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(54) **DROP CATCHER FOR USE IN INKJET PRINTER**

TROPFENFÄNGER ZUR VERWENDUNG IN EINEM TINTENSTRAHLDRUCKER

DISPOSITIF DE COLLECTE DE GOUTTES POUR ÊTRE UTILISÉ DANS UNE IMPRIMANTE À JET D ENCRE

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(56) References cited:
EP-A- 0 473 179
EP-A- 1 591 258
EP-A- 1 757 457

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Description

[0001] The invention relates to removing means according to claim 1.

[0002] An apparatus according to the preamble of claim 1 is known from for instance the earlier European patent application of applicant, EP-A-1 591 258.

[0003] It is noted that "ink" is also understood to mean other liquids, for instance dye, conditioning liquids and other liquids intended for the purpose of printing and/or treating textile.

[0004] When the ink is applied from the ink-jet heads there occurs ink-splashing, i.e. scattering of droplets of ink into already applied ink. It is hereby not possible to prevent the surrounding area, in particular the substrate for printing but also the lower surface of the ink-jet heads, being contaminated with ink. Splashes are generally clearly visible on for instance a part of the textile which has not been printed or printed with another colour, or in other colour areas, which are visible up to a distance of more than 5 cm. This unwanted scattering of the ink has the further adverse consequence that a printed pattern, for instance on paper of textile, is contaminated and blurring and colour contamination occur. This is particularly visible in the case of colours applied in large quantities. This problem is even so far-reaching that the unintentionally applied ink is clearly visible to the naked eye. This is highly undesirable, for instance for fine textile materials such as printed fashion fabrics. The described unwanted splashing often makes a printed product completely unusable.

[0005] It is known to use a certain suction by means of a suction fan or the like, with which ink droplets floating in the air are removed from the critical zone by means of an airflow. Such a solution has been found not to be very effective.

[0006] The invention has for its object to substantially improve the effectiveness of catching floating ink droplets.

[0007] The removing means according to the invention comprises for this purpose removing means for catching and removing floating ink droplets which, after being sprayed toward the web of material by an inkjet head, are not or not fully absorbed by the material but splash for instance into already applied ink and subsequently undergo a displacement in a direction with a component having an orientation opposite that of the spraying direction, or cause already applied ink to undergo such a displacement,
which removing means are of electrostatic type, and comprise:

- a plate which is added to each head, or to a group of heads, or to all heads and which is charged with an electrical voltage, for instance in the order of 5 kV, relative to the head or heads and which during operation electrically attracts the floating ink droplets; and
- a transport member which is present between the conveyor belt and the relevant head or heads and which in a collecting position collects ink droplets attracted by the plate, is subsequently guided to a cleaning station for removal of collected ink from the transport member, and is then guided back again to its collecting position.

[0008] The appended claims describe various possibilities and options within the basic framework of the invention.

[0009] Use can preferably be made of pairs of endless conveyor belts which run below the row of nozzles and leave a space clear between them for spraying ink droplets to the substrate for printing.

[0010] The unintentionally upward splashing ink is attracted electrostatically by the electrically charged plate. The active part of the conveyor belt is guided with its underside along this plate. The return part is guided back again via another route, for instance over the upper side of the plate.

[0011] Relative to the frame, and in particular the inkjet heads, the plate has a high voltage, for instance in the order of 5 kV.

[0012] The active part of the endless conveyor belt which has left the contamination zone in the area of the nozzles is preferably guided through a rinsing bath, is there cleaned of adhering ink, leaves the bath, is dried, for instance by an airflow and/or heat or by being scraped dry with a doctor blade of for instance a rubber elastic material, such as a rubber, a synthetic rubber or a polyurethane, and once again enters the zone of the heads in order to resume its operation for catching the floating droplets.

[0013] The conveyor belt is not conductive. The electrostatic field is therefore not disrupted by the conveyor belt.

[0014] The conveyor belt need not lie against the plate charged with electrical voltage, although it is recommended to keep this distance as small as possible.

[0015] In a preferred embodiment the invention has the special feature that a transport member is a conveyor belt, which conveyor belt comprises two mutually parallel parts driven at equal speeds.

[0016] According to a specific aspect, the apparatus has the special feature that the conveyor belt is reciprocally displaceable.

[0017] Recommended is an embodiment in which the conveyor belt is of the endless type.

[0018] Cleaning of the conveyor belt can take place in any suitable manner.

[0019] According to a determined aspect, the apparatus has the special feature that the cleaning station comprises a bath with rinsing liquid.

[0020] This latter apparatus preferably comprises drying means for removing rinsing liquid from the cleaned transport member to be returned to the collecting position.

[0021] A simple embodiment possibly to be recommended has the special feature that the cleaning station comprises a doctor blade pressing against the conveyor belt.

[0022] This latter embodiment can for instance have the feature that the doctor blade consists of a rubber elastic material, for instance a natural rubber, a synthetic rubber or a polyurethane.

[0023] According to a subsequent aspect, an apparatus has the feature that the or each plate has an electrically insulating cover layer, for instance an epoxy layer with a thickness in the order of 0.5 mm.

[0024] According to a following aspect, the apparatus has the special feature that the conveyor belt consists mainly of a TPO (thermoplastic olefin), for instance Habileen®, or the belt is of the Transilon® type from the manufacturer Siegling.

[0025] According to yet another aspect, the apparatus has the special feature that on the side remote from the side collecting ink droplets the belt is provided with a layer enhancing the tensile strength and optionally roughness, for instance a rough-profiled layer of polyester.

[0026] The apparatus can also have the feature that on its side collecting ink droplets the belt has at least an outer layer with hydrophilic, ink-dispersing properties such that droplet formation is prevented. In this variant there is a negligible risk of ink droplets forming on the belt which could drop off the belt. Even when there is serious splashing of ink, this risk is wholly negligible.

[0027] Inexpensive, strong and reliable is an embodiment in which the apparatus has the feature that the or each plate consists substantially of metal, for instance steel, in particular stainless steel.

[0028] Alternatively the or each plate consists substantially of a plastic plate, for instance of PU (polyurethane), which is sufficiently wear-resistant and which is electrically conductive to at least some extent.

[0029] The invention will now be elucidated on the basis of the accompanying drawings. Herein:

figure 1 shows a cut-away schematic perspective view of an apparatus according to EP-A-1 591 258;
figure 2 is a schematic side view of the apparatus according to figure 1;
figure 3 is a schematic side view of a conveyor, the active upper part of which is straight;
figure 4 is a view corresponding to figure 3 of a conveyor, the active upper part of which has a generally curved form;
figure 5 shows a more detailed side view of the conveyor according to figure 4;
figure 6 is a schematic perspective view of the conveyor according to figures 4 and 5;
figure 7 is a front view along the direction of transport of a U-shaped frame which can be moved in and out of the apparatus;
figure 8 is a schematic front view of a removing means according to the invention;
figure 9 is a side view on enlarged scale of the apparatus according to figure 8;
figure 10 is a perspective view of a part of the apparatus according to the invention in the area of the rinsing bath;
figure 11 is a perspective view of a part of the apparatus on the other side;
figure 12 shows part of another exemplary embodiment in which the endless conveyor belt comprises an upper and a lower part, these parts being held by rollers at a small mutual distance, and in which the part or the conveyor belt contaminated by ink is cleaned by a doctor blade;
figure 13A is an example shown in grey tones of a piece of textile printed with an ink pattern in which it is apparent that the light surfaces have been highly contaminated by floating ink droplets; and
figure 13B shows by way of comparison a piece of textile printed with a removing means according to the invention.

[0030] In the figures to be described below corresponding elements and components are always designated with the same reference numerals.

[0031] Figure 1 shows an apparatus 1 for printing a textile web 2 (see also figure 2). The apparatus comprises a main frame 3 placed on the ground or a shop floor.

[0032] As is particularly apparent from figures 3, 4, 5 and 6, apparatus 1 comprises an endless conveyor belt 6 which is guided over a driven roller 4 and a reversing roller 5 disposed substantially parallel thereto and which is driven by motor means (not shown) at a chosen constant speed as according to arrow 7.

[0033] The apparatus further comprises glue dispensing means 8 for applying a glue layer upstream of the active upper part 9 of conveyor belt 6 for temporary light adhesion of textile web 2 to this active part 9 such that web 2 is fixed non-movably relative to the conveyor belt during transport by said upper part 9.

[0034] A washing apparatus 10 shown in figure 5 comprises sponge means 11 and a scraper 12 for removing glue residues from conveyor belt 9. These washing means 10 are placed downstream of the active part 9.

[0035] Figure 2 shows a supply and feed unit and a pressure roller 15 which co-acts with roller 4 and which provides an intimate and adhering contact between the active upper part 9 and textile web 2.

[0036] A printing unit 16 comprises eight U-shaped frames 17, 18, 19, 20, 21, 22, 23, 24, which are each adapted to generate, under the control of a control unit (not shown), a very small droplet of coloured ink at any point in time determined by the control unit by means of an inkjet head unit added to each frame, one colour for each frame. Printing means 16 are operative in the zone of the active part 9 of the conveyor belt. The printing takes place in accordance with an adjustable pattern to be selected.

