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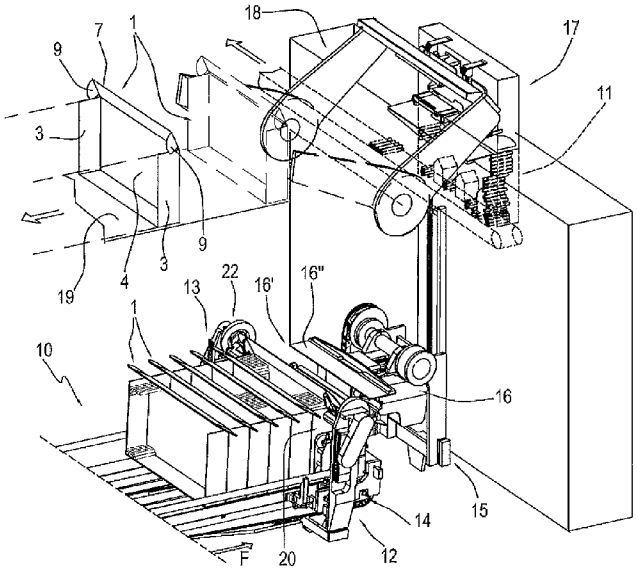
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(54) Title: MACHINE AND METHOD FOR EMPTYING TRAYS CONTAINING CYLINDRICAL ARTICLES IN THE TOBACCO INDUSTRY

FIG.2



(57) Abstract: A machine (10) for emptying trays (1) containing cylindrical articles (6) in the tobacco processing industry comprises a conveyor (14) for transporting the trays (1), conveyor devices (12, 16, 18) for gripping a first tray (1), conveying it towards an emptying station (17) inside a hopper (1 1) and removing it from the emptying station (17); a conveyor (19) receives the trays (1) and moves them away; each tray (1) comprises a box-shaped body (5) having an emptying mouth (7') and a wall (7) for opening and closing the mouth (7') and hinged to the box-shaped body (5); a rotation and locking device (22) for the walls (7) is located on the conveyor devices (12, 16, 18) and is capable of causing the walls (7) to be rotated and then locked so as to fully open the mouth (7') of the trays (1) before emptying into the hopper (11).

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DESCRIPTION

MACHINE AND METHOD FOR EMPTYING TRAYS CONTAINING CYLINDRICAL ARTICLES IN THE TOBACCO INDUSTRY

Technical field

This invention relates to a machine and a method for emptying trays containing cylindrical articles in the tobacco industry.

More specifically, the invention relates to a machine and a method for emptying trays containing cylindrical articles in the tobacco industry, consisting in particular of filter sticks or cigarettes.

In this specification, reference is made by way of example, and for simplicity of description, to the handling of filter sticks, referred to as "filters" for short, without thereby limiting the scope of the invention.

Background art

In the tobacco processing industry, machines are known which comprise a gripper head for sequentially picking up trays which are full of cylindrical smokers' articles, and a movement device for moving the gripper head from an infeed station, where the gripper head picks up a tray, to an emptying station, where the smokers' articles are emptied out of the tray and delivered to a handling unit consisting, for example, of a filter-tipped cigarette production line or a cigarette packing line. The movement device is designed to rotate the gripper head in such a way as to tip the tray to empty out its contents.

There are machines of the type briefly described above which are capable of handling trays made of substantially rigid material (for example, plastic) and machines capable of handling trays made of semirigid material (for example, cardboard or the like).

In the description which follows, reference is made to machines of the second type, that is, those capable of handling trays made of cardboard

or similar materials.

The trays handled by these machines usually have a body defined by a base wall, two vertical side walls and a central rear wall joining the two side walls to each other. These walls define a chamber for housing the smokers' articles and equipped with an emptying mouth, where there is a further side wall defining a containment wall which prevents the smokers' articles from falling out while the tray is being transferred.

This further side wall is designed to be positioned to open and close the emptying mouth and, more precisely, when the tray is fed into the machine in order to be emptied, since the wall is hinged along a longitudinal edge of the central rear wall, the further side wall is in the tilted position where the emptying mouth is partly open.

Opening these further side walls and keeping them in the open position while the respective trays are being emptied are aspects which often lead to blockages in the machines which handle the trays. Moreover, since the trays are usually emptied and then re-filled for a certain number of times before being scrapped on account of wear and tear, the machine blockages are all the more frequent when the trays have been used several times since the tray walls are more likely to have been damaged or to have lost their shape and stability, becoming weak around the hinge line which joins them to the body of the trays.

Disclosure of the invention

This invention has for an aim to provide a machine and a method for emptying trays and which allow overcoming the above mentioned disadvantages and which can handle without problems also trays that are worn to a certain extent on account of repeated use.

According to the invention a tray emptying machine and method are provided as described in the appended claims.

Brief description of the drawings

The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment and in which:

- Figure 1 is a perspective view of a smokers' articles tray which can be handled by the machine of this invention;
- Figure 2 schematically illustrates the machine of this invention in an overall perspective view;
- Figures 3 and 4 schematically illustrate two operating sequences performed, in use, by the machine of Figure 2;
- Figures 5-11 are perspective views of certain details of the machine of Figure 2 in different successive operating conditions;
- Figure 12 is a schematic perspective view of certain details of the machine of Figure 2; and
- Figures 13-16 are scaled-up views of certain details of the machine of Figure 2 in four different and successive operating conditions.

Detailed description of preferred embodiments of the invention

With reference to Figure 1, the numeral 1 denotes in its entirety a tray made of cardboard or similar material.

The tray 1 has a base wall 2, two vertical side walls 3 and a vertical rear wall 4 which joins the two side walls 3 to each other.

The walls 2, 3 and 4 define a box-shaped body 5 and form a chamber for accumulating and withdrawing the smokers' articles 6 consisting, for example, of "filters".

An upper portion of the central wall 4 is integral with a further wall 7 for opening and closing an emptying mouth 7' through which the trays 1 in transit are emptied.

The wall 7 is hinged to the box-shaped body 5 along a respective hinge line 7' and is therefore designed to be positioned tiltably in the position for opening the emptying mouth 7' when the trays 1 have to be opened

The wall 7 is defined by a planar volume 8, whose thickness is reduced compared to its length and breadth and which extends between the two vertical side walls 3, and by two wings 9 respectively connected to the wall 7, perpendicular to the wall 7 and designed to be inserted into the box-shaped body 5 when the wall 7 is in the position where it closes the mouth 7' (Figure 1).

The numeral 10 in Figure 2 denotes in its entirety a machine for emptying trays 1 containing smokers' articles 6 (in particular, filters) into a hopper 11.

The machine 10 comprises a gripper head 12 for gripping the trays 1 one at a time, and a movement device (not illustrated) for moving the gripper head 12 between an infeed station 13 to which the trays 1 are carried by conveyor means comprising a belt conveyor 14 extending along a substantially horizontal direction F (Figures 2-11) and where the gripper head 12 grips the full trays 1 one after the other, and an exchange station 15 where the gripper head 12 transfers the trays 1 it is holding to a tipper head 16.

The exchange station 15 is located at substantially the same level as the infeed station 13.

The trays 1 carried by the belt conveyor 14 are positioned with their respective walls 7 facing forward in their direction of feed and opened following an action by an operator in that direction.

In use, the tipper head 16 is moved by a movement device not illustrated to take the trays 1 it is carrying one by one from the exchange station 15 to an emptying station 17.

At the station 17, the trays 1 are overturned and the smokers' articles 6 contained therein are allowed to drop into the hopper 11 (Figure 3) and from there forwarded to user stations not illustrated.

The machine 10 also comprises a removal head 18 which, under the action of a movement device not illustrated, grips the trays 1 just emptied

one by one at the emptying station 17 and carries them to conveyor means which move them away.

The moving-away means comprise a belt conveyor 19 extending along a substantially horizontal direction above the belt conveyor 14 and designed to move the empty trays 1 away from the machine 10 (Figure 4).

The tipper head 16 comprises a closing device 16', of essentially known type, equipped with a wall 16" movable horizontally both ways along the direction F to open or close the mouth at the top of the tray 1 carried by the tipper head 16 itself, as explained in more detail below.

At two portions of it intended to come into contact with respective side walls 3 of the trays 1, the gripper head 12 mounts respective locking means 20 by which it grips and retains a tray 1.

The locking means 20 which can be associated with each wall 3 of a tray 1 comprise (by way of example) at least one vacuum member or suction cup 21 (two in the example illustrated) which is connected to a suction source not illustrated and which is designed to come into abutment against a wall 3 of the tray 1 itself.

As will become clearer as this description continues, each time the gripper head 12 receives a tray 1, a rotation and locking device 22 is activated by which the wall 7 of the tray 1 is rotated and locked and which is associated with the gripper head 12 itself.

Described below is the operation of the machine 10, excluding for the moment the structure and mode of operation of the rotation and locking device 22 which will be described in more detail later on.

At each operating cycle of the machine 10, the belt conveyor 14 carries a tray 1 towards the infeed station 13 on its transporting surface along the direction F. This tray 1 is the first of a sequence of trays 1 positioned side by side on the belt conveyor 14.

An operator places the trays 1 one after the other on the belt conveyor 14 with the wall 7 open and facing towards the infeed station 13, that is to

say, facing forward in the direction of feed F of the trays 1 towards the infeed station 13 itself.

