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(54) **Device and method for checking the presence of a spacer element in a box**

(57) A device for checking if a box (3), housing therein at least one packaging element (1) comprising at least a conductive portion (1A), also houses at least one spacer element (2) spacing at least a part (1 B) of said packaging element (1) from an inner face (3B) of a base wall (3A) of said box (3), said spacer element (2) and/or said packaging element (1) resting on said inner face (3B),

characterised by comprising:
- non contact sensor means (6) capable of generating a signal relating to the distance (D5) between said non contact means and said conductive portion (1A),
- and means (9) for determining on the basis of said signal whether or not said box houses said spacer element (2).

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Description

[0001] The present invention relates to a device for checking a box housing therein at least a packaging element comprising at least a conductive portion, and also housing at least a spacer element spacing at least a part of said packaging element from an inner face of a base wall of said box.

[0002] In the pharmaceutical industry devices are known to check if a box housing a plurality of blisters containing pills or tablets, houses also a paper manual relating to said drugs.

[0003] It is to be noted that in the present context by the term blister it is meant a packaging element for one or more products, in particular drugs, comprising at least a conductive portion, in particular a portion with a metal foil or coating or a conductive membrane or film.

[0004] The known checking devices comprise non contact sensors using UV beams which are reflected by the paper of the manual contained in the box, and means for determining on the basis of said reflection, whether or not in said box there is a paper manual.

[0005] The known devices may be used only when the boxes to be checked are open and contain manuals made of paper which is reflective with respect to UV beams.

[0006] It is an object of the present invention to provide a device which enables the accurate detection of the presence inside a box of a spacer able to space at least a part of at least one packaging element contained in said box, when said box is preferably completely closed and with said spacer made of whatever nonconductive material.

[0007] A further object is to provide a device for checking closed boxes housing one or more blisters containing, in turn, pharmaceutical products, and with a spacer element formed of a paper manual relating to said pharmaceutical products, with said manual made in any possible paper material.

[0008] This and further objects are achieved by a device according to the characterizing portion of the attached claims.

[0009] The device of the invention and its intended use will be understood from the following description taken in combination with the accompanying drawings, in which:

Fig. 1 is a schematic front view of a device according to the invention in combination with a box and a conveyor for said box.

Figures 2A- 2B are schematic lateral and front views showing a box as that of Figure 1 but housing a different number of blisters.

[0010] As shown in Figures 1 and 2 the box 3 to be checked houses a plurality of conventional blisters 1, each comprising an aluminium foil or coating, and a paper manual 2 wrapped around a part 1 B (Fig. 1) of said blister 1.

[0011] Said box 3 comprises a base wall 3A, on an inner face 3B of which a part 2A of said paper manual 2 rests (as shown in figure 1) and on which also a part of the blister might rest.

[0012] The boxes are moved in a direction A (fig. 2A), through a conventional conveyor 4 (for example a belt conveyor) with their base wall 3A resting on an upper face 4B of said conveyor. Preferably the blisters 1 are housed upside-down in the box 3 when it is placed on the conveyor 4, i.e., as shown in the Figures, with the aluminium foil portion 1A of the blister which is the closest to the base wall 3A of the box 3 not in contact with the portion 2A of paper manual 2 resting on said base wall 3A.

[0013] Preferably, the blister 1 is of a conventional type, comprising a plastic body provided with a plurality of separate seats, each for a pill, and a aluminium portion or foil 1A closing said seats and completely covering the top planar side of the body of the blister.

[0014] The device according to the invention comprises:

- non contact means 6 capable of generating a signal corresponding to a measurement of the distance between an emitting face 6A of said contact means and the aluminium foiled portion 1 A, of the blister closer to said non contact means,
- and means 9 for determining on the basis of said signal whether or not said closed packaging box comprises said paper manual.

[0015] Preferably, the non contact means 6 are located below the conveyor 4 and are fixed to conventional support means 7.

[0016] Preferably, the non contact means 6, are located as closed as possible to the lower face 4A (Fig. 1) of the conveyor 4, for example at a distance D1 (Fig. 1) between 1 and 5 mm and at a distance D2 between 3 and 10 mm from its upper side 4B of the conveyor. Usually the thickness of the base wall 3A of the pharmaceutical box 3 is about between 0,5 and 2 mm and the thicknesses of the paper manual and each of blisters 1, are respectively, between 0,5 and 3 mm and about 3 to 10 mm.

