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⑤④ **Method of applying droplets of an adhesive using an ink jet printer apparatus.**

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EP-A-0 101 280
FR-A-1 446 880
FR-A-2 158 636
FR-A-2 482 523
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Description

This invention relates to a method for applying adhesives to a substrate and is a divisional of co-pending European Patent Application No. 83304565.1.

The present invention has as its object the provision of a method for applying droplets of an adhesive to a surface utilising an ink jet printer apparatus.

Accordingly, the present invention provides a method for applying droplets of an adhesive composition to a surface via one or more nozzles, characterised in that the nozzle is a nozzle of an ink jet printing apparatus.

The jet printing apparatus for present use preferably is of the continuous jet type which comprises one or more nozzles each adapted to produce a continuous jet of adhesive which is broken up into a single stream of substantially uniformly spaced apart and substantially uniformly sized droplets of adhesive and electrostatic or other means for directing the individual droplets to selected positions on a surface or to a drain or gutter.

According to a preferred embodiment of the invention there is provided a method for applying an adhesive composition to a surface characterised in that the adhesive applying means comprises means for directing a continuous stream of drops of the adhesive in a direction to traverse and not impinge on a surface to which the adhesive is to be applied, means for effecting relative movement between the said stream of drops and the said surface in a direction perpendicular to the direction of travel of the stream of drops, means for selectively and variably electrically charging the drops in the said stream, and means for establishing a steady electric field about the path of travel of said stream of drops for deflecting the electrically charged drops onto said surface.

The invention will be more particularly described with reference to the accompanying drawings, in which:—

Figure 1 is a diagrammatic side elevation of one embodiment of labelling apparatus utilising the adhesive application method of the present invention,

Figure 2 is a diagrammatic front elevation of the apparatus shown in Figure 1,

Figure 3 is a diagrammatic side elevation of another embodiment of labelling apparatus,

Figure 4 is a fragmentary enlarged detail view of a modification of the apparatus shown in Figure 3,

Figure 5 is a side elevation of another embodiment of labelling apparatus and

Figure 6 is a diagrammatic representation of one form of adhesive applying means suitable for use with the labelling apparatus of Figure 1 to 5.

Referring to Figures 1 and 2 of the drawings it will be seen that the apparatus illustrated therein comprises a plain paper label supply station 1, an adhesive applying station 2 and a label applying station 3.

At the label supplying station 1 there is provided a label magazine 4 adapted to contain a stack of

plain paper labels and a vacuum label extractor 5 which is connected to a source of vacuum. The extractor 5 is intermittently controllable by a cut-off valve 6 to exert vacuum pressure on the lowermost label in the magazine 4 and draw this from the magazine onto an endless conveyor 7. As will be seen more clearly from Figure 2, the endless conveyor 7 comprises a plurality of parallel endless belts 8 having spaces 9 therebetween, the extractor nozzles 5a of the label extractor 5 being aligned with the spaces 9 between the endless belts 8. The endless belts 8 extend around a driven roller 10, idler rollers 11, 12 and 13 and a tensioning roller 14. The driven roller 10 is driven by a drive belt 15 which extends round a clutch and brake mechanism 16 which in turn is driven through a drive belt 17 by a motor 18. The idler rollers 11 and 12 are hollow and have apertures 19 in the peripheral wall thereof which are aligned with the spaces 9 between the endless belts 8. The interiors of the idler rollers 11 and 12 are connected to a source of vacuum so that vacuum will be exerted through the apertures 19 to maintain the labels in contact with the endless belts 8 as these pass round the rollers 11 and 12.

From the label supply station 1 the labels are carried on the conveyor 7 around the idler roller 12 to the adhesive applying station 2. The labels are maintained in contact with the conveyor 7 by establishing an area of low pressure 20 beneath the conveyor 7. This exerts vacuum pressure on the labels through apertures 21 provided in a platen 22 over which the conveyor 7 passes, the apertures 21 being aligned with the spaces 9 between the belts 8 of the conveyor 7.

