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(54) **Station for capping products with a tubular casing**

(57) A station (10) for capping an article set in a capping zone by means of a flexible tubular casing (12). It comprises means (17) of gripping the outside of the casing that are mobile to grip an edge of the end of the casing fed to them and they are equipped with means (26) of traction and curling the wall of the casing starting from this end edge to accommodate the curly part in a zone of accumulation (30) within the gripping means. The gripping means (17) being moreover mobile to insert the casing on the article in the capping zone gradually releasing the curled portion in the zone of accumulation. The gripping means (17) comprise blowing means (40) to form a cushion of air between a sliding wall (41) of the zone of accumulation and the curled wall of the casing to help unwind the casing from the zone of accumulation during capping.

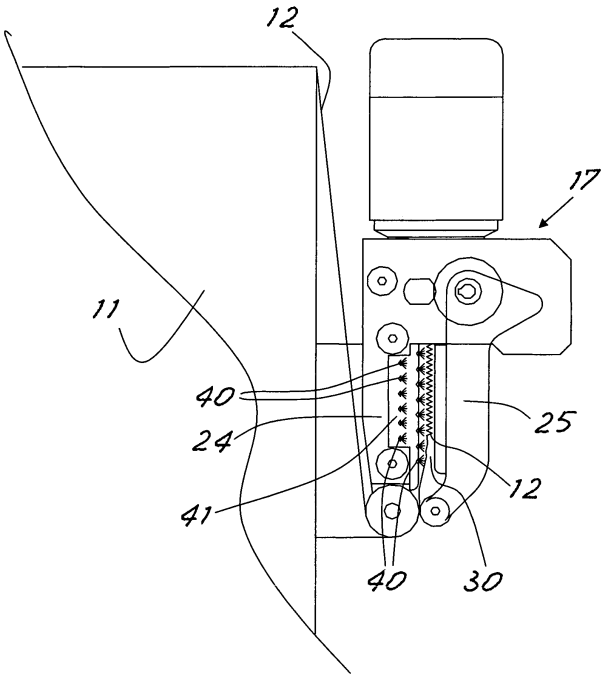

Fig. 9

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Description

[0001] This invention relates to a station for capping articles by means of a tubular casing made of plastic film, especially for capping articles stacked in an orderly manner on pallets.

[0002] The need is known for wrapping plastic film around products stacked in an orderly fashion on pallets for purposes of both protection and containment. For instance, building materials such as bricks are generally stacked on pallets to form a parallelepiped that is wrapped in plastic film to keep its shape and allow it to be transported.

[0003] In the art various machines and packaging stations have been suggested to do the packing quickly by using a relatively elastic tube of plastic film that is put on the article to package from above, usually after elastic expansion of the casing. Machines have, for instance, been put forward to be equipped with grippers that take hold of the edge of the casing and pull it onto the product to package, making it slide from the top downwards. A problem with this system is that the plastic film provides no little resistance to insertion and because of the friction on the product to package it can easily break.

[0004] To obviate this it has been suggested to curl the casing in the grippers so that during the vertical movement of the grippers from the top downwards along the product the casing is unrolled by the grippers on the product starting from the bottom of the casing toward the edge. This system does not always give an optimal result in unreeling the film, especially in the case of an elastic film tube to be dilated; the friction between the casing tube curled in the gripper and the gripper itself can indeed obstruct the correct unrolling of the film, possibly causing jamming or even breakage of the casing.

[0005] A general object of this invention is to obviate the above-mentioned drawbacks by supplying a capping station for products, especially stacked on pallets, by means of a tubular casing of plastic film, that allow rapid, efficient and reliable capping.

[0006] A further object of the invention is to provide a capping station of relatively reduced overall dimensions.

[0007] In view of this object it has been decided to make, according to the invention, a station for capping an article set in a capping zone by means of a flexible tubular casing, comprising means of gripping the outside of the casing that are mobile to grip an edge of the end of the casing fed to them and they are equipped with means of traction and curling the wall of the casing starting from this end edge to accommodate the curly part in a zone of accumulation within the gripping means. The gripping means being moreover mobile to insert the casing on the article in the capping zone gradually releasing the curled portion in the zone of accumulation, characterized in that the gripping means comprise blowing means to form a cushion of air between a sliding wall of the zone of accumulation and the curled portion of the casing to help unwind the casing from the zone of accumulation during capping.

