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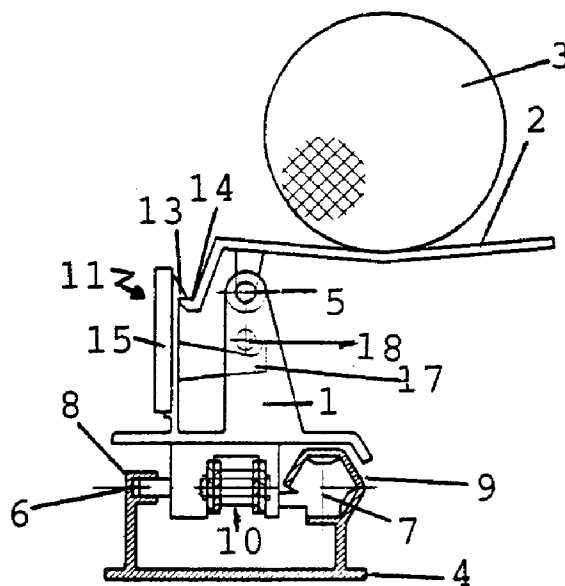
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**(54) A method and a device for moving agricultural products**

(57) A device for moving or grading agricultural products or other objects, which device comprises a frame which is movable along a path and which is provided with a supporting element on which a product may be present. The supporting element can pivot about a pivot axis with respect to said frame, from a substantially horizontal position to a sloping position, in which the product can fall from the supporting element. The supporting element can be maintained in said horizontal position by means of a stop which is movable with respect to the frame, and which can be moved to said sloping position by moving said stop. The device furthermore comprises an electromagnet disposed beside said path, which can be turned on and off. According to the invention, the movable stop is provided with a metal part, which can be moved under the influence of the magnetic field of the electromagnet.



**FIG. 1**

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## Description

[0001] The invention relates to a device for moving or grading agricultural products or other objects, which device comprises a frame which is movable along a path and which is provided with a supporting element on which a product may be present, which supporting element can pivot about a pivot axis with respect to said frame, from a substantially horizontal position to a sloping position, in which the product can fall from the supporting element, whereby said pivot axis extends substantially horizontally and in the direction of movement, which supporting element can be maintained in said horizontal position by means of a stop which is movable with respect to the frame, and which can be moved to said sloping position by moving said stop, which device furthermore comprises an electromagnet disposed beside said path, which can be turned on and off.

[0002] The term product or products used hereafter especially refers to agricultural products which must not be damaged or be loaded too heavily.

[0003] A device of this kind is known from GB 2 117 341. With this known device, a stationary lever mechanism is furthermore disposed along said path, which lever mechanism can be operated by turning the electromagnet on and off. Said lever mechanism can be used for moving the stop of a frame provided with a supporting element, which passes the lever mechanism when moving along said path. The movement of the stop causes the supporting element to pivot from the horizontal position to the sloping position with respect to the frame, so that the product will fall from the supporting element.

[0004] A drawback of the known device is the fact that it is not very reliable, due to the fact that the lever mechanism must be operated at exactly the right moment each time, that is, at precisely that moment when a stop of a frame provided with a supporting element passes the lever mechanism. In addition, the lever mechanism is liable to wear, which furthermore reduces the reliability of the device. Another drawback of the known device is the fact that the lever mechanism is noisy.

[0005] The object of the invention is to provide a device for moving or grading objects, which does not exhibit the above drawbacks. In order to accomplish that objective, the device according to the invention is characterized in that the movable stop is provided with a metal part, which can be moved under the influence of the magnetic field of the electromagnet.

[0006] Since the metal part moves directly under the influence of the magnetic field, the stop is moved without there being any mechanical contact between the moving frame and the operating device, which occupies a stationary position beside said path. Not only does this prevent wear, but also the production of noise is avoided. In addition, timing the movement of the stop is simpler under the direct influence of the electromagnet.

[0007] In another embodiment, the device according to the invention is characterized in that the frame is provided with a stop which determines the exact sloping position of the supporting element in that the supporting element bears against said stop. As a result, it is not necessary to provide an additional rail along the path, this in contrast to the device according to GB 2 117 341.

