(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 770 072 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.01.2021 Bulletin 2021/04

(51) Int Cl.:
B65B 69/00 *(2006.01)*

(21) Application number: **20187436.9**

(22) Date of filing: **23.07.2020**

(84) Designated Contracting States:
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 SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **25.07.2019 PL 43071419**

(27) Previously filed application:
25.07.2019 PL 43071419

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(54) **SACK EMPTYING DEVICE**

(57) The invention relates to a sack-emptying device which is used, for example, in the chemical, pharmaceutical or plastics industries. The sack emptying device (1) comprises longitudinal tubular elements (2) arranged parallel to each other and having individual connections (5) for a pneumatic conduit. On the length of these tubular elements (2), through holes (6) are made in their walls, directed towards the working space of the device (1) defined above these tubular elements (2). Adjacent tubular elements (2) are connected at their ends with connectors (8) in sets (7), and connectors (8) are provided with axles (9, 10) embedded in the frame (3). The axes (9, 10) of the connectors (8) at one end of the sets (7) of the tubular elements (2) are eccentrically connected with the drive (4).

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Description

[0001] The subject of the invention is a sack emptying device, which is used in those industries where raw materials are delivered in sacks that require emptying. For example, the subject of the invention can be used in the chemical, pharmaceutical or plastics industries.

[0002] In the state of the art, in practical application, known are devices for emptying sacks containing bulk materials, which devices are often in the form of automated processing lines or in the form of devices which support workers performing activities related to emptying the sacks. In case of automated technological lines, the devices collect the sacks from the pallets on which they are delivered, empty them and return empty packages.

[0003] The description of US 5,613,824 discloses a compact device for automatically opening and emptying sacks of free-flowing raw materials. The device is provided with a housing having an input opening for filled sacks and an output opening for empty packages. Behind the input opening in the device, there is a support plate for the sack introduced into the device, which forms a trough on which the sack slides until the sack rests on a proper support, on which it is positioned vertically. In such an arrangement of the sack, devices for its emptying are activated. The device is provided with a penetrator which has a hollow form with a sharp end and which pierces the sack. In addition, in the area directly above the actual support there is a blade which cuts the sack as soon as it is pierced by the penetrator. Then, in the device, the actual sack support, while rotating, is withdrawn from under the sack, which remains suspended on the penetrator. Thus, the sack is emptied and its contents are directed to the charging hopper. Additionally, during the emptying operation, high pressure air is introduced into the sack through the penetrator, which supports the sack emptying process. The device also has an additional high-pressure air nozzle, directed at the sack to be emptied and pulsating while emptying the sack. This results in the sack shaking, which further supports its emptying. Moreover, the device has a dust collector above the sack emptying devices to collect bulk material particles and reduce dust. The device is also provided with a pusher to guide the emptied sack to the output opening.

[0004] Also PL / EP 1838582 T3 discloses devices forming a processing line for automatic emptying of sacks. The process line is formed by the interconnected gripping unit and emptying unit. The gripping unit, using curved grippers, transfers the full bags from a stack or pallets to the emptying unit, where they are cut and emptied, after which the gripping unit again removes empty packages. The emptying unit has rods and associated with them rotating blades. The sacks supported by the gripping unit are slit and then moved by poles entering the previously made slits. The bars help to tear the packages and support emptying the sacks. The contents of the sacks are directed to the receiver located under the bars and blades. Alternatively, the emptying device may have horizontally sliding bars, which is achieved by mounting bars on a frame which is eccentrically connected to the driven wheel. Then the cut residues of the sacks are in contact with the adjacent, moving bars and by their movement are tilted in opposite directions. In this way, vigorous shaking can be realized whereby the residual material in the sacks is removed.

[0005] The object of the invention is to solve the problem of time-consuming and relatively inaccurate emptying of the sacks containing bulk material which occurs when emptying the sacks using both the devices intended for this purpose and when emptying the sacks by workers.

[0006] The invention relates to a sack emptying device comprising longitudinal tubular elements arranged parallel to one another, pivotally mounted in a frame and eccentrically connected to the drive. The essence of the invention consists in the fact that the pipe elements have individual connections for a pneumatic conduit, and along the length of these pipe elements, through holes are provided in the walls of said elements, the holes being directed towards the working space of the device above the pipe elements, the adjacent pipe elements at their ends are connected to each other with connectors to form sets, and the connectors are provided with axles mounted in the frame, and the axles of the connectors at one end of said sets of tubular elements are eccentrically connected to the drive.

