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(54) **METHOD OF VERIFYING AND IMPROVING THE POSITIONING OF ROD-LIKE ARTICLES IN TRAYS OR INTERMEDIATE STORES AND A DEVICE ENABLING THE VERIFICATION OF CORRECT POSITIONING OF ROD-LIKE ARTICLES AND ALIGNING OF THEIR FRONT FACE IN TRAYS OR INTERMEDIATE STORES**

VERFAHREN ZUR ÜBERPRÜFUNG UND VERBESSERUNG DER POSITIONIERUNG VON STANGENARTIGEN ARTIKELN AUF ABLAGEN ODER ZWISCHENLAGERN UND VORRICHTUNG ZUR ÜBERPRÜFUNG DER KORREKTEN POSITIONIERUNG VON STANGENARTIGEN ARTIKELN SOWIE AUSRICHTUNG IHRER VORDERSEITE AUF ABLAGEN ODER ZWISCHENLAGERN

PROCÉDÉ DESTINÉ À VÉRIFIER ET À AMÉLIORER LE POSITIONNEMENT D'ARTICLES SIMILAIRES À DES TIGES SUR DES PLATEAUX OU DES MAGASINS INTERMÉDIAIRES ET DISPOSITIF PERMETTANT DE VÉRIFIER LE POSITIONNEMENT CORRECT D'ARTICLES SIMILAIRES À DES TIGES ET L'ALIGNEMENT DE LEUR FACE AVANT SUR DES PLATEAUX OU DES MAGASINS INTERMÉDIAIRES

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Description

[0001] The object of the invention is a method of verifying the correct positioning of rod-like articles with simultaneous correction of their arrangement in trays or intermediate stores used in the tobacco industry, and a device enabling the verification of correct positioning of rod-like articles in trays or intermediate stores and aligning of their front face.

[0002] Trays intended both for conveying cigarettes or cigars from the manufacturing machine to the packing machine and for the transport and/or temporary storage of filters in the manufacturing process are frequently used in the tobacco industry. Conventional trays have the shape of a cuboid without the front wall and the top wall. Furthermore, multi-segment trays which are divided inside into segments by means of vertical inner walls are known. Such tray was disclosed in the description of the German utility model No. DE 1.915.446. In the production lines of the tobacco industry, intermediate stores intended for unloading conventional or segment trays are used. One of such stores was presented in the description of the European patent No. EP 2.079.327 A1 belonging to the holder of the present invention, where the rod-like articles are conveyed from the tray to multiple segments separated from each other by vertical division walls, which are then emptied independently on each other through a throat formed at the base of the store, where both the intermediate store and the base with the throat independently of each other make reciprocating motions along the receiving conveyor so as to enable meeting of successive segments with the throat, and the sequence of emptying the segments is backward to the direction of receiving the articles on the conveyor. Said articles are fed onto the conveyor via a chute, which is permanently connected to the throat, where the throat of the surface area corresponding to the surface area of the horizontal section of a segment of the intermediate store receives articles each time from one, successive segment, and complete emptying of a segment is monitored by means of a sensor. In the production practice, it happens that the tray filling unit may jam, the consequence being that not all segments are correctly filled with rod-like articles. Similarly, when emptying the intermediate store, the arrangement of rod-like articles may be distorted, which would result in their suspension, and in effect a disturbance of the emptying process. In such cases, the production process has to be interrupted as quickly as possible in order to remove the irregularities, and for their detection serve sensors situated in different places of the tray or the store. In the publication of the USA invention No. US 2008/0181754 A1, an apparatus for unloading trays, in particular multi-segment trays, was presented in which sensors situated above the bottom of reversed tray in the number corresponding to the number of segments were used, where, in the bottom of the tray, holes in the axis of operation of said sensors are made through which the emptying status of the tray is checked. In the

publication of another USA invention No. US 2008/0213072 A1, an apparatus for unloading multi-segment trays was presented in which sensors situated axially to rod-like articles in the number corresponding to the number of segments were used, where the sensors are situated in one row in the bottom part of the tray, after its reversal. On the other hand, in the publication of the international invention No. WO 2008/110390 A1, an unloading store for emptying trays of rod-like articles was shown in which, alternatively, apart from the sensors situated as in said publication No. US 2008/0181754 A1, also the use of sensors situated axially to rod-like articles in two rows - lower and higher, in the central part of the tray was presented, where to each segment of the tray two sensors are assigned. The USA patent No. US 7.609.393 B2 shows a method and an apparatus for controlling the correctness of arrangement of rod-like articles in a conventional tray by means of a scanner checking the upper layer of the articles or the lateral layer of the articles as well as controlling, by means of a laser, the tray after its emptying. From the German patent No. DE 1.066.118 an apparatus for filling conventional trays with cigarettes is known, where the inside of the one-compartment tray is, before filling, divided into cavities by self-aligning partition walls, situated vertically for the filling time. After complete filling, the tray is put away onto the conveyor for full trays, where, in the course of putting away the tray, the partition walls are removed from inside of it, and the cigarettes accumulated in vertical cavities are joined. In order to prevent axial shift of cigarettes in the course of removal of partition walls, the trays are conveyed to the receiving station by means of a pusher making reciprocating motions on which a vertical wall of the area corresponding to the front surface of the tray, provided with vertical grooves corresponding to partition walls of the apparatus is mounted. Document DE1877941U discloses a tray filler which is designed to fill a conventional one chamber tray with cigarettes. Consecutive layers of cigarettes are placed in a tray while the tray is lowered. When the tray is partially filled, an aligning swinging plate realizes the first stage of aligning cigarettes over a number of layers. After the tray has been filled completely, final alignment of all cigarettes in the tray is realized by means of a rectangular plate pushed by a pneumatic cylinder. Shallow grooves are arranged on the plate in order to avoid suction effect during backward movement of the plate. In the state of the art, no solution enabling simultaneous control of filling and improving the positioning of rod-like articles in trays or intermediate stores used in production lines of the tobacco industry is known.