From the adhesive applying station 2 the labels are transported on the conveyor 7 around the idler roller 11 to the label applying station 3. At the label applying station 3, the conveyor 7 travels over a platen 24 which, like the platen 22, has apertures 25 therein which are aligned with the spaces 9 between the belts 8. Some of the apertures 25 are connected to a source of vacuum for maintaining the labels in contact with the conveyor 7, whilst others of the apertures 25 are connected to a source of air under pressure 23 for transferring the labels from the conveyor 7 onto articles to be labelled. Although not shown in the drawings, the articles to be labelled are transported on a suitable conveyor which extends parallel to the reach 7a of the conveyor 7 at the label applying station.

The label applying apparatus illustrated in Figures 1 and 2 may be adapted for either continuous or intermittent operation. Where it is adapted for continuous operation, then the labels will travel continuously from the label supply station 1 to the label applying station 3 and will have adhesive continuously supplied thereto at the adhesive applying station 2. Where the apparatus is designed for intermittent operation, then the labels will be transported from the label supplying station 1 to the adhesive applying station 2 where their travel will be interrupted whilst the adhesive is applied thereto. The travel of the labels can be interrupted either by stopping the conveyor 7 or by

providing suitable stops which can be extended through the spaces 9 between the belts 8 at the adhesive applying station 2. The leading edge of each label engages the extended stops so that the label skids on the conveyor 7 whilst the adhesive is applied thereto. The stops are then retracted to allow the label to continue its travel.

The labelling apparatus illustrated in Figures 3 and 4 is for applying labels to bottles, cans or other cylindrical articles. As will be seen, the apparatus comprises a label magazine 26, a feed roller 27 or other suitable feed mechanism for feeding the labels one at a time to an adhesive applying station 28, a conveyor 29 for transporting bottles or other similar articles 30 to a label applying station 31, and a wrap-around belt 32 for wrapping the labels with adhesive thereon around the articles 30. The adhesive applying station 28 comprises a vacuum box or like means 33 having an apertured wall on which the labels are held by vacuum pressure whilst adhesive is applied thereto by a nozzle 34.

The labelling machine illustrated in Figure 5 is for use with labels which are printed on and cut from a web and comprises a support 35 on which is mounted a supply reel 36 of printed web, a coder 37, label cutting means 38, a web matrix take-up reel 40, adhesive applying means 41 and label applying means 42.

Where the labels printed on the web 43 are to have a code marking applied thereto by the coder 37, which coder may be of any suitable form and may comprise, for example, suitable ink jet printing means, then the web 43 is taken off the supply web 36, over a tension roller 44, around a guide roller 45, through suitable coder registration means 46, past coder 37 so that code markings can be applied to the labels and on to suitable cutter registration means 47. Where code marking of the labels is not required, then the web 43 is taken from the supply reel 36 around a tension roller 48 and then direct to the cutter registration means 47. From the cutter registration means 47 the label web passes by way of driven feed rollers 49 to the cutting means 38. The cutting means 38 comprises opposed die cutting rollers which are adapted to sever the labels completely from the web matrix 43a but to leave them retained in the web matrix. From the cutting means 39 the web passes between guide plates 50 to a vacuumised label transport 51 on which the labels are retained by suction or vacuum whilst the web matrix 43a from which the labels are removed continues on and is re-wound on matrix take-up reel 40. The vacuumised label transport 61 comprises spaced hollow perforate rollers 52, one of which is driven, and spaced guide rollers 52a around which a series of spaced parallel belts 53 extend and means for maintaining the pressure within the rollers 52 and on the underside of the reach 54 of the belts 53 below atmospheric so that the labels will be retained on the rollers 52 and belts 53 by vacuum pressure exerted through the perforations in the rollers 52 and the spaces between the belts 53. The label transport 51 transports the

labels from the adhesive applying means 41 to the label applying means 42.

The continuous jet adhesive applying means is capable of applying adhesive to moving labels. The label transport 51 may therefore operate continuously as well as intermittently. Where desired or necessary suitable label sensing means 55 may be provided downstream of the adhesive applying means 41 for providing a control signal indicative of the presence of a label and so enabling the label applying means 42 to be suitably controlled.

Where both the coder 37 and the adhesive applying means 41 are of the jet printing kind, and possibly in other cases also, the control functions required to control the operation thereof will be the same or similar and accordingly a common control means, e.g. a common microprocessor based control circuit, may be provided for controlling the operation thereof.