[0037] Connecting onto printing unit 16 is a dryer 25

which is finally followed by a discharge and storage unit 26 in which the dried web, otherwise than in the infeed unit 13, is not rolled up onto a roll but, swinging back and forth as according to arrow 27 in per se known manner, comes to lie under its own weight in layers of the now printed textile web 28 on a stack 29.

[0038] The printing means, of which frames 17-24 form part, comprise frame beams which are added to the respective frames and supported thereby, and each of which carries an array of inkjet heads. During operation each of these arrays is immobile relative to the upper surface defined by the active part.

[0039] As shown in figure 3, conveyor belt 6 is supported over active part 9 by support surfaces, drawn in this case as rollers 31, 32, 33, 34, 35, 36, 37, 38, where the support positions for the conveyor belt correspond with the zones of the inkjet arrays situated thereabove. Rollers 31-38 are incorporated in the structure such that during operation they have a substantial difference in speed from that of conveyor belt 6. The rollers can for instance be driven or braked or, in the simplest case, be fixed.

[0040] Figures 4, 5 and 6 show an embodiment in which the rollers are ordered in an arc such that active part 9 of conveyor belt 6 is deflected by each roller through an angle in the order of 1°.

[0041] Conveyor belt 6 is arranged under tensile stress over rollers 4 and 5.

[0042] Figure 7 shows U-shaped frame 22 which can be displaced laterally out of apparatus 1 in the manner shown in figure 1. The U-shape leaves clear an opening 41 such that with a lateral displacement as according to arrow 42 the frame 22 can be moved to the right in the drawing without disrupting the operation of the rest of the apparatus. During normal operation with seven colours for instance one beam corresponding to a colour not in use can thus be removed for service lines.

[0043] The upper leg of the U bears a beam 43 which carries an inkjet array in a manner not shown. Beam 43 can be positioned very precisely relative to lower leg 44 by means of respective recesses and protrusions.

[0044] Reference numeral 71 designates a supply station for coloured ink. As shown particularly clearly in figure 2, this station contains two containers 72, 73, each with its own colour, between which it is possible to switch, or with the same colour for continuation of the printing process when one container is completely empty.

[0045] Figures 8, 9, 10, 11 and 12 show the aspects added according to the invention to the known apparatus according to figures 1-7.

[0046] In these figures the reference numerals have the following designations:

101: inkjet heads

102: driven roller or reversing roller for the conveyor belt for the purpose of transporting the substrate of paper or textile for printing

103: drive motor for the endless cleaning conveyor belt according to the invention

104: stainless steel plate provided with a 0.5 mm thick epoxy coating, this plate being provided with a gap or free space 110 for passage of ink droplets 111. Electrical breakdown and sparking from the electrode to the surrounding area, particularly to the chassis parts of the drive, are prevented by this epoxy coating. This earlier occurring phenomenon was made worse when no coating was present because the belt became wet and therefore transmitted the electric voltage further into the mechanism. The epoxy layer is applied by powder-coating. This insulating cover layer has the further important advantage that there are substantially no electrified parts with which users and operatives can come into contact. This is an important aspect in terms of safety.

105: the active upper part of the cleaning conveyor consisting of two parallel parts

106: the lower return part of the cleaning conveyor

107: deflecting roller, one on each side, tensioned with draw springs for the purpose of holding the endless cleaning conveyor belt under tension

108: an electrical connection for the high voltage on electrode plate 104

109: the bath with rinsing liquid

110: the gap or free space between the two parts of the conveyor

111: the paths of the ink droplets, indicated schematically with straight lines

112: the direction of transport of the active upper part 105

113: the direction of displacement of the lower return part 106.

[0047] It is noted that, as shown particularly in figures 8 and 11, cleaning conveyor 105, 106 is disposed such that the gap or intermediate space 110 is situated in the zone in which the nozzles, lying in one line, of the inkjet heads are active. Cleaning conveyor 105, 106 thus extends in transverse direction relative to the direction of displacement 7 of endless conveyor belt 6 with which the textile web for printing is guided through the apparatus.

[0048] Not shown are drying means for removing rinsing liquid from the cleaning conveyor after it leaves bath 9.

[0049] Figure 12 shows a detail of an embodiment in which parts 105 and 106 are held at small mutual distance by sets of rollers 211 which are situated both at the shown

end and at the other end of cleaning conveyor 105, 106. This construction achieves that cleaning conveyor 105, 106 is situated a small distance from electrode plate 104. The number of rollers is kept as low as possible in order to limit as far as possible contamination and the occurrence of mechanical resistance.

[0050] Other than in the embodiment of figure 11, in which use is made of bounding flanges 232 on deflecting rollers 107 in order to prevent lateral displacement, in the embodiment of figure 12 use is made of a number of fixedly disposed guide plates 212 which guide the two parts 105, 106 of the cleaning conveyor and prevent lateral displacement. This prevents a high mechanical load on the side edges of the conveyors.

[0051] The embodiment according to figure 12 further comprises a cleaning mechanism in which use is not made of a rinsing bath but of a doctor blade 213 which scrapes dry the outer side of the conveyor by removing ink residues. In this embodiment the doctor blade 213 consists of a polyurethane and is pressed against the conveyor by means of spring means (not shown). The ink droplets 210 removed by doctor blade 213 are collected and discharged in suitable manner. The excess ink can for instance drop onto the pressure belt of the apparatus adjacently of the textile web. This is possible in some circumstances because the pressure belt is for instance 60 cm or more wider than the overall printing width. The pressure belt is washed repeatedly such that the excess ink carried along by the pressure belt is always washed off.

[0052] The unit shown in figure 12 consists entirely of an electrically insulating material, for instance an epoxy composite material or other GRP (Glassfibre Reinforced Plastic). Parts 105 and 106 also take a form which is entirely electrically insulating.

[0053] Owing to the described choices of material the leakage of voltage, electrical breakdown and spark-over can be effectively prevented.

[0054] Figure 13A shows a piece of textile 214 printed with a prior art apparatus. The light zones are shown to be highly contaminated with ink. This ink consists of deposited, unintentionally floating ink droplets.

[0055] Figure 13B shows a piece of textile 215 which largely corresponds to the textile 214 of figure 13A but which differs therefrom in the sense that the non-printed or light-coloured zones are free of unintentionally deposited floating ink droplets.

Claims

1. Removing means for catching and removing floating ink droplets for use in an apparatus (1) for printing a web (2) of material, for instance paper or textile, which apparatus is of the continuous or the discontinuous type and comprises:

   a main frame (3);

   an endless conveyor belt (6) which is guided over a driven roller (4) and a reversing roller (5) disposed substantially parallel thereto and which is driven by motor means at a chosen constant speed;

   glue dispensing means (8) for applying a glue layer upstream of an active upper part (9) of the conveyor belt (6) for temporary light adhesion of the textile web to this active part such that this web (2) is fixed non-movably relative to the conveyor belt (6);

   supply and feed means for feeding a textile web from a supply to the active part (9) of the conveyor belt (6);

   printing means (16) for printing the passing web (2) in the zone of the active part (9) of the conveyor belt (6); a dryer (25) for drying the ink applied to the web (2);

   and discharge and storage means (26) for removing the printed web (2) from the conveyor belt (6) and subsequent storage thereof;

   wherein

   the printing means (16) comprise a number of, for instance 2-8, frame beams extending in transverse direction above said active part (9) at determined mutual longitudinal distances along the direction of transport, each of which frame beams carries an array of fixedly disposed inkjet heads (101) or one or more movable inkjet heads;

   control means are present which fulfil at least the following functions of:

   storing a chosen printing pattern, for instance a uniform printing, by means of inputting pattern information, for instance from a scanner;

   energizing the inkjet heads, in relation to the chosen constant speed of the conveyor belt and the mutual distances in the direction of transport between successive inkjet heads, such that each head sprays droplets of ink of the relevant colour onto the web (2) at the positions on the web (2) determined by the control means;

   Characterised in that the

   removing means (213) is for catching and removing floating ink droplets (210) which, after being sprayed toward the web (2) of material by an inkjet head (101), are not or not fully absorbed by the material but splash for instance into already applied ink and subsequently undergo a displacement in a direction with a component having an orientation opposite that of the spraying direction, or cause already applied ink to undergo such a displacement, and **in that** the removing means (213) are of electrostatic type,

and comprise:

a plate (104) which is added to each head, or to a group of heads, or to all heads and which is charged with an electrical voltage, for instance in the order of 5 kV, relative to the head or heads and which during operation electrically attracts the floating ink droplets (210); and
a transport member (105, 106) which is present between the conveyor belt (6) and the relevant head or heads (101) and which in a collecting position collects ink droplets attracted by the plate (104), is subsequently guided to a cleaning station for removal of collected ink from the transport member, and is then guided back again to its collecting position.

2. Means as claimed in claim 1, wherein a transport member is a second conveyor belt (105, 106), which second conveyor belt (105, 106) comprises two mutually parallel parts driven at equal speeds.

3. Means as claimed in claim 2, wherein the second conveyor belt (105, 106) is reciprocally displaceable.

4. Means as claimed in claim 2 or 3, wherein the second conveyor belt (105, 106) is of the endless type.

5. Means as claimed in claim 1, comprising said cleaning station, wherein the cleaning station comprises a bath with rinsing liquid (109).

6. Means as claimed in claim 5, comprising drying means for removing rinsing liquid from the cleaned transport member (105, 106) to be returned to the collecting position.

