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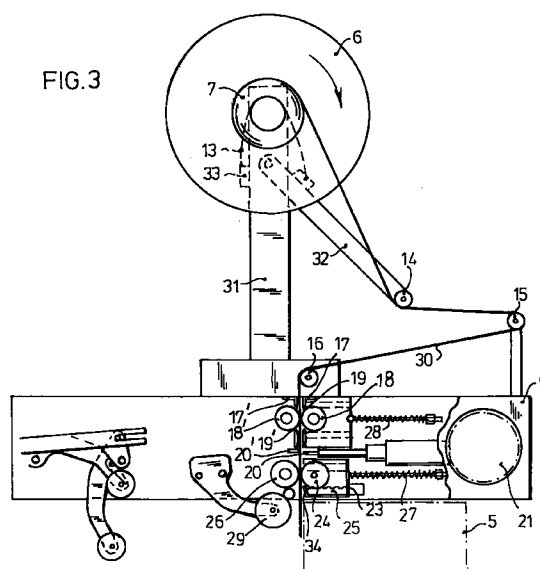
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(54) **Apparatus for applying a gummed paper tape to a box to be closed.**

(57) Apparatus for applying gummed paper tape to a box (5) to be closed. The apparatus contains a supporting unit (6) for carrying a roll of gummed paper tape (7), a transporting and guiding unit for intermittently transporting and guiding the gummed paper tape along a path from the supporting unit to the box, a cutting unit for cutting the gummed paper tape into strips, a moistening unit for moistening the gummed paper tape, and an applying unit for applying the gummed paper tape to the box to be closed after the gummed paper tape has been moistened. In order to be able to uniformly moisten large lengths of gummed paper tape the moistening unit is provided with two rolls (24,26) placed on both sides of the path (30) of the gummed paper tape, in which the rolls can be being pressed against each other with a specified pressure force. The moistening unit is also provided with a holder (23) for containing a moistening agent up to a specified height, in which one of the rolls is rotatable in the holder and is positioned for contacting the moistening agent for moistening the gummed paper tape.



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## Description

The invention relates to an apparatus for applying gummed paper tape to a box to be closed, containing:

- a supporting unit for carrying a roll of gummed paper tape,
- a transporting and guiding unit for intermittently transporting and guiding the gummed paper tape along a path from the supporting unit to the box,
- a cutting unit for cutting the gummed paper tape into strips,
- a moistening unit for moistening the gummed paper tape, and
- an applying unit for applying the gummed paper tape to the box to be closed after the gummed paper tape has been moistened.

Suchlike apparatuses are used for manually, half-automatically and fully-automatically applying gummed paper tape to a box to be closed. The moistening unit for moistening the layer of adhesive applied to the gummed paper tape contains a brush, which is brought into contact with a moistening agent, such as water. The disadvantage of known apparatuses is that after a relatively short period of use, however, the moistening unit does not work well because the brush is not sufficiently saturated with moistening agent. As a result the gummed paper tape does not adhere adequately to the box. In order to remedy this problem, the apparatus has to be stopped and the defect put right. In addition, the use of gummed paper tape for closing a box has the disadvantage that gummed paper tape starts curling up in an uncontrolled manner after moistening the adhesive layer applied to that, so that applying gummed paper tape to the box takes place in a non-reproducible way.

Among other things it is an object of the present invention to provide an apparatus for applying gummed paper tape to a box to be closed, in which the apparatus has a better moistening unit with regard to the known apparatuses and the gummed paper tape can be applied in a reproducible manner to the box.

For this purpose a moistening unit as set out above is characterized according to the invention in that

- two rolls placed on both sides of the path of the gummed paper tape, in which the rolls can be being pressed against each other with a specified pressure force,
- a holder for containing a moistening agent up to a specified height, in which one of the rolls is rotatable in the holder and is positioned for contacting the moistening agent for moistening the gummed paper tape. Because the moistening of the gummed paper tape is carried out by a roll, the moistening of the gummed paper tape not only appears to be very uniform, which improves the adherence of the gummed paper tape to the box to be closed, but it is

also shown that a very large length of gummed paper tape can be moistened without the degree of moistening changing.

5 Preferably the moistening unit contains a control device for keeping the height of the moistening agent constant. It is thus ensured that for each amount of moistening the holder contains in all cases exactly enough moistening agent, such as water, for moistening the gummed paper tape.

10 A preferred embodiment of the apparatus according to the invention is characterized in that the moistening unit contains a heating device for keeping the moistening agent at a constant temperature. Because the degree of adherence of the gummed paper tape on the box to be closed depends on the temperature, an ideal adherence can be obtained through the heating device.