[0007] Preferably, a single set comprises two tubular elements.

[0008] The main advantage of the invention resulting from combining the tubular elements into sets having connections for a pneumatic conduit, and thus, as a result, purging through the sacks being emptied of the bulk contents, is a significant improvement in the accuracy and efficiency of emptying these sacks. Achievement of said advantages is caused in particular by the combination of shaking the emptied sacks due to the movement of the tubular elements with the simultaneous directed blowing of air. This improves the efficiency of emptying the sacks and allows the sacks to be emptied even from the residues of bulk materials that adhere to the inner surface of the sack. Additionally, the design of the sack emptying device is simple, which allows the device to be implemented in the existing sack emptying installations to streamline and increase the efficiency thereof. Thanks to this design, the device can also be installed without major difficulties on existing charging hoppers and similar devices through which bulk materials are directed for further processing. However, the greatest benefits can be appreciated because the use of the device reduces the amount of human work required to empty the sacks, which also translates into a significant improvement in efficiency.

[0009] The invention has been illustrated by an embodiment shown on the drawing where Fig. 1 shows the sack emptying device in perspective view, Fig. 2 presents sectional view of a tubular element, Fig. 3 shows top view

of the sack emptying device; Figure 4 presents a partial exploded view of the sack emptying device, Figure 5 shows the view of the sack emptying device from the side of the drive.

[0010] Device 1 for emptying sacks with bulk material comprises longitudinal tubular elements 2 which are arranged parallel to each other and are pivotally mounted in the two-part frame 3 and which are eccentrically connected to the drive 4. The two-part frame 3 has mounting holes allowing for it to be securely attached to, for example, a bulk product charging hopper. The tubular elements 2 define the working space of the device 1 to which the cut sacks with bulk material go, so that a charging hopper for the loose products is located below them.

[0011] Each individual tubular element 2 has an individual, thereto assigned, connection 5 for pneumatic conduit, not shown on the drawing. Air is supplied through the pneumatic conduit at the appropriate pressure and in a suitably programmed sequence. Also, in each tubular element, through holes 6 are provided, which point towards the working space of the device 1 defined above the tubular elements 2. The through holes 6 are thus directed only towards the sacks being emptied. Preferably, the through holes 6 have a diameter of, for example, 2.5 mm and are uniformly distributed over the entire length of each tubular element 2, for example every 25 mm.

[0012] Two individual tubular elements 2 adjacent to each other form sets 7 which perform the function of beating and shaking the sacks being emptied. The sets 7 are formed by joining the tubular elements 2 at both ends with connectors 8, the connectors 8 being provided with axles 9, 10 by means of which the sets 7 are pivotally mounted in the frame 3. The axles 9, 10 have a base through which they are rigidly connected with the connectors 8. However, depending on the connection side, the axes 9, 10 differ in length. On the side of the drive, are fastened to the connectors are axles 9 which have a length that allows for swivel mounting in the through holes of the frame 3 and allowing for attaching the drive elements 4 to them. On the other hand, on the opposite side of the sets 7, fastened are axles 10 having a length that allows only for pivoting mounting in the through-holes of the frame 3, consequently the axles 10 are shorter than the axles 9. The pivoting mounting of the axles 9, 10 in the frame 3 involves use of self-aligning bearings 11, so that the sets 7 do not fully rotate, but only oscillate, similarly to rocking, so that during operation alternately rise tubular elements 2 forming the set 7, once one and then the other. In the case of the axles 10, right behind the self-aligning bearings 11, they are secured by Seger rings 12. Also from the side of the drive 4, the axles 9 are fixed in the frame 3 with the use of self-aligning bearings 11 and protected by Seger rings 12. However, in front of protective rings Seger 12 there are fastened elements realizing the transmission of the drive 4, in the form of the first shaped flanges 13. The drive 4 in form of a motor is mounted on an intermediate plate 14 having mounting holes and enabling mounting of the motor in a location convenient for the end user. The second shaped flange 15 is mounted on the drive shaft of the motor. The first shaped flanges 13 and the second shaped flange 15 are connected to each other by rigid ties 16, which are fastened in the shaped flanges 13, 15. The shaped flanges 13, 15 themselves provide an eccentric connection of the axis 9 with the drive 4, which is another feature that allows for the swinging movements of the sets 7.