[0003] According to the invention, a method of verifying and improving the positioning of rod-like articles in trays or intermediate stores used in the production lines of the tobacco industry, where a verification of positioning of the articles is effected by means of sensors, and an improvement of positioning of the articles is effected by aligning the plane of end faces of the articles, consists

in verifying and improving the positioning of rod-like articles simultaneously by means of one aligning device provided with sensors, where the sensors detect the correct filling and/or arrangement of rod-like articles, and the aligning device levels the plane of end faces of the articles correctly filling the inside of the tray or the intermediate store. Such method ensures that the trays being filled have verified and corrected arrangement of articles, owing to which unloading of the tray will not be disturbed by improper arrangement of front faces of the articles. In case of detection of incorrect filling and/or arrangement of rod-like articles by sensors, the aligning device is switched off and the operation of the unit, on which the aligning device is mounted, is interrupted. In this way the flow of articles to the tray, which will be later rejected from production, is interrupted, owing to which the number of rod-like articles of full value rejected from production is limited because each improperly filled tray is removed from the production. It is of particular importance in a modern production line where, on average, the trays contain 4000 articles each, and the production output amounts to more than 16000 articles per minute, so that the loading or emptying cycle of one tray lasts about 15 seconds. The above information applies equally to intermediate stores.

[0004] The substance of the invention constitutes also the structure of a device enabling the verification of correct positioning of rod-like articles and aligning of their end face in trays or intermediate stores used in production lines of the tobacco industry, where the verification is effected by means of sensors controlling the filling level of a tray or an intermediate store, and aligning consists in aligning the plane of end faces of rod-like articles by their axial shift. According to the invention, an aligning device is made of a plate coming in contact with end faces of rod-like articles, provided with at least one sensor serving for the control of filling of a tray or an intermediate store. Said plate may consist of multiple pushers whose number corresponds to the number of segments of a multi-segment tray or an intermediate store, and a gap between the pushers corresponds to the thickness of a partition between the segments, with at least one sensor being situated on each pusher. The sensors may constitute an optical element operating in the range of visible radiation or invisible radiation, or may constitute an ultrasonic element. When conventional trays or intermediate stores with one compartment are used, movable gates eliminating the gap are placed between the pushers. An advantage of the device according to the invention constitutes the possibility to check the correct filling of trays or intermediate stores with rod-like articles, where simultaneously the front face of an entire layer of articles is aligned to one plane, and, if irregularities in arrangement or filling are detected, filling or emptying may be interrupted and removed from the production line.

[0005] The object of the invention was shown in an embodiment in a drawing in which fig. 1 shows in perspective view an apparatus in the form of an aligning

device in a position for handling multi-segment trays or intermediate stores, fig. 2 - a perspective view of the apparatus of fig. 1 in the course of loading a multi-segment tray, fig. 3 - a perspective view of the apparatus of fig. 1 in the course of loading or emptying a multi-segment intermediate store, fig. 4 - a perspective view of the apparatus of fig. 1 in the course of emptying a multi-segment tray, fig. 5 - a perspective view of an apparatus in the form of an aligning device in a position for handling conventional trays or intermediate stores with one compartment, fig. 6 - a perspective view of the apparatus of fig. 5 in the course of loading a conventional tray, fig. 7 - a perspective view of the apparatus of fig. 5 in the course of loading or emptying an intermediate store with one compartment, fig. 8 - a perspective view of the apparatus of fig. 5 in the course of emptying a conventional tray, fig. 9 - an incorrectly filled multi-segment tray in vertical section using a verifying device provided with optical sensors, and fig. 10 - an incorrectly filled multi-segment tray in the top view using a verifying device provided with ultrasonic sensors.

[0006] The apparatus constitutes an aligning device 1, having a front plate 2 coming in contact with end faces of rod-like articles 3. The plate 2 is divided into multiple pushers 4 whose number corresponds to the number of segments 5 of a multi-segment tray 6 or an intermediate store 7, where a gap 8 between pushers 4 corresponds to the thickness of a partition 9 between segments 5. Each of the pushers 4 of the plate 2 has at the top a slant wall 10 which facilitates aligning of axially protruding rod-like articles 3 in the course of vertical movement in the tray 6 or the intermediate store 7 being loaded or emptied. In gaps 8 between pushers 4 of the plate 2, movable gates 11 connected by a common slat 12 shifted horizontally by an actuator 13 are situated, with the gates 11 having the shape corresponding to a vertical section of the plate 2. If conventional trays 6' or intermediate stores 7' with one compartment are used, the slat 12 is shifted forwards in order that the gates 11 fill the gap 8 between the pushers 4, making the plate 2 a monolith. In the plate 2, sensors 14 of the axis perpendicular to the aligning plane are situated, where preferably each pusher 4 is provided with at least one sensor 14. The sensors 14 may constitute an optical element, operating in the range of visible or invisible radiation which detects the absence of rod-like articles 3 in a tray 6 or 6' or in an intermediate store 7 or 7', respectively, whereas for locating improperly arranged rod-like articles 3 ultrasonic sensors 14 are used. It is obvious that each pusher 4 may be simultaneously provided with both kinds of sensors 14.

[0007] The operation of an apparatus in the form of the aligning device 1 provided with sensors 14 and situated in a production line unit of the tobacco industry is as follows: the device 1 is situated horizontally, preferably in the upper part of the unit loading the articles 3 to trays 6 or 6' or to stores 7 or 7', respectively, and may be also situated in the bottom part of the unit emptying the trays 6 or 6' or the stores 7 or 7', respectively. In the course of

movement of rod-like articles 3, the aligning device 1, making constantly and uniformly a reciprocating motion in a plane parallel to the axis of the articles 3, provisionally aligns by means of the slant wall 10, and then by means of the plate 2, the front face of successive layers of rod-like articles 3. Simultaneously, the sensors 14 check the correctness of filling or arrangement of the articles 3, and in case of detection of improper positioning or filling, the operation of the unit is stopped.