7. Means as claimed in claim 2, comprising said cleaning station, wherein the cleaning station comprises a doctor blade (213) pressing against the second conveyor belt (105, 106).

8. Means as claimed in claim 7, wherein the doctor blade (213) consists of a rubber clastic material, for instance a natural rubber, a synthetic rubber or a polyurethane.

9. Means as claimed in any of the foregoing claims, wherein the or each plate (104) has an electrically insulating cover layer, for instance an epoxy layer with a thickness in the order of 0.5 mm.

10. Means as claimed in any of the claims 2, 3 and 4, wherein the second conveyor belt (105, 106) consists mainly of a thermoplastic olefin (TPO), for instance Habileen®.

11. Means as claimed in any of the claims 2, 3 and 4, wherein on a side remote from the side collecting ink droplets (210) the second conveyor belt (105, 106) is provided with a layer enhancing the tensile strength and optionally roughness, for instance a rough-profiled layer of polyester.

12. Means as claimed in any of the claims 2, 3 and 4, wherein on a side collecting ink droplets (210) the second conveyor belt (105, 106) has at least an outer layer with hydrophilic, ink- dispersing properties such that droplet formation is prevented.

13. Means as claimed in any of the foregoing claims, wherein the or each plate (104) consists substantially of metal, for instance steel, in particular stainless steel.

14. Means as claimed in any of the claims 1-12, wherein the or each plate (104) consists substantially of a plastic plate, for instance of polyurethane (PU), which is sufficiently wear-resistant and which is electrically conductive to at least some extent.

15. Means as claimed in any of the foregoing claims, wherein the transport member (105, 106) consists of one or more electrically insulating materials.

16. Apparatus (1) for printing a web (2) of material, for instance paper or textile, which apparatus is of the continuous or the discontinuous type and comprises:

a main frame (3);
an endless conveyor belt (6) which is guided over a driven roller (4) and a reversing roller (5) disposed substantially parallel thereto and which is driven by motor means at a chosen constant speed;
glue dispensing means (8) for applying a glue layer upstream of an active upper part (9) of the conveyor belt (6) for temporary light adhesion of the textile web to this active part such that this web (2) is fixed non-movably relative to the conveyor belt (6);
supply and feed means for feeding a textile web from a supply to the active part (9) of the conveyor belt (6);
printing means (16) for printing the passing web (2) in the zone of the active part (9) of the conveyor belt (6);
and discharge and storage means (26) for removing the printed web (2) from the conveyor belt (6) and subsequent storage thereof;
wherein
the printing means (16) comprise a number of, for instance 2-8, frame beams extending in transverse direction above said active part (9) at determined mutual longitudinal distances

along the direction of transport, each of which frame beams carries an array of fixedly disposed inkjet heads (101) or one or more movable inkjet heads;
control means are present which fulfil at least the following functions of:

storing a chosen printing pattern, for instance a uniform printing, by means of inputting pattern information, for instance from a scanner;
energizing the inkjet heads, in relation to the chosen constant speed of the conveyor belt and the mutual distances in the direction of transport between successive inkjet heads, such that each head sprays droplets of ink of the relevant colour onto the web (2) at the positions on the web (2) determined by the control means;
the discharge means comprise drying means (25) for drying the ink applied to the web (2),
further comprising
removing means (213) for catching and removing floating ink droplets (210) according to any preceding claim.

Patentansprüche

1. Entfernungsmittel zum Einfangen und Entfernen von schwebenden Tintentröpfchen zur Verwendung in einer Vorrichtung (1) zum Bedrucken einer Materialbahn (2), beispielsweise aus Papier oder Textil, wobei die Vorrichtung der kontinuierlichen oder diskontinuierlichen Art ist und folgendes umfassen:

- einen Hauptrahmen (3);
- ein Endlosförderband (6), das über eine angetriebene Rolle (4) und um eine im Wesentlichen parallel dazu angeordnete umlenkende Rolle (5) geführt wird, und das von Antriebsmitteln, mit gewählter konstanter Geschwindigkeit, angetrieben wird;
- Klebstoffabgabemittel (8) zum Aufbringen einer Klebstoffschicht örtlich vor einem aktiven oberen Teil (9) des Förderbandes (6) zur vorübergehenden leichten Adhäsion der Textilbahn mit diesem aktiven Teil so, dass diese Bahn (2) unbeweglich in Bezug auf das Förderband (6) fixiert ist;
- Versorgungs- und Zuführungsmittel zum Zuführen einer Textilbahn von einem Vorrat zu dem aktiven Teil (9) des Förderbandes (6);
- Bedruckungsmittel (16) zum Bedrucken der vorbeilaufenden Bahn (2) im Bereich des aktiven Teils (9) des Förderbandes (6);
- einen Trockner (25) zum Trocknen der auf die Bahn aufgetragenen Tinte;
- und Abgabe- und Lagermittel (26) zum Entnehmen der bedruckten Bahn (2) von dem Förderband (6) und anschließender Lagerung dieser;
wobei
- die Bedruckungsmittel (16) eine Anzahl von, beispielsweise 2 bis 8, Rahmenbalken umfassen, die sich oberhalb des aktiven Teils (9) in vorbestimmten gegenseitigen Abständen in Querrichtung entlang der Transportrichtung erstrecken, wobei jeder Rahmenbalken eine Anordnung fest verteilter Tintenstrahlköpfe (101) oder einen oder mehrere bewegliche Tintenstrahlköpfe trägt;
- Steuermittel vorhanden sind, welche mindestens die folgenden Funktionen erfüllen:
- Speichern eines gewählten Druckmusters, beispielsweise eines uniformen Drucks, durch Eingeben von Musterinformationen, beispielsweise von einem Scanner;
- Ansteuern der Tintenstrahlköpfe, entsprechend der gewählten konstanten Geschwindigkeit des Laufbandes und der gegenseitigen Abstände entlang der Transportrichtung zwischen aufeinanderfolgenden Tintenstrahlköpfen, so dass jeder Kopf Tintentröpfchen der relevanten Farbe auf die Bahn (2) an die von den Steuermitteln festgelegten, Positionen auf der Bahn (2) sprüht;
dadurch gekennzeichnet, dass die Entfernungsmittel (213) zum Einfangen und Entfernen von schwebenden Tintentröpfchen (210) vorgesehen sind, welche, nachdem sie in Richtung auf die Materialbahn (2) mit einem Tintenstrahlkopf gesprüht worden sind, nicht oder nicht vollständig durch das Material absorbiert worden sind, sondern beispielsweise in schon aufgebrachte Tinte spritzen und dort anschließend eine Verschiebung in eine Richtung mit einer Komponente entgegengesetzt der Spritzrichtung erfahren, oder bei der bereits aufgebrachten Tinte eine solche Verschiebung verursachen,
und, dass die Entfernungsmittel (213) elektrostatischer Art sind, und folgendes umfassen:
- eine Platte (104), die jedem Kopf oder einer Gruppe von Köpfen, oder allen Köpfen zugefügt wird und die mit einer elektrischen Spannung, beispielsweise in der Größenordnung 5kV, in Bezug auf den Kopf oder die Köpfe aufgeladen wird und welche während des Betriebes die schwebenden Tintentröpfchen (210) elektrisch anzieht; und
- ein Transportelement (105, 106), das zwischen dem Förderband (6) und dem relevanten Kopf oder Köpfen (101) vorhanden ist und das in einer Sammelstellung von der Platte (104) angezoge-

ne Tintentröpfchen sammelt, anschließend zu einer Reinigungsstation geführt wird, zum Entfernen der vom Transportelement gesammelten Tinte, und danach wieder in die Sammelstellung zurück geführt wird.

2. Mittel nach Anspruch 1, wobei ein Transportelement ein zweites Förderband (105, 106) ist, wobei das zweite Förderband (105, 106) zwei parallel zueinander verlaufende Teile mit gleicher Geschwindigkeit angetrieben umfasst.

3. Mittel nach Anspruch 2, wobei das zweite Förderband (105, 106) umgekehrt verfahrbar ist.

4. Mittel nach Anspruch 2 oder 3, wobei das zweite Förderband (105, 106) ein Endlosförderband ist.

5. Mittel nach Anspruch 1, umfassend die genannte Reinigungsstation, wobei die Reinigungsstation ein Bad mit einer Spülflüssigkeit (109) umfasst.

6. Mittel nach Anspruch 5, umfassend ein Trocknungsmittel zum Entfernen von Spülflüssigkeit vom gesäuberten Transportelement (105, 106), das zu der Sammelstellung zurück geschickt werden soll.

7. Mittel nach Anspruch 2, umfassend die genannte Reinigungsstation, wobei die Reinigungsstation ein Rakel (213) aufweist, das gegen das zweite Förderband (105, 106) drückt.

8. Mittel nach Anspruch 7, wobei das Rakel (213) aus einem gummielastischen Material, beispielsweise Naturkautschuk, Synthesekautschuk oder Polyurethan, besteht.

9. Mittel nach einem der vorhergehenden Ansprüche, wobei die oder jede Platte (104) eine elektrisch isolierende Deckschicht, beispielsweise eine Epoxidschicht mit einer Dicke in der Größe von 0,5mm, hat.

10. Mittel nach einem der Ansprüche 2, 3 und 4, wobei das zweite Förderband (105, 106) vorwiegend aus einem thermoplastischen Olefin (TPO), beispielsweise Habileen®, gebildet ist.