[0013] The actuated drive 4 sets in motion three sets 7, each of which consists of two tubular elements 2. The sets 7 make oscillating movements, similar to rocking, so that during operation alternately rise the tubular elements 2 forming the set 7, once one and then the other. Due to the swinging movements of the sets 7, the emptied sacks located in the working space of the device 1 are shaken. At the same time, during the swinging movements of the sets 7, air is supplied to the tubular elements 2 via connectors 5, under a pressure of 6 bar. It is obvious that the amount of the supplied air pressure is adjustable. The control of the air pressure and its supply is carried out by means of the solenoid valves and the operator panel of the device. In the preferred setting the air is supplied alternately to the tubular elements 2 forming the sets 7, so that it flows through the tubular element 2 at the time when it is raised and the air flow through the lowered tubular element 2 is stopped. Controlling the air flow through the tubular elements 2 allows the sacks to be effectively emptied, including efficiently cleaning the sacks from residues of the material. The efficiency of the device is also influenced by the oscillating movements of the sets 7, causing irregular movements of the previously cut sack elements, and thus their much more efficient emptying.

Claims

1. Sack emptying device, comprising longitudinal tubular elements arranged parallel to each other, pivotally mounted in the frame and eccentrically connected to the drive, **characterized in that** the tubular elements (2) have individual connections (5) for a pneumatic conduit while along the length of said tubular elements (2) in their walls there are provided hrough holes (6) directed towards the working space of the device (1) over the tubular elements (2), while the adjacent tubular elements (2) are connected to each other at their ends by connectors (8) to form sets (7), the connectors (8) are provided with axles (9, 10) embedded in the frame (3), and the axles (9, 10) of the connectors (8) at one end of the sets (7) of tubular elements (2) are connected eccentrically with the drive (4).

