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(54) **Automatic peripheral wrapping machine for rolls of material in strips such as cloth.**

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Description

In the art of production of rolls, e.g. of cloth, the necessity of stopping the end of the wound strip and completely packing the roll to protect it from the environment is known.

Meeting said necessities is made difficult by the desire to perform the operations in a completely automatic manner to comply with the ever advancing automation of entire production lines.

The problem consists principally of the fact that the initial edge of a tape or a sheet, usually of plastic material, that is desired to wrap around the periphery of the roll, tends to escape without allowing completion of the turn to fix it to itself. The use of glues or the like (see US-A-3 901 757) to hold in position on the roll the beginning of the tape or sheet until complete wrapping involves an unavoidable deterioration of the section of strip of the roll involved by the glueing. Especially in the case of valuable materials the loss upon unpacking is an added cost poorly tolerated by users. In addition, the method is clearly inapplicable for rolls of material by nature difficult or impossible to glue.

The general object of the present invention is to obviate the above mentioned drawbacks by providing a packing device for rolls which would allow rapid and accurate automatic packing thereof without the use of glue or the like to stop the beginning of the tape employed for packing.

In view of said object it has been sought to provide a packaging machine according to claim 1.

To further clarify the explanation of the innovative principles of the present invention and its advantages as compared with the known art there are described below with the aid of the annexed drawings possible embodiments as examples applying said principles. In the drawings -

- FIG. 1 shows schematically a side elevation view of a packaging machine for rolls provided in accordance with the innovative principles of the present invention,
- FIG. 2 shows schematically a partial view of a first operative phase of the machine of FIG. 1,
- FIG. 3 shows schematically a partial view of a second operative phase of the machine of FIG. 1,
- FIG. 4 shows schematically a partial view of a third operative phase of the machine of FIG. 1,
- FIG. 5 shows schematically a partial view of the machine of FIG. 1 operating on a narrower roll, and
- FIG. 6 shows a partial view of a different embodiment of the packaging machine in accordance with the present invention.

With reference to the FIGS. as may be readily seen in FIG. 1 a packaging machine indicated generally by 10 comprises two powered rollers 11 and 12 for support and rotation of a roll 13, e.g. of cloth. A slide 14 conveys the roll from a known machine (not shown) for formation of the rolls by winding of a continuous strip.

Along the slide 14 is placed a device 15 for cutting the strip from which the roll was formed. Said cutting device is of the known art and therefore not shown. For example it can comprise a rotating circular blade moving transversely to the path of the strip as will be readily imaginable to those skilled in the art.

A plane 16 is moved by a drive 24 between a raised stop position controled for positioning of the roll on the rollers 11 and 12 and an unloading position of the roll by the rollers. Said two positions are shown in FIG. 1 in unbroken and broken lines respectively.

Above the rolls 11 and 12 is placed a moving pivoted arm 17 powered and bearing at the free end a packaging unit 28 comprising an unrolling device 18 for a tape 19 of plastic material, e.g. a heat welding film, fed from a spool 20. The unit 28 comprises also a welding and cutting head 21 sliding thanks to a powered guide 22.

Advantageously for reasons which will be clarified below the arm 17 is equipped with an encoder 29 for detection of its angular position.

The packaging unit 28 is connected to the arm by a pivot and connected to a kinematic mechanism 23 for its inclination in relation to the longitudinal extension of the end part of the arm 17 as a function of the rotation of the arm as will be clarified below.

The kinematic mechanism can for example consist of a tie-rod 23 sliding on a system of pulleys under the effect of a weight 31 opposed by a drawing spring 32 as shown schematically in the drawings.

Advantageously there is present a sensor which detects the arrival of the unit 28 at a roll to be packaged. Said sensor can be for example a proximity sensor 26 supported by the packaging unit 28 and provided in the form of a microswitch so as to detect the approach of the periphery of the roll.

It could be thought also to provide other systems for detecting the approach of a roll by the unit 28. For example, stopping of the arm 17 in the low position could be detected by the encoder 29.

The various component parts of the machine are interconnected for operation to a control device 27, e.g. electronic with cabled or programmed logic. On the basis of the following operative description such a control device is readily imaginable to those skilled in the art and is therefore not further

shown nor described.

