge cycle, or they can be variable and controlled by the automaton effecting discharge control during this cycle.

Preferably, the angle defined by said discharge control elements 3 with respect to the horizontal, indicated in Figures 2 and 3 by means of the letter "a", is preferably comprised between 50° and 90°.

The operation of the discharge control device is as described below.

In the closed position, in the dead center position of the connecting rod-crank mechanism, the hopper 1 is filled with the metered product amount to be filled or discharged into the bag.

In this closed position of the discharge control elements 3, the product is retained in the hopper 1, preventing it from being passed on to the fill tube 2.

When the form-fill-seal machine located downstream gives the discharge order, the discharge control elements 3 move following the opening cycle pre-established by the control system for discharging the metered product amount in a controlled manner.

The movement of the discharge control elements 3 is achieved by means of driving the connecting rod-crank mechanism described above by means of the motor 7.

Once the desired product amount has been discharged, the discharge control elements 3 move to the closed position following the closing cycle pre-established by the control system, also by means of the connecting rod-crank mechanism and the motor 7.

The angular movement trajectory (angular positions and speeds) of the discharge control elements during the opening and closing cycle can be programmed and/or adjusted by means of the control automaton for the purpose of obtaining the shortest time for the complete metered product amount discharge.

Then from the closed position of the discharge control elements 3, the cycle is repeated again as soon as the device receives a new metered product amount, and the form-fill-seal machine requests a new discharge.

The cycle described above is obviously performed continuously, many times at a high speed.

Figure 4 shows a first embodiment of the discharge control device according to the present invention.

For the sake of simplicity, the same reference numbers are used to indicate elements equivalent to the preceding discharge control device. It should furthermore be indicated that only the driving means of the discharge control elements are different in this embodiment of the invention, the remaining elements being the same as earlier.

In this embodiment, the driving means of the discharge control elements also comprise first and second levers 5, 6 connected by means of said synchronizing connecting rod 9, each integral with a shaft for moving each of said discharge control elements 3, and the movement of which is driven by means of a drive belt 10 located between the output shaft of the motor 7, preferably a servomotor, and one of said levers 5, 6.

Figure 5 shows a second embodiment of the discharge control device according to the present invention.

Like in the preceding case, for the sake of simplicity, the same reference numbers are used to indicate elements equivalent to the preceding embodiment. It should furthermore be indicated that only the driving means of the discharge control elements are different in this embodiment, the remaining elements being the same as in the first embodiment.

In this second embodiment, the driving means also comprise first and second levers 5, 6 connected by means of said synchronizing connecting rod 9, each integral with a shaft for moving each of said discharge control elements 3, and the movement of which is driven by means of the output shaft of the motor 7 directly driving one of said levers 5, 6.

Although reference has been made to a specific embodiment of the invention, it is obvious for a person skilled in the art that the discharge control device described is susceptible to a number of variations and modifications without departing from the scope of protection defined by the attached claims.
Claims

1. Product discharge control device for a form-fill-seal machine, comprising a hopper (1) receiving a metered product amount where it is deposited, discharge control elements (3) movable between a closed position and an open position by driving means, and a fill tube (2) connecting the discharge control device with a fill nozzle of the form-fill-seal machine whereby a bag is filled with product, the driving means of the discharge control elements (3) comprising a motor (7) driving the movement of one of the discharge control elements (3), and a synchronizing connecting rod (9) synchronizing the movement of the discharge control element (3) driven by the motor (7) with the other discharge control element (3), said driving means also comprise first and second levers (5, 6) connected by means of said synchronizing connecting rod (9), each integral with a shaft for moving each of said discharge control elements (3), characterized by the movement of which is driven by means of a drive belt (10) located between the output shaft of the motor (7) and one of said levers (5, 6).