[0008] In order to make clearer the explanation of the innovative principles of the present invention and the advantages thereof over the prior art, with the help of the enclosed drawings a possible embodiment thereof applying such principles will be disclosed below. In the drawings:

- figure 1 is a schematic side elevation view of a capping station with a tube of film;
- figure 2 is a schematic plan view of a portion of the station of figure 1;
- figures from 3 to 8 are schematic views of the operational phases of the station of figure 1,
- figure 9 is an enlargement of a gripper in the phase of unwinding the tubular film.

[0009] With reference to the figures, in figure 1 there is schematically shown a station, indicated generally with 10, for capping articles 11 with a tubular casing of plastic film 12. In particular, the article to package can be composed of a stack of items set orderly on a pallet to form a parallelepiped. The tube of plastic film is of a relatively elastic known type to allow its elastic expansion by traction during the packaging of the product and better adhesion to the walls of the product after release. Advantageously, the film could be of an elasto-plastic type. It should be noted that the item to be packed might not have the shape of a parallelepiped, still being able to be packaged all the same by using very elastic film. The traction of the film during packaging can be conducted both vertically and horizontally (radially).

[0010] The tubular casing can be obtained from a continuous pipe 13 fed to the machine (for instance, in a flattened condition) and joined and cut crossways by known means of joining and cutting 14, so as to obtain a sack-shaped cap facing downward to hang above the zone for receiving the product to package.

[0011] A capping unit 15 is made sliding vertically with motorized control to move between a high position (shown with a solid line in figure 1) for receiving the casing and a low position (shown with a dotted line) for complete capping of the product. As it is schematically clearly visible also in figure 2, the unit 15 advantageously has a frame structure 16 to surround the zone for receiving the product so as to slide along the side walls of the product.

[0012] The unit includes means 17 for gripping the outside of the casing and curling it starting from the lower edge of the end to accumulate the wall of the casing inside a zone of accumulation in these means. Advantageously, the gripping means are in the form of four grippers that each comes near an edge of a rectangle (as shown again in figure 2).

[0013] In the embodiment shown in the figures, as will be explained better hereunder, the gripping means 17 are mobile to turn over the curled casing on them and then to unroll it on the article to cap, so as to bring it back "straight." The grippers have therefore initially the mouth

facing upward to grip the lower edge of the hanging casing, while they have the mouth facing downward while they slide along the vertical walls of the product being packaged.

[0014] The station can include a horizontal conveyor 23 (for instance, a conveyor belt, rollers or similar) that transits in the capping zone of the station to bring an article 11 in and out of this zone.

[0015] Advantageously, the gripping and curling means are mobile to pull and dilate the casing toward the outside before putting it on the article.

[0016] For this purpose, the frame 16 advantageously includes motorized controlled means of moving the grippers to move the grippers horizontally so as to form a rectangle of pre-arranged dimensions. In figure 1 above the solid line shows the near position of the grippers to receive the edge of the casing as it arrives from the feeder. The dotted line instead shows the grippers in the far position after curling and stretching the film, ready to begin the phase of turning over and moving down. If necessary, guiding means or positioning grippers 28 can be included at the corners of the casing to aid an initial opening of the tubular casing so as to position its mouth correctly on the vertical of the four grippers.

[0017] As clearly shown in figure 2, to have a coordinated and symmetrical movement of the grippers moving away and near, the frame is advantageously formed with four guides, arranged according to the sides of a rectangle and with a motorized system of symmetrical movement away and near for each pair of parallel guides. For each pair of guides the system of motorization can advantageously include a male-female screw transmission 18, 19 moved by a corresponding motor 20, 21. At each junction between two perpendicular guides there is an appropriate carriage 22 supporting a gripper 17.

[0018] As is schematically shown in figure 2, advantageously the grippers are directed on the plane so as to grip each casing on a different side of the rectangle near to a different edge. For convenience of description and drawing in the side views the grippers are in any case shown simply as a pair of grippers facing each other.

[0019] The horizontal movement of the grippers permits dilating the casing stretching the elastic film so as to bring it to a greater size than that of the product to package and allow its easy insertion. The real extent of the movement will depend on the dimensions of the product to package. The machine can in this way receive and treat articles of different size.

[0020] Figure 3 shows two grippers 17 in the near position in greater detail. Each gripper that can be opened is advantageously equipped with a fixed jaw 24 and a mobile jaw 25 to control opening and closing by an appropriate actuator (not shown). The gripper also includes motorized means to pull the casing toward the inside of the gripper and to curl it between the jaws in a zone of accumulation 30, made sufficiently long. These motorized means advantageously include a motorized roller 26 near the gripping end of the gripper on the fixed jaw. An idle counter-roller 27 is correspondingly present on the end of the mobile jaw.