Claims

1. A method of verifying and improving the positioning of rod-like articles (**3**) in trays (**6, 6'**) or intermediate stores (**7, 7'**) used in production lines of the tobacco industry, where the verification of positioning of the articles (**3**) is effected by means of sensors (**14**), and the improvement of positioning of the articles (**3**) is effected by aligning the plane of end faces of the articles (**3**), **characterised in that** the verification and the improvement of positioning of rod-like articles (**3**) is effected simultaneously by means of one aligning device (**1**) provided with sensors (**14**).
2. A method as in claim 1 **characterized in that** the sensors (**14**) detect the correct filling and/or arrangement of rod-like articles (**3**), and the aligning device (**1**) aligns the plane of end faces of the articles (**3**) correctly filling the inside of a tray (**6, 6'**) or an intermediate store (**7, 7'**).
3. A method as in claim 1 or 2 **characterized in that**, in case of detection of incorrect filling and/or arrangement of rod-like articles (**3**) by the sensors (**14**), the aligning device (**1**) is switched off and the operation of the unit, on which the aligning device (**1**) is mounted, is interrupted.
4. An apparatus enabling the verification of correct positioning of rod-like articles (**3**) and aligning of their front face in trays (**6, 6'**) or intermediate stores (**7, 7'**) used in production lines of the tobacco industry, wherein the verification is effected by means of sensors (**14**) controlling the level of filling of a tray (**6, 6'**) or an intermediate store (**7, 7'**), and aligning consists in aligning the plane of end faces of rod-like articles (**3**) by their axial shift, **characterised in that** the aligning device (**1**) constitutes a plate (**2**) coming in contact with end faces of rod-like articles (**3**), provided with at least one sensor (**14**) arranged for the control of filling of a tray (**6, 6'**) or an intermediate store (**7, 7'**), respectively.
5. An apparatus as in claim 4 **characterized in that** the plate (**2**) consists of multiple pushers (**4**) whose number corresponds to the number of segments (**5**) of a multi-segment tray (**6**) or an intermediate store

(**7**), and a gap (**8**) between the pushers (**4**) corresponds to the thickness of a partition (**9**) between the segments (**5**).

6. An apparatus as in claim 4 or 5 **characterized in that** on each pusher (**4**) at least one sensor (**14**) is situated.
7. An apparatus as in claim 6 **characterized in that** the sensors (**14**) constitute an optical element operating in the range of visible radiation.
8. An apparatus as in claim 6 **characterized in that** the sensors (**14**) constitute an optical element operating in the range of invisible radiation.
9. An apparatus as in claim 6 **characterized in that** the sensors (**14**) constitute an ultrasonic element.
10. An apparatus as in claim 5 **characterized in that** between the pushers (**4**) movable gates (**11**) eliminating the gap (**8**) in case of using conventional trays (**6'**) or intermediate stores (**7'**) with one compartment are situated.

Patentansprüche

1. Das Verfahren zur Überprüfung und Verbesserung der Positionierung von stangenartigen Artikeln (**3**) auf Ablagen (**6, 6'**) oder Zwischenlagern (**7, 7'**), die auf der Produktionslinien der Tabakindustrie verwendet werden, wobei die Überprüfung der Positionierung der Elemente (**3**) mit Hilfe der Fühler (**14**) und Verbesserung der Positionierung der Elemente (**3**) durch Ausgleichung der Ebene der Enden der Elemente (**3**) erfolgt, **dadurch gekennzeichnet, dass** die Überprüfung und Verbesserung der Positionierung von stangenartigen Artikeln (**3**) gleichzeitig mit Hilfe von einem mit Fühlern (**14**) ausgestatten Richtgerät (**1**) erfolgt.
2. Das Verfahren gemäß dem Anspruch 1 **dadurch gekennzeichnet, dass** die Fühler (**14**) eine richtige Abfüllung und/oder Anordnung von stangenartigen Artikeln (**3**) ermitteln und das Richtgerät (**1**) das Ebene der Enden von Artikeln (**3**) einfluchtet, die das Innere der Ablage (**6, 6'**) oder Zwischenlagern (**7, 7'**) richtig befüllen.
3. Das Verfahren gemäß dem Anspruch 1 oder 2 **dadurch gekennzeichnet, dass** im Falle von der Feststellung einer fehlerhaften Befüllung und/oder Anordnung von stangenartigen Artikeln (**3**) durch die Fühler (**14**) das Richtgerät (**1**) ausgeschaltet wird und das Funktionieren des Gerätes, auf dem das Richtgerät (**1**) installiert ist, unterbrochen wird.