11. Mittel nach einem der Ansprüche 2, 3 und 4, wobei auf einer Seite, entfernt von der Tintentröpfchen sammelnden Seite (210), das zweite Förderband (105, 106) mit einer Schicht zur Verbesserung der Zugfestigkeit und wahlweise Rauigkeit ausgestattet ist, beispielsweise mit einer rauprofilierten Schicht aus Polyester.

12. Mittel nach einem der Ansprüche 2, 3 und 4, wobei auf der Tintentröpfchen sammelnden Seite (210) das zweite Förderband (105, 106) wenigstens eine äußere Schicht mit hydrophilen, tintendispergierenden Eigenschaften hat, so dass Tröpfchenbildung verhindert wird.

13. Mittel nach einem der vorgehenden Ansprüche, wobei die oder jede Platte (104) im Wesentlichen aus Metall, beispielsweise Stahl, insbesondere rostfreiem Stahl, gebildet ist.

14. Mittel nach einem der Ansprüche 1-12, wobei die oder jeder Platte (104) im Wesentlichen aus einer Kunststoffplatte, beispielsweise Polyurethan (PU), gebildet ist, welche ausreichend verschleißfest und zumindest zu einem gewissen Grad elektrisch leitend ist.

15. Mittel nach einem der vorgehenden Ansprüche, wobei die Transporteinheit (105, 106) aus einem oder mehreren elektrisch isolierenden Materialien gebildet ist.

16. Vorrichtung (1) zum Bedrucken einer Materialbahn (2), beispielsweise aus Papier oder Textil, wobei die Vorrichtung der kontinuierlichen oder diskontinuierlichen Art ist, und folgendes umfasst:

- einen Hauptrahmen (3);
- ein Endlosförderband (6), das über eine angetriebene Rolle (4) und um eine im Wesentlichen parallel dazu angeordnete umlenkende Rolle (5) geführt wird, und das von Antriebsmitteln, mit gewählter konstanter Geschwindigkeit, angetrieben wird;
- Klebstoffabgabemittel (8) zum Aufbringen einer Klebstoffschicht örtlich vor einem aktiven oberen Teil (9) des Förderbandes (6) zur vorübergehenden leichten Adhäsion der Textilbahn mit diesem aktiven Teil so, dass diese Bahn (2) unbeweglich in Bezug auf das Förderband (6) fixiert ist;
- Versorgungs- und Zuführungsmittel zum Zuführen einer Textilbahn von einem Vorrat zu dem aktiven Teil (9) des Förderbandes (6);
- Bedruckungsmittel (16) zum Bedrucken der vorbeilaufenden Bahn (2) im Bereich des aktiven Teils (9) des Förderbandes (6);
- und Entlade- und Speichermittel (26) zum Entfernen der bedruckten Bahn (2) von dem Förderband (6) und anschließender Lagerung dieser;

wobei

- Bedruckungsmittel (16) eine Anzahl von, beispielsweise 2 bis 8, Rahmenbalken umfassen, die sich oberhalb des aktiven Teils (9) in vorbestimmten gegenseitigen Abständen in Querrichtung entlang der Transportrichtung erstrecken, wobei jeder Rahmenbalken eine Anordnung fest verteilter Tintenstrahlköpfe (101) oder einen

oder mehrere bewegliche Tintenstrahlköpfe trägt;
- Steuermittel vorhanden sind, welche mindestens die folgenden Funktionen erfüllen:
- Speichern eines gewählten Druckmusters, beispielsweise eines uniformen Drucks, durch Eingeben von Musterinformationen, beispielsweise von einem Scanner;
- Ansteuern der Tintenstrahlköpfe, entsprechend der gewählten konstanten Geschwindigkeit des Laufbandes und der gegenseitigen Abstände entlang der Transportrichtung zwischen aufeinanderfolgenden Tintenstrahlköpfen, so dass jeder Kopf Tintentröpfchen der relevanten Farbe auf die Bahn (2) an die, von den Steuermitteln festgelegten, Positionen auf der Bahn (2) sprüht;
- die Entlademittel Trocknungsmittel (25) zum Trocknen der auf die Bahn (2) aufgebrachten Farbe umfassen,
weiter umfassend
- Entfernungsmittel (213) zum Einfangen und Entfernen von schwebenden Tintentröpfchen (210) nach einem der vorhergehenden Ansprüche.

Revendications

1. Moyens d'enlèvement destinés à collecter et enlever des gouttelettes d'encre flottantes pour utilisation dans un appareil (1) destiné à imprimer une bande (2) de matière, par exemple de papier ou de textile, lequel appareil est du type continu ou discontinu et comporte :

un cadre principal (3) ;
une bande transporteuse sans fin (6) qui est guidée sur un rouleau entraîné (4) et un rouleau d'inversion (5) disposé de manière sensiblement parallèle et qui est entraîné par des moyens de moteur à une vitesse constante choisie ;
des moyens de distribution de colle (8) destinés à appliquer une couche de colle en amont d'une partie supérieure active (9) de la bande transporteuse (6) pour une adhésion légère temporaire de la bande de textile sur cette partie active de telle sorte que cette bande (2) est fixée de manière non mobile par rapport à la bande transporteuse (6) ;
des moyens d'alimentation et d'avance destinés à avancer une bande de textile depuis une alimentation jusqu'à la partie active (9) de la bande transporteuse (6) ;
des moyens d'impression (16) destinés à imprimer la bande qui passe (2) dans la zone de la partie active (9) de la bande transporteuse (6) ;
un séchoir (25) destinés à sécher l'encre appliquée sur la bande (2) ;
et des moyens d'évacuation et de stockage (26) destinés à retirer la bande imprimée (2) de la bande transporteuse (6) et un stockage consécutif,
dans lesquels
les moyens d'impression (16) comportent un nombre, par exemple 2 à 8, de traverses de cadre s'étendant dans une direction transversale au-dessus de ladite partie active (9) à des distances longitudinales mutuelles déterminées le long de la direction de transport, chacune des traverses de cadre portant une rangée de têtes à jet d'encre disposées de façon fixe (101) ou une ou plusieurs têtes à jet d'encre mobiles ;
des moyens de commande sont présents et remplissent au moins les fonctions suivantes consistant à :

enregistrer une configuration d'impression choisie, par exemple une impression uniforme, au moyen de l'entrée d'une information de configuration, par exemple à partir d'un scanner ;
activer les têtes à jet d'encre, par rapport à la vitesse constante choisie de la bande transporteuse et aux distances mutuelles dans la direction de transport entre des têtes à jet d'encre successives, de telle sorte que chaque tête pulvérise des gouttelettes d'encre de la couleur appropriée sur la bande (2) dans des positions sur la bande (2) déterminées par les moyens de commande ;
caractérisés en ce que les moyens d'enlèvement (213) sont destinés à collecter et enlever des gouttelettes d'encre flottantes (210) qui, après avoir été pulvérisées vers la bande (2) de matière par une tête à jet d'encre (101), ne sont pas ou pas entièrement absorbées par la matière mais éclaboussent par exemple de l'encre déjà appliquée et subissent ensuite un déplacement dans une direction avec une composante ayant une orientation opposée à celle de la direction de pulvérisation, ou amènent de l'encre déjà appliquée à subir un tel déplacement,

et **en ce que** les moyens d'enlèvement (213) sont du type électrostatique, et comportent :

une plaque (104) qui est ajoutée à chaque tête, ou à un groupe de têtes, ou à toutes les têtes et qui est chargée avec une tension électrique, par exemple de l'ordre de 5 kV, par rapport à la tête ou aux têtes et qui attire

de manière électrique pendant le fonctionnement les gouttelettes d'encre flottantes (210) ; et
un élément de transport (105, 106) qui est présent entre la bande transporteuse (6) et la tête ou les têtes appropriés (101) et qui dans une position de collecte collecte des gouttelettes d'encre attirées par la plaque (104), est ensuite guidé vers une station de nettoyage pour l'enlèvement de l'encre collectée de l'élément de transport, et est alors guidé en retour de nouveau vers sa position de collecte.

2. Moyens selon la revendication 1, dans lesquels un élément de transport est une deuxième bande transporteuse (105, 106), laquelle deuxième bande transporteuse (105, 106) comporte deux parties mutuellement parallèles entraînées à des vitesses égales.

3. Moyens selon la revendication 2, dans lesquels la deuxième bande transporteuse (105, 106) peut être déplacée en va-et-vient.

4. Moyens selon la revendication 2 ou 3, dans lesquels la deuxième bande transporteuse (105, 106) est du type sans fin.

5. Moyens selon la revendication 1, comportant ladite station de nettoyage, dans lesquels la station de nettoyage comporte un bain avec du liquide de rinçage (109).

6. Moyens selon la revendication 5, comportant des moyens de séchage destinés à enlever le liquide de rinçage de l'élément de transport nettoyé (105, 106) devant être retourné vers la position de collecte.

7. Moyens selon la revendication 2, comportant ladite station de nettoyage, dans lesquels la station de nettoyage comporte une racle (213) appuyant contre la deuxième bande transporteuse (105, 106).

8. Moyens selon la revendication 7, dans lesquels la racle (213) se compose d'une matière élastique en caoutchouc, par exemple du caoutchouc naturel, du caoutchouc synthétique ou du polyuréthane.