The label applying means 42 comprises a perforate grid 56 onto which the labels are transferred from the label transport 51 and which forms one wall of an air box 57 the interior of which is maintained by a fan 58 at a pressure below atmospheric so that the labels will be retained on the grid 56 by vacuum pressure. Mounted in the air box 57 is a manifold 59 which is connected to a source of air under pressure (not shown) by way of a suitable control valve (not shown). Connected to the manifold 59 are a series of tubes (not shown) the other ends of which communicate with apertures in the grid 56 through which air under pressure can be applied to the labels to overcome the vacuum holding the labels on the grid and transfer the labels onto articles to be labelled which are transported past the grid 56 on suitable conveyor means (not shown).

Said control valve controlling the supply of air under pressure to the manifold 59 may be actuated by suitable control means so as to ensure that the labels are correctly applied to the articles to be labelled. Such control means may comprise a pair of photocells or other suitable detectors which are arranged a predetermined distance apart at locations upstream of the grid 56 and which are adapted to detect articles to be labelled moving towards the grid 56, means for measuring the time it takes an article, e.g. the leading edge of the article, to travel the predetermined distance between the two detectors, means for computing the speed of travel of the article from said time measurement, and means for actuating said control valve after a suitable computed time delay so that a label will be correctly applied to the article.

Whilst the apparatus of Figure 5 has been described in relation to labels which are die-cut from a web matrix and are retained in the web matrix until they are transferred to the label transport 51, the apparatus is with only slight modification also suitable for use with square cut or butt cut labels, i.e. labels which extend the full width of the web 43 and which are formed by simply transversely cutting the web. For such butt cut labels

the die-cutting rollers 38 are replaced by a suitable cutting knife, guillotine, or the like and, since there will no longer be a web matrix to carry the labels onto the label transport 51, a pair of feed rollers or the like are interposed between the cutting means and the label transport 51 for feeding the labels from the cutting means to the label transport.

The adhesive applying means for use in the apparatus of Figures 1 to 5 typically comprise a nozzle 61 having an inlet 62 whereby it can be connected to a source of adhesive under pressure (not shown) and piezo electric stimulating means 63, e.g. in the form of a bimorph or a unimorph. The nozzle 61 is adapted to produce a single stream 63 of adhesive which under the stimulation of the stimulating means 63 breaks up into uniformly spaced and uniformly sized drops 65. The line of flight of the droplets is along a path which is either directed at the surface of the label to which adhesive is to be applied or, as shown in Figure 6, which traverses and is perpendicular to the path of travel of a label web 67 extending between a feed roller 68 and a take up roller 69. The adhesive applying means further comprises a charge electrode or electrodes 70 for selectively and variably charging the jet of adhesive as or before it breaks up into the drops 65; and a pair of opposed deflector plates 71 which are arranged on either side of the path of travel of the drops 65 and are suitably connected into an electric circuit (not shown) for applying either a positive or negative charge thereto so that a steady electric field will be established therebetween. With the device shown in Figure 6, the path of travel of the label web 67 is between the lower deflector plate 71 and the path of travel of the stream of drops 65.

When the adhesive application means is in use, the uncharged drops 65 will pass in a straight line between the deflector plates 71 to the drain or gutter 66, whilst the charged drops 65 will be deflected onto the surface of the label web 67. By selectively varying the charge applied to the selected drops 65 and coordinating this with the speed of travel of the label web 67 the selected drops 65 can be deposited at any required selected position on the web 67, as indicated at 65a and 65b.

Claims

1. A method for applying droplets of an adhesive composition to a surface via one or more nozzles characterised in that the nozzle is a nozzle of an ink jet printing apparatus.

2. A method as claimed in claim 1 characterised in that adhesive is fed under pressure to the nozzle from which the adhesive issues as a single stream, the stream is stimulated to break up the stream into substantially uniformly sized and spaced apart droplets, the droplets are selectively charged and passed through a deflecting electric field whereby the droplets are caused to follow a selected flight path either to a selected position on the surface or to a catching means.

3. A method as claimed in claim 2 characterised in that the stream of adhesive is broken up into discrete droplets by means of stimulation of the stream using a piezoelectric crystal.

4. A method as claimed in claim 2 characterised in that the stream of adhesive passes one or more charge electrodes for selectively and variably charging the stream of adhesive as or before it breaks up into the drops; and in that the charged droplets pass between a pair of opposed deflector plates which are arranged on either side of the path of travel of the droplets and are suitably connected into an electric circuit for applying either a positive or negative charge thereto so that a steady electric field will be established therebetween.