After reaching the infeed station 13, the trays 1 are gripped by their sides and held in position by the suction cups 21 of the locking means 20 mounted on the gripper head 12. The wall 7 of the tray 1 is then tilted and brought into contact with the rear face of the wall 4 of the selfsame tray 1 by the rotation and locking device 22, in a way that will be described below. The gripper head 12 then moves translationally up to the exchange station 15, carrying with it the tray 1 held by the suction cups 21.

During the course of this translational movement, the wall 7 of the tray 1 is held in position by the rotation and locking device 22. On reaching the exchange station 15, the movable wall 16" of the closing device 16' mounted on the tipper head 16 moves in the direction opposite to that of the direction F to cover the open mouth at the top of the tray 1. The suction cups 21 of the locking means 20 then move away from the tray 1, the tipper head 16 grips the tray 1, holding it in known manner not illustrated, while the belt conveyor 14 withdraws in the direction opposite to the direction F, moving the trays 1 on it away from the exchange station 15, and the gripper head 12 moves back to the infeed station 13. The tipper head 16 then carries the tray 1 towards the hopper 11 and overturns the tray 1 in known manner to pour into the hopper 11 the smokers' articles contained in the accumulation and emptying chamber of the tray 1 (Figure 3). The removal head 18 then receives the tray 1 just emptied, overturns it and carries it in known manner on the belt conveyor 19 which moves the empty trays 1 away from the machine 10.

During the operations just described, the tipper head 16 returns to the above mentioned lower position, at the exchange station 15, to receive another full tray 1 in the manner already described.

The rotation and locking device 22 comprises two identical rotation and locking apparatuses 23 mounted on the gripper head 12 next to and in the

proximity of the positions occupiable respectively by the upper portions of the two walls 3 of the tray 1 located at the infeed station 13. In other words, the rotation and locking device 22 comprises two rotation and locking apparatuses 23 mounted at positions adjacent to the trajectory followed by respective side walls 3 of the trays 1 carried by the gripper head 12.

The structure and operating mode of only one rotation and locking apparatus 23 is described below since the two apparatuses 23 are the same and work in the same way.

With reference to Figures 5-16 in particular, the rotation and locking apparatus 23 essentially comprises an upright 24 which is integral with the gripper head 12 and which mounts at the top of it a disc-shaped element 25 whose axis is horizontal and perpendicular to the direction F.

The disc-shaped element 25 (Figures 13-16) coaxially mounts a pin 26 extending towards the zone occupiable by a tray 1. Keyed to the free end of the pin 26 is a plate 28, which rigidly mounts in an eccentric position relative to the selfsame pin 26 one end of a tube 29 extending towards the zone occupiable by a tray 1. The other end of the tube 29 is rigidly connected to one end of a pusher element consisting of a folding sheet or bar 30 extending in a plane perpendicular to the axis of the pin 26 itself and positioned in the proximity of the position occupiable by a wall 3 of a tray 1 at the gripper head 12. Slidable inside the tube 29 is a pin 31 movable both ways along a direction F1 along its axis parallel to the axis of the pin 26 under the action of actuating means not illustrated. More generally speaking, as will become clearer as this description continues, the pin 31 constitutes a presser element and is movable towards and away from a rear wall 4 of the trays 1 carried by the gripper head 12 in order to lock the open planar volumes 8 of the trays 1 themselves against the wall 4.

In use, with reference to Figures 5-16 in particular, just after each tray 1

reaches the infeed station 13 and the locking means 20 are activated as described above to capture the tray 1 by means of the suction cups 21, the rotation and locking apparatuses 23, in the proximity of both walls 3 of the tray 1, are positioned with their respective folding bars 30 oriented horizontally and directed parallel to the direction F towards the zone from which the trays 1 are coming (Figures 5, 13).

The trays 1 carried by the belt conveyor 14, as mentioned earlier, are positioned with the respective open walls 7 facing forward in their direction of feed, and the wings 9 are normally slightly open and laterally on the outside of the planar volume 8 connected thereto. At this stage, the folding bars 30 are positioned under the planar volume 8, in the space between the wings 9 (Figure 13).

The locking device 22 is then actuated and the pins 26 are rotated by 180° under the action of the actuating means 27 in a direction such that the folding bars 30 mounted thereon are first brought into contact with the surface of the wall 8 inside the tray 1 (in Figure 14, this contact is about to take place) and produce a gradual rotation of the wall 7 (Figures 15 and 16) such as to bring it into contact with the surface of the wall 4 outside the tray 1 (Figures 6, 12). In the last part of the 180° rotation just described, the folding bars 30, after moving the planar volume 8 of the wall 7 against the wall 4 of the tray 1, fold the wings 9 against the walls 3 and move to the horizontal position in abutment against the wings 9 themselves, alongside the tray 1 (Figures 6, 12).

At this point, the locking means constituted by the pins 31 are extracted from the respective tubes 29 by the respective actuating means (Figure 12), and move into contact with the planar volume 8 of the wall 7 positioned against the wall 4 of the tray 1.

The gripper head 12 then moves towards the exchange station 15, while the pins 31 continue to keep the planar volume 8 of the wall 7 in abutment against the wall 4 of the tray 1 (Figures 7, 8). The movable wall 16" of the

closing device 16', as mentioned above, moves and covers the open mouth at the top of the tray 1. The pins 31 withdraw into the respective tubes 29, and the suction cups 21 move away from the walls 3 of the tray 1 carried by the gripper head 12 (Figure 9). The tipper head 16 then grips the tray 1 in essentially known manner not illustrated and the gripper head 12 moves back to the infeed station 13, while the belt conveyor 14 starts moving the trays 1 on it away from the exchange station 15 for a short stretch (Figure 10). While the tipper head 13 carries the tray 1 towards the hopper 11 to then overturn it in such a way as to pour the smokers' articles 6 into the selfsame hopper 11, the pins 26, under the action of the actuating means 27, are rotated by 180° in the direction opposite to that considered above and the locking device 22 then returns to the condition it had at the start of the operating cycle described, before a tray 1 came within its range of action (Figure 11). Once tipping has been completed, the tipper head 13 returns to the exchange station 15 in the position for receiving another tray 1 from the gripper head 12 in the manner described above. The removal head 18 grips the tray 1 just emptied at the emptying station 17 and carries it towards the belt conveyor 19 in order to move it away. Lastly, the belt conveyor 14 starts again so as to move the trays 1 on it towards the exchange station 15 and takes one tray 1 towards the gripper head 12 to repeat the cycle described above.

To complete this description, it should be noted that there are available on the market low-cost machines of the type described above and which work at low operating speeds, where the trays delivered by a feed conveyor belt are carried to an emptying station and from there to a belt conveyor for moving them away, by means of one or only two conveyor heads. In that case, the rotation and locking device of the wall 7 must in any case operate on the trays positioned on the tray/trays upstream of the emptying station.

CLAIMS

1. A machine for emptying trays containing cylindrical articles in the tobacco processing industry, consisting, for example, of filter sticks or cigarettes, comprising first conveyor means (14) for successively transporting the trays (1) which house the articles (6), second conveyor means (12, 16, 18) for gripping a first tray (1), conveying it towards an emptying station (17) inside a hopper (11) and removing it from the emptying station (17) of the articles (6), and third conveyor means (19) for receiving in succession the trays (1) from the second conveyor means (12, 16, 18) and moving them away; each tray (1) comprising a box-shaped body (5) having an emptying mouth (7') at which there is a wall (7) that is hinged along a hinge line (7") for opening and closing the emptying mouth (7'); characterized in that the conveyor (14) carries the trays (1) positioned in such a way that their respective walls (7) facing forward in their direction of feed and are opened following an action by an operator in that direction, the walls (7) being positioned tiltably in the position where the emptying mouth (7') is open, and also characterized in that it comprises rotation and locking means (22) by which the walls for opening and closing the mouth (7') are rotated and locked and which are located and operative along the trajectory followed by the selfsame trays (1) on the second conveyor means (12, 16, 18), between the first conveyor means (14) and the emptying station (17), in order to cause the opening and closing walls (7) to be rotated and then locked so as to perfectly open the mouth (7') for emptying the trays (1) before the articles (6) therein contained are emptied into the hopper (11).

2. The machine according to claim 1, characterized in that the second conveyor means comprise a gripper head (12) for gripping individual trays (1) from the first conveyor means (14); the rotation and locking means (22) for the walls (7) of the trays (1) being associated with the gripper head (12).

3. The machine according to claim 1 or 2, characterized in that the rotation and locking means (22) for the walls (7) comprise at least one rotation and locking device (23) equipped with a pushing element (30) which can be engaged in a portion of the walls (7) of the trays (1) to rotate them and push them against a rear wall (4) of the selfsame trays (1), and locking means (31) for holding the walls (7) in that position for a predetermined time.

4. The machine according to claim 3, characterized in that the rotation and locking means (22) for the walls (7) comprise two rotation and locking devices (23) located at positions adjacent to the trajectory followed by respective side walls (3) of the trays (1) carried by the second conveyor means (12, 16, 18).

5. The machine according to claim 4, characterized in that the rotation and locking means (22) for the walls (7) comprise two rotation and locking devices (23) located at positions adjacent to respective side walls (3) of the tray (1) carried by the gripper head (12).

6. The machine according to any one of claims 3 to 5, characterized in that each pushing element comprises a plate (30) having one end connected to a pin (26) which is rotatable in both directions through arcs of 180°.