In the use of the machine the roll to be packaged rolls along the slide 14 until it is positioned on the rollers 11 and 12. The plane 16, in said raised position, stops the travel of the roll. Simultaneously the cutting device 15 separates the roll from the strip from which it was wound.

The powered rollers rotate the roll to wind the free terminal edge 25 and simultaneously the arm 17 is commanded to rotate until the sensor 26 detects the periphery of the roll while the feed device 18 unrolls the tape 19 so that its free end lies on the edge being wound as shown in FIG. 2. The tape 19 is thus gripped and pulled by the rolling of the edge 25 as may be readily seen in FIG. 3.

Rotation of the roll continues until the plastic tape 19 has entirely covered the periphery of the roll until it overlaps itself. As seen in FIG. 4 the guide 22 is then moved along the welding head so that it enters in contact with the tape 19, welding it and cutting it at the overlapping point to form the complete wrapping of the roll. The tape is welded to itself and therefore there are no alterations or damage to the material of the roll. Advantageously the angular rotation of the arm 17, necessary for the sensor 26 to encounter the surface of the roll and detected by the encoder 29, allows the control circuit 27 to calculate the diameter of the roll and hence rotation of the roll necessary for the tape 19 to completely wrap the roll. In this manner the quantity of tape used is surely sufficient and can also be adjusted to the minimum necessary for packaging, whatever the diameter of the roll, with no need to adjust the machine in advance. Again to be able to handle rolls of various diameters, the kinematic mechanism 23 orients the unit 28 so that the welding and cutting head is always substantially perpendicular to the surface of the roll regardless of the diameter thereof.

By way of example in FIG. 5 is shown the machine during packaging of a roll 13' of small diameter.

Once the roll is packaged the arm 17 is raised again and the roll is removed from the machine by rolling it along the inclined plane formed by commanding the actuator 24 to lower the plane 16. Rolling along the plane 16 can be started for example by stopping the rotation of the roller 12 while that of the roller 11 continues so as to supply to the roll a momentum which causes it to roll on the roller 12 toward the inclined plane 16.

As an alternative there can readily be provided a mechanism for raising the roller 11 to push the roll beyond the roller 12.

Obviously it is not strictly necessary that the packaging take place by welding of the tape.

FIG. 6 shows schematically a different embodiment of the machine in accordance with the present invention. In said different embodiment a packaging unit 28' (the rest of the machine being substantially the same as that of FIG. 1 it is not further shown nor described here) comprises a nozzle 30 for controled delivery of the glue for its spreading on the surface of a tape 19' already partly wrapped in the position of the subsequent overlapping on itself. A cutting head 21' sliding with a guide 22' performs the cutting of the tape after covering by the tape of the glued zone, thus completing the packaging.

Advantageously there is again present a sensor 26' similar to the sensor 26 of FIG. 1 to detect the correct positioning of the unit 28'. The tape 19' can for example be made of paper.

Naturally the above description of embodiments applying the innovative principles of the present invention is given merely by way of example and therefore is not to be taken as a limitation of claims. For example, the blocking of the movement of the roll at the end of the slide 14 to position it correctly on the rollers 11 and 12 can be secured by providing a vertical movement of the roller 12 to arrange itself momentarily in a higher position than the roller 11 so as to constitute a stop ledge for the roll and then move to the same height as the roller 11 for the packaging phase. For unloading the roll there could be utilized the same vertical movement of the roller 12 by lowering it beneath the level of the roller 11 to make the roll pass over the roller 12.

Naturally there must be provided an outlet slide from the machine arranged at the height reached below by the roller 12, i.e. lower than the inclined plane 16 which in this case will not be present. As an alternative the roll 13 can be supported at the ends by rotating chucks moving along guides, first to carry the roll to the machine and then to remove it therefrom.

The welding head 21 could also be provided integral with the unrolling device and then taken into contact with the part to be welded by means of another rotation of the arm 17.

Finally the tape 19 can of course be of a different width than the roll, e.g. if smaller with prevalently only fixing function of the free end of the roll or if greater side edges folding on the ends of the roll. It is also possible to use several tapes arranged parallel to link the roll along various circumferences.