5. A method as claimed in claim 1 characterised in that the ink jet printing apparatus comprises means for directing a continuous stream of drops of the adhesive in a direction to traverse and not impinge on a surface to which the adhesive is to be applied, means for effecting relative movement between the said stream of drops and the said surface in a direction perpendicular to the direction of travel of the stream of drops, means for selectively and variably electrically charging the drops in the said stream, and means for establishing a steady electric field about the path of travel of said stream of drops for deflecting the electrically charged drops onto said surface.

Patentansprüche

1. Verfahren zum Aufbringen von Tröpfchen eines Haftstoffes auf eine Oberfläche durch eine oder mehrere Düsen, dadurch gekennzeichnet, daß die Düse eine Düse eines Farbspritzdruckers ist.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß Haftstoff unter Druck in die Düse gespeist wird, aus der der Haftstoff als einzelner Strahl austritt, wobei der Strahl in im wesentlichen gleich große und voneinander getrennte Tröpfchen zerlegt wird und die Tröpfchen selektiv elektrisch geladen und durch ein ablenkendes elektrisches Feld geleitet werden, so daß die Tröpfchen einem ausgewählten Flugweg entweder zu einer ausgewählten Position auf der Oberfläche oder zu einer Auffangvorrichtung folgen.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß der Haftstoff-Strahl durch Anregung mittels eines piezoelektrischen Kristalls in einzelne Tröpfchen zerlegt wird.

4. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß der Haftstoff-Strahl eine oder mehrere Ladungselektroden passiert, um den Haftstoffstrahl während oder vor dem Zerlegen in Tropfen selektiv und variabel aufzuladen, und daß die aufgeladenen Tröpfchen zwischen einem Paar gegenüberliegender Ablenkplatten hindurchtreten, die auf jeder Seite des Flugwegs der Tröpfchen angeordnet sind und derart mit einem elektrischen Kreis verbunden sind, daß entweder eine positive oder negative Ladung auf sie aufge-

bracht werden kann, um ein gleichförmiges elektrisches Feld zwischen ihnen zu bilden.

5. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß der Farbspritzdrucker eine Einrichtung, um einen kontinuierlichen Strahl aus Tropfen des Haftstoffes so in eine Richtung zu leiten, daß er zur Seite fliegt und nicht auf eine Oberfläche trifft, und die Haftstoff aufgebracht werden soll, eine Einrichtung, um eine relative Bewegung zwischen dem Tropfenstrahl und der Oberfläche in eine Richtung senkrecht zur Flugrichtung des Tropfenstrahls zu bewirken, eine Einrichtung, um selektiv und variabel die Tropfen in dem Strahl elektrisch aufzuladen, sowie eine Einrichtung zum Bilden eines gleichförmigen elektrischen Feldes um den Flugweg des Tropfenstrahls, um die elektrisch geladenen Tropfen auf die Oberfläche abzulenken, aufweist.

Revendications

1. Procédé pour appliquer, à l'aide d'un ou plusieurs gicleurs, des gouttelettes d'une composition adhésive à une surface, caractérisé en ce que le gicleur est un gicleur d'une imprimante à jet d'encre.

2. Procédé tel que revendiqué à la revendication 1 caractérisé en ce que l'adhésif est introduit sous pression dans le gicleur d'où l'adhésif sort sous forme d'un courant unique, le courant est stimulé de façon à être brisé en des gouttelettes dimensionnées et espacées de manière essentiellement uniforme, les gouttelettes sont sélectivement chargées et traversent un champ électrique déviateur, ce qui les oblige à suivre un trajet de vol choisi les dirigeant vers une position choisie de la surface ou vers un moyen qui les capte.

3. Procédé tel que revendiqué à la revendication 2, caractérisé en ce que le courant d'adhésif est brisé en des gouttelettes discontinues sous l'effet de la stimulation du courant à l'aide d'un cristal piezo-électrique.