4. Das Gerät, das die Überprüfung einer richtigen Positionierung von stangenartigen Artikeln (3) und das Fluchten ihrer Vorderfläche in den auf der Produktionslinien der Tabakindustrie verwendeten Ablagen (6, 6') oder Zwischenlagern (7, 7') ermöglicht, wobei die Überprüfung mit Hilfe von den einen Grad der Befüllung von Ablagen oder Zwischenlagern kontrollierenden Fühlern (14) erfolgt und das Fluchten in der Ausgleicheung der Ebene der Enden der stangenartigen Elemente durch ihre axiale Verschiebung besteht, **dadurch gekennzeichnet, dass** das Richtgerät (1) aus einer Platte (2) besteht, die in einen Kontakt mit den Enden der stangenartigen Artikeln (3) kommt, die mit mindestens einem Fühler (14), zur Kontrollierung der Befüllung der Ablage (6, 6') oder Zwischenlager (7, 7') ausgestattet ist.
5. Das Gerät gemäß dem Anspruch 4 **dadurch gekennzeichnet, dass** die Platte (2) aus mehreren Stößeln (4) besteht, deren Stückzahl der Stückzahl von Segmenten (5) der Vielsegment-Ablage (6) oder des Zwischenlagers (7), und der Abstand (8) zwischen Stößeln (4) der Dicke der Teilung (9) zwischen Segmenten (5) entspricht.
6. Das Gerät gemäß dem Anspruch 4 oder 5 **dadurch gekennzeichnet, dass** sich auf jedem Stößel (4) mindestens ein Fühler (14) befindet.
7. Das Gerät gemäß dem Anspruch 6 **dadurch gekennzeichnet, dass** die Fühler (14) ein optisches Element darstellen, das im Bereich der sichtbaren Strahlung wirkt.
8. Das Gerät gemäß dem Anspruch 6 **dadurch gekennzeichnet, dass** die Fühler (14) ein optisches Element darstellen, das im Bereich der unsichtbaren Strahlung wirkt.
9. Das Gerät gemäß dem Anspruch 6 **dadurch gekennzeichnet, dass** die Fühler (14) ein Ultraschall-Element darstellen.
10. Das Gerät gemäß dem Anspruch 5 **dadurch gekennzeichnet, dass** sich zwischen den Stößeln (4) verstellbare Schieber (11) befinden, die den Abstand (8) im Falle von Anwendung der konventionellen Ablagen (6') oder Zwischenlagern (7') mit einer Kammer beseitigen.

Revendications

1. Le procédé destiné à vérifier et à améliorer le positionnement des articles similaires à des tiges (3) dans des cassettes (6, 6') ou dans des magasins intermédiaires (7, 7') utilisés dans les lignes de fabrication de l'industrie de tabac, en outre la vérifica-

tion du positionnement des articles (3) s'effectue à l'aide de détecteurs (14), et l'amélioration du positionnement des articles (3) se fait par l'alignement de la face des extrémités des articles (3), qui se caractérisent par le fait que la vérification et l'amélioration du positionnement des articles (3) similaires à des tiges s'effectuent en même temps à l'aide d'un seul dispositif (1) d'alignement doté de détecteurs (14).

2. Procédé selon la revendication 1, le procédé qui se **caractérise par le fait que** les détecteurs (14) détectent un remplissage et/ou un positionnement correct des articles (3) similaires à des tiges, et le dispositif d'alignement (1) aligne la face des extrémités des articles (3) remplissant correctement l'intérieur de la cassette (6, 6') ou du magasin intermédiaire (7, 7').
3. Procédé Selon la revendication 1 ou 2, le procédé qui se **caractérise par le fait que** dans le cas où les détecteurs détecteraient un remplissage et/ou un positionnement incorrect des articles (3) similaires à des tiges (14), le dispositif d'alignement (1) sera déclenché ainsi que le bloc dans lequel le dispositif d'alignement (1) est monté, est interrompu.
4. Le dispositif permettant de vérifier le positionnement correct des articles (3) similaires à des tiges et l'alignement de leur face avant dans des cassettes (6, 6') ou dans des magasins intermédiaires (7, 7') utilisés dans les lignes de fabrication de l'industrie de tabac, en outre la vérification s'effectue à l'aide des détecteurs (14) contrôlant un degré du remplissage de la cassette (6, 6') ou du magasin intermédiaire (7, 7'), et l'alignement consiste à aligner la face des extrémités des articles (3) similaires à des tiges par leur décalage axial qui se caractérise par le fait que le dispositif d'alignement (1) constitue un plateau (2) entrant en contact avec les extrémités des articles similaires à des tiges (3), doté d'un détecteur (14) au moins servant à contrôler un remplissage de la cassette (6, 6') ou du magasin intermédiaire (7, 7'), respectivement.
5. Appareil selon la revendication 4, le dispositif qui se **caractérise par le fait que** le plateau (2) se compose de nombreux poussoirs (4) dont le nombre correspond à celui des segments (5) de la cassette à nombreux segments (6) ou à celui des segments du magasin intermédiaire (7), et un écart (8) entre les poussoirs (4) correspond à une épaisseur de la paroi (9) entre les segments (5).
6. Appareil selon la revendication 4 ou 5, le dispositif qui se **caractérise par le fait que** chaque poussoir (4) est doté d'un détecteur au moins (14) est situé.

7. Appareil selon la revendication 6, le dispositif qui se **caractérise par le fait que** les détecteurs (14) constituent un élément optique fonctionnant dans le spectre de la radiation visible. 5
8. Appareil selon la revendication 6, le dispositif qui se **caractérise par le fait que** les détecteurs (14) constituent un élément optique fonctionnant dans le spectre de la radiation invisible. 10
9. Appareil selon la revendication 6, le dispositif qui se **caractérise par le fait que** les détecteurs (14) constituent un élément ultrasonore. 15
10. Appareil selon la revendication 5, le dispositif qui se **caractérise par le fait qu'**entre les poussoirs (4) sont installées les vannes (11) liquidant un écart (8) en cas de l'usage de cassettes traditionnelles (6') ou de magasins intermédiaires (7') avec un compartiment sont situées. 20