9. Moyens selon l'une quelconque des revendications précédentes, dans lesquels la ou chaque plaque (104) a une couche de revêtement électriquement isolante, par exemple une couche époxyde avec une épaisseur de l'ordre de 0,5 mm.

10. Moyens selon l'une quelconque des revendications 2, 3 et 4, dans lesquels la deuxième bande transporteuse (105, 106) se compose principalement d'une oléfine thermoplastique (TPO), par exemple Habileen®.

11. Moyens selon l'une quelconque des revendications 2, 3 et 4, dans lesquels, sur un côté éloigné du côté qui collecte les gouttelettes d'encre (210), la deuxième bande transporteuse (105, 106) est pourvue d'une couche améliorant la résistance à la traction et de manière optionnelle la rugosité, par exemple une couche à profil rugueux de polyester.

12. Moyens selon l'une quelconque des revendications 2, 3 et 4, dans lesquels, sur un côté qui collecte les gouttelettes d'encre (210), la deuxième bande transporteuse (105, 106) a au moins une couche externe avec des propriétés hydrophiles de dispersion d'encre de telle sorte que la formation de gouttelette est empêchée.

13. Moyens selon l'une quelconque des revendications précédentes, dans lesquels la ou chaque plaque (104) se compose de manière substantielle de métal, par exemple de l'acier, en particulier de l'acier inoxydable.

14. Moyens selon l'une quelconque des revendications 1 à 12, dans lesquels la ou chaque plaque (104) se compose de manière substantielle d'une plaque en matière plastique, par exemple du polyuréthane, qui est suffisamment résistante à l'usure et qui est électriquement conductrice dans au moins une certaine mesure.

15. Moyens selon l'une quelconque des revendications précédentes, dans lesquels l'élément de transport (105, 106) se compose d'une ou plusieurs matières électriquement isolantes.

16. Appareil (1) destiné à imprimer une bande (2) de matière, par exemple de papier ou de textile, lequel appareil est du type continu ou discontinu et comporte :

un cadre principal (3) ;
une bande transporteuse sans fin (6) qui est guidée sur un rouleau entraîné (4) et un rouleau d'inversion (5) disposé de manière sensiblement parallèle et qui est entraîné par des moyens de moteur à une vitesse constante choisie ;
des moyens de distribution de colle (8) destinés à appliquer une couche de colle en amont d'une partie supérieure active (9) de la bande transporteuse (6) pour une adhésion légère temporaire de la bande de textile sur cette partie active de telle sorte que cette bande (2) est fixée de manière non mobile par rapport à la bande transporteuse (6) ;
des moyens d'alimentation et d'avance destinés

à avancer une bande de textile depuis une alimentation jusqu'à la partie active (9) de la bande transporteuse (6) ;
des moyens d'impression (16) destinés à imprimer la bande qui passe (2) dans la zone de la partie active (9) de la bande transporteuse (6) ;
et des moyens d'évacuation et de stockage (26) destinés à retirer la bande imprimée (2) de la bande transporteuse (6) et un stockage consécutif,
dans lequel
les moyens d'impression (16) comportent un nombre, par exemple 2 à 8, de traverses de cadre s'étendant dans une direction transversale au-dessus de ladite partie active (9) à des distances longitudinales mutuelles déterminées le long de la direction de transport, chacune des traverses de cadre portant une rangée de têtes à jet d'encre disposées de façon fixe (101) ou une ou plusieurs têtes à jet d'encre mobiles ;
des moyens de commande sont présents et remplissent au moins les fonctions suivantes consistant à :

enregistrer une configuration d'impression choisie, par exemple une impression uniforme, au moyen de l'entrée d'une information de configuration, par exemple à partir d'un scanner ;
activer les têtes à jet d'encre, par rapport à la vitesse constante choisie de la bande transporteuse et aux distances mutuelles dans la direction de transport entre des têtes à jet d'encre successives, de telle sorte que chaque tête pulvérise des gouttelettes d'encre de la couleur appropriée sur la bande (2) dans des positions sur la bande (2) déterminées par les moyens de commande ;
les moyens d'évacuation comportent des moyens de séchage (25) destinés à sécher l'encre appliquée sur la bande (2) ; ;
comportant en outre
des moyens d'enlèvement (213) destinés à collecter et enlever des gouttelettes d'encre flottantes (210) selon l'une quelconque des revendications précédentes.