4. Procédé tel que revendiqué à la revendication 2, caractérisé en ce que le courant d'adhésif passe devant une ou plusieurs électrodes de charge qui chargent sélectivement et de façon variable le courant d'adhésif pendant qu'il se brise en les gouttelettes ou avant cette rupture; et en ce que les gouttelettes chargées passent entre deux plaques défectrices opposées disposées de chaque côté du trajet de déplacement des gouttelettes et qui sont reliées de façon appropriée pour former un circuit électrique destiné à leur appliquer une charge positive ou négative de façon à établir entre les plaques un champ électrique constant.

5. Procédé tel que revendiqué à la revendication 1, caractérisé en ce que l'imprimante à jet d'encre comprend un moyen pour diriger un courant continu de gouttes de l'adhésif dans une direction leur permettant de passer devant une surface et non pas de heurter une surface sur laquelle l'adhésif est à appliquer, un moyen pour effectuer un mouvement relatif entre ledit courant de gouttes et ladite surface en une direction perpendiculaire à la direction de déplacement du courant des gouttes, un moyen pour charger sélectivement et de manière électriquement variable les gouttes dudit courant, et un moyen pour établir un champ électrique permanent autour du trajet de déplacement dudit courant de gouttes pour dévier vers ladite surface les gouttes électriquement chargées.

40

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55

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65

5

Fig.1.