7. The machine according to any one of claims 3 to 6, characterized in that the locking means comprise a presser element (31) movable in both directions towards and away from a rear wall (4) of the trays (1) carried by the second conveyor means (12, 16, 18).

8. The machine according to claim 7, characterized in that the locking means comprise a locking pin (31) which is movable axially in both directions along a direction perpendicular to the conveying direction of the first conveyor means (14).

9. A method for emptying trays, in particular trays containing cylindrical articles in the tobacco processing industry, consisting, for example, of

filter sticks or cigarettes, each tray (1) comprising a box-shaped body (5) having an emptying mouth (7') and equipped with a wall (7) for opening and closing the selfsame emptying mouth (7') and hinged along a hinge line (7"); the method comprising the following steps:

- successively transporting the trays (1), which house the articles (6), through the agency of first conveyor means (14);
- gripping a first tray (1) from the succession of trays (1), conveying it towards an emptying station (17) inside a hopper (11) and removing it from the emptying station (17) of the articles (6) through the agency of second conveyor means (12, 16, 18);
- successively receiving the trays (1) from the second conveyor means (12, 16, 18) and moving them away from the selfsame second conveyor means (12, 16, 18) through the agency of third conveyor means (19);

characterized in that it comprises the further steps of rotating the walls (7) of the trays (1) carried by the second conveyor means (12, 16, 18) and pushing them against a rear wall (4) of the selfsame trays (1) through the agency of rotation and locking means (22) so as to perfectly open the mouth (7') for emptying the trays (1) before the articles (6) therein contained are emptied into the hopper (11).

10. The method according to claim 9, characterized in that the further steps of rotating the walls (7) of the trays (1) and pushing them against a rear wall (4) of the selfsame trays (1) is carried out while the trays (1) are being conveyed to an emptying station (17) by a gripper head (12).