15 In order to transport the gummed paper tape properly through the moistening unit, an even moistening, among other things, being obtained, one of the rolls is preferably driven. Preferably the driven roll is the roll which is rotatable in the holder.

20 If the pressure force is adjustable, then for each type of gummed paper tape, for example of variable thickness or weight of the gummed paper tape, an optimal moistening can be fixed.

25 In an embodiment of an apparatus according to the invention, the roll which is rotatable in the holder is a hard roll, preferably made of aluminium, and provided with circumferential grooves. The circumferential grooves serve to receive the moistening agent from the holder and to deliver it to the gummed paper tape.

30 In an alternative embodiment of the apparatus according to the invention the roll which is rotatable in the holder comprises a foam rubber roll.

35 Proper transport of the gummed paper tape through the moistening unit is guaranteed, irrespective of the type of foam rubber, if the roll placed in the holder comprises two foam rubber rolls with a synthetic or rubber ring placed therebetween.

40 With regard to foil tape gummed paper tape has the disadvantage that when the gummed paper tape has been wound off a supply roll, the rolled-off gummed paper tape starts to curl up. When the gummed paper tape has been moistened, the degree of curling up increases. Conversely gummed paper tape is much cheaper than foil tape and the degree of adherence to a box to be closed, made, for example of recycled cardboard, is also several times higher.

45 In addition the invention provides an apparatus through which the gummed paper tape can be transported without it curling up, which contributes to an undisturbed functioning of the apparatus.

50 For all kinds of the moistened gummed paper tape the holder is preferably provided with a scraper in order to prevent curling up of the moistened gummed paper tape around the rotatable roll in the holder.

A further preferred embodiment of the apparatus according to the invention is characterized in that the transporting and guiding unit is provided with:

- a pair of guiding jaws, in which the guiding jaws are placed on both sides of the path of gummed paper paper tape, in which each guiding jaw is provided with a recess, 5
- a first pair of rolls, in which the rolls are placed on both sides of the path of gummed paper tape, in which the first pair of rolls is placed between the supporting unit and the cutting unit, in which each roll extends through the recess of the corresponding guiding jaw, and in which the rolls of the first pair can be pressed against each other with a specified pressure force, 10 15
- a second pair of rolls, in which the rolls of the second pair are placed on both sides of the path of gummed paper tape, in which the second pair of rolls is placed between the cutting unit and the applying unit, and in which the rolls of the second pair can be pressed against each other with a specified pressure force, 20
- in which one roll of the first pair and one roll of the second pair is driven. Because of this each type of gummed paper tape is transported in a flat manner, that is without curling up, along the cutting unit to the moistening unit and the applying unit, the risk of undesirable tearing of the gummed paper tape, particularly in the case of lighter gummed paper tape, being negligible. As a consequence the cutting also takes place reproducibly. 25 30

Preferably the second pair of rolls of the transporting and guiding unit is formed by the pair of rolls of the moistening unit, so that less parts are needed. 35

Preferably the roll of the first pair and the roll of the second pair are jointly driven.

In order to keep the gummed paper tape taut whilst the gummed paper tape is being cut, so that cutting is facilitated, the diameter of the driven roll of the second pair is larger than the diameter of the driven roll of the first pair. For all types of gummed paper tape and roll diameters, keeping the gummed paper tape taut appears to be satisfactory, if the diameter of the driven roll of the second pair is 1.5 mm larger than the diameter of the driven roll of the first pair. 40 45

So as to apply the moistened gummed paper tape with the proper adhesion to the box to be closed, the applying unit comprises a smooth roll, which is preferably rotatable in one direction only, so as to apply the gummed paper tape to a defined place on the box to be closed. 50

By way of example some preferred embodiments of an apparatus for applying gummed paper tape to a box to be closed will be described on the basis of the drawing. 55

Figure 1 schematically shows a side view of an apparatus according to the invention,

figure 2 schematically shows a front view of the apparatus according to figure 1,

figure 3 schematically shows a more detailed view in cross section of the inventive units of the apparatus according to the invention for closing a box at the top, and

figure 4 schematically shows a more detailed view in cross section of the inventive units of the apparatus according to the invention for closing a box at the bottom.

Figure 1 schematically shows a side view and figure 2 schematically shows a front view of an apparatus for applying gummed paper tape to a box 5 to be closed. In the example shown the apparatus is mounted to a fixed frame 1, although it is clear that the apparatus can also be movably mounted.