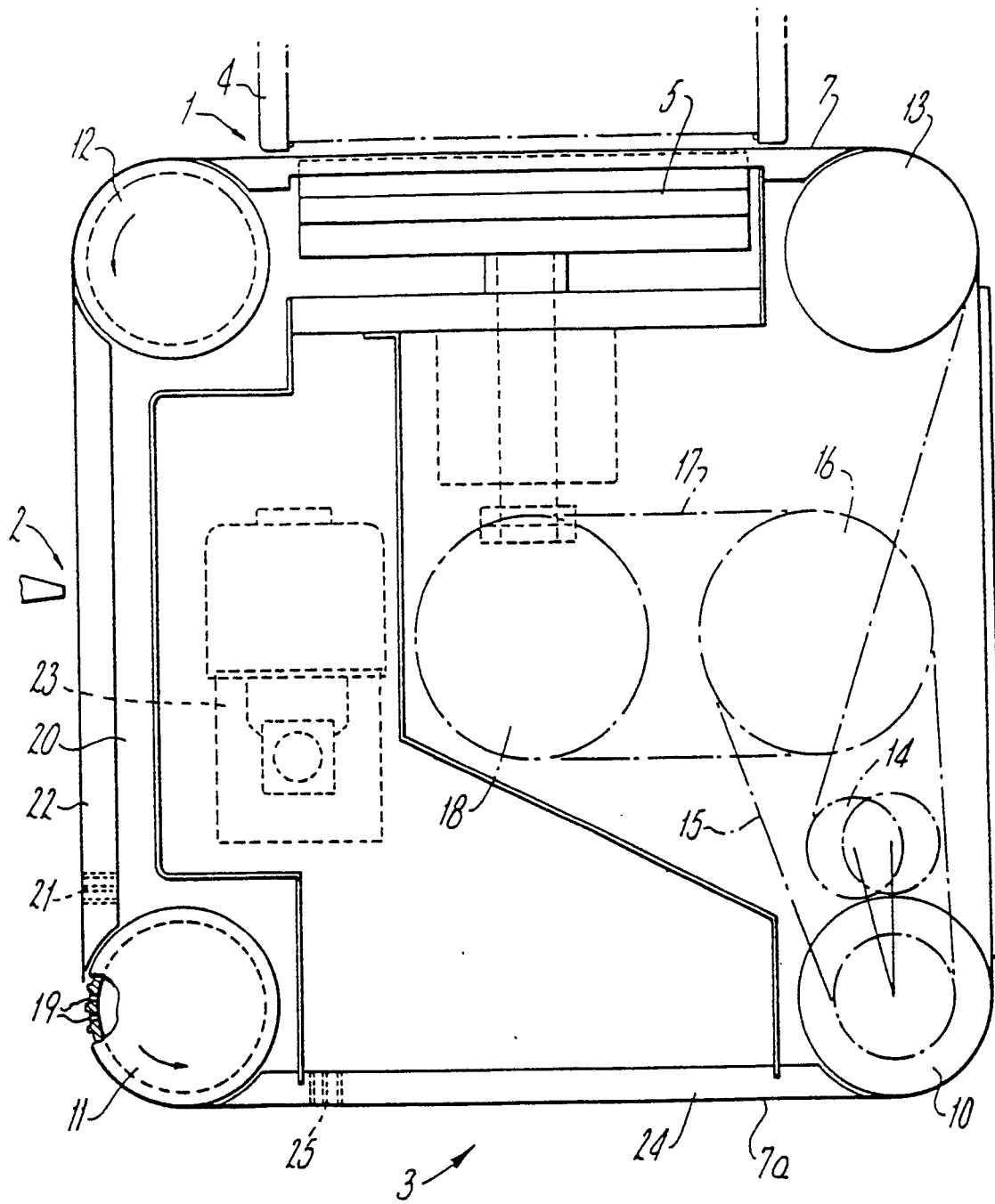


Fig. 2.

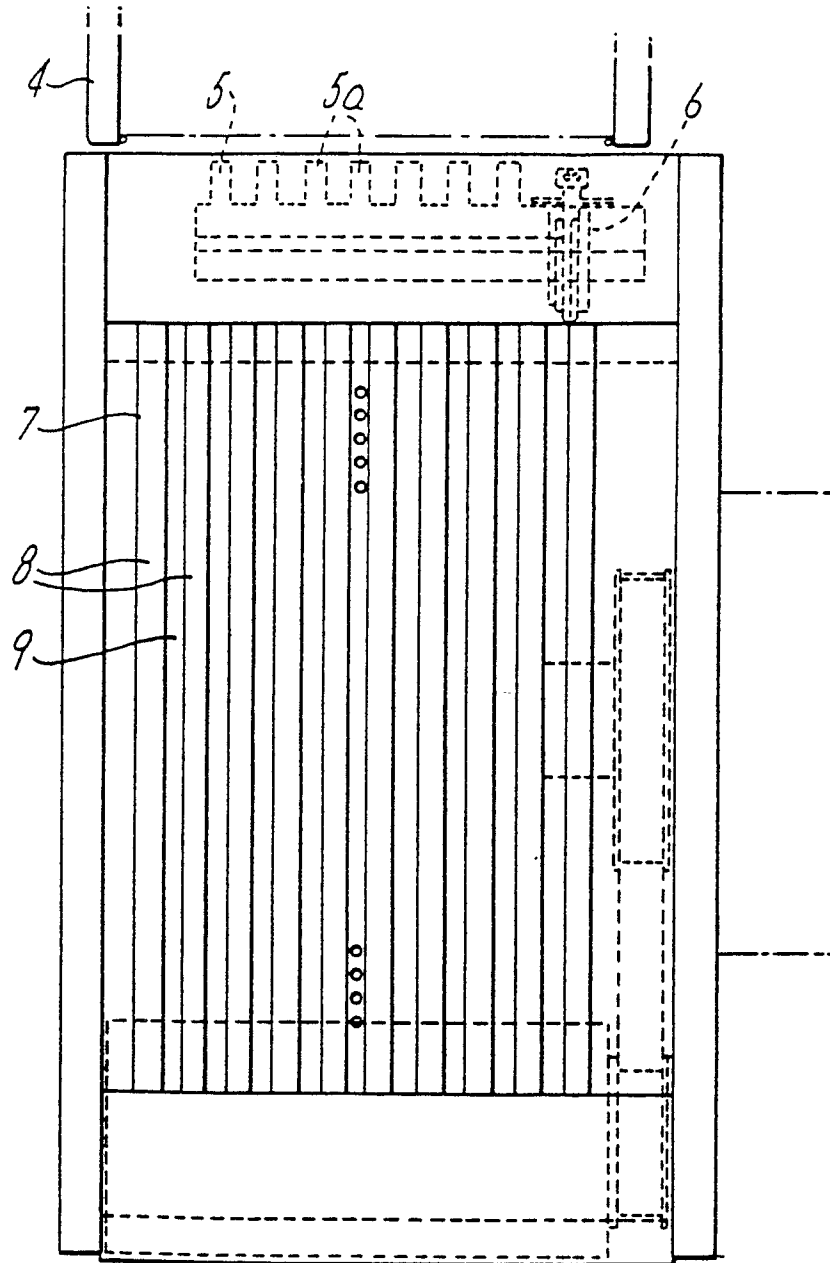


Fig. 3.