2. The device according to claim 1 **characterized in that** the single set (7) comprises two tubular elements (2).

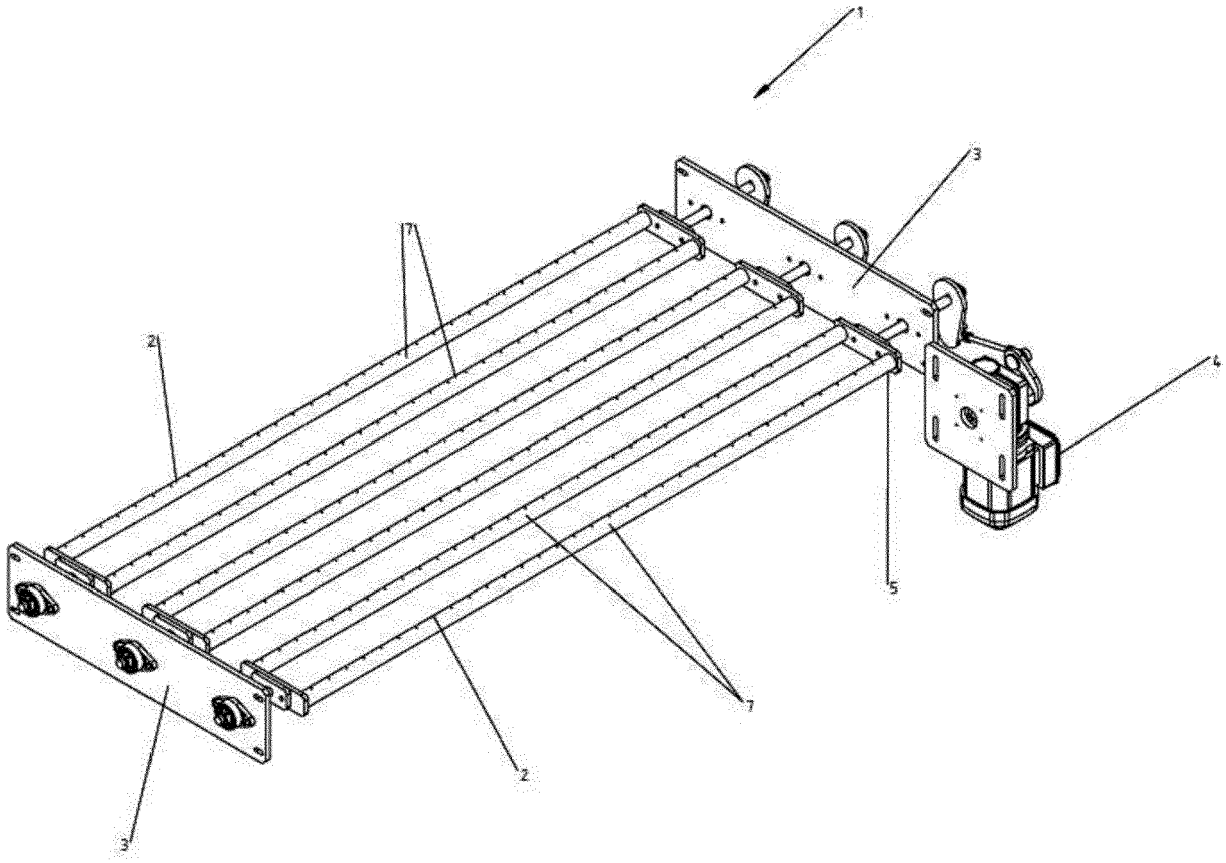

Fig 1

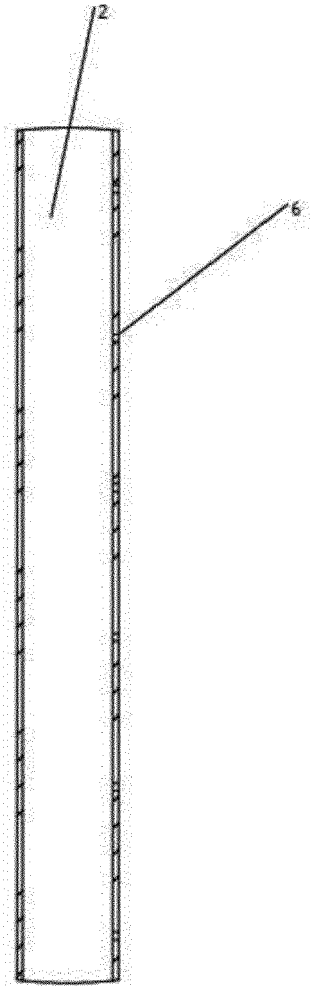

Fig 2

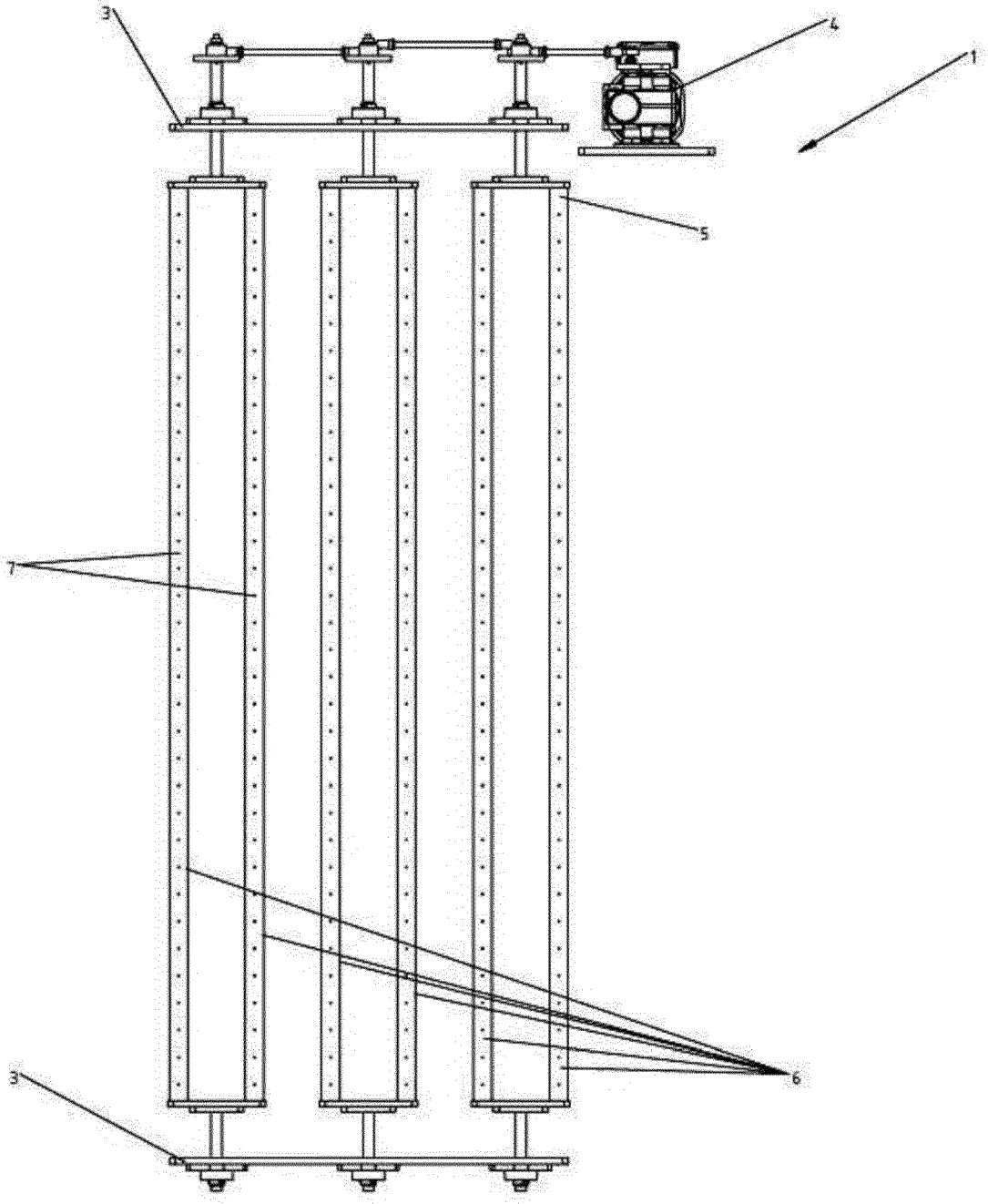

Fig 3

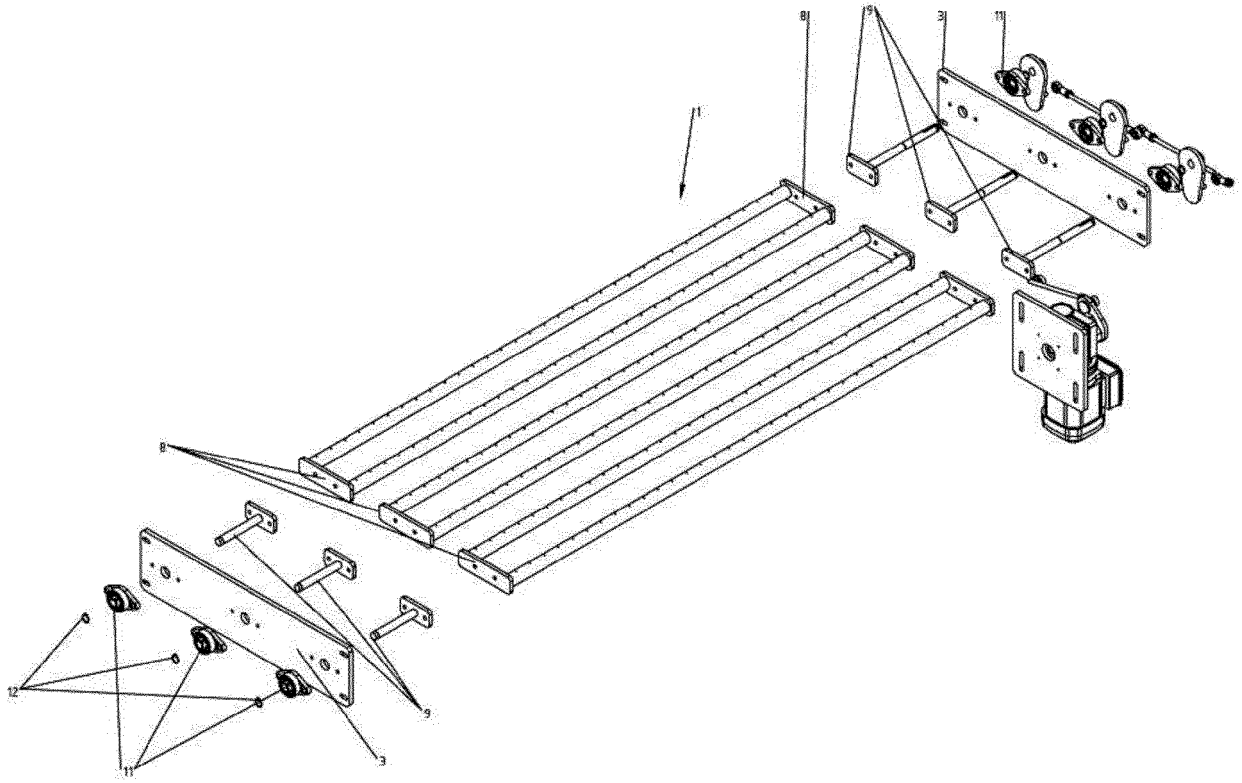