A transport means 2 for transporting the box 5 to be closed through the apparatus is mounted to the frame. In the example shown the transport means 2 is a roll conveyor, although one or more conveyor belts or wire mesh conveyors can be used. In order to centre the box 5 to be closed well, thus guaranteeing the reproducible action of the apparatus, the box 5 is confined in a lateral direction by two side guiding conveyors 3. These side guiding conveyors can each contain a conveyor belt, which can be compressed in a lateral direction by the box 5 so as to obtain good centering and good transport. Particularly in the case of high boxes it is preferable if additional side guides 4, for example in the shape of rolls, are used. The distance between the side guiding conveyors 3 is adjustable so as to receive boxes of different widths. The distance is adjustable between 120 and 600 mm, for instance.

The apparatus contains a supporting unit 6 for supporting a roll of gummed paper tape 7. The gummed paper tape 7 can be of a variety of gummed paper tape types, and has a width of 48 - 80 mm, for example, a weight of approximately 60 - 100 g/m<sup>2</sup>, and the weight can be even lesser or greater. In addition, the apparatus contains a housing 9 in which a transporting and guiding unit, a cutting unit, a moistening unit and an applying unit are accommodated. The supporting unit 6 and the housing 9 are movably attached in height with regard to the transport means 2 to a bar 8 mounted to the frame 1. The height is adjustable between 140 - 550 mm, for example.

The supporting unit 6 and the housing 9 are used for closing the box 5 at the top. To be able to close a box at the bottom, on the lower side of the transport means 2, an additional housing 9' and an additional supporting unit 6' for a roll of gummed paper tape 7' can be mounted to the frame. The inventive units of the appara-

tus according to the invention will henceforth be described on the basis of units for closing the top of a box 5. The units for closing the bottom of a box are analogous hereto, as can be seen in figure 4, and only the differences from the units for top closure of the box 5 will be discussed, where necessary.

A box 5 to be closed can be moved continuously through the apparatus, in which the box 5, passing a particular place, and being detected, for instance, by a photo sensor, activates the action of the units for applying the gummed paper tape 7 to the box 5, such that there is a flap of a specified length between the applying unit and the box at the moment a box reaches the applying unit. Conversely the transport of the box 5 on the transport means 2 can be interrupted for a short while, so that gummed paper tape 7 has enough time to adhere well to the material of the box 7. After having passed through the apparatus, the box 10 will be closed at the top as well as at the bottom by a strip of gummed paper tape 11 and 12, respectively.

In figure 3 the inventive units of an apparatus according to the invention are schematically shown in cross section.

The supporting unit 6 is provided with a shaft on which a roll of gummed paper tape 7 is arranged and is mounted in its entirety to a bar 31. Via a guiding roll 14, which is mounted to a swivelling arm 32 and via fixed guiding rolls 15 and 16 the gummed paper tape 7, unwound from the roll, is brought into an almost vertical path which eventually ends at the front of the box 5. A brake band 13 is attached on the one hand to a fixed point 33 and on the other hand to the swivelling arm 32, and surrounds the shaft of the supporting unit 6. If a transport unit to be described below draws off gummed paper tape from the roll, on account of the tension in the gummed paper tape 7 the swivelling arm 32 is lifted up and the shaft of the supporting unit 6 and with it the gummed paper tape can rotate freely. When the transport unit becomes inactive, the swivelling arm 32 then descends and consequently presses the brake band 13 against the shaft of the supporting unit 6, as a result of which the latter stops so that the gummed paper tape 7 is kept taut.

When the path 30 of gummed paper tape 7 is branched off in a vertical direction after the roll 16, the gummed paper tape 7 comes in between a pair of guiding jaws 17 and 17', which ensures a flat, that is a non-curling guidance of the gummed paper tape 7. Each guiding jaw 17, 17' is provided with one or more recesses 19, 19'. A first pair of rolls 18, 18' is placed on both sides of the path 30 of the gummed paper tape, each roll 18, 18' projecting through the recess 19, 19' of the corresponding guiding jaw 17, 17' to the gummed paper tape 7. The rolls 18, 18' can be pressed against each other with a specified pressure force, in order to transport the gummed paper tape 7 properly. Preferably the pressure force is adjustable, so as to set the right pressure force for every type of gummed paper tape.

The adjustability of the pressure force is schematically shown in figure 3 by an adjustable, spring-loaded suspension 28 of the roll 18 in the housing 9.

Each roll of the first pair comprises at least two adjacently placed smooth synthetic or rubber rolls, which are spaced from each other, each smooth roll projecting through its own recess in the corresponding guiding jaw. Yet another part of the guiding jaw is present between each recess, so that wide gummed paper tape can also be transported by the guiding jaws 17, 17' without curling up.