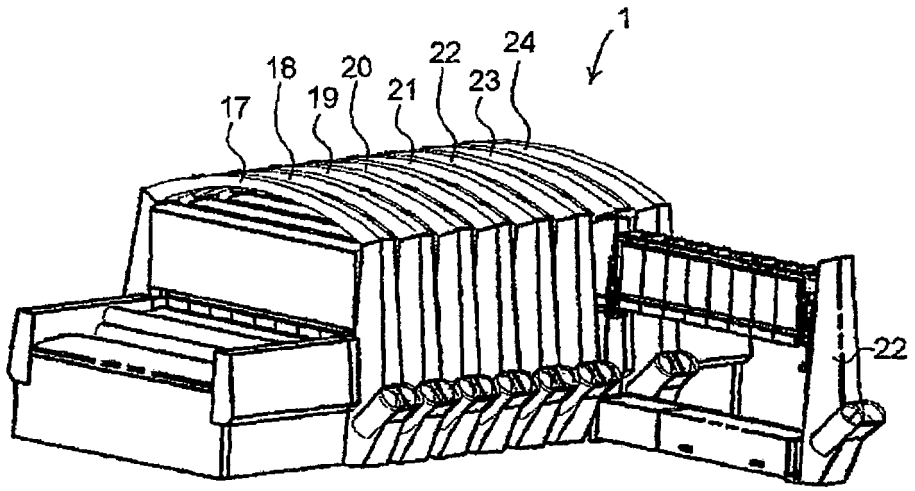


Fig. 1

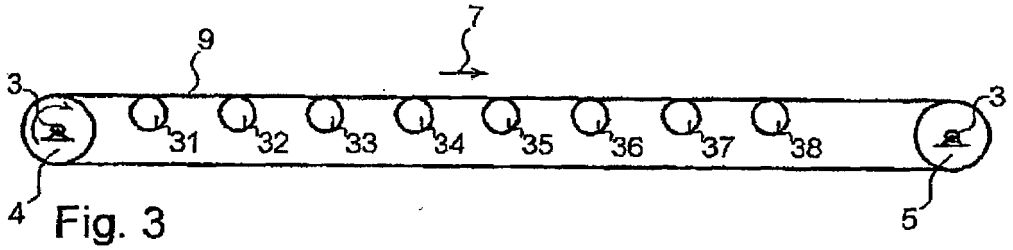


Fig. 3

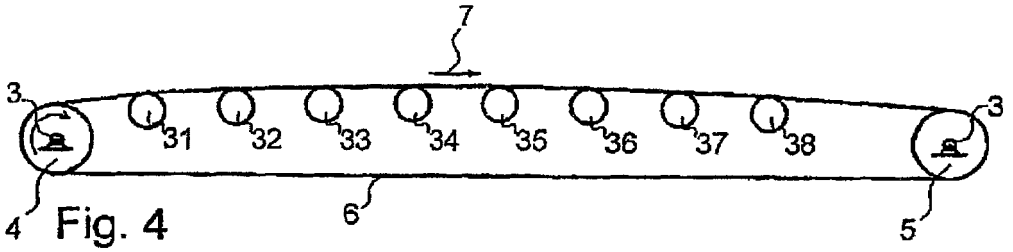


Fig. 4

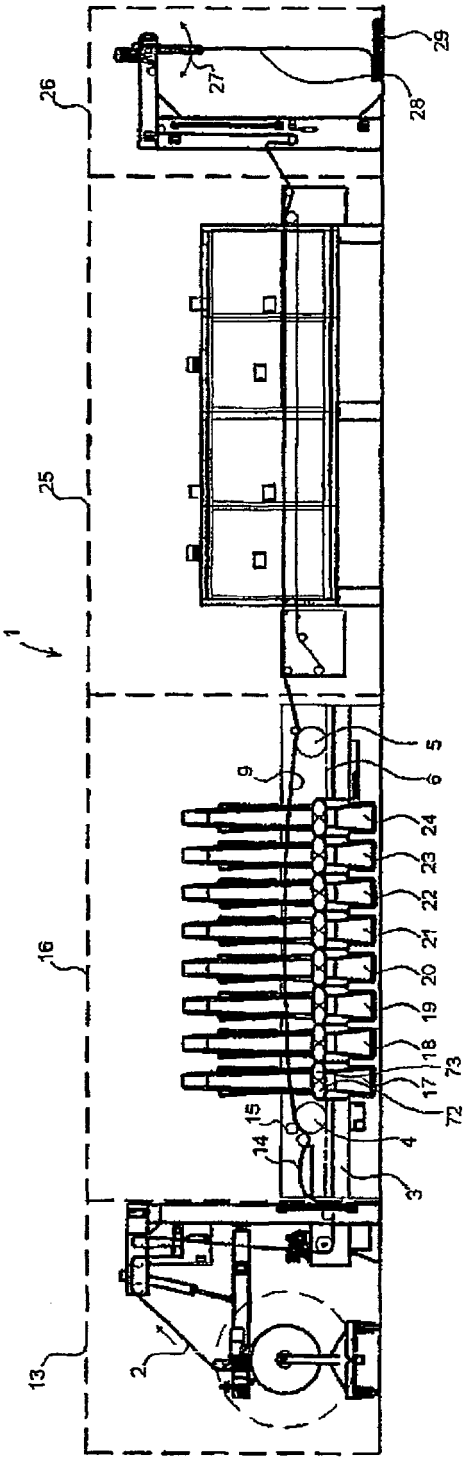


Fig. 2

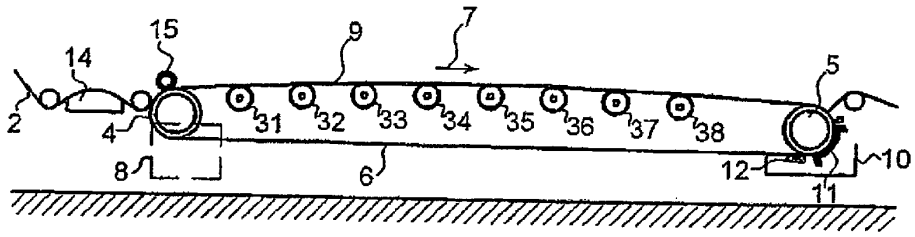


Fig. 5