[0021] The gripping means 17 are provided with blowing means 40 in correspondence with the zone of accumulation 30, suited to create a cushion of air between the wall of the casing 12 collected in the zone of accumulation 30 and a wall 41 of the zone of accumulation, so as in the capping phase to aid the release of the casing from the gripper 17.

[0022] The blowing means are, preferably, made with a plurality of nozzles 40 arranged on the sliding face 41, formed on the jaw 24 that, as will be seen, keeps the tubular film dilated under tension during capping.

[0023] Figure 3 shows the first phase of a capping cycle, with the grippers open and near and the casing 12 not yet dilated and held by positioning grippers 28 to insert its mouth in the grippers. In the following phase the grippers close and the motorized means curl the casing in the zone of accumulation of the grippers, as shown in figure 4. After curling the grippers are made to turn opposite to each other around the axis 29 to tip over downwards so as to overturn the casing (figures 5 and 6). During or before this phase the grippers can be moved appropriately outwards to avoid reciprocal interference. The casing 12 is kept gripped by keeping the motorized rollers stationary.

[0024] At the end of the rotation the bag of the casing keeps the join facing upward but the grippers are above the bag. In addition, the motorized winding wheel goes inside the perimeter of the bag and the pressing roller outside.

[0025] After turning over by 180°, the four grippers are made to move away symmetrically (figure 6) to stretch the four sides of the tubular casing uniformly to a sufficient size to put it on the product that has reached the capping zone. The motorized roller inside facilitates the following operation of stretching while keeping the film firmly blocked.

[0026] After reaching the correct expansion, the capping unit begins to come down onto the pack gradually unrolling the curled casing between the grippers (figure 7). In this phase the blowing means 40 are operated, so as to help the casing unroll as the grippers come down.

[0027] Figure 9 shows an enlargement of a gripper 17 with the operated blowing means 40. The emission of air by the nozzles 40 forms a cushion of air that makes the wall of the casing 12 move away from the sliding wall 41 in the zone of accumulation 30. This makes it possible to have optimal film unrolling, decreasing friction and, as a result, the risk of the casing getting broken or stuck. The nozzles 40 on the wall 41 are advantageously spaced apart in a regular manner to reduce the friction uniformly all over the jaw 24 that keeps the film under tension as it unwinds. The blowing air could be fed to the nozzles 40 through a special hose (not shown in the figure) that feeds a circuit inside the gripper 17.

[0028] As shown in figure 8, in the final part of capping it is possible to change the angle of the gripper units so

as to further facilitate expulsion of the film. The join of the film stays facing upward and outside the final pack; the inside surface of the bag gets positioned in contact with the product, while the external surface of the bag (that could also be printed for publicity) will be facing outside the packed product.

[0029] At this stage, capping has ended. The capping unit 15 can raise up again and the packaged product can be evacuated from the station, with the contracted film firmly blocking it.

[0030] To optimize the times, during the packing phases a new casing can in the meantime be prepared hanging from the feeding unit.

[0031] At this stage, it is clear how the set objects have been accomplished, supplying a station that enables capping quickly and reliably, reducing the possibility of the tubular casing jamming or breaking thanks to the blowing means on the gripper.

[0032] In addition, by first turning over the casing and then unrolling it to bring it straight with the grippers of the capping unit coming down forwards, the unrolling of the film on the package is more uniform and the grippers can even reach the base of the package without any need for them to have a gap under the base level of the package. This allows having a reduced height of the station and using a conveyor with no need for vertical lifters.

[0033] Naturally, the above description of an embodiment applying the innovative principles of the present invention is provided by way of example of such innovative principles and must not therefore be taken to limit the scope of what is claimed herein. For example, the positioning means and the exact structure of the grippers can vary according to specific requirements. The grippers can also be directly set on the diagonals of the rectangle.

[0034] In addition, the grippers need not even be able to be overturned, but move along the product to be capped always maintaining the same orientation in relation to the article to cap.

[0035] The blowing means of the gripper need not necessarily be made with a plurality of nozzles, as described above. For instance, to produce the desired cushion of air straight channels could be obtained on the sliding wall of the gripper, or holes that can form a manifold.

[0036] In addition, rather than use a frame to move the grippers as described above, there could be an open structure on the product infeed/outfeed with the gripper units mounted in pairs on two separate mobile cross members on opposite sides of the product to cap. This could be used to gain speed on the machine cycle, since when the cross members are in the lowered position the capped product can already come out from the machine and at the same time the product to pack can enter the station while the two cross members carrying the gripper units return to the raised position for the beginning of the new packing cycle.