One of the rolls of the first pair, for example roll 18, is intermittently driven by a drive, for example a pneumatic motor 21.

The guiding jaws 17, 17' project downwards over an adequate length, so as to guide the gummed paper tape 7 properly to a cutting unit 20, 20'. The cutting unit comprises a fixed knife blade 20' and a movable knife blade 20, which are located on both sides of the path 30 of the gummed paper tape 7.

There is a moistening unit for moistening the adhesive or gum layer of the gummed paper tape 7 underneath the cutting unit. The moistening unit is provided with two rolls 24, 26 placed on both sides of the path 30 of the gummed paper tape 7, and the rolls 24, 26 can be pressed together with a specified pressure force. The moistening unit is moreover provided with a holder 23 for containing a moistening agent 25, such as water, to a specified height, for instance. One of the rolls, roll 24 in the example given in figure 3, is rotatably mounted in the holder 23 and is in contact with the moistening agent 25 as well as with the gummed paper tape 7, for moistening the gummed paper tape. Because the moistening is carried out by a roll, moistening the gummed paper tape not only appears to be very uniform, but a very large length of more than 2 km gummed paper tape can be moistened without the degree of moistening changing, too.

Depending on the type of gummed paper tape, which thickness or weight this has, for instance, a specified pressure force can produce an ideal moistening. In order to provide, in a simple way, an ideal moistening for each type of gummed paper tape, the pressure force between the rolls of the moistening unit is preferably adjustable. This is schematically shown in figure 3 in that roll 26 is adjustably mounted in a spring-loaded fashion 27 to the housing 9.

The moistening unit further contains a control device for keeping the height of the moistening agent 25 in the holder 23 constant, so that there is always enough agent 25 at hand to guarantee a proper moistening, without the holder having to be exceptionally large.

Since the degree of adhesion of the gummed paper tape 7 to a box to be closed is in part dependent on the temperature, the moistening unit is provided with a heating device for keeping the moistening agent 25 at a constant temperature. Hence the temperature of the

agent 25 is almost insensitive to varying ambient conditions, as a result of which a reproducible adhesion of the gummed paper tape 7 to the box to be closed can be obtained.

The transport of the gummed paper tape through the moistening unit takes place properly in all cases, for instance without the gummed paper tape tearing if one of the rolls 24, 26 is driven, preferably the roll 26 which is rotatable in the holder 23. For this drive advantageous use can be made of the drive 21 of the driven roll of the first pair of the transporting and guiding unit. In this case the moistening unit in fact forms a part of the transporting and guiding unit.

In an alternative embodiment the transporting and guiding unit contains a second pair of rolls placed under the cutting unit 20, 20' and on both sides of the path 30 of the gummed paper tape. One of the rolls of the second pair is then intermittently driven by a drive, for example a pneumatic motor. Preferably the driven rolls are driven jointly by one motor 21 in order to obtain a highly synchronized transport.

In order to prevent the gummed paper tape 7 from slackening because of turning back the rolls when the drive is at a standstill, the driven rolls are preferably rotatable in one direction only.

When the gummed paper tape 7 comes in between the pair of rolls 24, 26 for the first time, a certain blockage of the gummed paper tape 7 can occur, whereby the gummed paper tape is somewhat deformed. In order to overcome this deformation the diameter of the driven roll 26 is larger than the diameter of the driven roll 18 of the first pair. The gummed paper tape 7 is thus stretched taut, as a result of which all deformations in the gummed paper tape 7 are removed. As an additional advantage the cutting of the taut gummed paper tape 7 can take place more reproducibly.

It has been shown that for all types of gummed paper tape deformations can be removed if the diameter of the driven roll of the moistening unit is 1.5 mm larger than the diameter of the driven roll of the first pair. As an alternative the driven rolls of the first pair and the moistening unit can have an equal diameter, the driven roll of the moistening unit being driven at a higher velocity than that of the first pair.

It has been shown in practice that for all types of gummed paper tape a proper transport is realized if the roll of the moistening unit, which is not rotatable in the holder, contains a number of adjacently placed synthetic or rubber rings.

A hard roll provided with circumferential grooves is provided as a roll for moistening the gummed paper tape, preferably a roll of stainless steel material, such as aluminium, or a roll of foam rubber being extremely appropriate, although other rolls can be used.

It has been shown that depending on the type of foam rubber that is used for the roll, a foam rubber roll is less suited for moistening the gummed paper tape which is intended for closing the bottom of a box to be

closed. On account of the other rotational direction of this roll this can lead to a certain blockage of the moistening agent on the gummed paper tape, and the moistening is therefore of lesser quality. This blockage can also be considered a kind of chamois effect. For this reason it could be preferable using a hard roll with circumferential grooves for moistening gummed paper tape which is intended for the bottom of a box to be closed.