[0017] The sensor 6 is therefore preferably located at the following distances:

- D3, of about 3.5 to 12 mm from the inner face 3B of the base wall 3A of the box 3,
- D4 of about 4 to 15 mm from the upper face of the paper manual and,
- D5 of about 7 to 25 mm from the aluminium foiled portion 1 A of the blister 1 which is the closest to the sensor 6.

[0018] Preferably, the non contact means 6 capable of generating a signal corresponding to the measurement of the distance between said emitting face 6A of the non contact means and said conductive portion, are able to generate such a signal with an error for said distance

which is at least less than +/- 0.5 mm, and preferably less than +/- 0.2 mm with the aluminium foiled portion 1A of the blister at a distance between 7 and 25 mm from said non contact means.

[0019] Preferably, the non contact means 6, comprise an eddy current sensor preferably acting with alternative magnetic filed.

[0020] Preferably, the eddy current sensor is of the type described in W02009/025105, comprising a receiver separated from the exciter and placed on a side of a vertical portion of the core of said exciter and with the core of said receiver inclined with respect to said vertical portion.

[0021] Preferably, as shown in figures 2A and 2B the eddy current sensor 8 is installed beneath the conveyor 4 in such a way that its emitting axis is not overlapping the box centre line C. As the paper manual is usually provided in the box only in correspondence of one side S of the same, the sensor is located in correspondence of this side S, and its sensing axis Z1 is parallel to the centre axis C1 of the box but is offset from it.

[0022] Preferably, the sensor is placed in such a way that during the sensing phase, the receiver face 10 is provided inside the base wall 3A and the corresponding portion of the paper manual 2 of the box and the exciter face 11 is provided outside said base wall, or the receiver face 10 is provided underneath a wider portion of said base wall than the corresponding portion of said wall, underneath which the exciter side 11 is positioned (see figure 2B).

[0023] The non contact means 6 may work with the box travelling on the conveyor 4 on a constant speed or also when the box is temporarily stopped over said non contact means.

[0024] Preferably, the non contact means have a sensing face size less than 1000 mm^2 and preferably of about 22 X 28 mm

[0025] Preferably, the eddy current sensor is such that its distance resolution (i.e. the output voltage difference for the same target placed at two different distances) is about 0,2V for a first distance of 19 mm and a second distance of 20 mm with an aluminium foiled blister of abouth 38 X 95 mm and about 1.0V for a distance from 9 to 10 mm with the same blister (with an output voltage error within 0.02V) Preferably the eddy current sensor is such that its distance resolution is more than 0,5V from 9 to 10 mm distance with an aluminium foiled blister having a surface between 3000 mm^2 and 4000 mm^2 and with an output voltage error within 0.02V The invention has been hitherto described with reference to pharmaceutical boxes containing blisters and paper manuals relating to the drugs contained in such blisters. The invention may be used in connection with any conventional box able to house:

- at least one packaging element comprising at least a conductive portion,
- and at least one spacer element for at least a part of said packaging element from with respect to an inner surface of a base wall of said box.

[0026] According to the invention the non contact means 6 are connected to a conventional control unit 9 (for a example a computer based unit) for determining on the basis of the signal generated by said non contact means whether or not the box comprises a spacer inside, and in particular a paper manual 2.

[0027] The invention also relates to a method for checking if a closed packaging box 3, houses therein: at least one packaging element 1 comprising at least a conductive portion 1A, and at least one spacer element 2 for space at least a part 1 B of said packaging element 1 from an inner face 3B of a base wall 3 of said box; the method according to the invention being characterised by comprising:

- a step in which in correspondence of said spacer element 2, the distance D5 between said conductive portion 1 A and an emitting surface 6A of a sensor used for said measurement is measured,
- and a further step wherein it is determined on the basis of said measurement whether or not said packaging box houses said spacer. As the correct measurement (distance D5 (fig. 1)) is known and fixed for a given box (containing given packaging elements and a given spacer) any measurement different from the fixed one will be deemed to be not correct and related to a box which does not comprise a desired spacer.