Claims

1. A station (10) for capping an article set in a capping zone by means of a flexible tubular casing (12). It comprises means (17) of gripping the outside of the casing that are mobile to grip an edge of the end of the casing fed to them and they are equipped with means (26) of traction and curling the wall of the casing starting from this end edge to accommodate the curly part in a zone of accumulation (30) within the gripping means. The gripping means (17) being moreover mobile to insert the casing on the article in the capping zone gradually releasing the curled portion in the zone of accumulation, **characterized in that** the gripping means (17) comprise blowing means (40) to form a cushion of air between a sliding wall (41) of the zone of accumulation and the curled portion of the casing to help unwind the casing from the zone of accumulation during capping.

2. Station according to claim 1, **characterized in that** the blowing means include a plurality of nozzles (40) set on the sliding wall (41) of the zone of accumulation (30).

3. Station according to claim 1, **characterized in that** said gripping means are mobile crossways to the extension of the tubular casing (12) to dilate the curled portion of the casing in the zone of accumulation (30) during capping.

4. Station according to claim 1, **characterized in that** said gripping means comprise reciprocally mobile grippers (17) with jaws (24, 25) to grip the edge of the casing between which the zone of accumulation (30) is formed.

5. Station according to claims 3 and 4, **characterized in that** said sliding wall (41) is formed on a fixed jaw (24) of the gripper (17) that acts on the casing to dilate it during capping.

6. Station according to claim 4, **characterized in that** the jaws of the gripper are equipped with motorized means (26, 27) to pull the gripped casing towards the inside of the gripper and into the zone of accumulation (30).

7. Station according to claim 4, **characterized in that** the motorized means comprise a motorized roller (26) near one gripping end of the jaws of the gripper.

8. Station according to claim 1, **characterized in that** the gripping means (17) can turn over to overturn the casing that has been curled on them.

9. Station according to claims 4 and 8, **characterized in that** the grippers (17) can be turned between a

first position directed upward and a second position directed downward, to receive in the first position the edge of the mouth of the casing lowered from above and to overturn the casing, moving toward the second position, once curled in the zone of accumulation.

10. Station according to claim 4, **characterized in that** the grippers (17) are supported in a capping unit (15) that defines a frame that moves vertically around a capping zone designed to accommodate the product to cap.

11. Station according to claim 4, **characterized in that** there are four grippers, each supported near one edge of a rectangle.

12. Station according to claim 4, **characterized in that** the grippers (17) are supported by means (16, 18, 19, 20, 21, 22) for moving the grippers that can be made to move them away or near reciprocally crossways to the extension of the casing.

13. Station according to claim 12, **characterized in that** the gripper moving means comprise four guides (16), arranged according to the sides of a rectangle and with a motorized system (18, 19, 20, 21) of symmetrical movement away and near for each pair of parallel guides (16), carriages (22) supporting the grippers being set at each junction of the perpendicular guides (16) to have coordinated and symmetrical movement of the grippers moving away and near as the motorized system is operated.

14. Station according to claim 13, **characterized in that** the grippers (17) are directed on a plane so as to grip each casing on a different side of the rectangle near a different edge.

15. Station according to claim 1, **characterized in that** it includes means of feeding the casing with mouth facing downward above the capping zone.