If a foam rubber roll is used, then a proper transport of the gummed paper tape through the moistening unit is guaranteed, irrespective of the type of foam rubber, if the roll placed in the holder comprises two foam rubber rolls with a synthetic or rubber ring therebetween.

In order to prevent the moistened gummed paper tape 7 from curling around the moistening roll 24, the holder is provided with a scraper 34. For the moistening unit that is intended for moistening the gummed paper tape for closing the top of a box, the scraper is integrated in the base of the holder 25, for instance. For the moistening unit that is intended for moistening gummed paper tape for bottom of a box, there is a scraper above the moistening roll.

An applying unit is located underneath the moistening unit, which comprises a smooth roll 29 rotatable preferably in one direction only, which presses the gummed paper tape 7 against a box 5 to be closed. The activation of the apparatus, through a box passing a specified place, is such that the intermittent drive draws off enough gummed paper tape from the roll, that a flap with a specified length is transported between the roll 29 and the box 5, which flap is pressed against the box. The length of the flap can be adjusted by the degree of intermittent drive.

## Claims

1. Apparatus for applying gummed paper tape to a box to be closed, containing:

- a supporting unit for carrying a roll of gummed paper tape,
- a transporting and guiding unit for intermittently transporting and guiding the gummed paper tape along a path from the supporting unit to the box,
- a cutting unit for cutting the gummed paper tape into strips,
- a moistening unit for moistening the gummed paper tape, and
- an applying unit for applying the gummed paper tape to the box to be closed after the gummed paper tape has been moistened,

**characterized in that** the moistening unit is provided with:

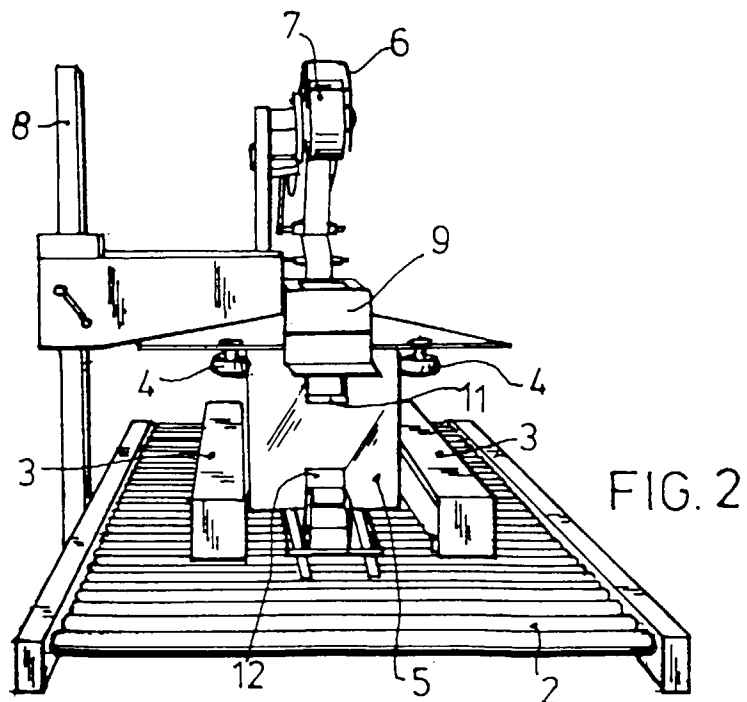
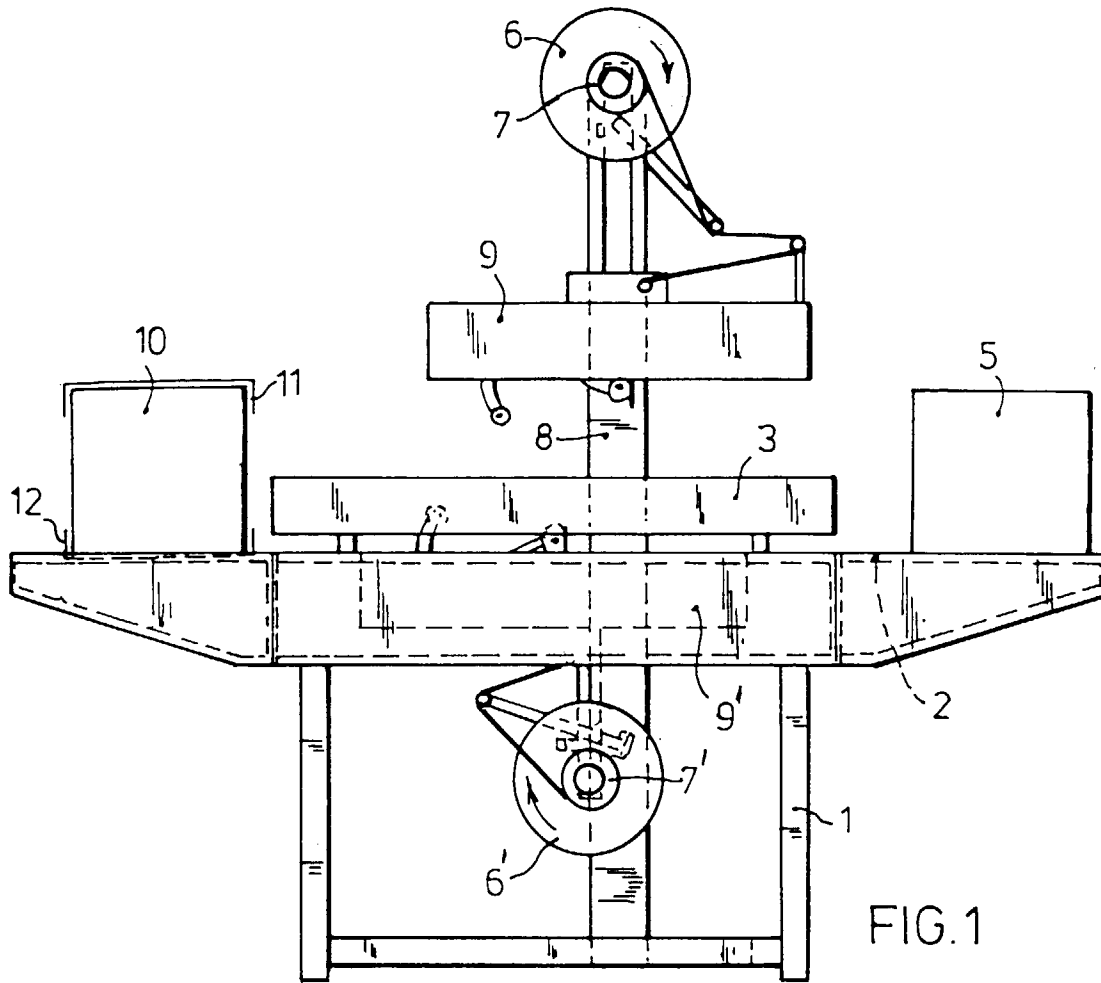
- two rolls placed on both sides of the path of the gummed paper tape, in which the rolls can be being pressed against each other with a speci-