Claims

1. A device for checking if a box (3), housing therein at least one packaging element (1) comprising at least a conductive portion (1A), also houses at least one spacer element (2) able to space at least a part (1 B) of said packaging element (1) from an inner face (3B) of a base wall (3A) of said box (3), **characterised by** comprising:

   non contact means (6) capable of generating a signal relating to the distance (D5) between said non contact means and said at least conductive portion (1A),
   and means (9) for determining on the basis of said signal whether or not said box houses said spacer element (2).

2. Device according to claim 1, **characterised in that** said non contact means (6) are able to generate the signal relating to the distance (D5) between said non contact means and said conductive portion (1A), with an error for said distance which is less than +/- 0.5 mm.

3. Device according to claim 1, **characterised in that** the packaging element is a blister 1, comprising a conductive foiled or coated portion (1A), and **in that** the spacer element is a paper manual 2 wrapped around a part 1 B of said blister (1).

4. Device according to claim 1, **characterised in that** said non contact means (6) comprise an eddy current sensor

5. Device according to claim 4, **characterised in that** the eddy current sensor is of the type having a resolution distance of more than 0.5V for a distance between 9 and 10 mm of the conductive portion (1A), with a packaging element having a conductive portion thereof having a surface between 3000 mm^2 and 4000mm^2 and with an output voltage error within 0.02V.

6. Device according to claim 4 **characterised in that** the eddy current sensor (6) is placed in such a way that during the sensing phase, a receiver side (10) is inside the base wall (3A) and the corresponding portion of the spacer (2) of the box and an exciter face (11) is outside said base wall, or the receiver face (10) is provided underneath a wider portion of said base wall than the corresponding portion of said base wall, underneath which the exciter face (11) is positioned.

7. System for checking a plurality of boxes (3), each housing inside at least one packaging element (1) comprising at least a conductive portion (1A), and also housings at least a spacer element (2) for spacing at least a part (1 B) of said packaging element (1) from an inner face (3B) of a base wall (3A) of said boxes (3), **characterised in that** it comprises:

   a device according to one or more of the preceding claims 1-6,
   conveyor means (4) for moving said boxes,
   non contact means (6) capable of generating for each box a signal relating to the distance (D5) between said non contact means and said conductive portion (1A).

8. System according to claim 7 **characterised in that** the non contact means (6) are provided underneath the conveyor means (4).

9. Method for checking a box (3), housing therein at least one packaging element (1) comprising at least a conductive portion (1 A), and also housing at least a spacer element (2) for spacing at least a part (1 B) of said packaging element (1) from an inner face (3B) of a base wall (3A) of a box (3), **characterised in that** it comprises a step in which the distance (D5) between said non contact means (6) and said conductive portion (1A) is measured ,
   and a further step wherein it is determined on the basis of said measured distance whether or not said box houses said spacer element (2).

10. Method according to claim 9 **characterised in that** the box (3) is positioned over a conveyor 4 with the at least conductive portions (1A) of the packaging elements (1) provided parallel to an upper planar surface (4B) of said conveyor and with said at least a portion (1A) which is the closest to the base wall (3A) of the box 3 not in contact with the portion (2A) of the paper manual resting on the base wall (3A).