[0008] In yet another embodiment, the device according to the invention is characterized in that more than one supporting element, preferably more than two, are provided on the frame. The length of the frame will be increased as a result of this, which leads to an enhanced stability during transport, whilst the spacing between the respective products can be relatively small.

[0009] In yet another embodiment, the device according to the invention is characterized in that a guide supports and guides the frame. This prevents the device from sagging with respect to the path, thus enhancing the reliability of the device, whilst the provision of a supporting rail, which is required in the device according to GB 2 117 341, will not be necessary. Preferably, the guide is made up of an aluminium section comprising two spaced-apart guide channels. In one advantageous embodiment, the frame and the guide may be shaped to complement each other, seen in cross-sectional view, in such a manner that the frame cannot be removed from the guide when it is present therein.

[0010] In yet another embodiment, the device according to the invention is characterized in that several frames are interconnected by means of a chain. This makes it easy to move the frames along an endless path. Preferably, a frame is supported by said guide, whilst the chain is used for moving the frame. As a result of this arrangement, the transport of the products will be more reliable.

[0011] The invention furthermore relates to a method for moving or grading products.

[0012] The invention will be explained in more detail hereafter by means of an example of a preferred embodiment of the invention. In the drawing:

- Figures 1 - 5 are diagrammatic, cross-sectional views of a frame present in a guide, showing the frame in different positions along the path which is made up by said guide.
- Figure 6 is a diagrammatic side view of a frame.

[0013] Figure 1 shows a frame 1 provided with a supporting element 2, on which a product 3, for example a potato, is present. The frame is supported by a guide 4. Guide 4 forms a path, along which frame 1 can be moved in a direction perpendicularly to the plane of the drawing. Supporting element 2 can pivot with respect to frame 1 about a pivot axis 5, whose axis extends substantially parallel to the direction of movement of the frame, that is, perpendicularly to the plane of the drawing. The supporting element takes up a horizontal position in Figure 1, in which position it supports product 3.

**[0014]** Frame 1 is provided on the underside, on either side thereof, with two supporting elements 6, 7, which each cooperate with a channel 8, 9 in guide 4. Supporting elements 6, 7 and channels 8, 9 are complementary to each other, seen in cross-sectional view. Frame 1 can only be removed from guide 4 when it is positioned at one end of guide 4. Preferably, frame 1 and supporting elements 6, 7 are made of plastic material, and guide 4 is an extruded aluminium section. Supporting element 2 may also be made of plastic material so as to keep the production simple and reduce the noise level.

**[0015]** Near its underside, frame 1 is furthermore provided with a chain, the first link 10 of which is visible in Figure 1. In this manner, frame 1 is supported by guide 4, and the chain only functions to move the frame.

**[0016]** Frame 1 comprises a stop 11, which supports a cam 13 at its end, which cam mates with a corresponding cam 14 of supporting element 2. Stop 11 is provided with a metal plate 15.

**[0017]** Referring to Figure 2, frame 1 has been moved perpendicularly to the plane of the drawing of Figure 1, and frame 1 is just moving past the electromagnet 16, which occupies a stationary position beside the path. When the electromagnet 16 is turned on, the metal plate 15 of stop 11 will be moved by the magnetic field, as a result of which stop 11 will pivot and the mating cams 13, 14 will be unlocked.

**[0018]** Referring to Figure 3, supporting element 2 pivots to a sloping position under the influence of the weight of product 3, in which position product 3 can fall from supporting element 2. As soon as frame 1 has moved past electromagnet 16, stop 11, which is preferably made of plastic material, will spring back to its vertical starting position. Supporting element 2 butts against the underside of frame 1, which forms stop 19.

**[0019]** Again referring to Figure 2, stop 1 is provided with a hook 17, which cooperates with a cam 18 of frame 1. This prevents metal plate 15 from making mechanical contact with the electromagnet 16 upon passing. Electromagnet 16 takes up a slightly sloping position, so that contact between metal plate 15 and electromagnet 16 is prevented on the upper side as well.

**[0020]** Referring to Figures 4 and 5, frame 1 passes a guide rail 20, which rail is disposed perpendicularly to the plane of the drawing. The guide rail 20, whose height increases in the forward direction of the path, returns supporting element 2 to the horizontal starting position.