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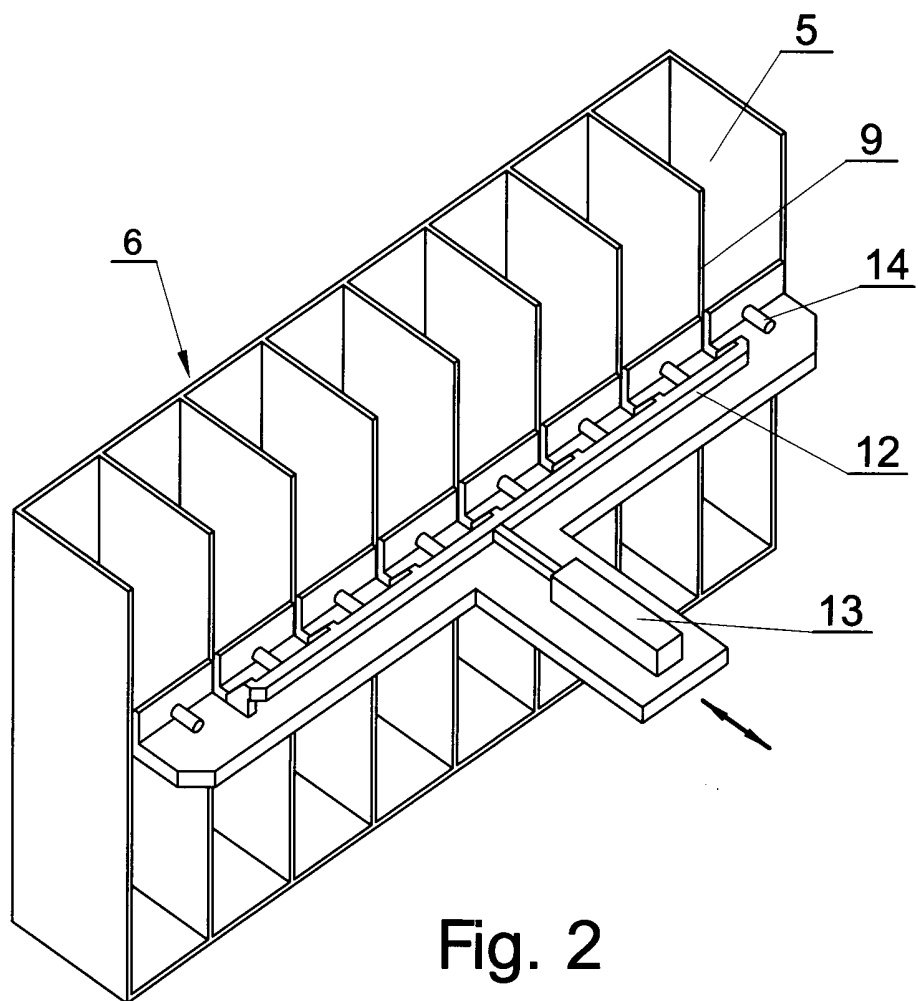
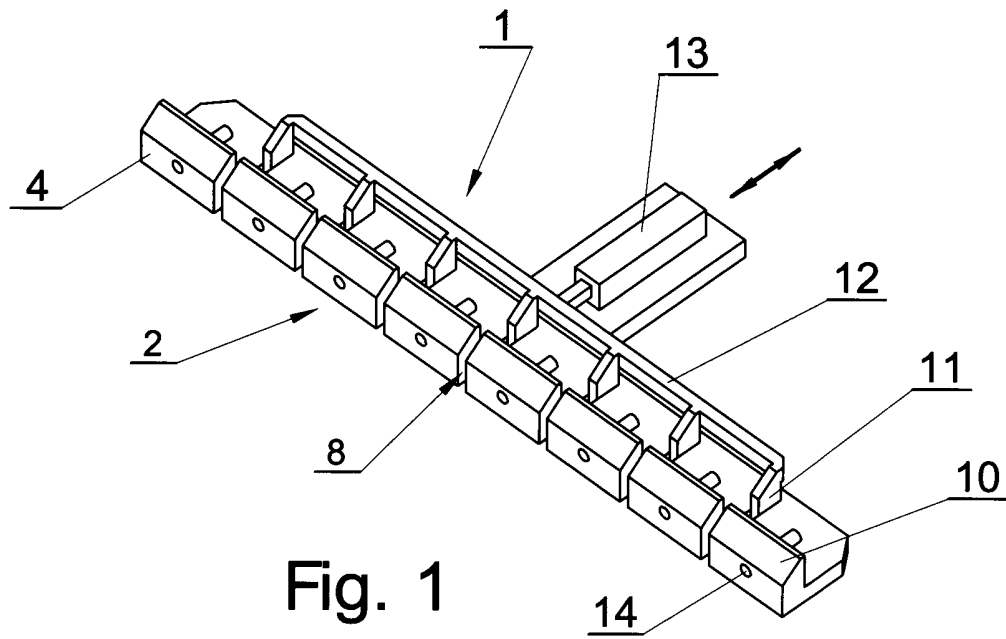
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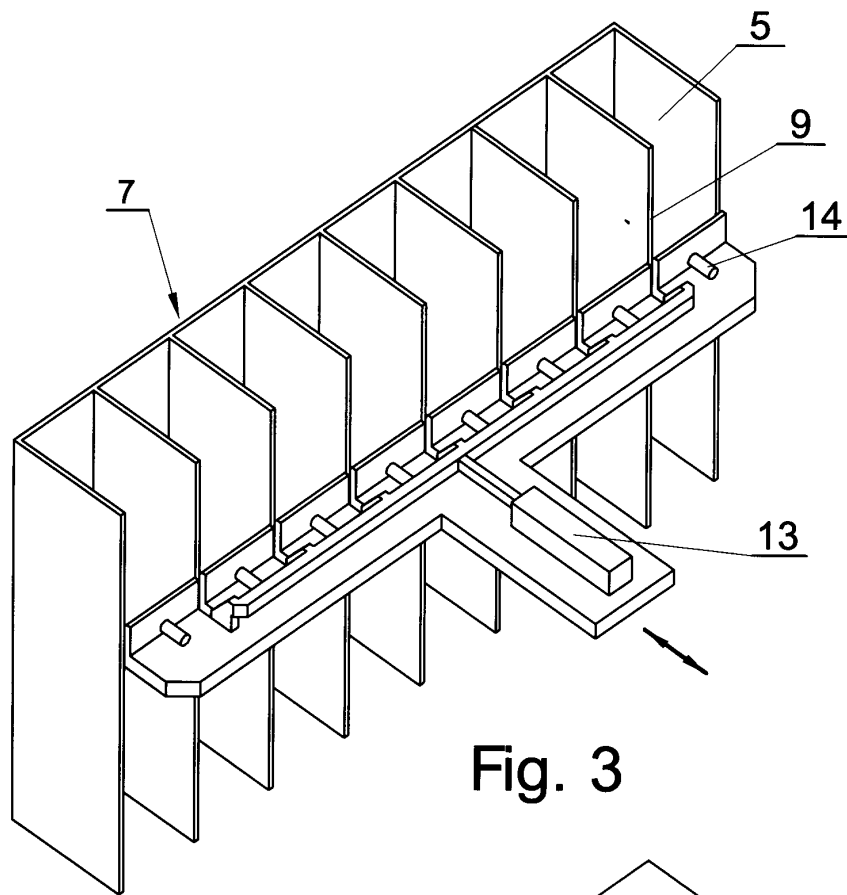