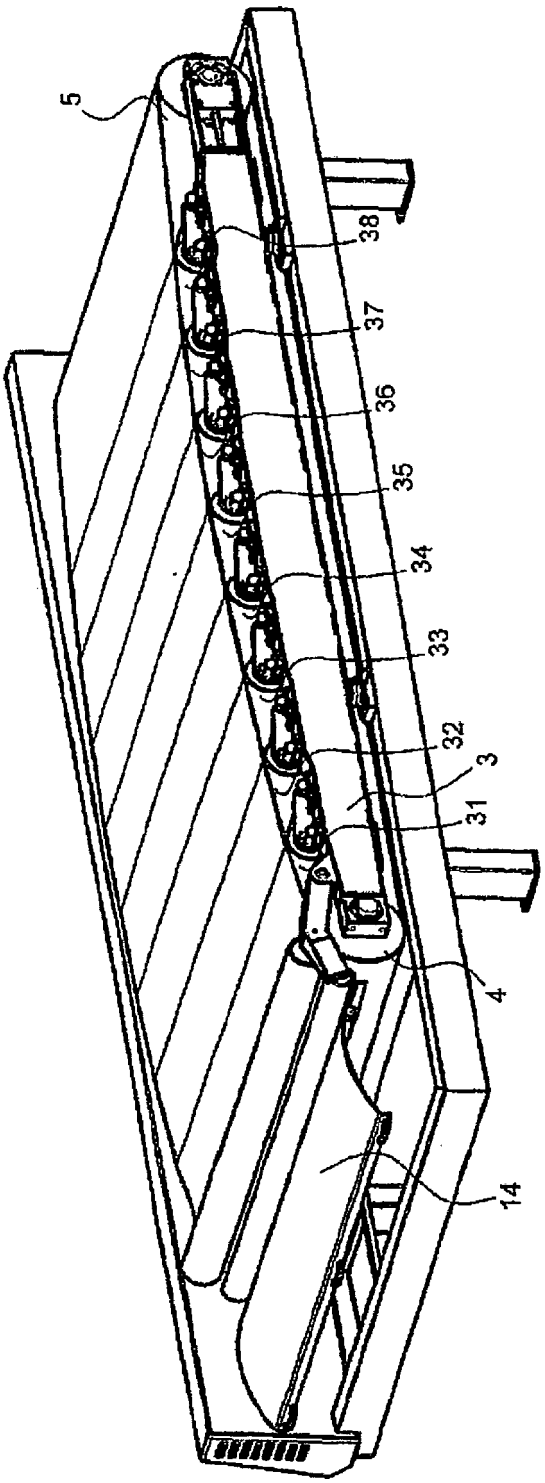


Fig. 6

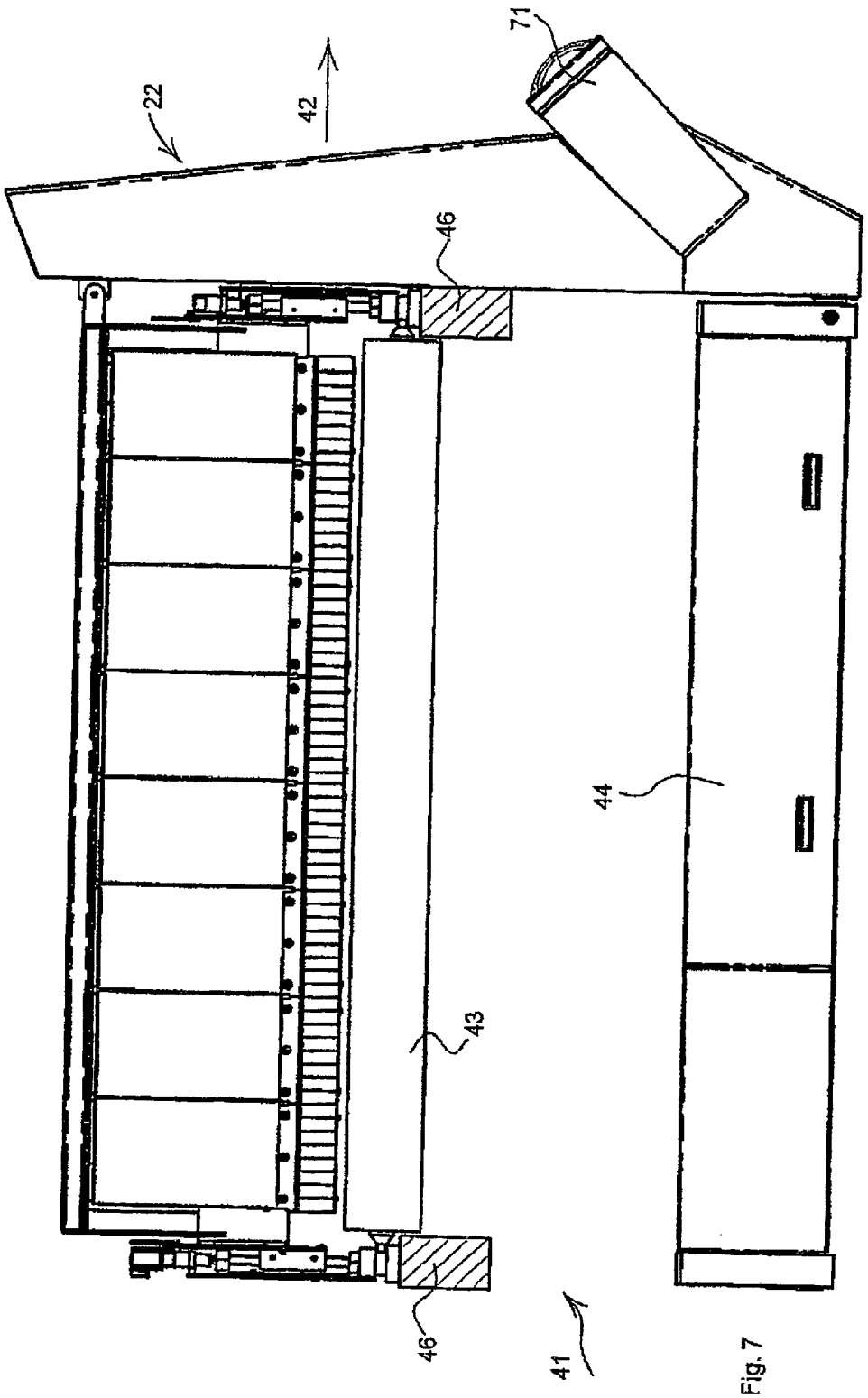


Fig. 7

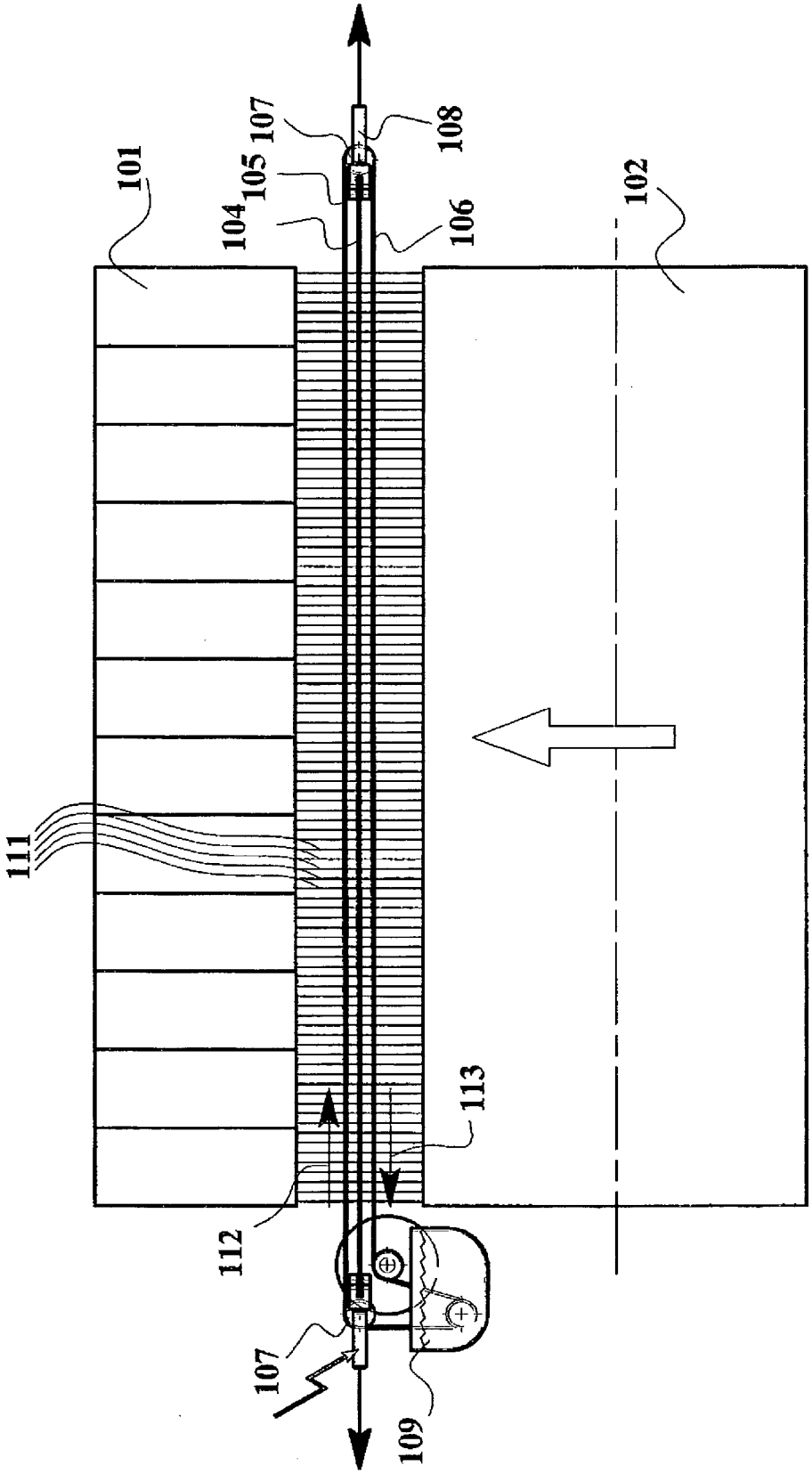


Fig. 8

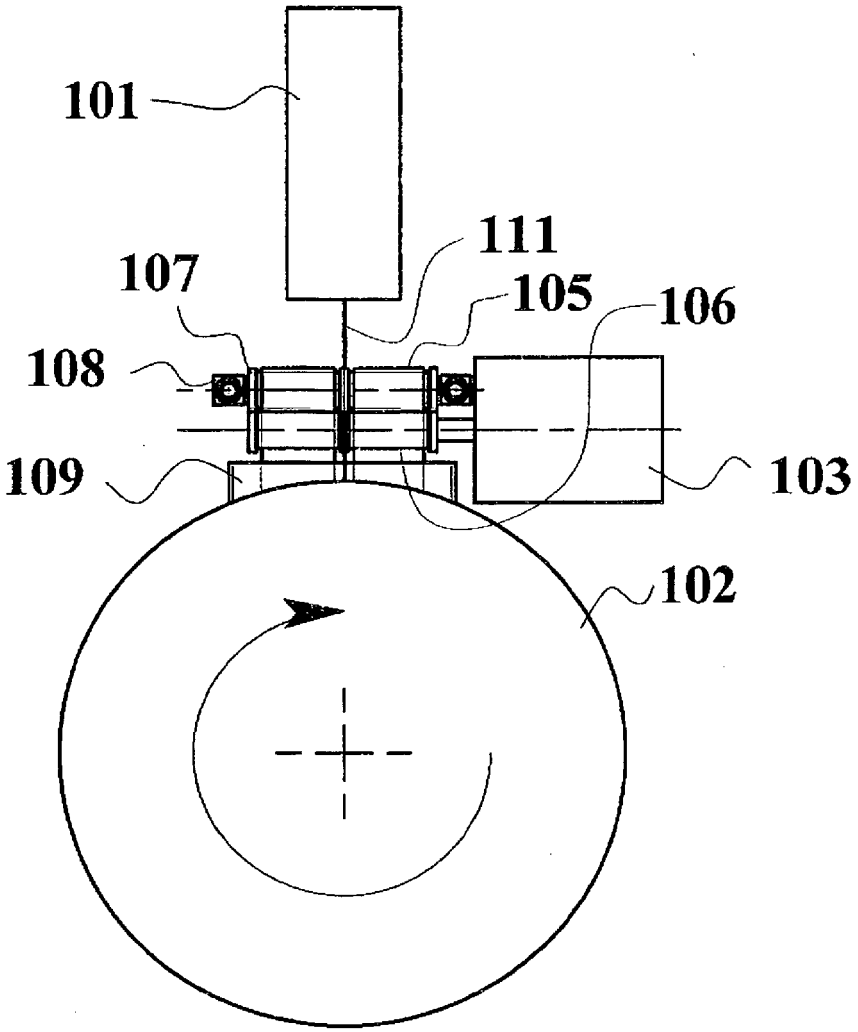


Fig. 9

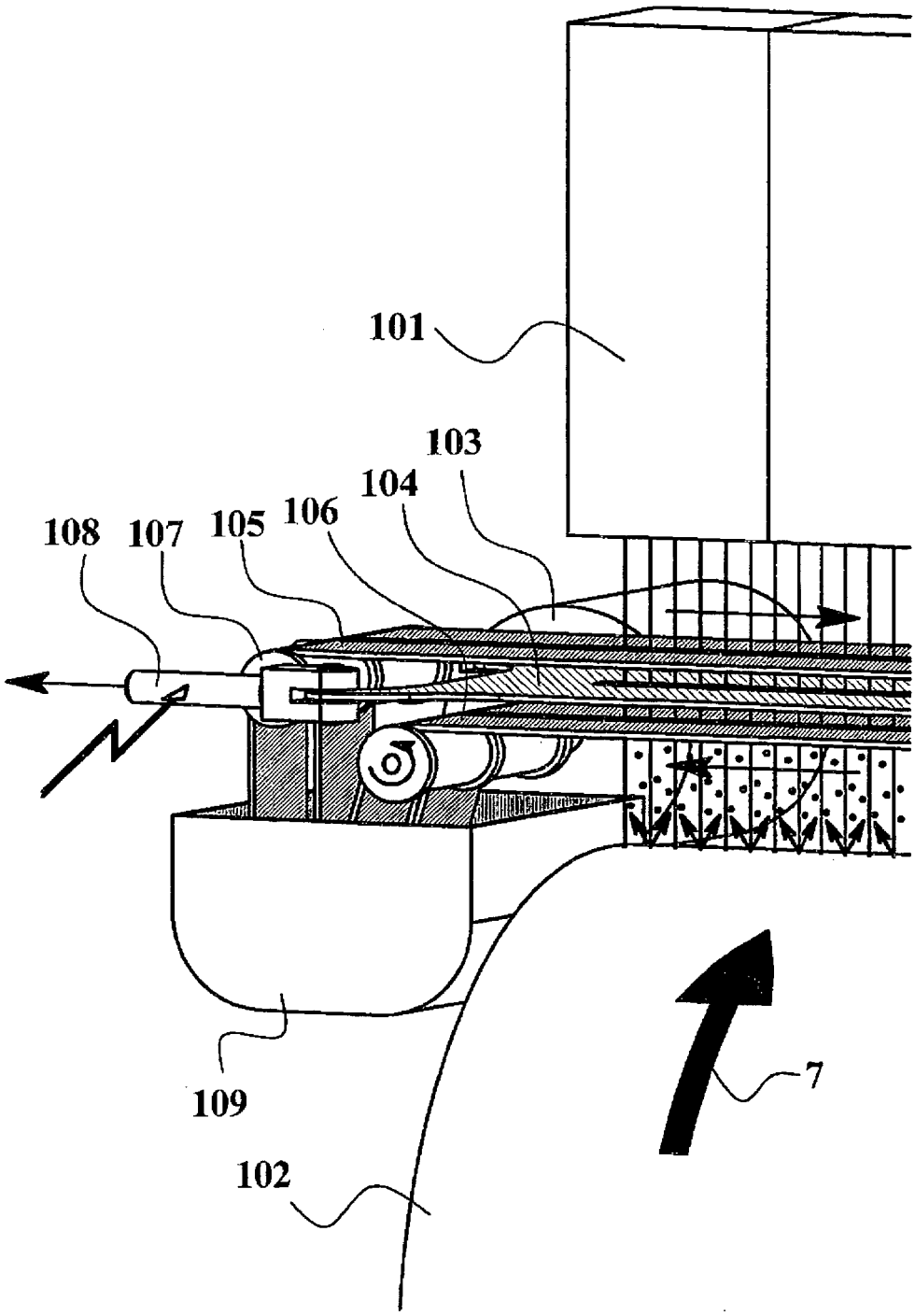


Fig. 10

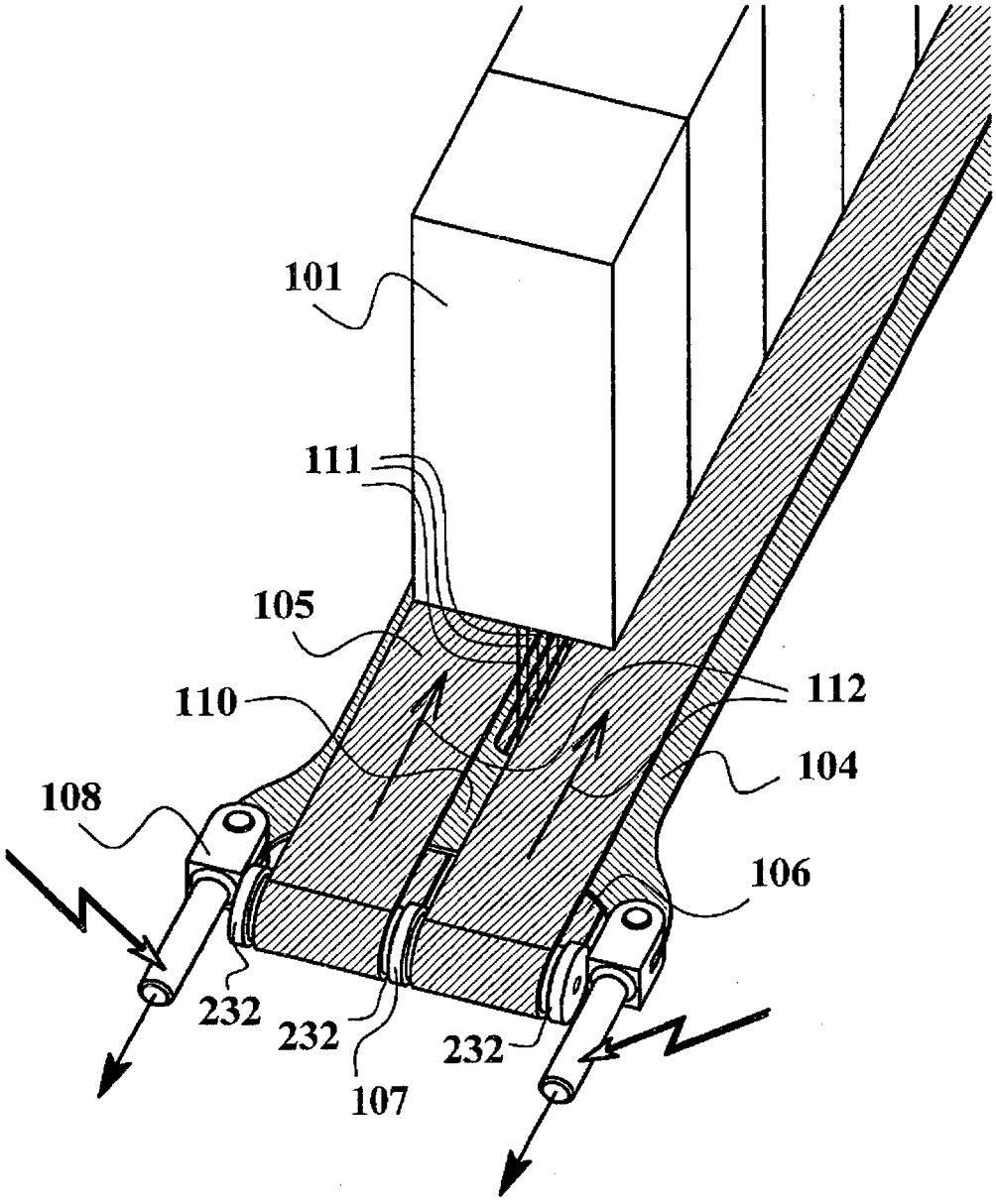