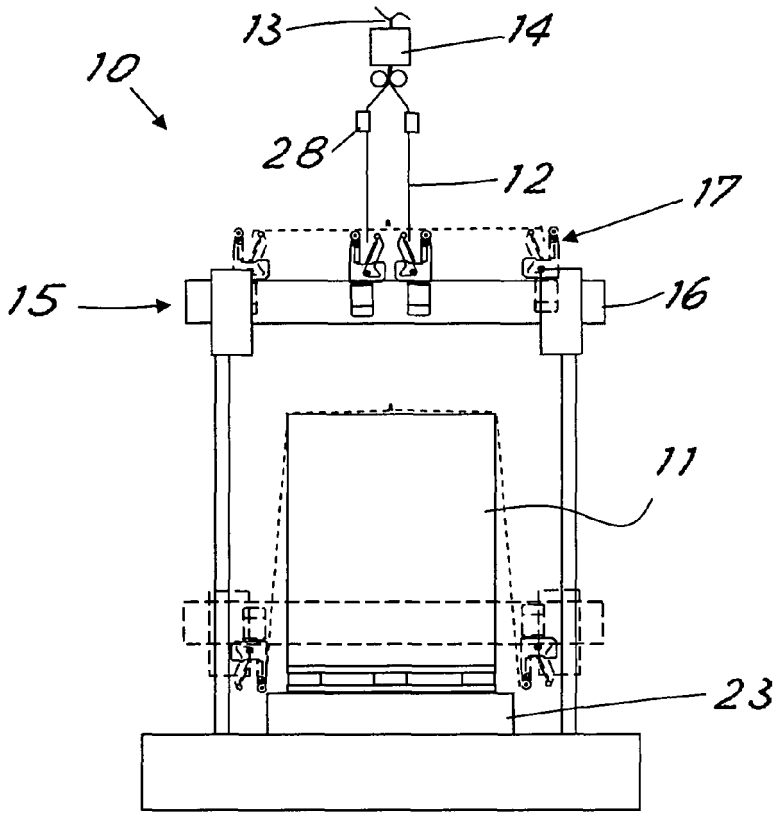

Fig.1

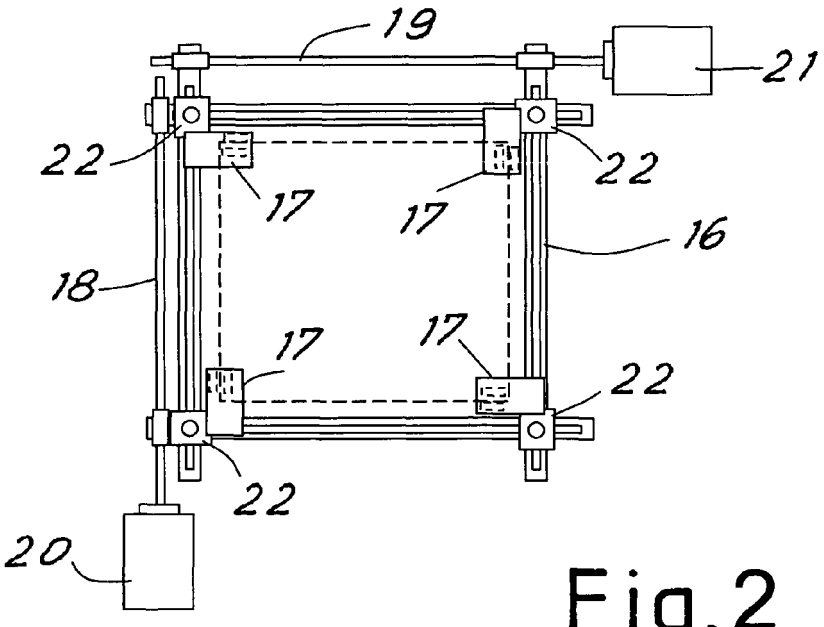

Fig.2