Fig. 3

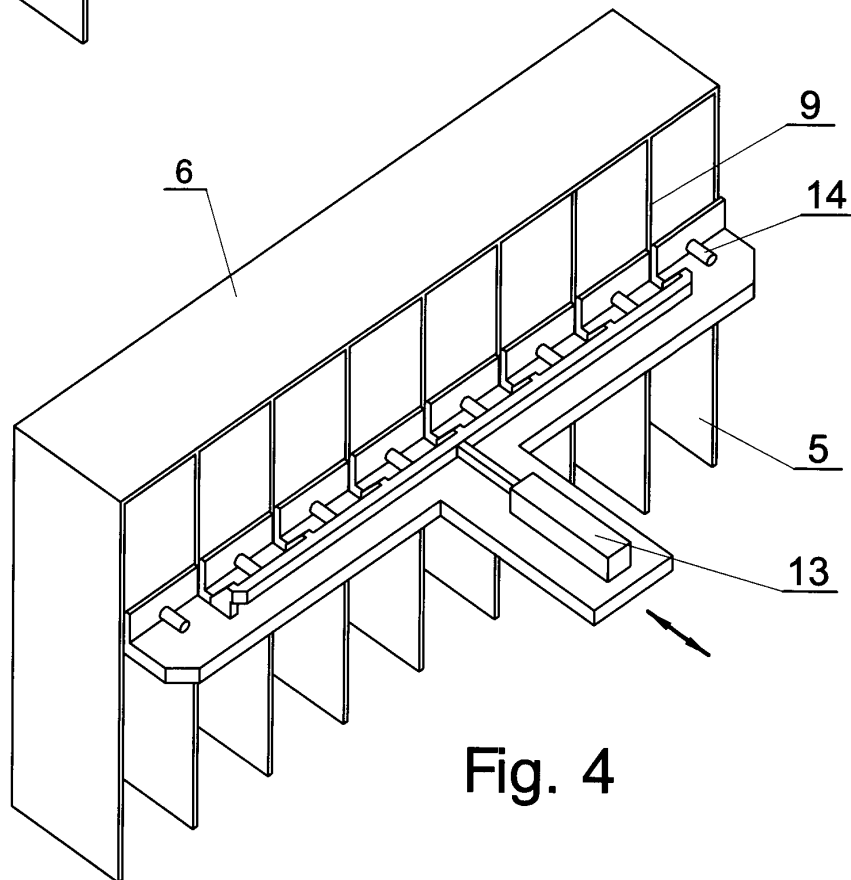


Fig. 4

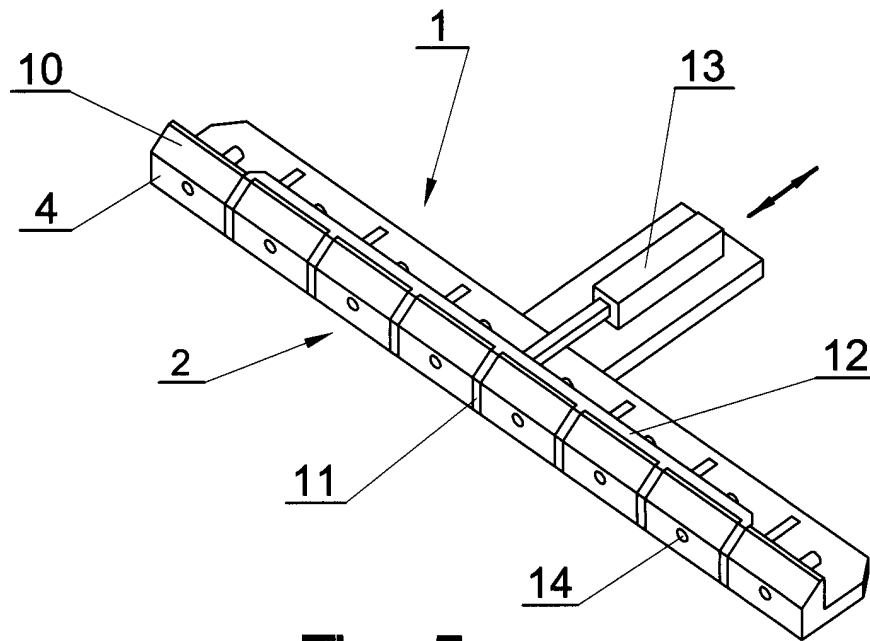


Fig. 5