**[0021]** Figure 6 is a side view of a frame 1, which is not provided in a guide. Four supporting elements 2 are provided on frame 1. Figure 6 furthermore shows that the frame is attached to the links 10 of the chain by which frame 1 is moved along the path.

**[0022]** It is possible by means of the device according to the invention to dispose an electromagnet at any desired place along the path so as to cause a product to fall from the support. If desired, the electromagnet can

be activated permanently so as to cause the products to fall from every supporting element that passes, but it is also possible to turn the electromagnet on and off each time. This may for example be the case when products must be graded for size or weight. The electromagnet preferably has a laminated core in order to prevent eddy currents and thus generate a magnetic field quickly.

**[0023]** The invention is not limited to the illustrated preferred embodiment. Other variants are possible within the scope of the invention.

## Claims

1. A device for moving or grading agricultural products or other objects, which device comprises a frame which is movable along a path and which is provided with a supporting element on which a product may be present, which supporting element can pivot about a pivot axis with respect to said frame, from a substantially horizontal position to a sloping position, in which the product can fall from the supporting element, whereby said pivot axis extends substantially horizontally and in the direction of movement, which supporting element can be maintained in said horizontal position by means of a stop which is movable with respect to the frame, and which can be moved to said sloping position by moving said stop, which device furthermore comprises an electromagnet disposed beside said path, which can be turned on and off, characterized in that the movable stop is provided with a metal part, which can be moved under the influence of the magnetic field of the electromagnet.
2. A device according to claim 1, characterized in that there is no mechanical contact at all between parts provided on said movable frame and operating means disposed along said path.
3. A device according to claim 1 or 2, characterized in that said frame is provided with a stop which determines the exact sloping position of the supporting element in that the supporting element bears against said stop.
4. A device according to any one of the preceding claims, characterized in that more than one supporting element, preferably more than two, are provided on said frame.
5. A device according to any one of the preceding claims, characterized by a guide which supports and guides said frame.
6. A device according to claim 4, characterized in that said guide is made up of an aluminium section comprising two spaced-apart guide channels.

7. A device according to claim 4 or 5, characterized in that the frame and the guide may be shaped to complement each other, seen in cross-sectional view, in such a manner that the frame cannot be removed from the guide when it is present therein. 5
8. A device according to claim 3, characterized in that several frames are interconnected by means of a chain. 10
9. A method for moving or grading products agricultural products or other objects, wherein a frame provided with a supporting element on which a product is present is moved along a path, which supporting element is pivoted about a pivot axis with respect to said frame, from a substantially horizontal position to a sloping position so as to cause the product to fall from the supporting element, whereby said pivot axis extends substantially horizontally and in the direction of movement, which supporting element is maintained in said horizontal position by means of a stop which is movable with respect to the frame, and which is moved to said sloping position by moving said stop, wherein furthermore an electromagnet, which can be turned on and off, is disposed beside said path, characterized in that a metal part connected with said movable stop is moved under the influence of the magnetic field of said electromagnet. 15 20 25 30
10. A method according to claim 9, characterized in that said frame is supported in its sloping position by a stop provided on said frame, against which the supporting element bears. 35
11. A method according to claim 9 or 10, characterized in that said frame is supported and guided by a guide. 40
12. A method according to any one of the claims 9 - 11, characterized in that several frames are interconnected by means of a chain, which functions to move said frames. 45 50 55