FIG.1

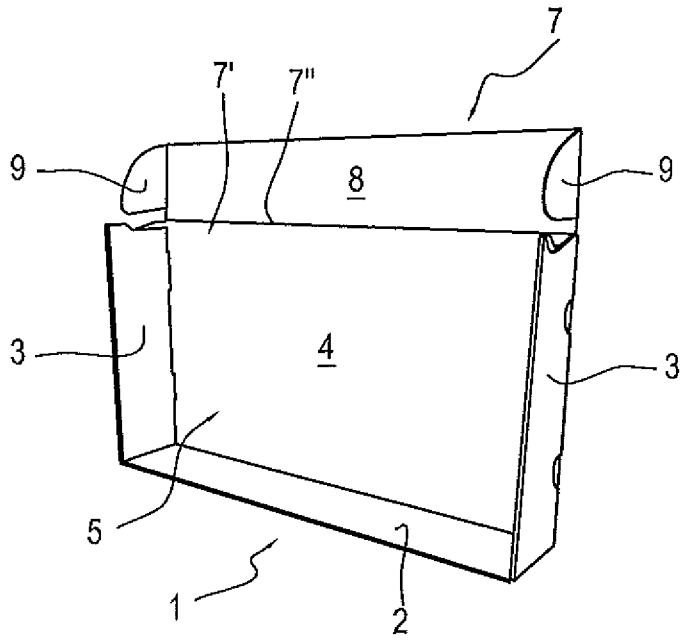


FIG.2

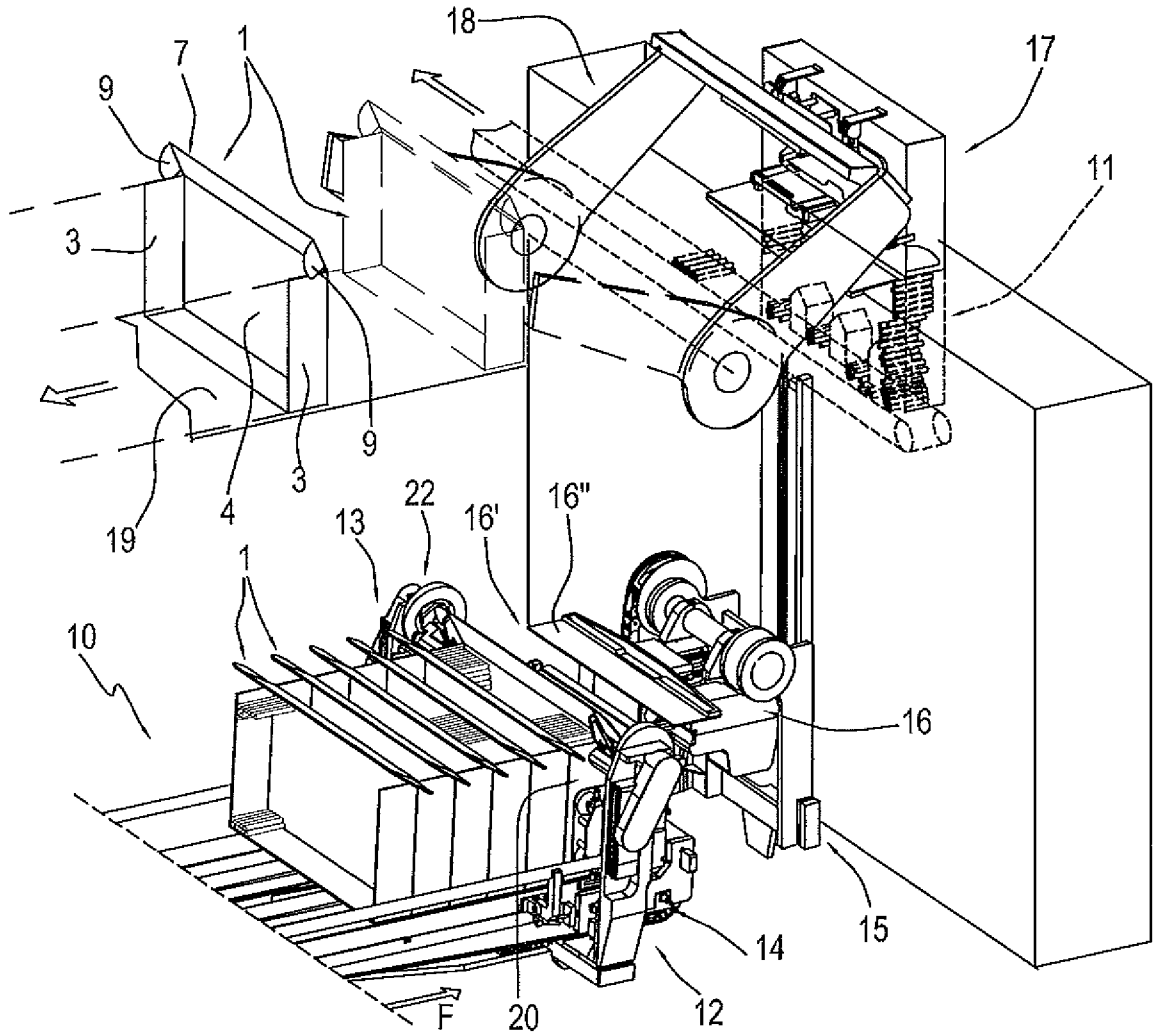


FIG.4

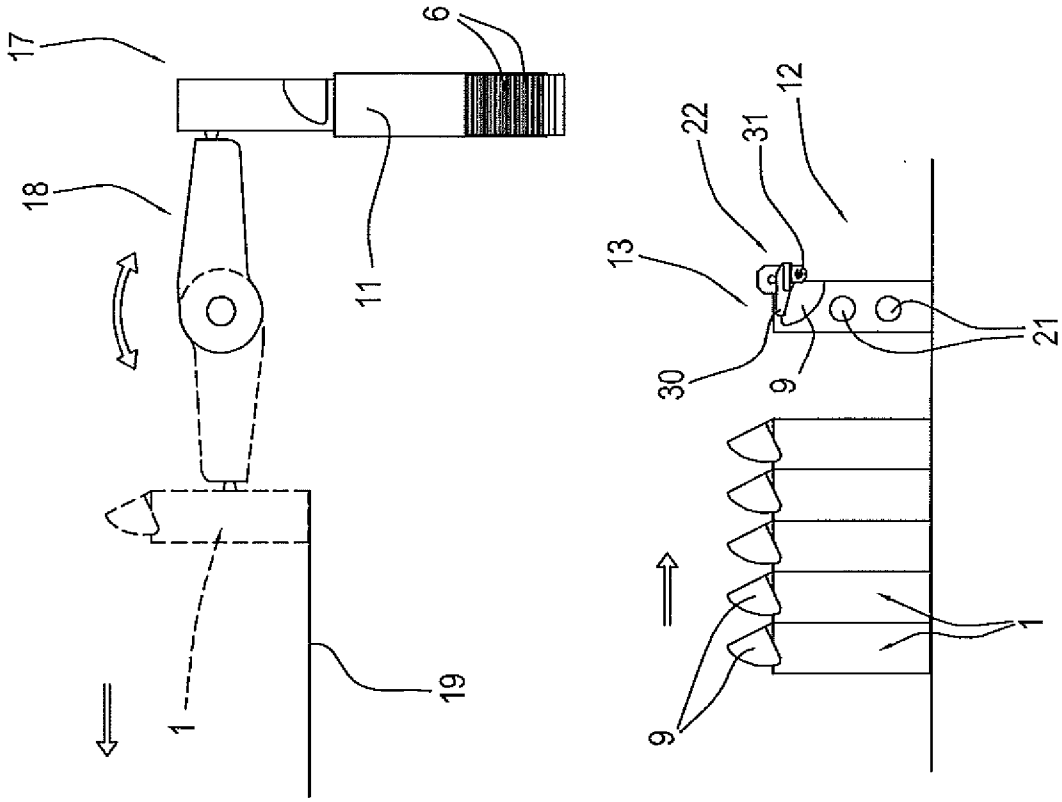

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FIG.3

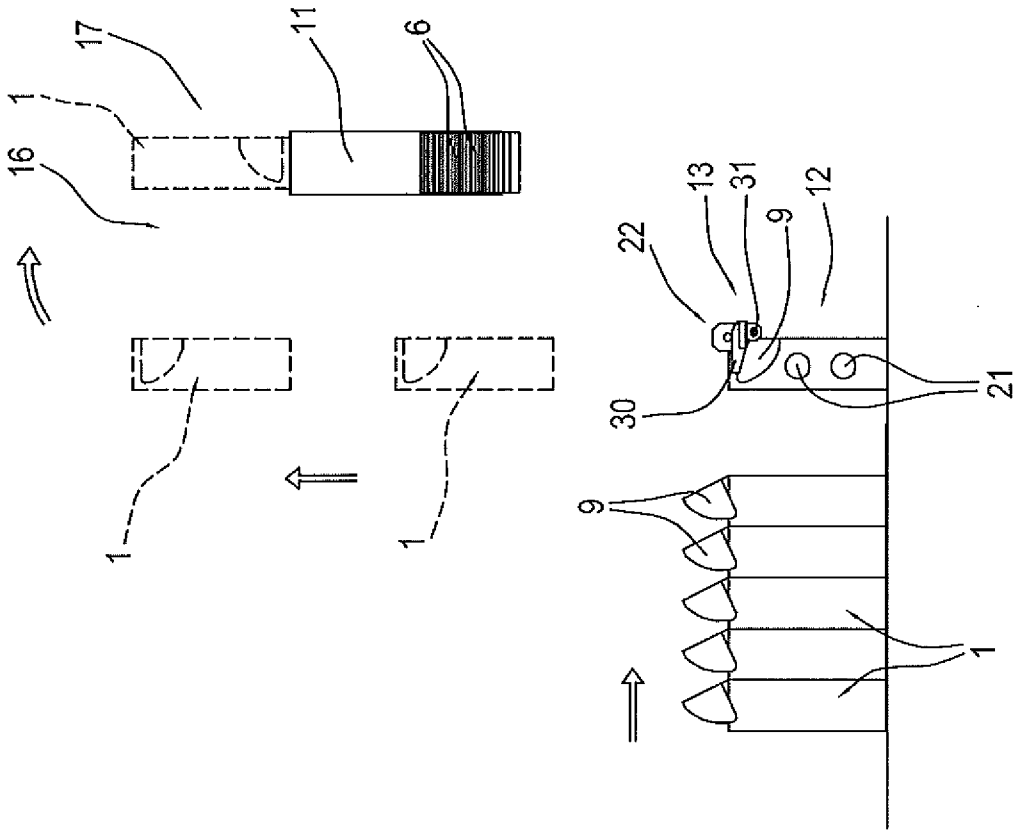

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FIG.5

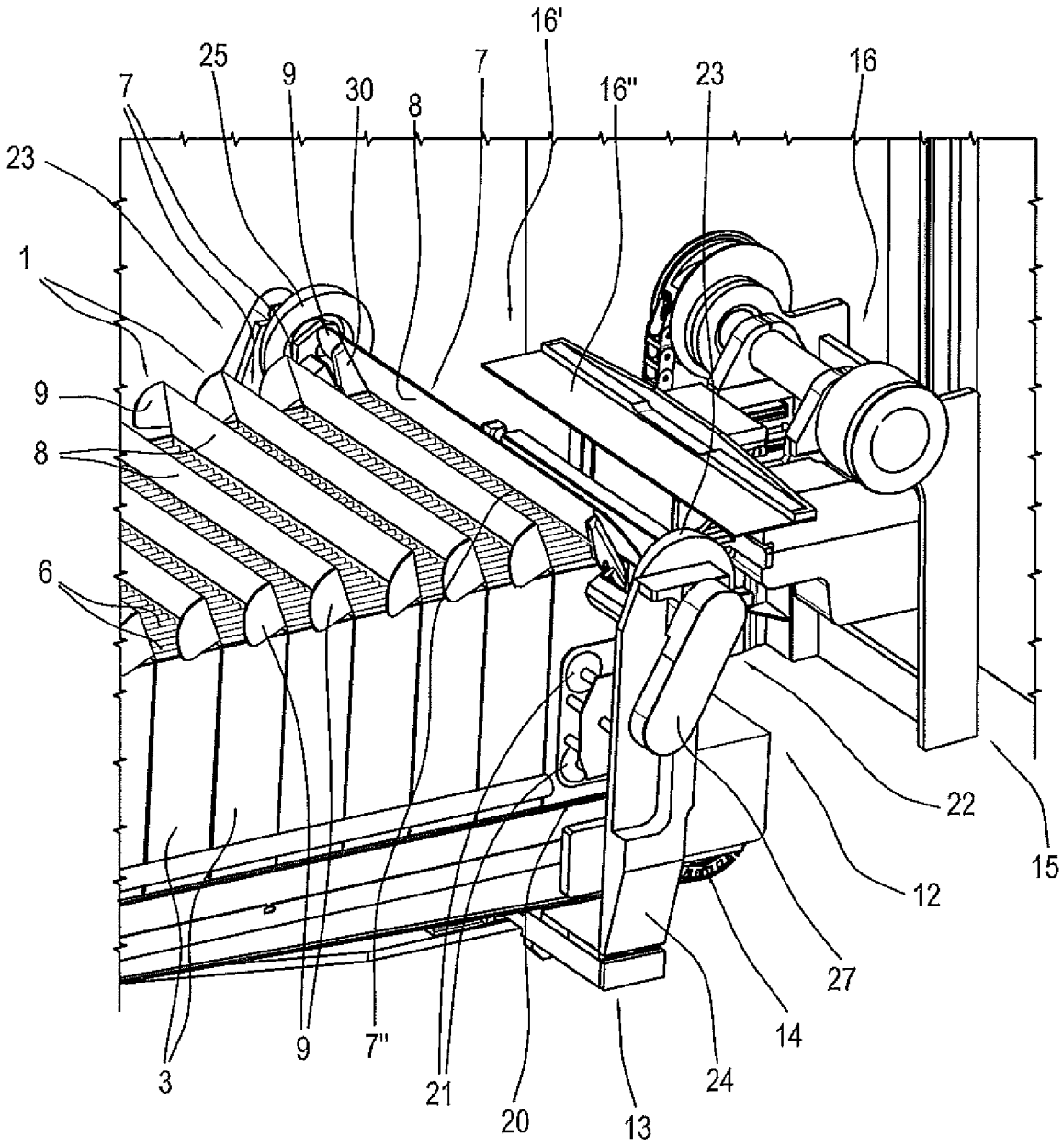


FIG.6

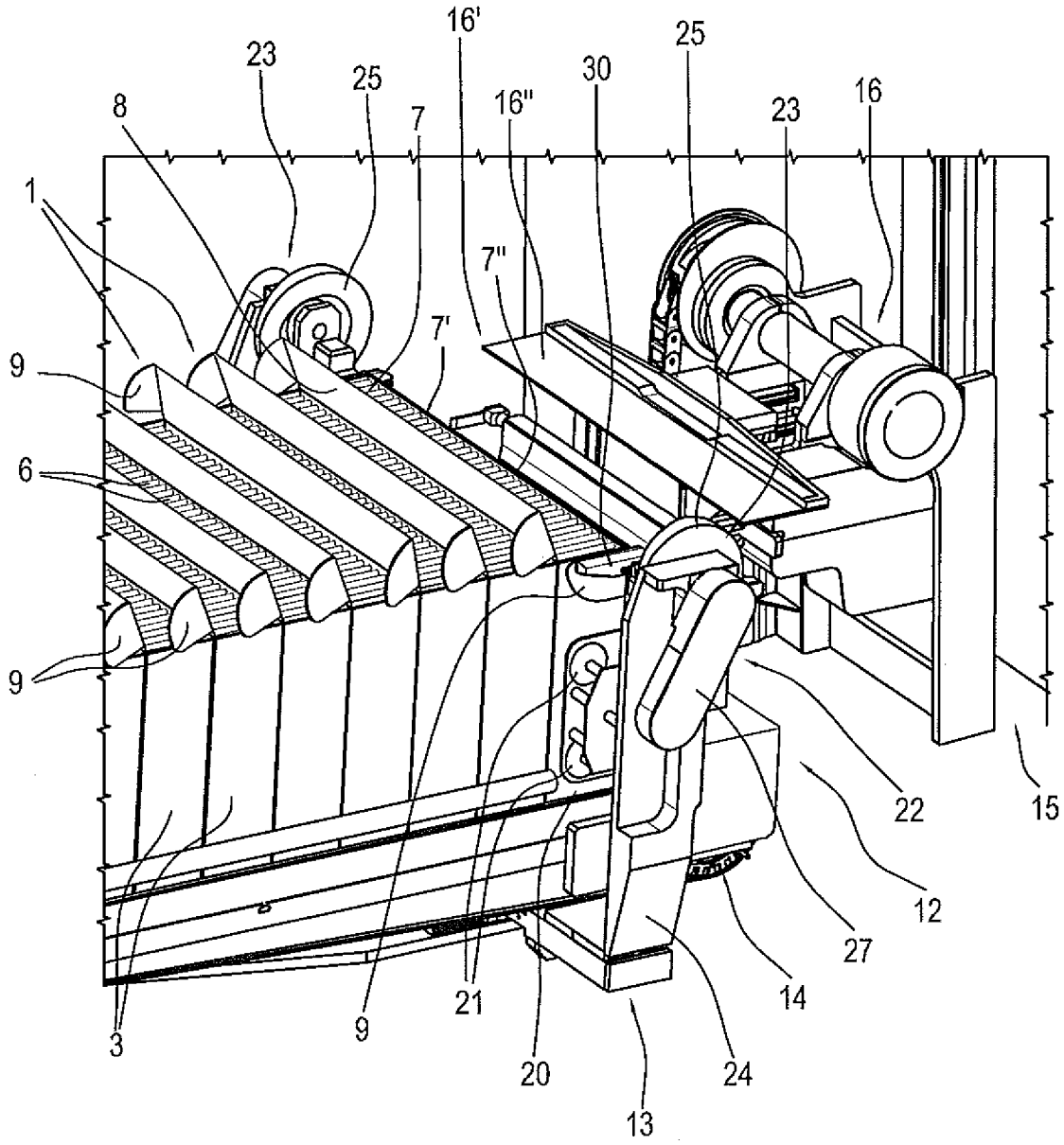


FIG.7