fied pressure force,

- a holder for containing a moistening agent up to a specified height, in which one of the rolls is rotatable in the holder and is positioned for contacting the moistening agent for moistening the gummed paper tape. 5
- 2. Apparatus according to claim 1, **characterized in that** the moistening unit contains a control device for keeping the height of the moistening agent constant. 10
- 3. Apparatus according to claim 1 or 2, **characterized in that** the moistening unit contains a heating device for keeping the moistening agent at a constant temperature. 15
- 4. Apparatus according to claim 1, 2 or 3, **characterized in that** one of the two rolls is driven. 20
- 5. Apparatus according to claim 4, **characterized in that** the driven roll is the roll which is not rotatable in the holder.
- 6. Apparatus according to claim 1, **characterized in that** the pressure force is adjustable. 25
- 7. Apparatus according to any one of the preceding claims, **characterized in that** the roll which is rotatable in the holder is a hard roll provided with circumferential grooves. 30
- 8. Apparatus according to claim 7, **characterized in that** the roll is made of aluminium. 35
- 9. Apparatus according to any one of the claims 1 to 6, **characterized in that** the roll which is rotatable in the holder comprises a foam rubber roll.
- 10. Apparatus according to claim 9, **characterized in that** the roll which is rotatable in the holder comprises two foam rubber rolls with a synthetic or rubber ring placed therebetween. 40
- 11. Apparatus according to claim 1, **characterized in that** the holder is provided with a scraper. 45
- 12. Apparatus according to claim 1, **characterized in that** the transporting and guiding unit is provided with: 50
  - a pair of guiding jaws, in which the guiding jaws are placed on both sides of the path of gummed paper tape, in which each guiding jaw is provided with a recess, 55
  - a first pair of rolls, in which the rolls are placed on both sides of the path of gummed paper tape, in which the first pair of rolls is placed

between the supporting unit and the cutting unit, in which each roll extends through the recess of the corresponding guiding jaw, and in which the rolls of the first pair can be pressed against each other with a specified pressure force,