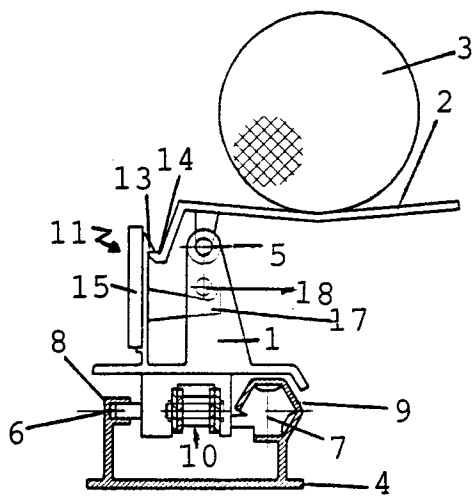


FIG. 1

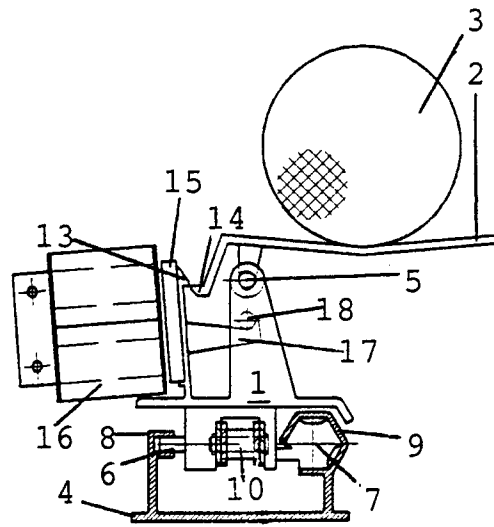


FIG. 2

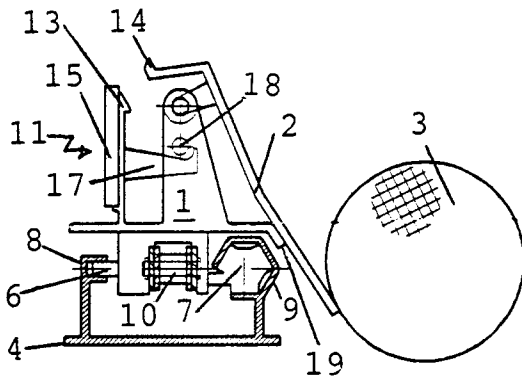


FIG. 3

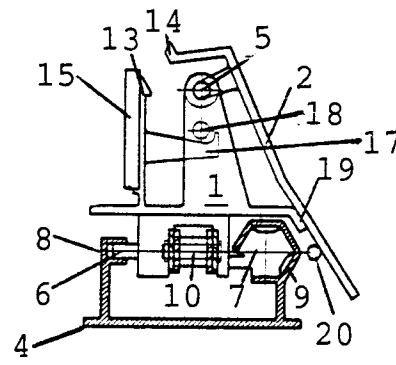


FIG. 4

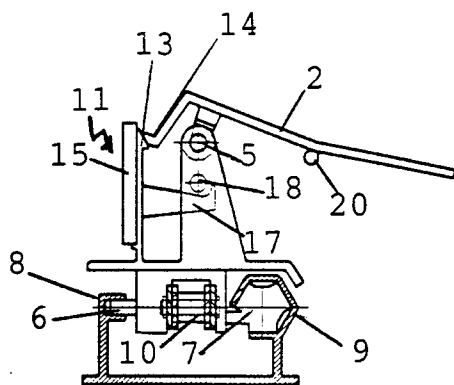


FIG. 5

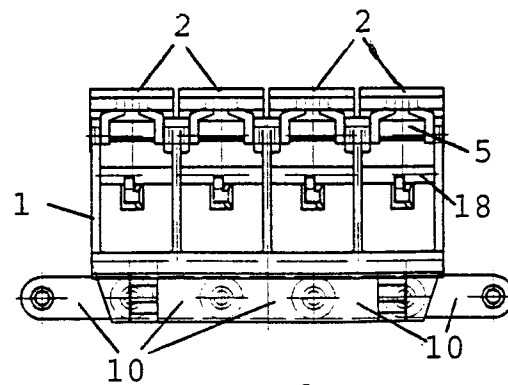


FIG. 6



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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 20 2908

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 593 126 A (PRO-PAK INTERNATIONAL) 20 April 1994	1,2,4,5, 8,9,11, 12	B07C5/36
Y	* the whole document *	3,10	
A	---	6,7	
Y	US 3 930 995 A (PADDOCK ET AL) 6 January 1976 * column 4, line 49 - line 54; figures 4-9 *	3,10	
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 92 (M-373), 20 April 1985 & JP 59 217524 A (ISEKI NOKI), 7 December 1984 * abstract *	1,3-5, 8-12	
A	WO 93 07972 A (COLOUR VISION SYSTEMS) 29 April 1993 * abstract; figure 2 *	1,3,5-7, 9-11	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B07C B65G
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>2 December 1998</b>	Examiner <b>Forlen, G</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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  &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 20 2908

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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