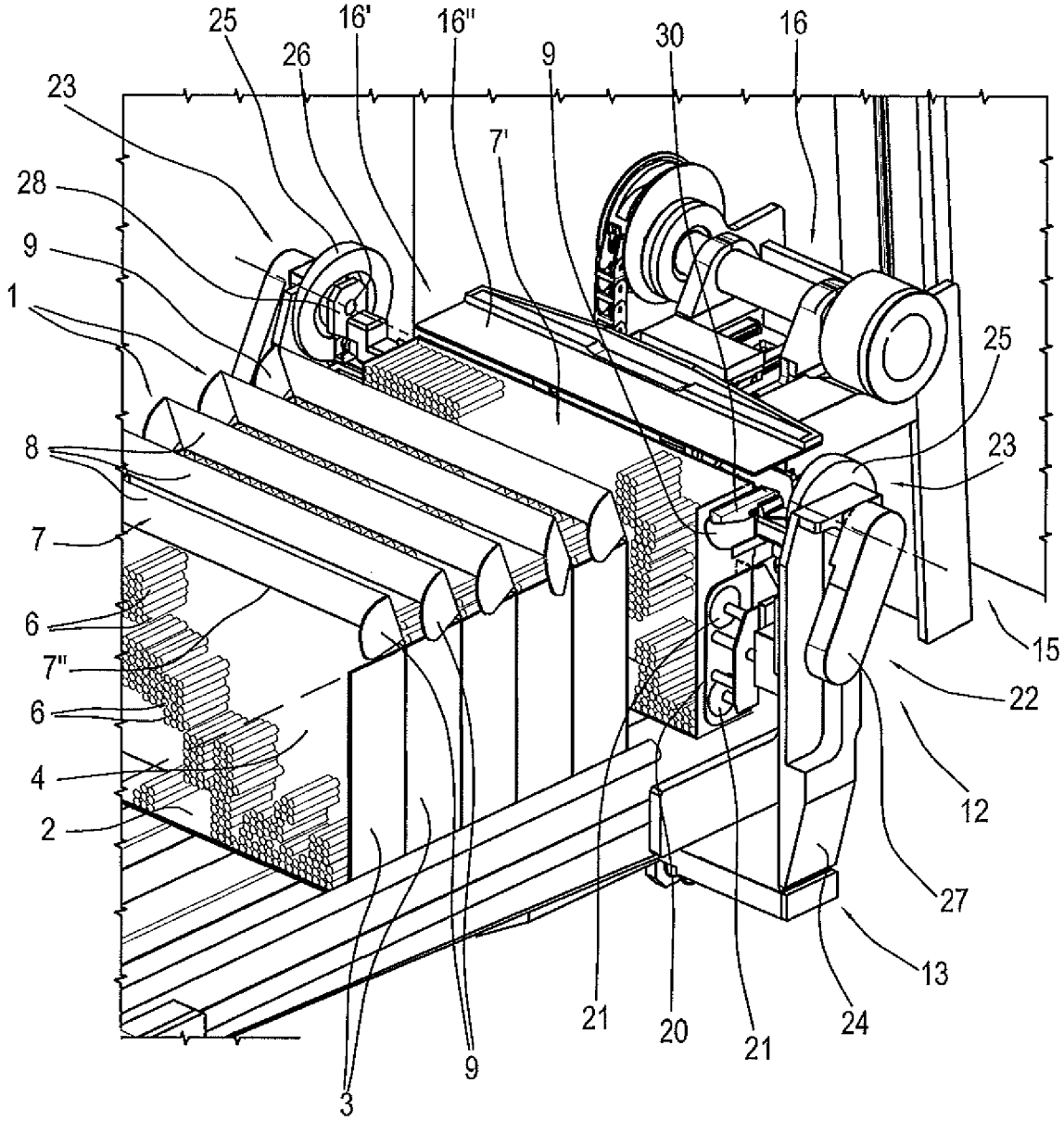

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FIG.8

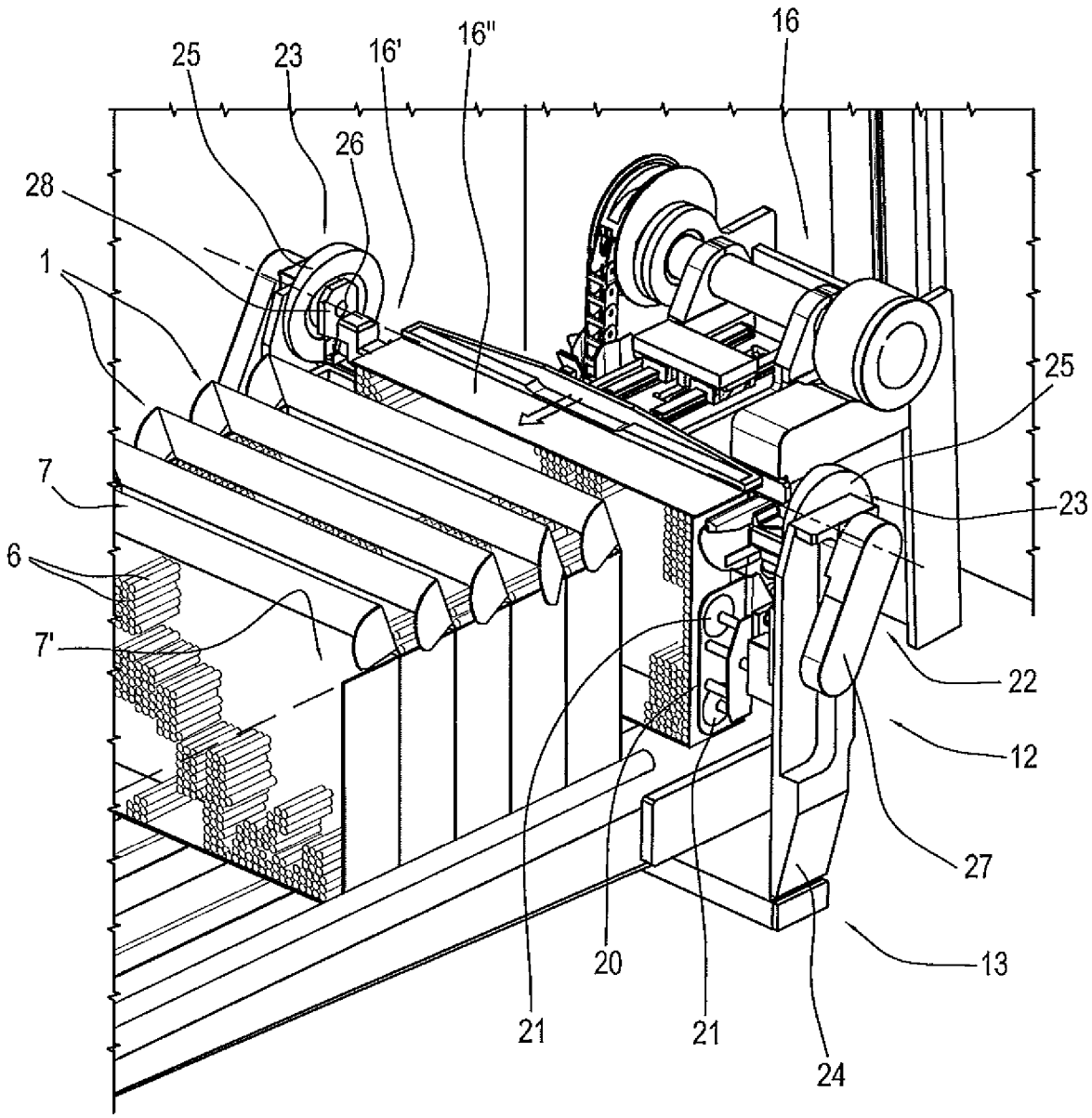


FIG.9

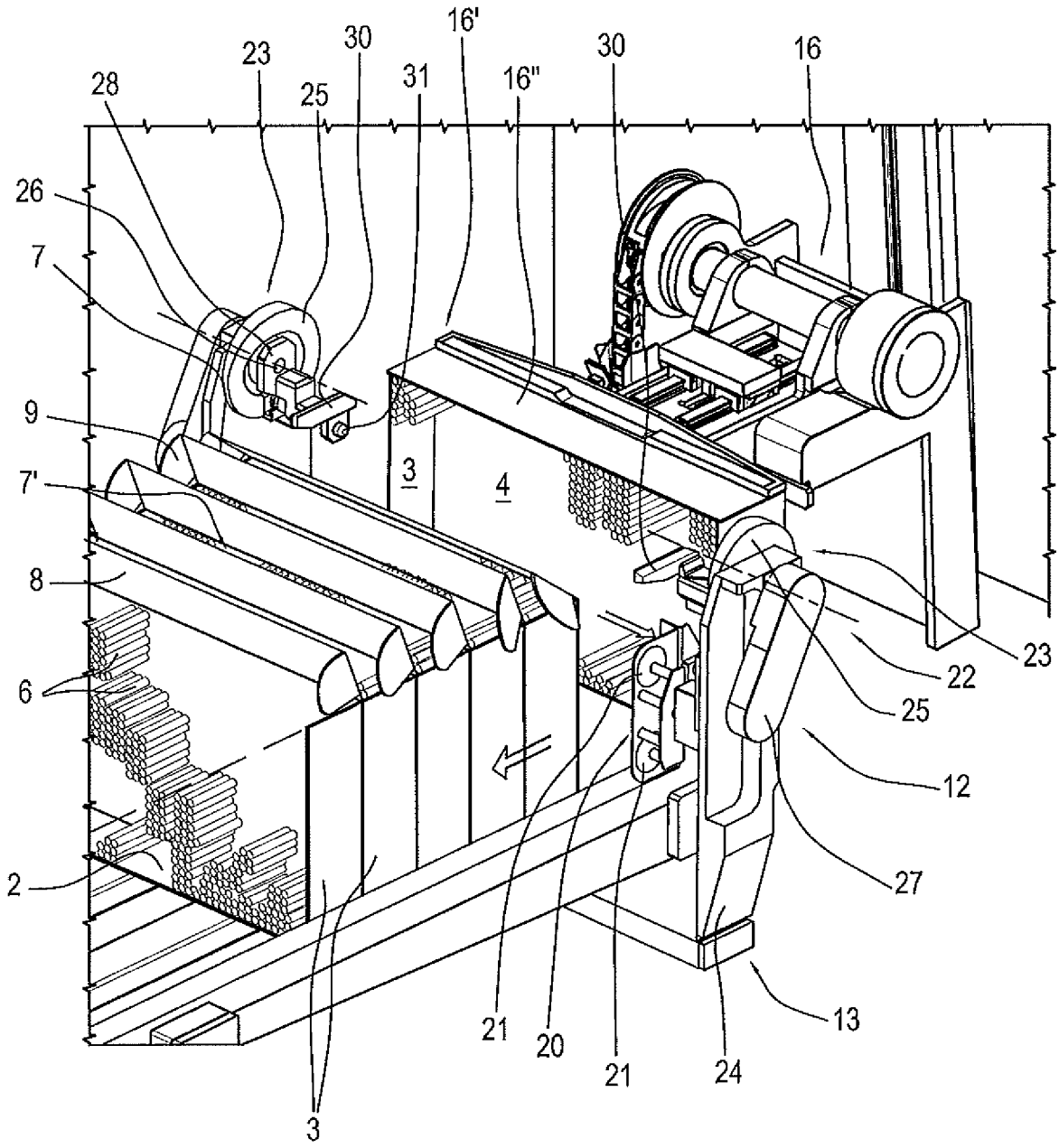


FIG.10

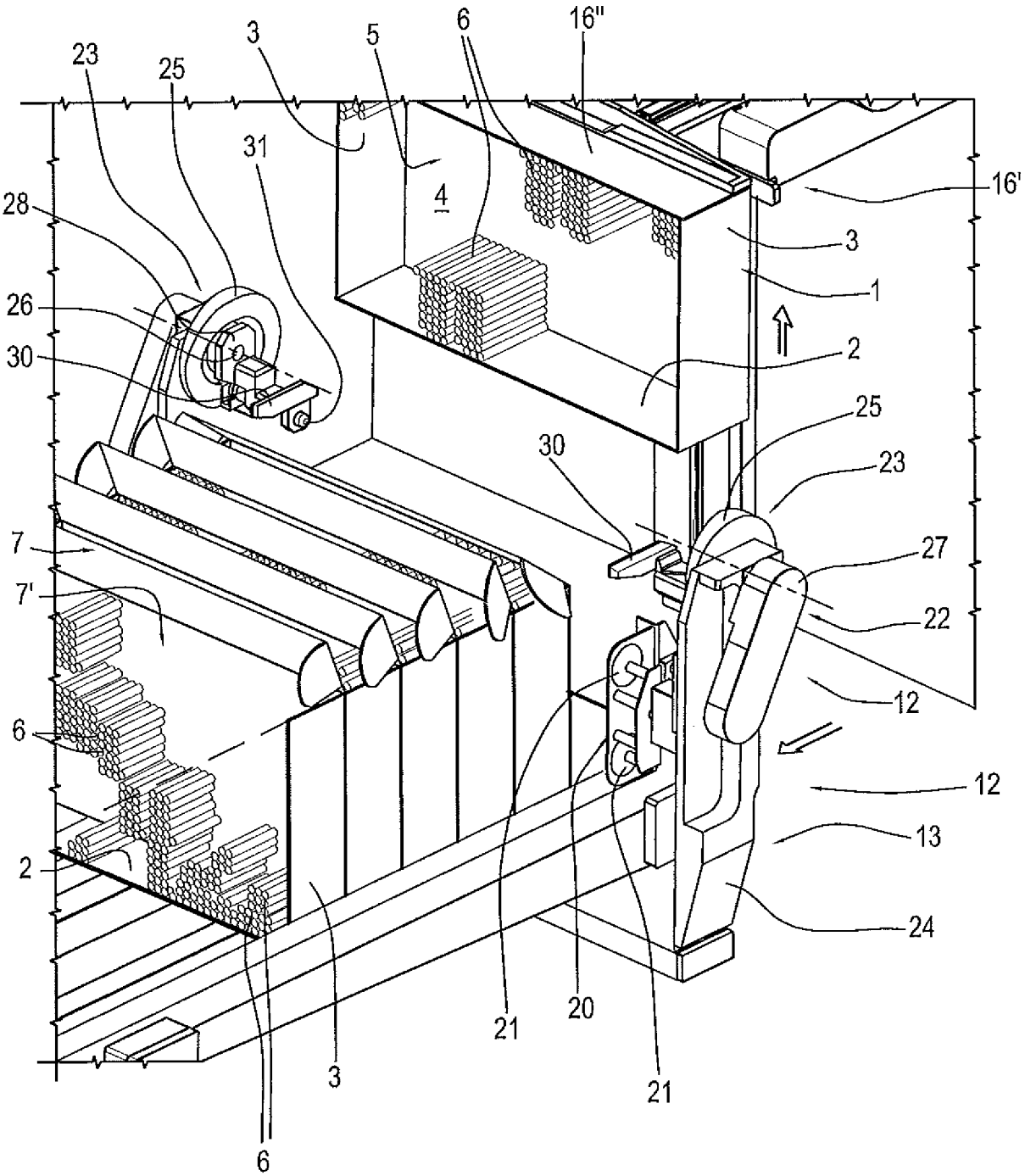

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FIG.11

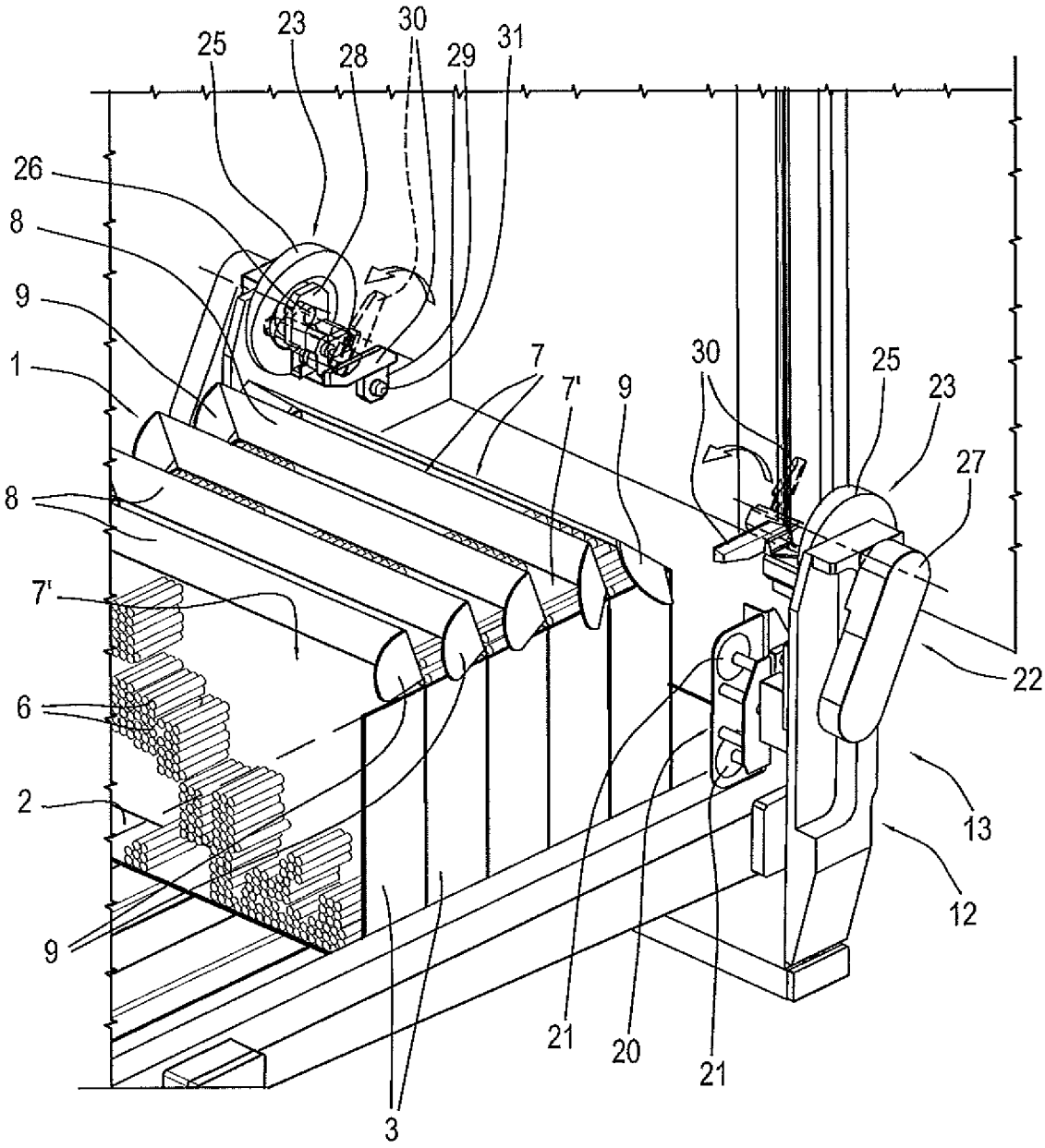


FIG.12

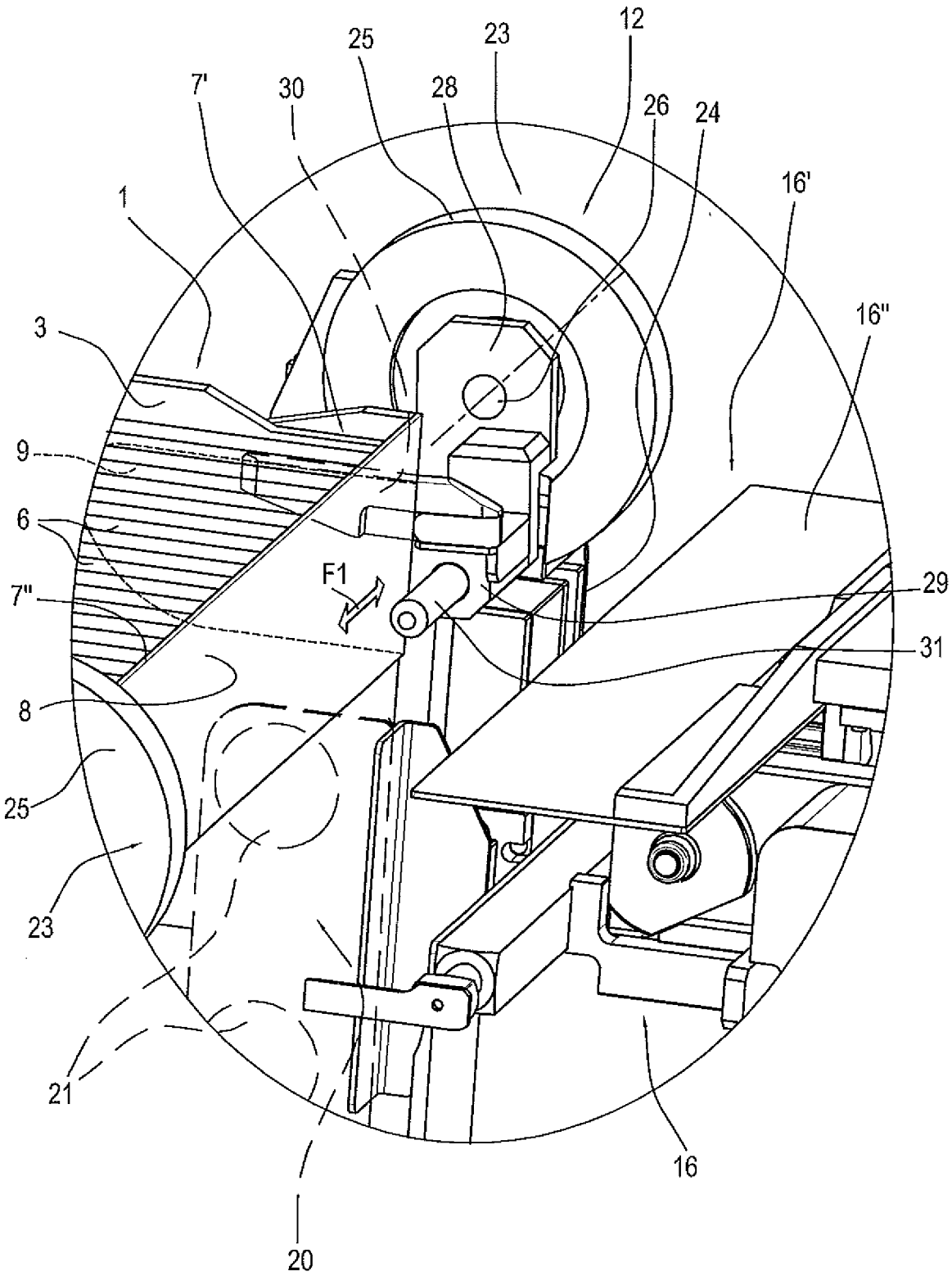


FIG.13