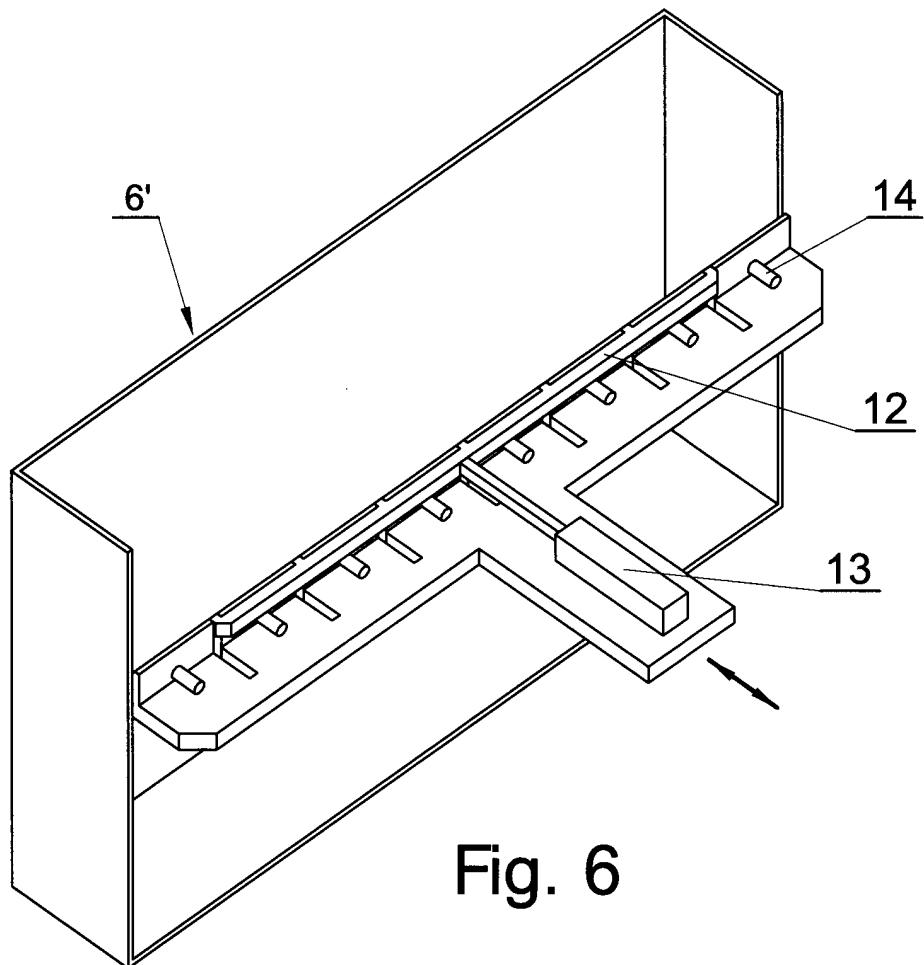
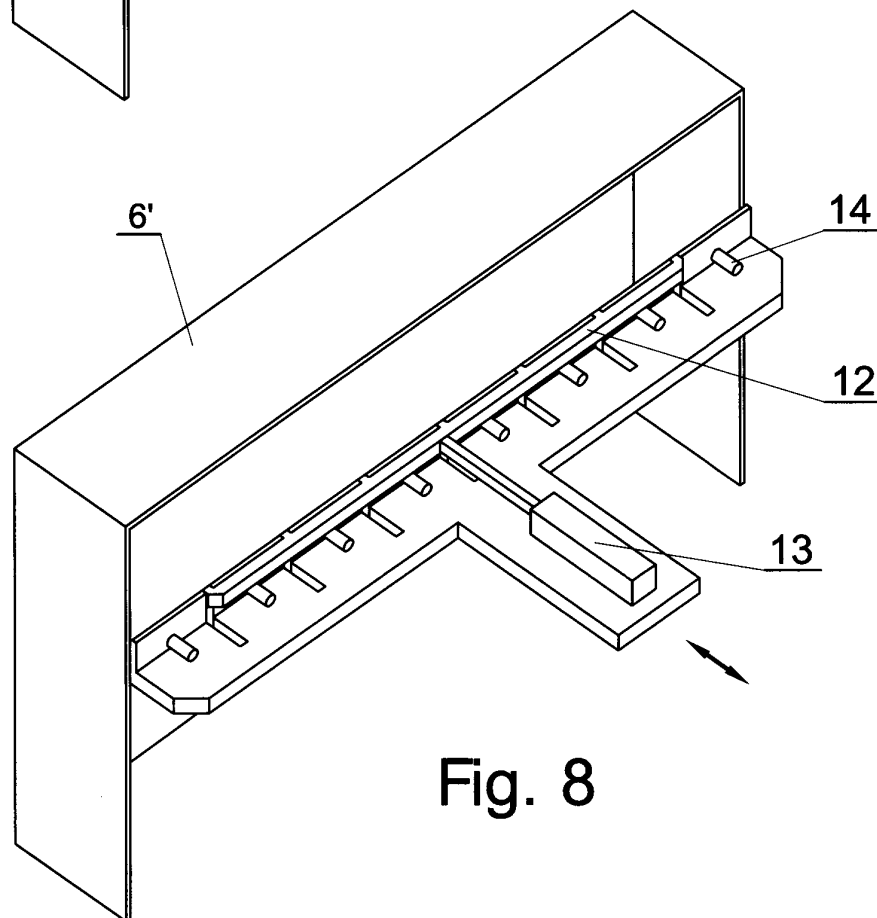
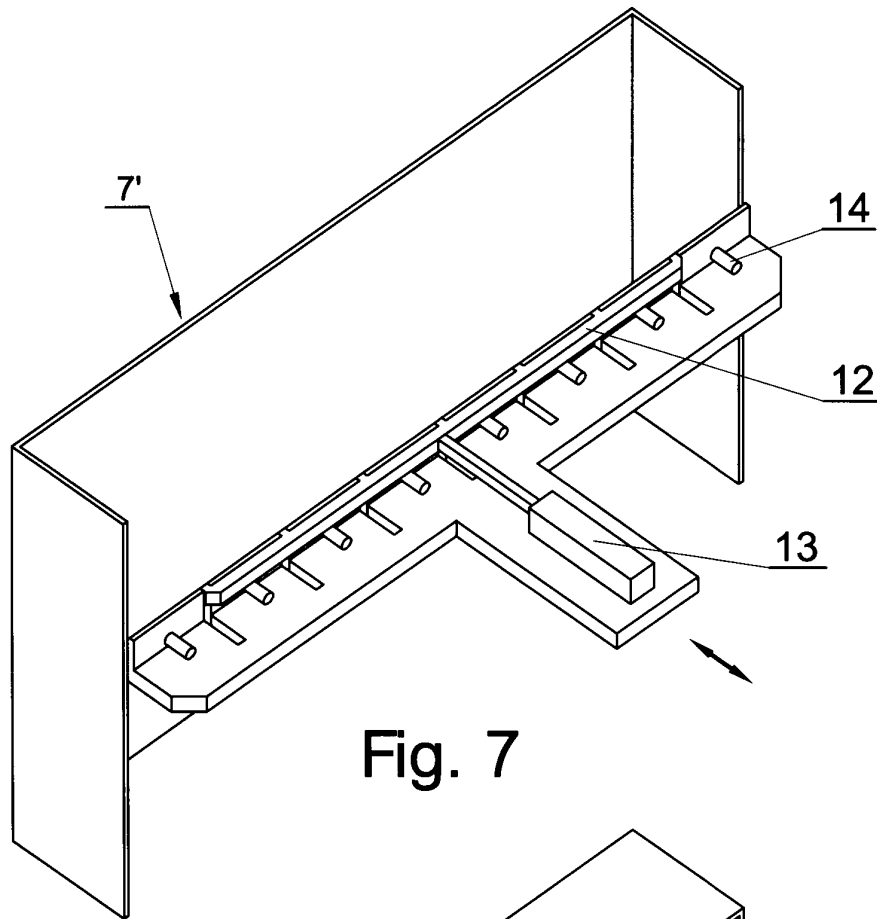