Fig. 11

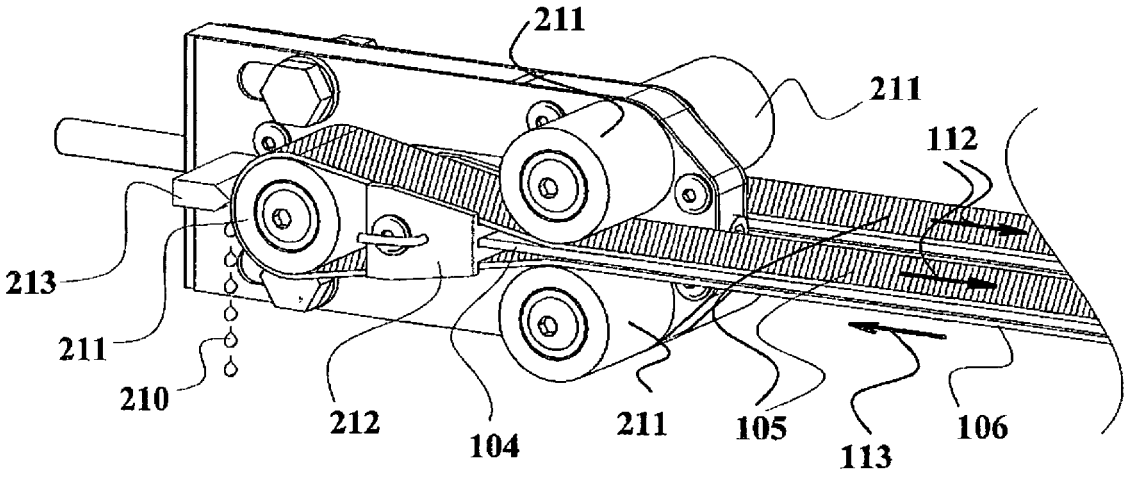


Fig. 12

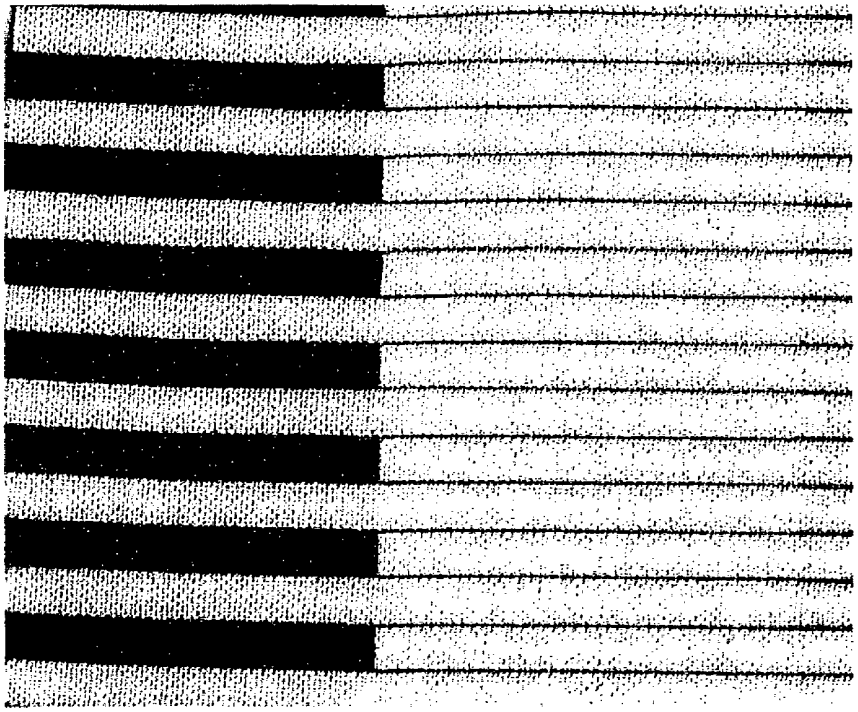


Fig. 13B

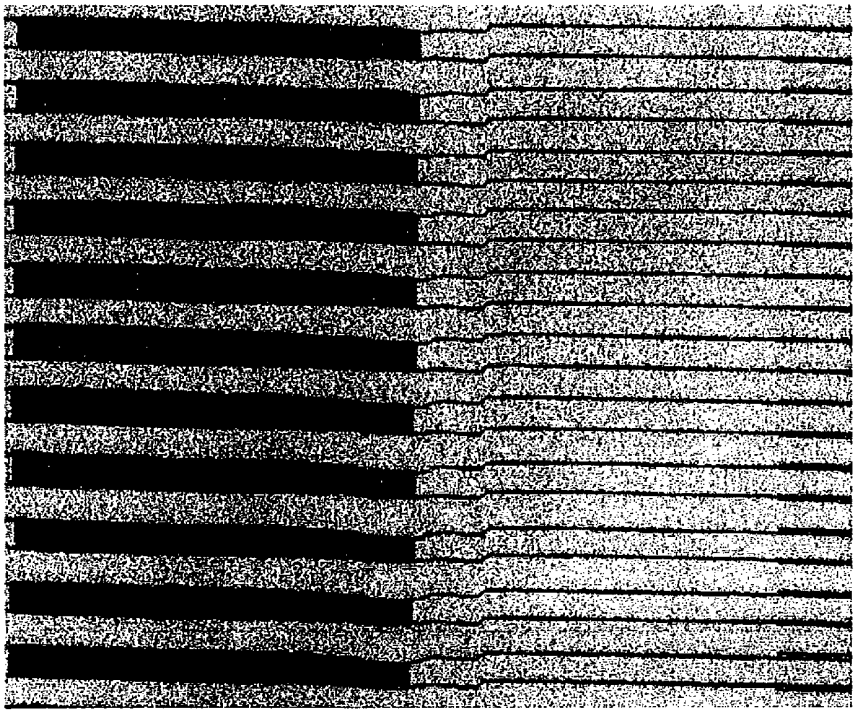


Fig. 13A

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1591258 A **[0002] [0029]**