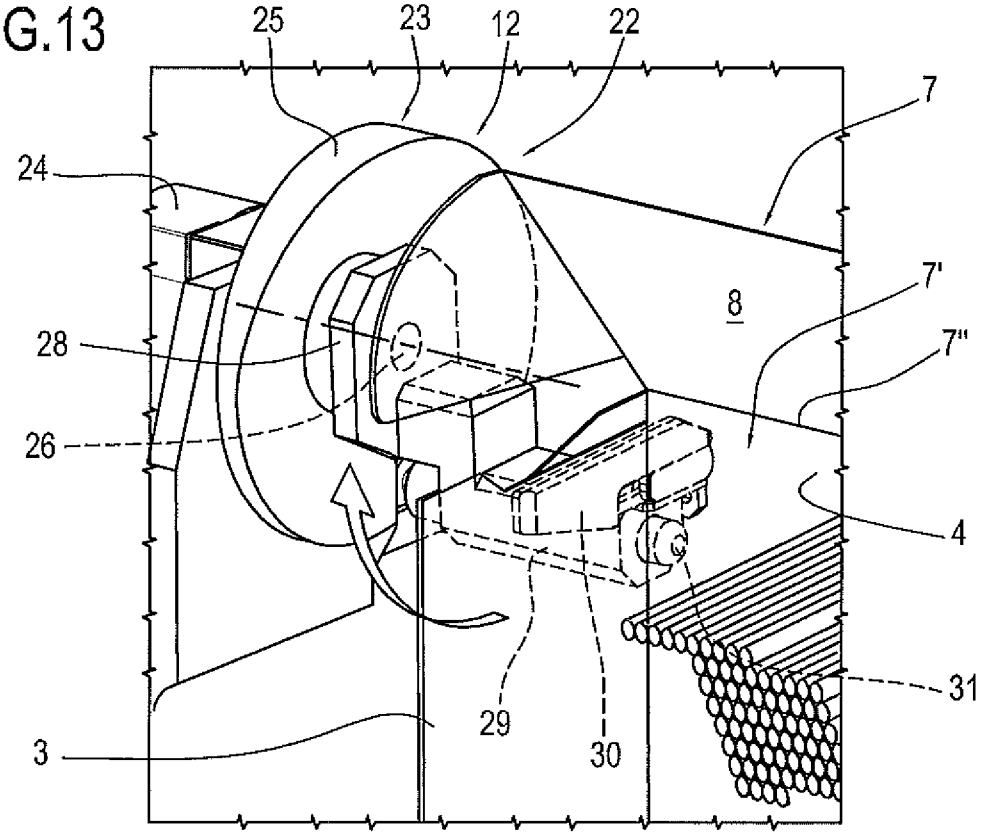

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FIG.14

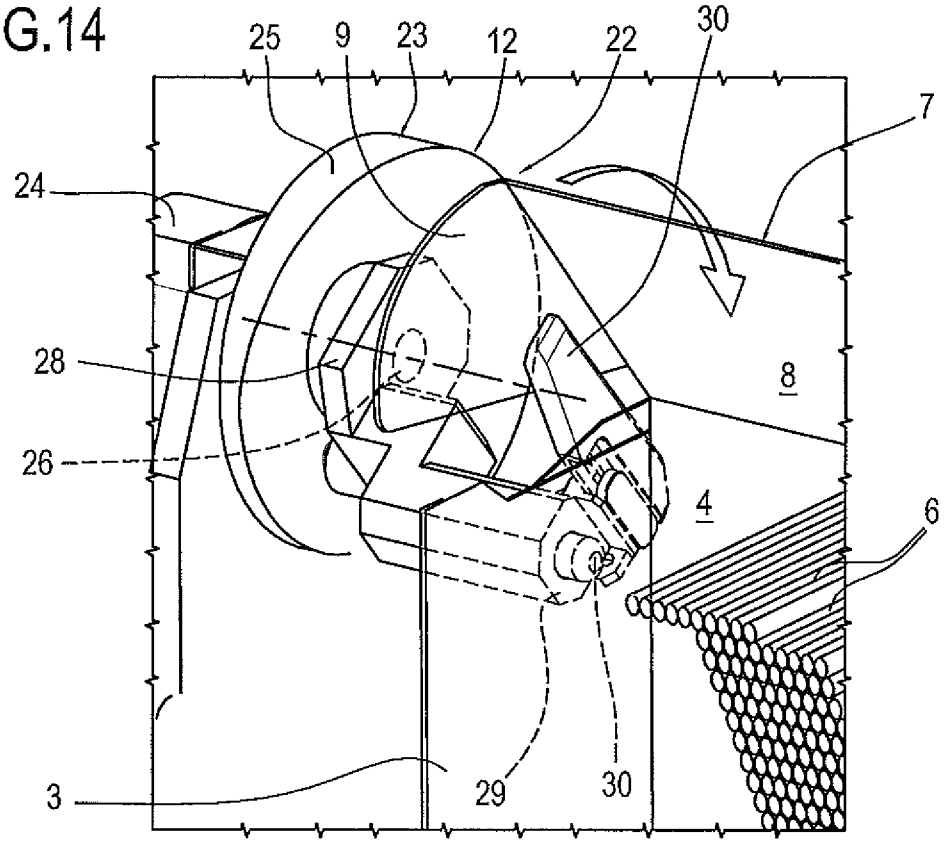

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FIG.15

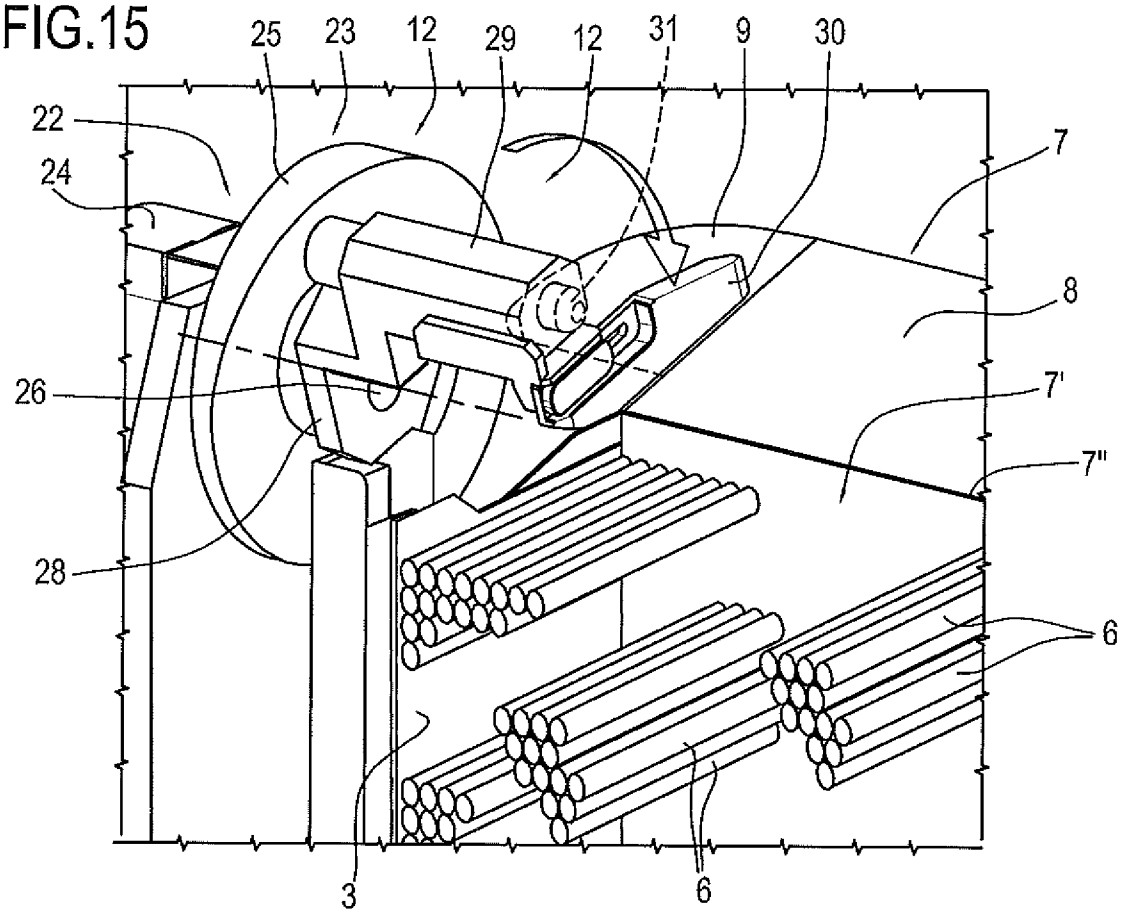
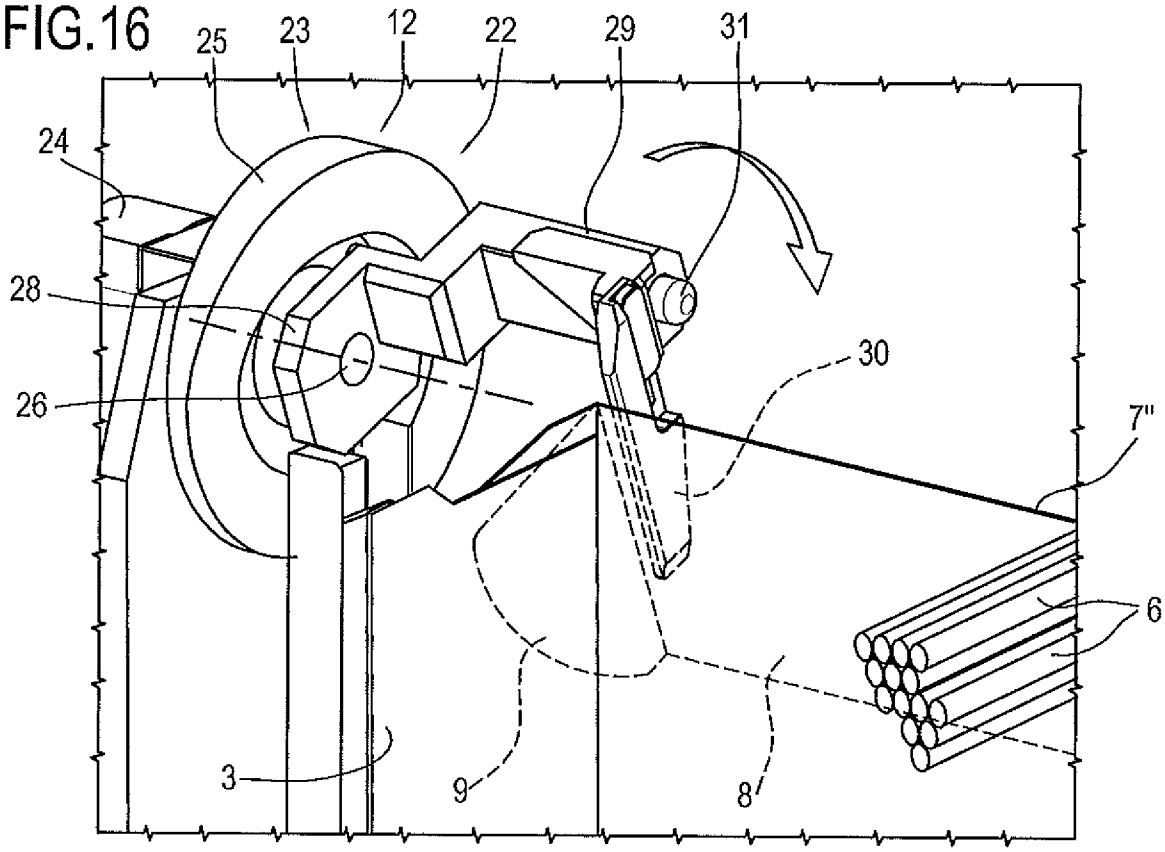

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FIG.16


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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/064194

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24C5/356
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24C B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 1 118 543 A1 (HAUNI MASCHINENBAU AG [DE]) 25 July 2001 (2001-07-25) paragraph [0022] - paragraph [0026]; figures	1,2 3-10
A	EP 2 570 040 A1 (HAUNI MASCHINENBAU AG [DE]) 20 March 2013 (2013-03-20) abstract; figures	1-10
A	EP 1 941 805 A1 (INT TOBACCO MACHINERY POLAND [PL]) 9 July 2008 (2008-07-09) abstract; figures	1-10
A	GB 2 148 853 A (MOLINS PLC) 5 June 1985 (1985-06-05) the whole document	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2014	07/01/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Marzano Monterosso

INTERNATIONAL SEARCH REPORT

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