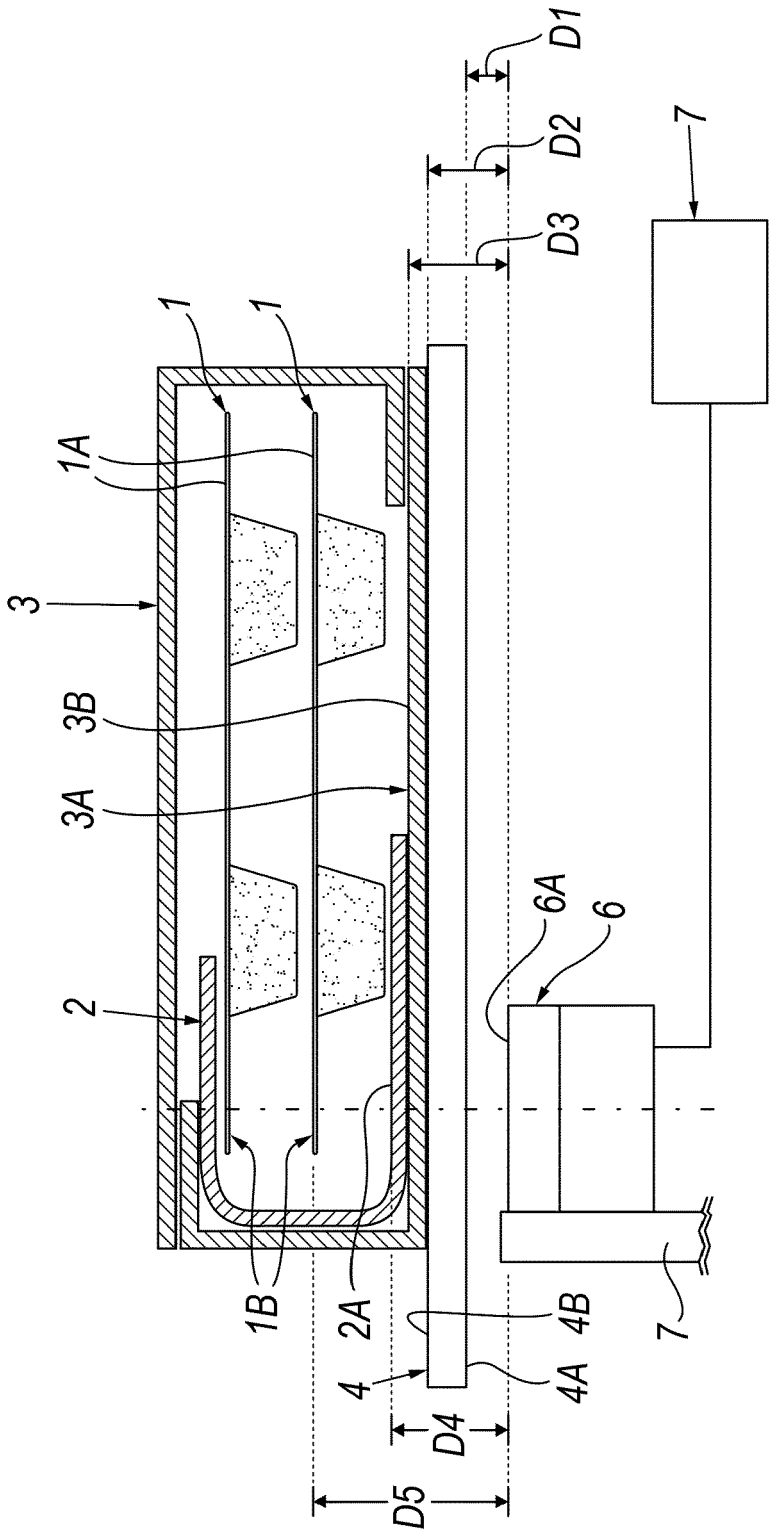

Fig. 1

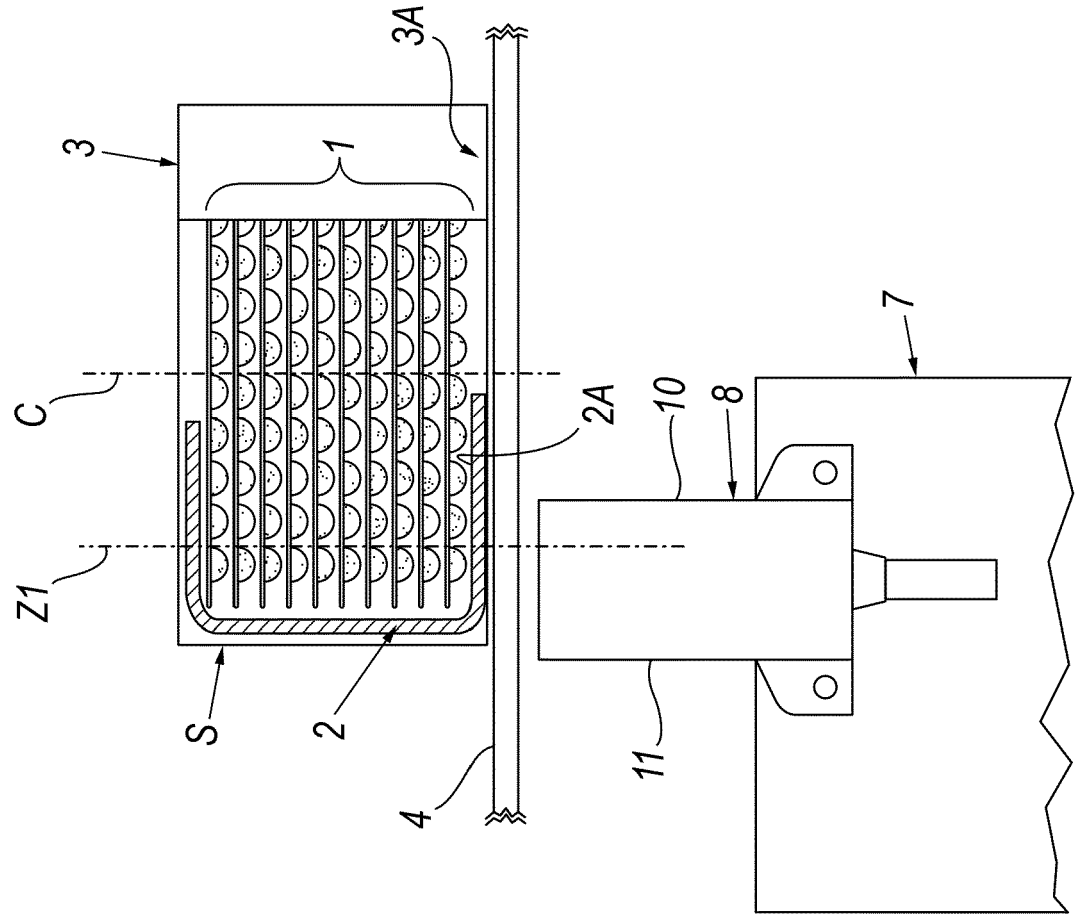

Fig. 2B

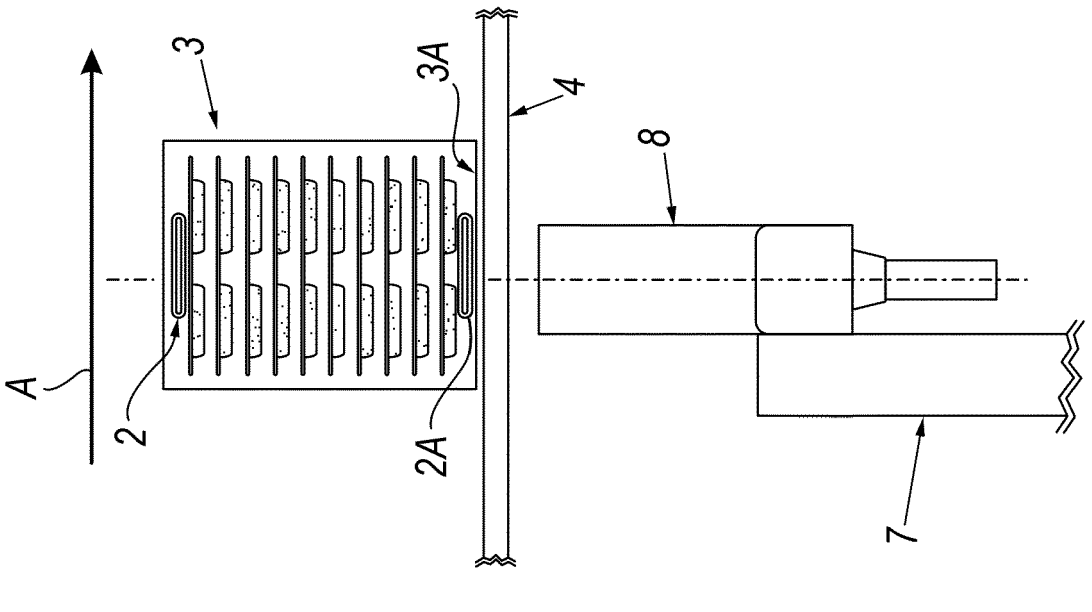

Fig. 2A

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 7851

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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B65B
G01N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 June 2012	Philippon, Daniel

CATEGORY OF CITED DOCUMENTS

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REFERENCES CITED IN THE DESCRIPTION

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