Fig 4

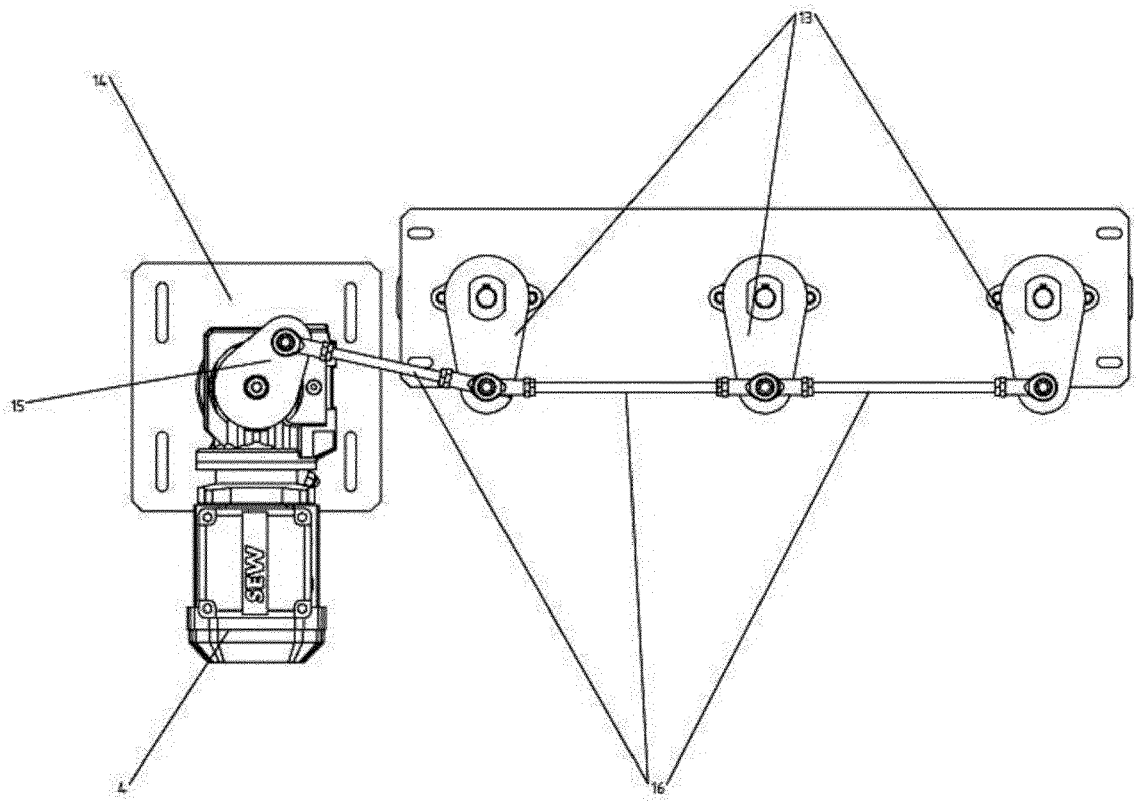

Fig 5

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EUROPEAN SEARCH REPORT

Application Number
EP 20 18 7436

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 3 070 014 A1 (KAHL GROUP S A [AR]) 21 September 2016 (2016-09-21) * figures 1-2B *	1,2	
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TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 December 2020	Garlati, Timea

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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