2. Product discharge control device for a form-fill-seal machine, comprising a hopper (1) receiving a metered product amount where it is deposited, discharge control elements (3) movable between a closed position and an open position by driving means, and a fill tube (2) connecting the discharge control device with a fill nozzle of the form-fill-seal machine whereby a bag is filled with product, the driving means of the discharge control elements (3) comprising a motor (7) driving the movement of one of the discharge control elements (3), and a synchronizing connecting rod (9) synchronizing the movement of the discharge control element (3) driven by the motor (7) with the other discharge control element (3), said driving means also comprise first and second levers (5, 6) connected by means of said synchronizing connecting rod (9), each integral with a shaft for moving each of said discharge control elements (3), characterized by the movement of which is driven by means of the output shaft of the motor (7) directly driving one of said levers (5, 6).

3. Product discharge control device for a form-fill-seal machine according to any of the preceding claims, wherein said open position of said discharge control elements (3) can be regulated, with an angle of opening comprised between 50° and 90°.

4. Product discharge control device for a form-fill-seal machine according to any of the preceding claims, wherein said discharge control elements (3) adopt different open positions during the discharge cycle.

5. Product discharge control device for a form-fill-seal machine according to claim 4 wherein said discharge control elements (3) adopt a given first open position and then a more open position during the discharge cycle.

6. Product discharge control device for a form-fill-seal machine according to claims 1 and 2, wherein said motor (7) is a servomotor (7).

Patentansprüche

1. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine umfassend einen Fülltrichter (1), der eine dosierte Produktmenge aufnimmt wo sie deponiert wird, Entladesteuersystemelemente (3), die durch Antriebsmittel zwischen einer geschlossenen Position und einer offenen Position beweglich sind, und ein Füllrohr (2), das die Produktentladungssteuerungsvorrichtung mit einem Füllstutzen der Form-Füll-Siegelmaschine verbindet durch welchen ein Beutel mit Produkt gefüllt wird, wobei die Antriebsmittel der Entladesteuersystemelemente (3) einen Motor (7), der die Bewegung von einem der Entladesteuersystemelemente (3) antreibt, und eine synchronisierende Pleuelstange (9), die die Bewegung des durch den Motor (7) angetriebenen Entladesteuersystemelements (3) mit dem anderen Entladesteuersystemelement (3) synchronisiert, umfassen, und die Antriebsmittel weiterhin mittels der synchronisierenden Pleuelstange (9) verbundene erste und zweite Hebel (5, 6), von denen jeder eine Einheit mit einer Welle zum Bewegen von jedem der Entladesteuersystemelemente (3) bildet, umfassen, dadurch gekennzeichnet, dass die Bewegung von diesen mittels eines Antriebsriemens (10), der sich zwischen der Antriebswelle des Motors (7) und einem der Hebel (5, 6) befindet, angetrieben wird.

2. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine umfassend einen Fülltrichter (1), der eine dosierte Produktmenge aufnimmt wo sie deponiert wird, Entladesteuersystemelemente (3), die durch Antriebsmittel zwischen einer geschlossenen Position und einer offenen Position beweglich sind, und ein Füllrohr (2), das die Produktentladungssteuerungsvorrichtung mit einem Füllstutzen der Form-Füll-Siegelmaschine verbindet durch welchen ein Beutel mit Produkt gefüllt wird, wobei die Antriebsmittel der Entladesteuersystemelemente (3) einen Motor (7), der die Bewegung von einem der Entladesteuersystemelemente (3) antreibt, und eine synchronisierende Pleuelstange (9), die die Bewegung des durch den Motor (7) angetriebenen Entladesteuersystemelements (3) mit dem anderen Entladesteuersystemelement (3) synchronisiert, umfassen, und die Antriebsmittel weiterhin mittels der
synchronisierenden Pleuelstange (9) verbundene erste und zweite Hebel (5, 6), von denen jeder eine Einheit mit einer Welle zum Bewegen von jedem der Entladesteuerungselemente (3) bildet, umfassen, dadurch gekennzeichnet, dass die Bewegung von diesen mittels der Antriebswelle des Motors (7), die einen der Hebel (5, 6) direkt antreibt, angetrieben wird.

3. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine gemäß einem der vorhergehenden Ansprüche, wobei die offene Position der Entladesteuerungselemente (3) reguliert werden kann, mit einem Öffnungswinkel umfassend zwischen 50° und 90°.

4. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine gemäß Anspruch 4, wobei die Entladesteuerungselemente (3) während des Entladezyklus verschiedene offene Positionen annehmen.

5. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine gemäß Anspruch 4, wobei die Entladesteuerungselemente (3) während des Entladezyklus eine vorgegebene erste offene Position und dann eine weiter geöffnete Position annehmen.

6. Produktentladungssteuerungsvorrichtung für eine Form-Füll-Siegelmaschine gemäß Anspruch 1 und 2, wobei der Motor (7) ein Servomotor (7) ist.

Revendications

1. Dispositif de commande de l’évacuation du produit d’une machine de formage-remplissage-scellement, comprenant une trémie (1), recevant une quantité mesurée de produit où il est déposé, des éléments (3) de commande de l’évacuation pouvant être déplacés par des moyens d’entraînement entre une position fermée et une position ouverte et un tube (2) de remplissage reliant le dispositif de commande de l’évacuation à une buse de remplissage de la machine de formage-remplissage-scellement, grâce à quoi un sac est empli de produit, les moyens d’entraînement des éléments (3) de commande de l’évacuation comprenant un moteur (7) entraînant le déplacement de l’un des éléments (3) de commande de l’évacuation et une barre (9) de liaison de synchronisation synchronisant le déplacement de l’élément (3) de commande de l’évacuation entraîné par le moteur (7) à l’autre élément (3) de commande de l’évacuation, chacun solidaire d’un arbre pour déplacer chacun des éléments (3) de commande de l’évacuation, caractérisé en ce que leur déplacement est entraîné au moyen d’une courroie (10) d’entraînement placée entre l’arbre de sortie du moteur (7) et l’un des leviers (5, 6).

2. Dispositif de commande de l’évacuation du produit d’une machine de formage-remplissage-scellement, comprenant une trémie (1), recevant une quantité mesurée de produit où il est déposé, des éléments (3) de commande de l’évacuation pouvant être déplacés par des moyens d’entraînement entre une position fermée et une position ouverte et un tube (2) de remplissage reliant le dispositif de commande de l’évacuation à une buse de remplissage de la machine de formage-remplissage-scellement, grâce à quoi un sac est empli de produit, les moyens d’entraînement des éléments (3) de commande de l’évacuation comprenant un moteur (7) entraînant le déplacement de l’un des éléments (3) de commande de l’évacuation et une barre (9) de liaison de synchronisation synchronisant le déplacement de l’élément (3) de commande de l’évacuation entraîné par le moteur (7) à l’autre élément (3) de commande de l’évacuation, les moyens d’entraînement comprenant également des premier et deuxième leviers (5, 6) reliés au moyen de la barre (9) de liaison de synchronisation, chacun solidaire d’un arbre pour déplacer chacun des éléments (3) de commande de l’évacuation, caractérisé en ce que leur mouvement est entraîné au moyen de l’arbre de sortie du moteur (7) entraînant directement l’un des leviers (5, 6).

3. Dispositif de commande de l’évacuation du produit d’une machine de formage-remplissage-scellement suivant l’une quelconque des revendications précédentes, dans lequel la position ouverte des éléments (3) de commande de l’évacuation peut être régulée en ayant un angle d’ouverture compris entre 50° et 90°.


5. Dispositif de commande de l’évacuation du produit d’une machine de formage-remplissage-scellement suivant la revendication 4, dans lequel les éléments (3) de commande de l’évacuation prennent une première position d’ouverture donnée, puis une position plus ouverte pendant le cycle d’évacuation.

6. Dispositif de commande de l’évacuation du produit
d'une machine de formage-remplissage-scellement suivant les revendications 1 et 2, dans lequel le mo-
teur (7) est un servomoteur (7).
REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader’s convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

• ES 2334474 [0005]  
• US 5168906 A [0005]  
• EP 2843379 A1 [0015]