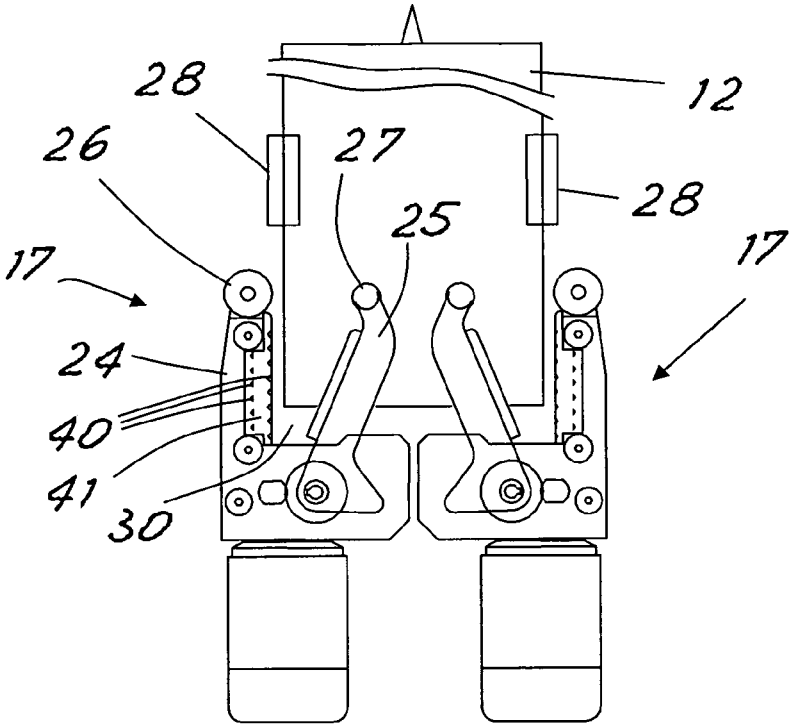

Fig.3

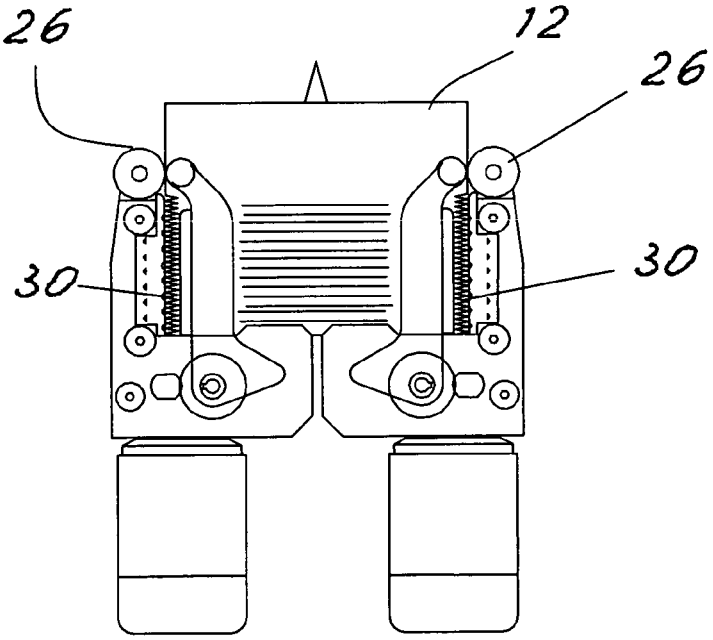

Fig.4

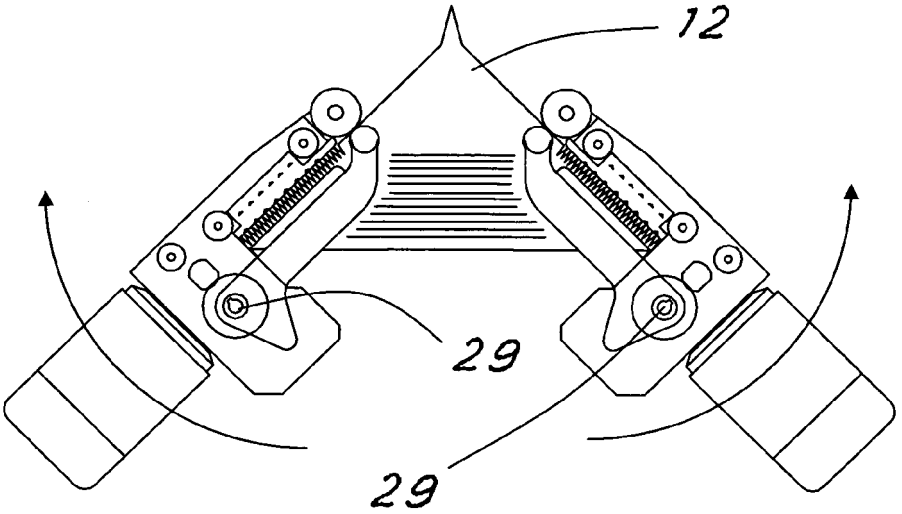