- a second pair of rolls, in which the rolls of the second pair are placed on both sides of the path of gummed paper tape, in which the second pair of rolls is placed between the cutting unit and the applying unit, and in which the rolls of the second pair can be pressed against each other with a specified pressure force,
- in which one roll of the first pair and one roll of the second pair is driven.
- 13. Apparatus according to claim 12, **characterized in that** the second pair of rolls of the transporting and guiding unit is formed by the pair of rolls of the moistening unit.
- 14. Apparatus according to claim 12 or 13, **characterized in that** the roll of the first pair and the roll of the second pair are jointly driven.
- 15. Apparatus according to claim 14, **characterized in that** the diameter of the driven roll of the second pair is larger than the diameter of the driven roll of the first pair.
- 16. Apparatus according to claim 15, **characterized in that** the diameter of the driven roll of the second pair is 1,5 mm larger than the diameter of the driven roll of the first pair.
- 17. Apparatus according to claim 12 to 16, **characterized in that** the rolls of the first pair and the second pair are rotatable in one direction only.
- 18. Apparatus according to claim 12, **characterized in that** the rolls of the first pair contain at least two adjacently placed smooth synthetic or rubber rolls.
- 19. Apparatus according to claim 12 or 13, **characterized in that** one of the rolls of the second pair contains a number of adjacently placed synthetic or rubber rings.
- 20. Apparatus according to claim 1, **characterized in that** the applying unit comprises a smooth roll.
- 21. Apparatus according to claim 19, **characterized in that** the smooth roll is rotatable in one direction only.