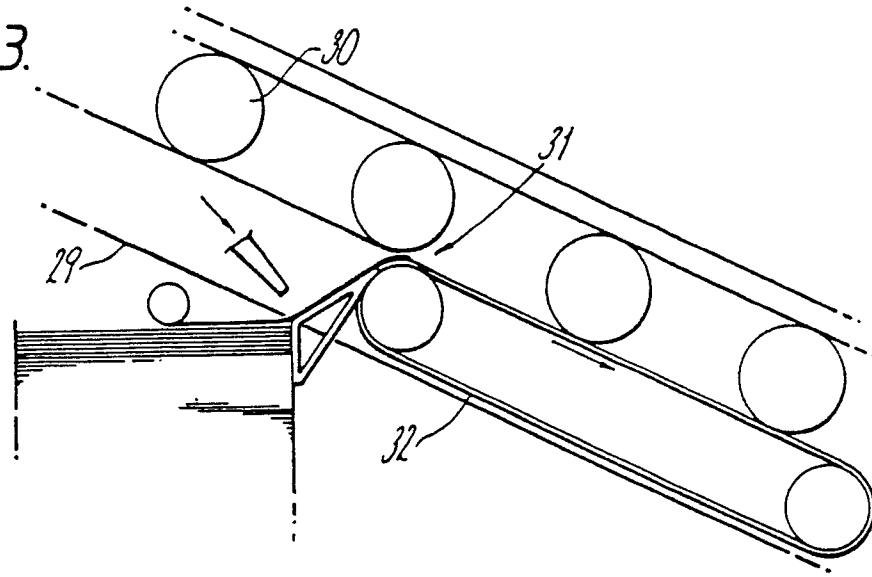


Fig. 4.

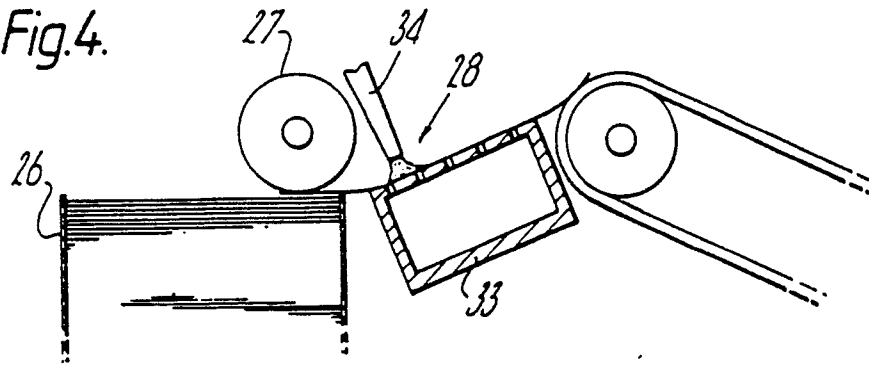


Fig. 6.

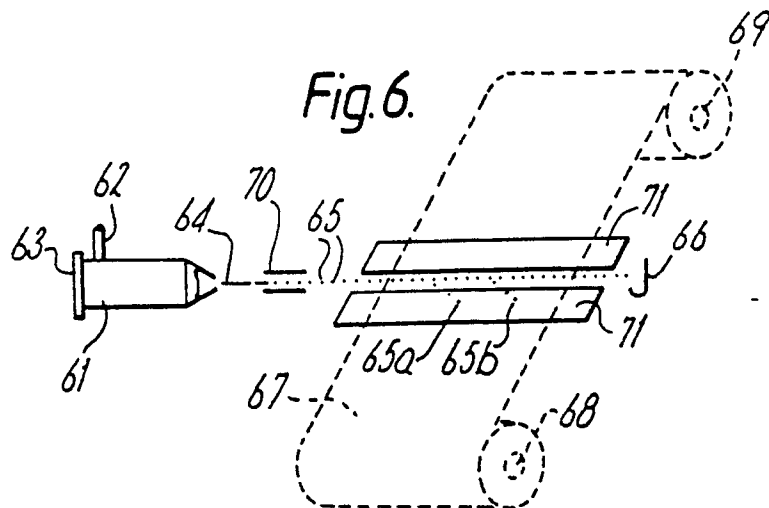


Fig. 5.