Fig.5

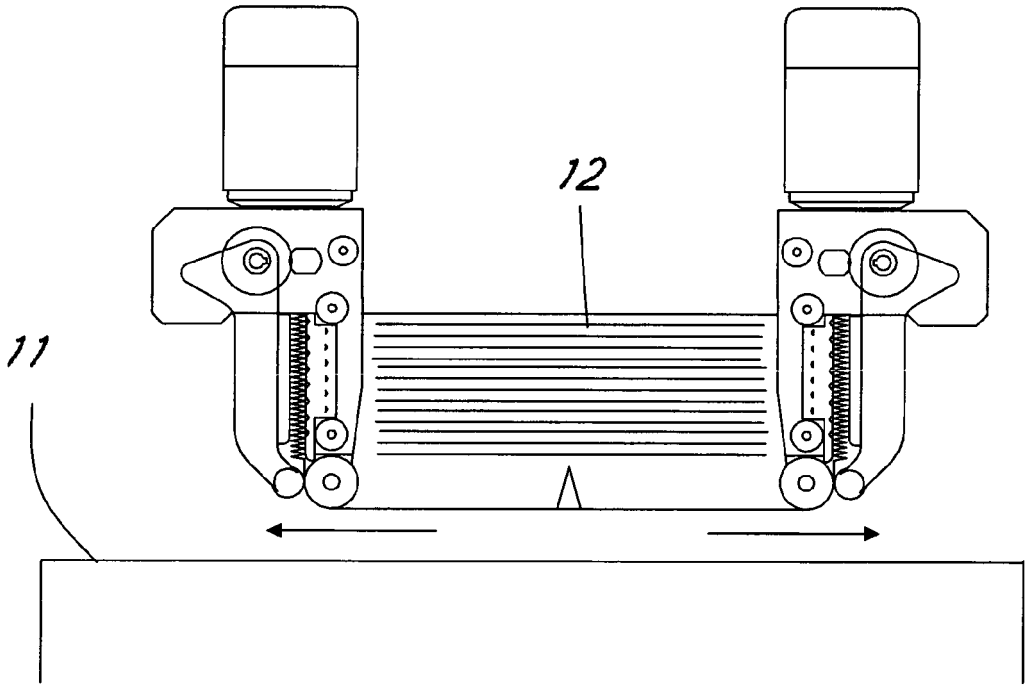

Fig.6

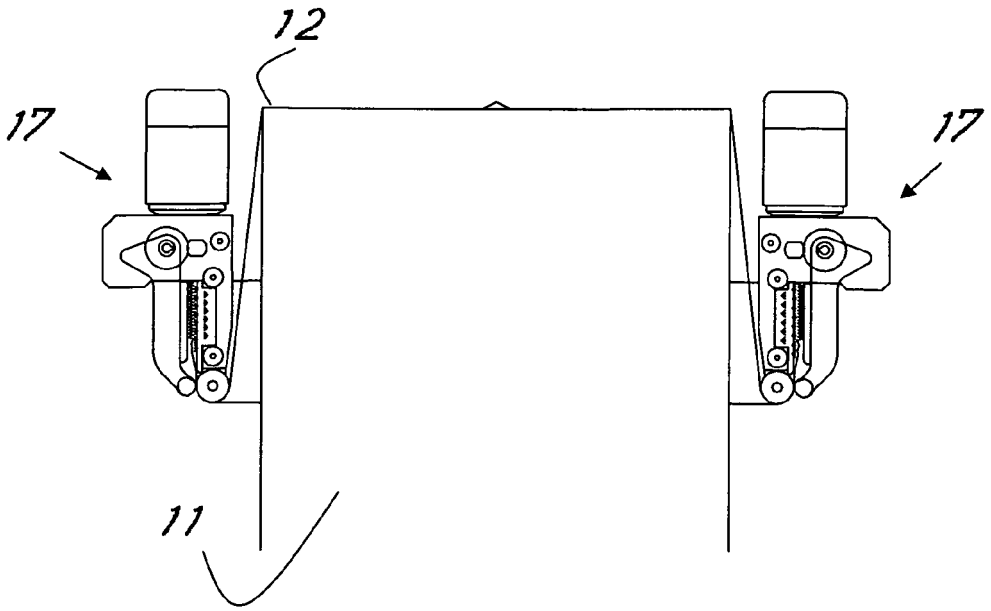