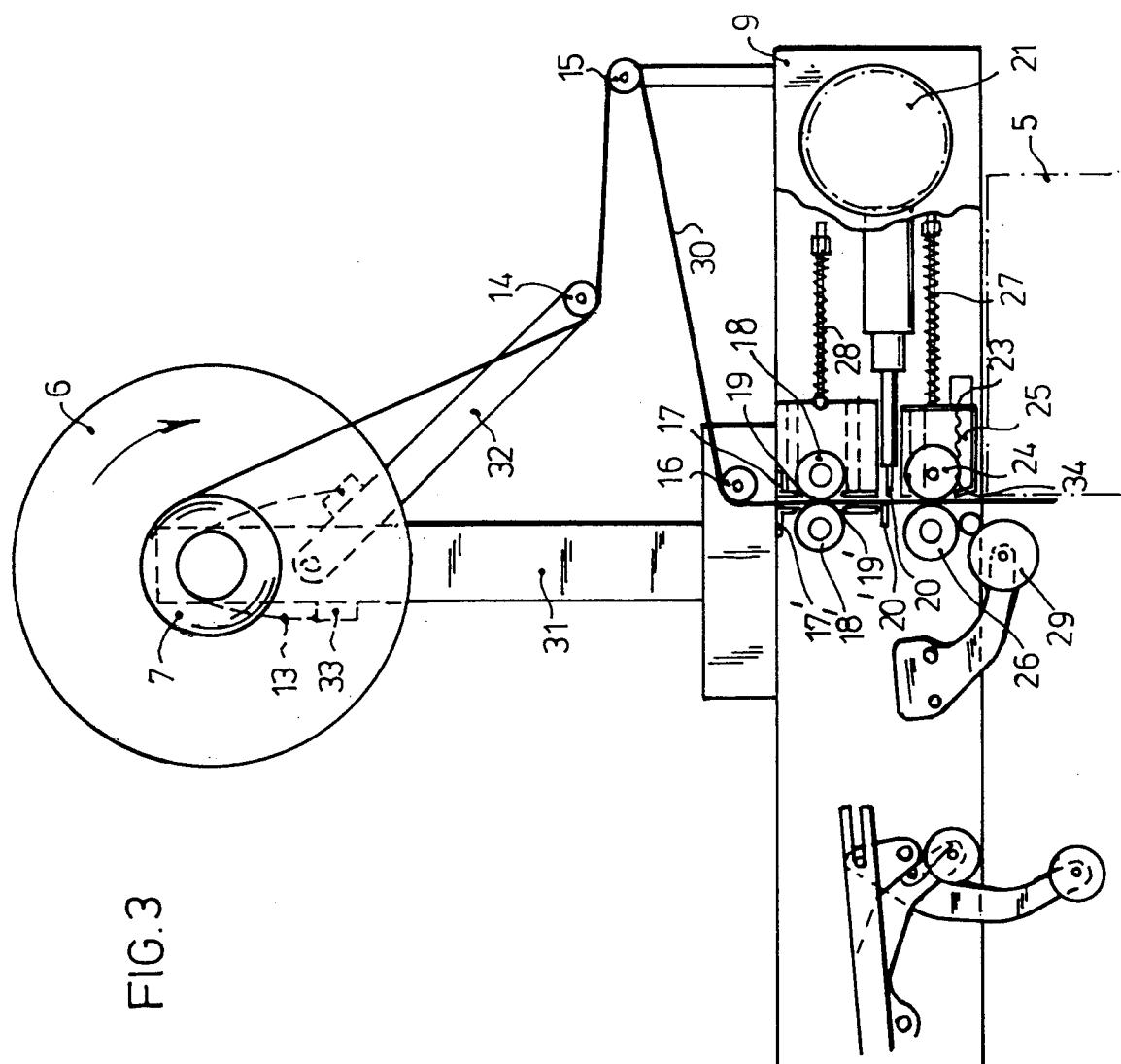


FIG. 3



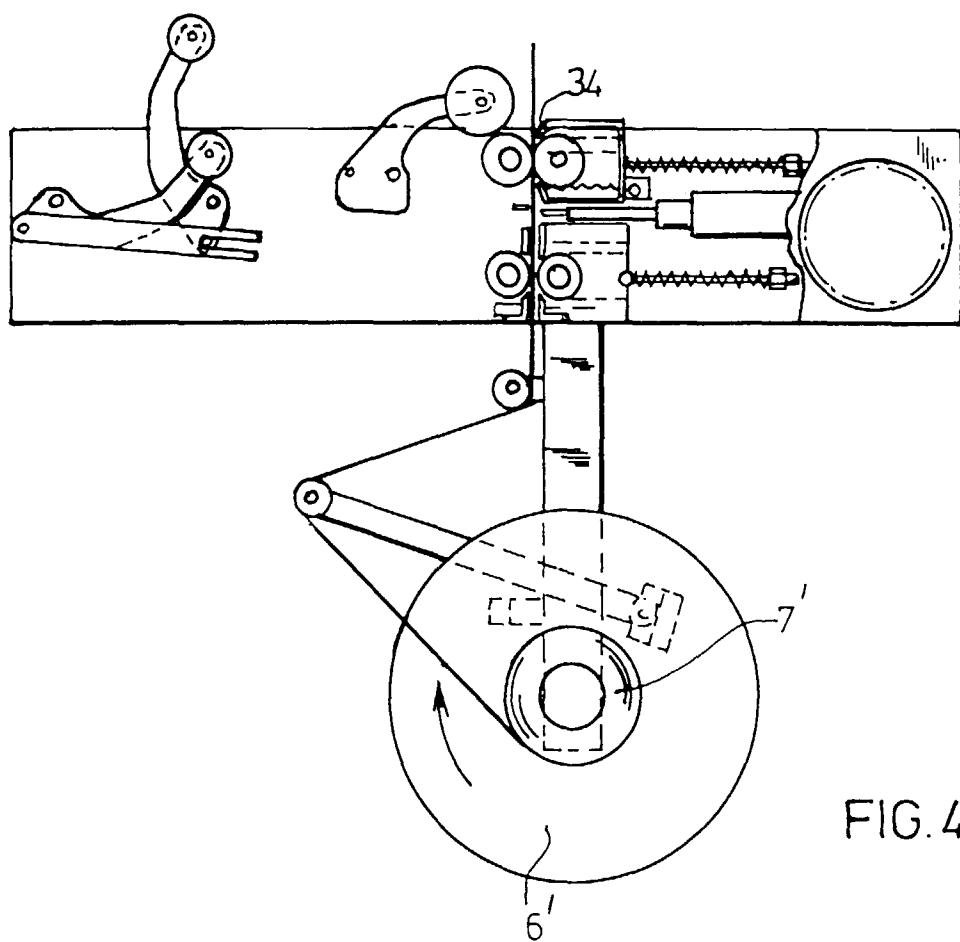


FIG. 4



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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 20 3388

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 3 466 843 A (MUMPER)	1,4, 11-13	B65B51/06
Y	* column 7, line 13 - column 8, line 10; figure 11 *	2,3	
X	US 3 505 774 A (GIDGE) * column 4, line 56 - column 5, line 16; figure 4 *	1,7,20	
Y	US 2 721 669 A (KEELY) * column 4, line 52 - line 59; figure 8 *	2	
Y	EP 0 647 563 A (MARCHETTI) * column 6, paragraph 4; figure 5 *	3	
The present search report has been drawn up for all claims			<b>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</b>  B65B B31B
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>24 April 1997</b>	Examiner <b>Claeys, H</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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