Fig. 6



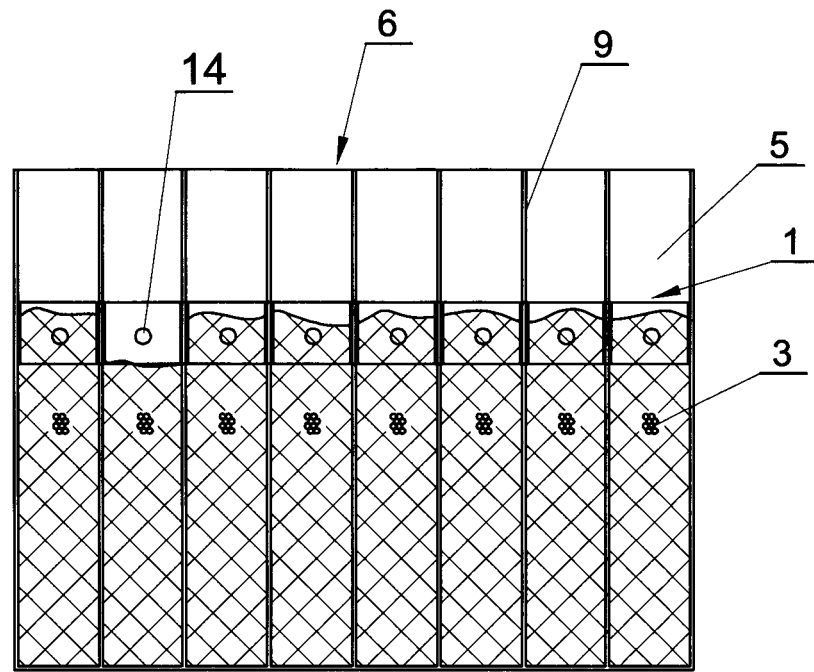


Fig. 9

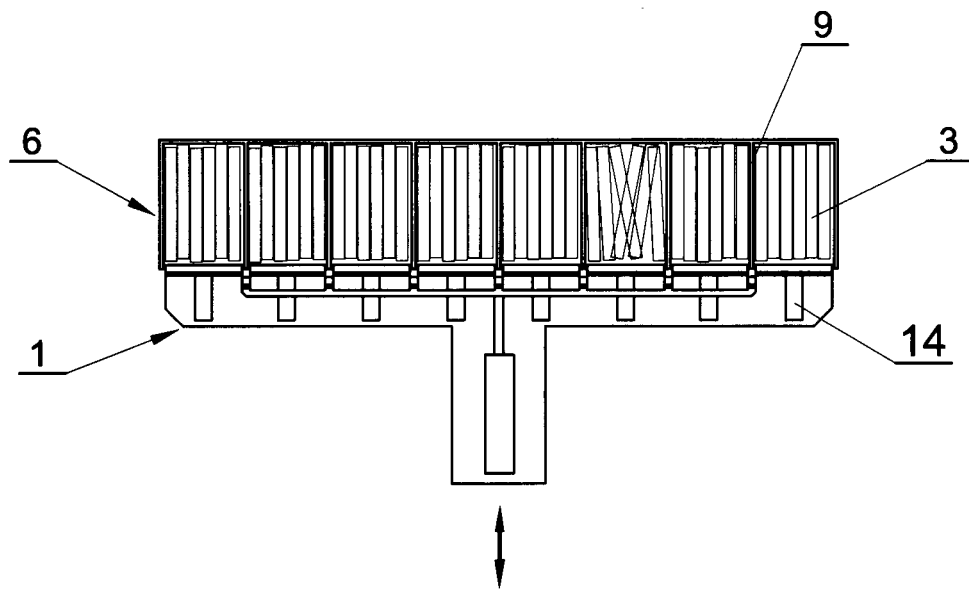


Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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