Fig.7

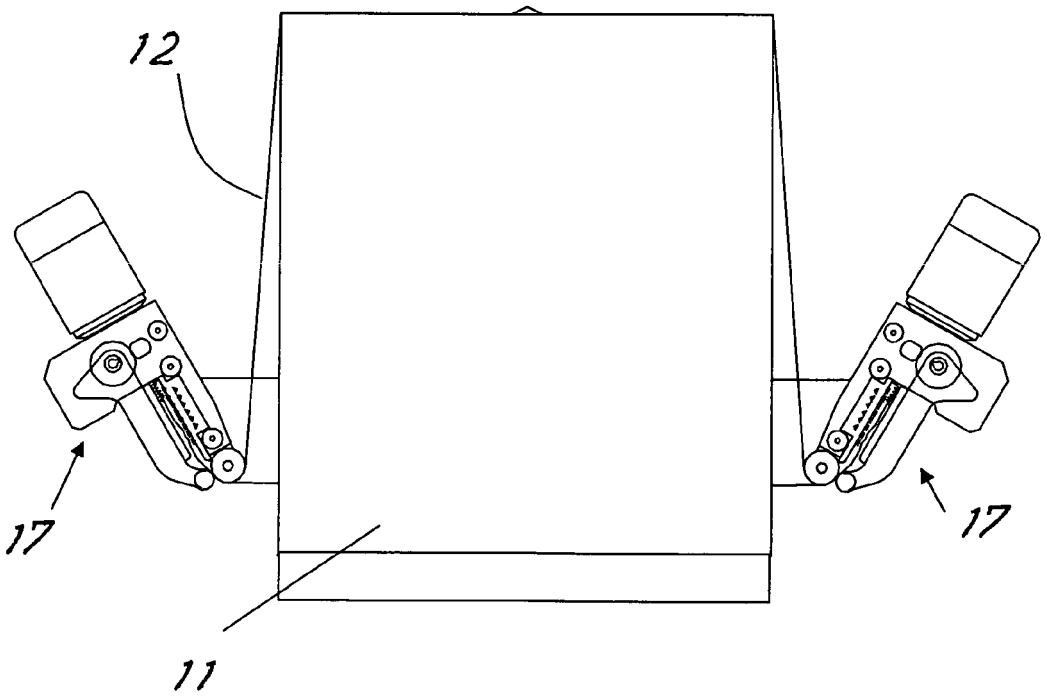

Fig.8

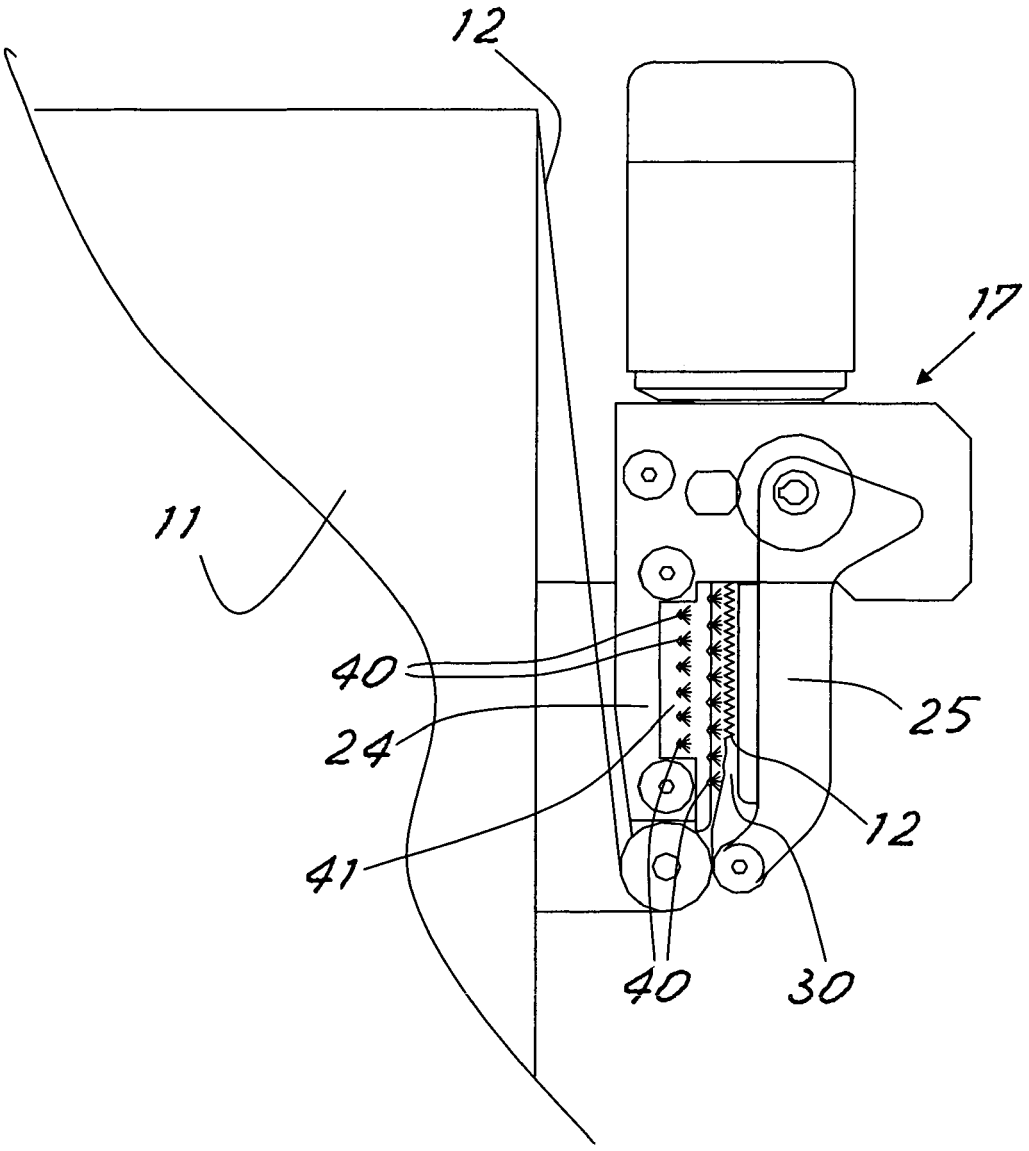

Fig. 9