Claims

1. Packaging machine for peripheral wrapping of a tape (19) around a roll of strip material (13) supported by support means (11,12) designed

to keep it in axial rotation comprising means for activating the supplementary rotation of the roll for at least one turn after completion of the winding of the material to wind the tape peripherally on the roll until it overlaps itself; means of fixing and cutting (21) which can be drawn near the periphery of the roll to fix together overlapped parts of the tape and cut it upstream of the fixing zone to provide the packaged roll, characterized in that it further comprises means of supply of the free end of the tape on the yet unwound terminal section of the strip material being wound, said end being thus at least partly gripped between the roll and the last turn of the strip material.

2. Packaging machine in accordance with claim 1 characterized in that the support means comprise a pair of parallel powered rollers (11,12) between which the roll (13) is supported with its axis parallel thereto.

3. Packaging machine in accordance with claim 1 characterized in that the fixing and cutting means comprise a fixing and cutting head (21) extending along the width of the tape and born by an arm (17) moving between a first position drawn away from and a second position wherein the head is substantially in contact with the roll (13).

4. Packaging machine in accordance with claim 1 characterized in that the fixing and cutting means comprise means of approach substantially perpendicular to the surface of the roll.

5. Packaging machine in accordance with claim 1 characterized in that the means for actuating the supplementary rotation comprise sensor means (29,26) for sensing the roll circumference controling the support means to cause the roll to complete said at least one turn.

6. Packaging machine in accordance with claims 3 and 5 characterized in that the circumference sensor means comprise a device (29) for measuring the movement of the arm in the sense of detecting the diameter of the roll on the basis of the amount of the movement of the arm between said two positions.

7. Packaging machine in accordance with claim 3 characterized in that there is present a sensor (26) for detection of the arrival of the arm at the second position.

8. Packaging machine in accordance with claim 3 characterized in that said arm (17) also supports the tape feed means.

9. Packaging machine in accordance with claim 1 characterized in that the tape (19) is of weldable material such as plastic and the fixing and cutting means comprise heating elements for melting together said overlapped parts of the tape.

10. Packaging machine in accordance with claim 1 characterized in that the fixing and cutting means comprise nozzles (30) for delivery of glue between the tape surfaces constituting subsequently said overlapped parts.

Patentansprüche

1. Verpackungsmaschine für das äußere Umwikkeln einer Rolle von Bandmaterial (13) mit einem Band (19), die von Stützmitteln (11, 12) gestützt wird, um sie in axialer Rotation zu halten, die Mittel aufweist, um die zusätzliche Rotation der Rolle für zumindest eine Umdrehung nach Abschluß der Wicklung des Materials in Gang zu bringen, um das Band entlang des Rollenrandsbereichs zu wickeln, bis es sich selbst überlappt, sowie Befestigungs- und Schneidmittel (21) aufweist, die in die Nähe des Randbereichs der Rolle gezogen werden können, um überlappende Teile des Bandes zusammenzufügen und um es aufwärts der zusammengefügten Zone zu schneiden, um eine verpackte Rolle zu erhalten,
dadurch gekennzeichnet,
daß die Maschine weiterhin Mittel zur Zufuhr des freien Bandendes an das schon umwickelte Endstück des zu umwickelnden Bandmaterials aufweist und daß dieses Ende mindestens teilweise zwischen der Rolle und der letzten Drehung des Bandmaterials erfaßt wird.

2. Verpackungsmaschine nach Anspruch 1,
dadurch gekennzeichnet,
daß die Stützen ein Paar paralleler angetriebener Rollen (11, 12) aufweisen, zwischen denen die Rolle (13) unterstützt ist, wobei ihre Achse zu deren Achsen parallel verläuft.

3. Verpackungsmaschine nach Anspruch 1,
dadurch gekennzeichnet,
daß die Befestigungs- und Schneidmittel einen Befestigungs- und Schneidkopf (21) aufweisen, der sich entlang des Bandes erstreckt und von einem Maschinenarm (17) gehalten wird, der sich zwischen einer ersten Position weg von und einer zweiten Position bewegt, wobei der Kopf im wesentlichen in Kontakt mit der Rolle (13) ist.

4. Verpackungsmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Befestigungs- und Schneidmittel Mittel aufweisen, um die Rollenoberfläche im wesentlichen senkrecht zu erreichen.

5. Verpackungsmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Mittel, die die zusätzliche Rotation in Gang bringen, Sensoren (29, 26) aufweisen, um den Rollenumfang zu messen und die Stützen zu kontrollieren, um die Rolle dahingehend einzustellen, daß diese zumindest die letzte Umdrehung vervollständigt.

6. Verpackungsmaschine nach Anspruch 3 und 5, dadurch gekennzeichnet, daß der Umfangsmeßsensor eine Vorrichtung (29) aufweist, um die Bewegung des Maschinenarms in dem Sinne aufzunehmen, daß der Rollendurchmesser auf der Basis der Anzahl der Bewegungen des Maschinenarms zwischen den beiden Positionen bestimmt wird.

7. Verpackungsmaschine nach Anspruch 3, dadurch gekennzeichnet, daß ein Sensor (26) für die Aufnahme der Ankunft des Maschinenarms in der zweiten Position vorhanden ist.

8. Verpackungsmaschine nach Anspruch 3, dadurch gekennzeichnet, daß dieser Maschinenarm (17) weiterhin die Bandzulieferungsmittel unterstützt.

9. Verpackungsmaschine nach Anspruch 1, dadurch gekennzeichnet, daß das Band (19) aus verschweißbarem Material wie Kunststoff besteht und daß die Befestigungs- und Schneidmittel Heizelemente enthalten, um die überlappenden Teile des Bandes zusammenzuschweißen.

10. Verpackungsmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Befestigungs- und Schneidmittel Düsen (30) aufweisen, um Klebemittel zwischen die Bandoberflächen im wesentlichen zwischen die überlappenden Teile, zu liefern.

Revendications

1. Machine d'emballage par enroulement périphérique d'une bande (19) autour d'un rouleau de matériau en feuille (13) porté par des moyens (11, 12) destinés à l'entraîner en rotation autour de son axe, comprenant des moyens pour engendrer une rotation supplémentaire du rouleau sur au moins un tour après le bobinage complet du matériau pour enrouler la bande de manière périphérique sur le rouleau jusqu'à ce qu'elle vienne en recouvrement d'elle-même, des moyens (21) de fixation et de coupe qui peuvent être rapprochés de la périphérie du rouleau pour lier ensemble les parties en recouvrement de la bande et la couper en amont de la zone de liaison afin de réaliser un rouleau emballé, caractérisée en ce qu'il comprend en outre des moyens pour amener l'extrémité libre de la bande sur la partie terminale non encore enroulée du matériau en feuille qui est enroulé, cette extrémité étant ainsi au moins partiellement pincée entre le rouleau et le dernier tour du matériau en feuille.

2. Machine d'emballage selon la revendication 1, caractérisée en ce que les moyens de support comprennent une paire de rouleaux (11, 12) moteurs entre lesquels le rouleau (13) est supporté avec son axe parallèle à celui des rouleaux.

3. Machine d'emballage selon la revendication 1, caractérisée en ce que les moyens de fixation et de coupe comprennent une tête de fixation et de coupe (21) qui s'étend le long de la largeur de la bande et qui est portée par un bras (17) mobile entre une première position écartée du rouleau (13) et une seconde position dans laquelle la tête est substantiellement au contact de ce rouleau (13).

4. Machine d'emballage selon la revendication 1, caractérisée en ce que les moyens de fixation et de coupe comportent des moyens de leur approche sensiblement perpendiculaires à la surface du rouleau.

5. Machine d'emballage selon la revendication 1, caractérisée en ce que les moyens pour réaliser la rotation supplémentaire comprennent des moyens de détection (29, 26) de la circonférence du rouleau pour commander les moyens de support pour qu'ils fassent tourner le rouleau jusqu'à la fin d'au moins ledit tour.

6. Machine d'emballage selon les revendications 3 et 5, caractérisée en ce que les moyens de détection de la circonférence comprennent un dispositif (29) pour mesurer les mouvements du bras dans la direction de détection du diamètre du rouleau sur la base de la longueur du mouvement du bras entre les guides de position.

7. Machine d'emballage selon la revendication 3, caractérisée en ce qu'il existe un détecteur (26) de l'arrivée du bras à sa seconde position.

8. Machine d'emballage selon la revendication 3, caractérisée en ce que le bras (17) porte également les moyens d'alimentation en bande.

9. Machine d'emballage selon la revendication 1, caractérisée en ce que la bande (19) est en matériau soudable tel qu'une matière plastique et les moyens de fixation et de coupe comprennent des moyens chauffants pour fondre ensemble les parties en recouvrement de la bande.

10. Machine d'emballage selon la revendication 1, caractérisée en ce que les moyens de fixation et de coupe comprennent des buses (30) pour délivrer de la colle entre les surfaces de la bande destinées à constituer les parties en recouvrement.

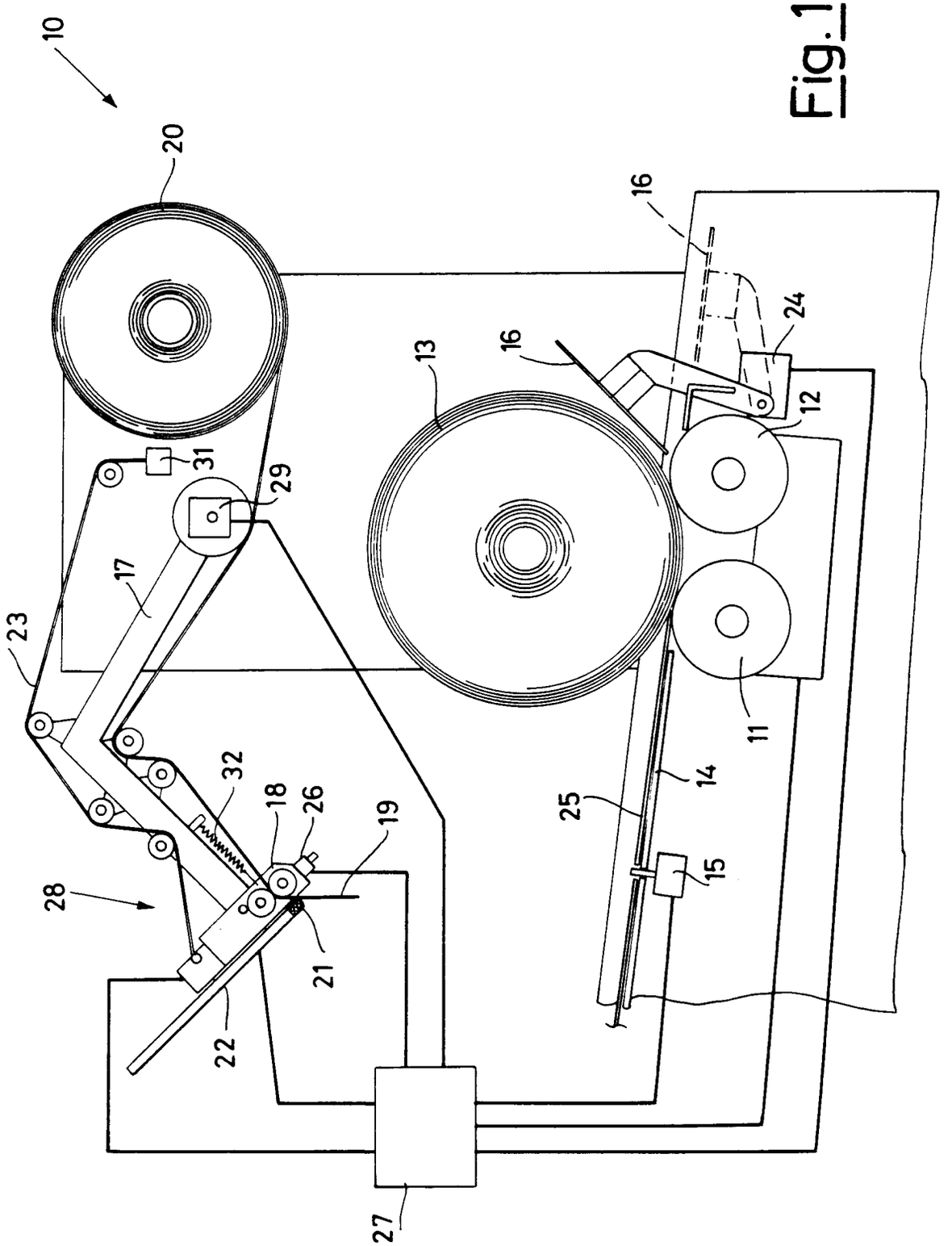


Fig.1

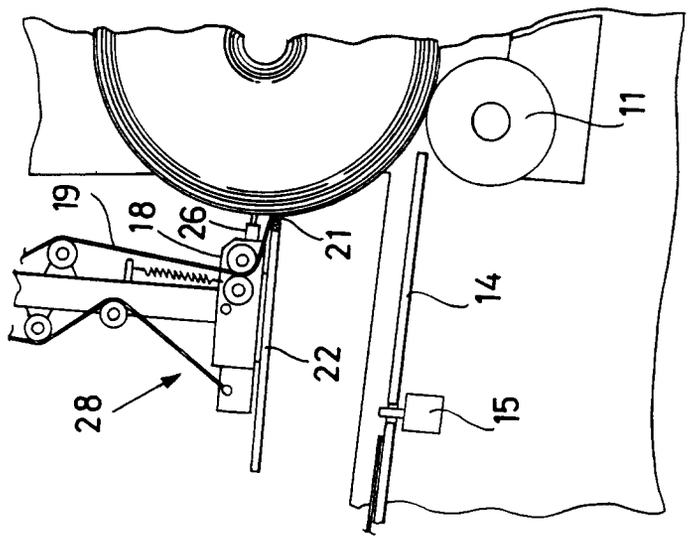


Fig.4

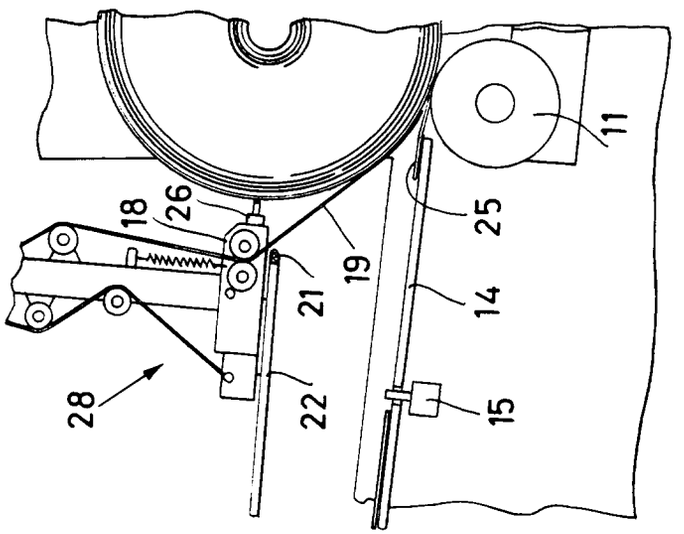


Fig.3

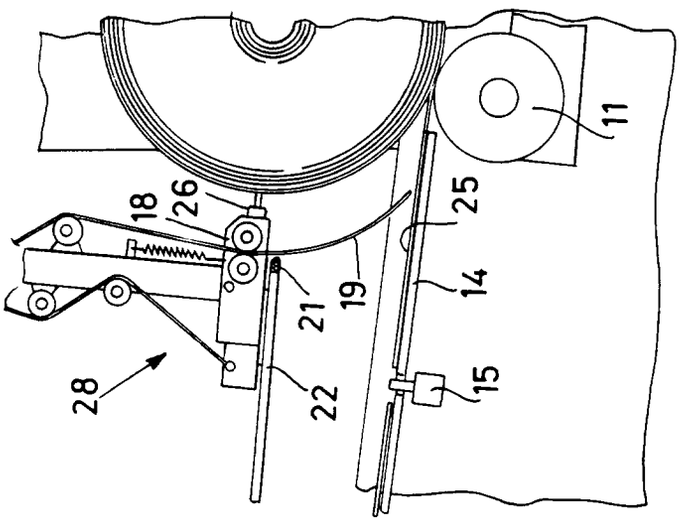


Fig.2

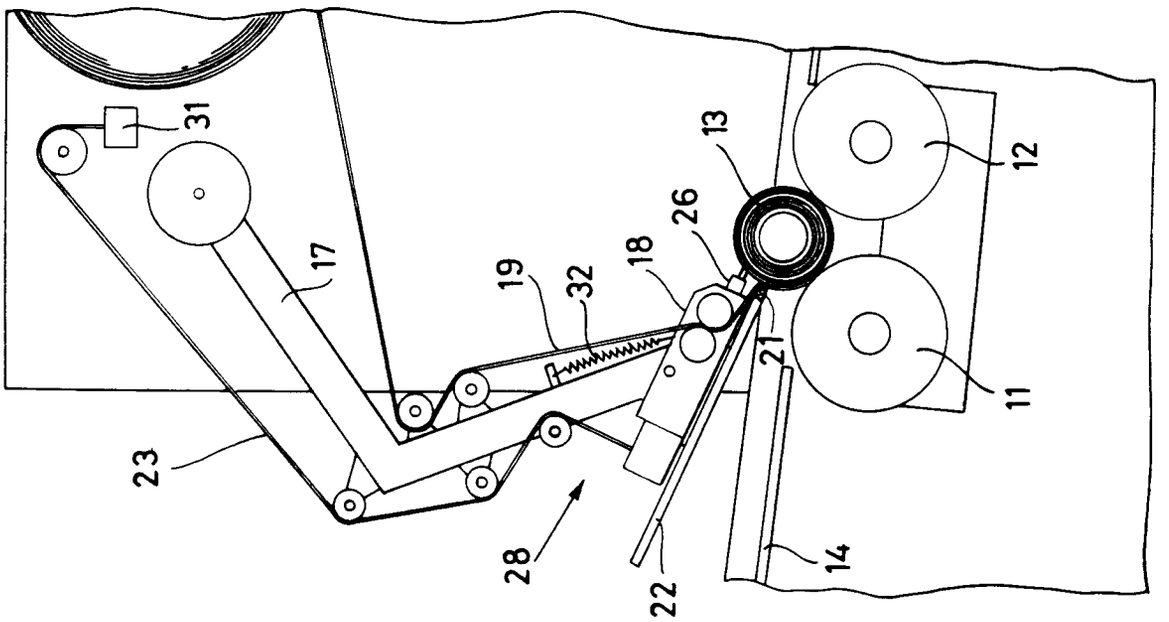


Fig.5

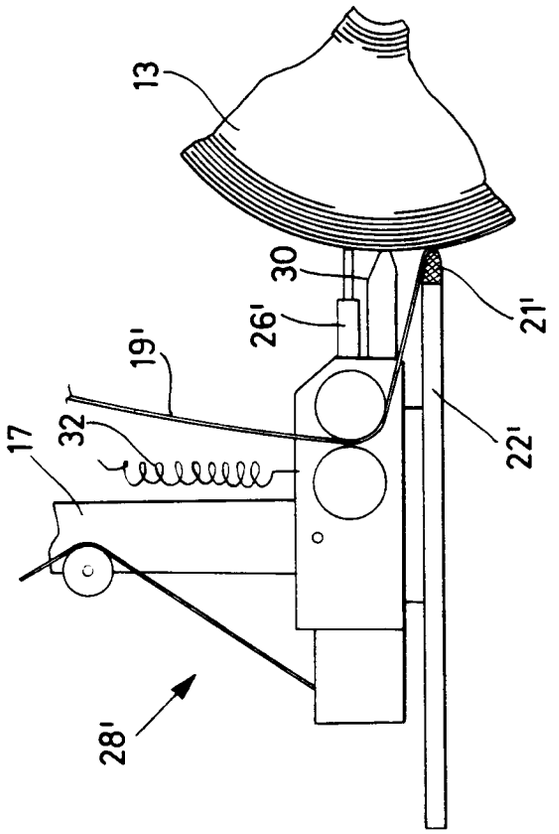


Fig.6